Making Meaningful Connections

Consultation Technical Report

East West Rail Consultation:
31 March – 9 June 2021

This document contains the full Consultation Technical Report, without the Appendices. To access the Appendices, please visit **www.eastwestrail.co.uk**

Glossary

	Term	Description
A	**A428 Improvement Scheme**	The scheme promoted by Highways England to upgrade the A428 between Black Cat roundabout east of Bedford and Caxton Gibbet roundabout west of Cambourne
	Air Quality Directive	European Directive 2008/50/EC on ambient air quality and cleaner air for Europe
	Air Quality Management Area	An area designated by a local authority, where it believes the Government's objectives for air quality will not be achieved without additional interventions
	Alternative	In this report, 'alternative' is used when referring to a possible solution that has been considered but has been discounted and is not expected to be taken forward
	Assessment Factors	The factors used to assess and compare different options for the Project
	Oxford-Cambridge Arc (the Arc)	The area between Oxford and Cambridge, incorporating the county areas of Oxfordshire, Buckinghamshire, Bedfordshire, Northamptonshire and Cambridgeshire
	At-grade junction	A railway junction where tracks cross at the same level. Also known as a flat junction
B	**Balancing pond**	A pond into which water drains, with the intention of ensuring that local watercourses are not overloaded during periods of heavy or prolonged rainfall
	Ballast	Stone or gravel used to form the bed of a railway track
	Biodiversity net gain	An approach to development that leaves biodiversity in a better state than before the development took place
	Blockade	The closure of a rail route for an extended period (typically more than two to three days)
	Bridleway	A route over which the public have rights to pass on foot, cycle and on horseback
	Business case assessment	An assessment to determine the justification for undertaking a project by considering benefits, costs and risks

	Term	Description
C	**Cambourne North Station**	Option for a new station to the north of Cambourne
	Cambourne South Station	Option for a new station to the south of Cambourne
	Cambridgeshire Autonomous Metro	A proposed transit system connecting Cambridge to Alconbury, St Neots, Mildenhall and Haverhill
	Capital costs	Cost incurred during delivery of a project in purchasing buildings, land, construction works, and equipment as opposed to the costs of operating, maintaining or decommissioning the project
	Clearance	Space available around a moving train
	Clock-face timetable	A timetable arranged so that trains arrive or depart at the same times in the hour, every hour (for instance at 10, 30 and 50 minutes past the hour)
	Code of Construction Practice (COCP)	A public document which will provide contractors and suppliers with details of the measures, controls, and standards of work that they must follow
	Conflicting movements	A movement that requires a train to cross another route on the railway, at the same level, or trains to travel in opposite directions on the same route, in order to continue a journey
	Congested Infrastructure	An element of railway infrastructure for which demand for infrastructure capacity cannot be fully satisfied during certain periods, even after coordination of different requests for capacity. Defined by The Railways (Access Management and Licensing of Railway Undertakings) Regulations 2016
	Connection stage	Work will be divided into three connection stages which relate directly to a full journey and not just a piece of track: Connection Stage 1 (CS1): Oxford - Bletchley and Milton Keynes (services may be first opened to Bletchley in a two-phased approach) Connection Stage 2 (CS2) : Oxford - Bedford Connection Stage 3 (CS3): Oxford - Cambridge

	Term	Description
C	**Conservation Area**	An area of notable architectural or historic interest or importance in relation to which change is managed by law
	Core Section	The section of the Project between Clapham Green and The Eversdens, also referred to as Project Section D in this report
	Critical path	The longest sequence of activities in a plan or programme which must be completed on time in order to achieve completion of a project on a due date
	Crossovers	A connection between two tracks where points/switches on each track allow trains to pass from one track to the other
	Culvert	A tunnel carrying a stream or open drain
	Cut and cover	Earth and similar material that needs to be excavated as part of construction works (for example to form a cutting)
	Cut	Earth and similar material that needs to be excavated as part of construction works (for example to form a cutting)
D	**Development Consent Order (DCO)**	Order made by the relevant Secretary of State to authorise the construction, operation and maintenance of a nationally significant infrastructure project (NSIP). In relation to East West Rail, this would be the Secretary of State for Transport
	Department for Transport (DfT)	Government department responsible for the English transport network and a limited number of transport matters in Scotland, Wales and Northern Ireland that have not been devolved
E	**Earthworks**	General term for the excavation and placement of soil, rock and other material; or for existing cuttings and embankments
	East Coast Main Line (ECML)	Railway line running from London King's Cross to Edinburgh through Sandy and St Neots
	East Midlands Railway (EMR)	Train operator running services between London, the East Midlands and Yorkshire
	East West Rail EWR	A proposed new rail link, which would connect communities between Oxford, Milton Keynes, Bedford and Cambridge

	Term	Description
E	**East West Rail Company Ltd (EWR Co)**	Company set up by the Secretary of State for Transport to develop East West Rail
	Embankment	An earthwork construction that allows railway lines to pass at an acceptable level and gradient above the surrounding ground that is generally composed of soil and rock
F	**Fare revenue**	Income generated from passenger fares
	Fill	Earth and similar material that needs to be placed as part of construction works (for example in new embankments)
	First-mile journey	The first part of a journey between the starting point and a railway station, regardless of its actual length
	Flat junction	A railway junction where tracks cross at the same level. Also known as an at-grade junction
	Floodplain	An area of low-lying ground adjacent to a river, which is subject to flooding
	Ftph	Freight trains per hour
G	**Gauging analysis**	Analysis to determine the space available (clearance) between a moving train and surrounding infrastructure and between two trains on adjacent tracks
	Generalised journey time	A representation of the total time or cost of travelling, taking account of time spent waiting for or interchanging between trains
	Greenhouse gas (GHG)	A gas that contributes to the 'greenhouse effect' because it absorbs infra-red radiation (for example, carbon dioxide)
	Grade-separated junction	A railway junction where tracks cross at different levels
	Great Western Main Line (GWML)	The main railway route between London, Didcot, Bristol and South Wales
	Govia Thameslink Railway (GTR)	Govia Thameslink Railway, a train operating company

	Term	Description
H	**Headway**	The distance, or time, between one train passing a given point and the following train passing the same point.
	High Level Station	Where a station has platforms at different levels, the parts of the station at the higher level
	Highways England (HE)	The Government body responsible for managing the Strategic Road Network in England
	HMT	Her Majesty's Treasury, a Government Department
	Hotspots	Areas where critical engineering or environmental constraints were identified or areas where there were multiple constraints in close proximity to the alignment being developed
	HS2	High Speed 2, the new railway line under construction between London and the West Midlands, and beyond
I	**Impact Risk Zone (IRZ)**	A zone around a Site of Special Scientific Interest (SSSI) used to make an initial assessment of the potential risks posed to that Site by development proposals
	Indicative Alignment	The indicative, concept alignment within each Route Option used for the comparison of Route Options A to E in the previous stage of design
	Infrastructure Maintenance Depot	A depot at which staff and equipment involved in maintaining rail infrastructure are based and from which maintenance operations are coordinated
	In-service hazards	A potential source of harm arising from the operation of the railway
	Interchange	A station at which passengers may change between trains serving different routes and destinations
	Island platform	A platform between two railway tracks, where passengers may board trains on either track
K	**Km**	Kilometres
	Kph	Kilometres per hour

	Term	Description
L	**Last-mile journey**	The last part of a journey, between a railway station and the final destination, regardless of its actual length
	Level crossing	A location at which vehicles and pedestrians may cross railway tracks at grade (at ground level). This definition includes accommodation crossings which provide access to specific properties; and crossings which are operated by their users rather than automatically
	Level crossing Risk Assessment	An assessment undertaken periodically by Network Rail at level crossings to establish risks and measures required to mitigate those risks
	Listed building	A building placed on a statutory list, because of its architectural or historical interest, in relation to which change is managed by law
	London & North Western Railway (LNWR)	Historic British railway company, the original owner and operator of the West Coast Main Line
	Loading gauge	The maximum height and width for railway vehicles and their loads to ensure that they can pass safely through tunnels and under bridges and keep clear of trackside buildings and structures
M	**m**	metres
	Maintenance Access Plan	A plan identifying how the railway will be accessed by vehicles and staff for maintenance purposes
	Manually Controlled Barrier (MCB)	A barrier at a level crossing whose raising or lowering is controlled by a signalman, rather than occurring automatically
	Marston Vale Line (MVL)	The existing line and services operating between Bletchley and Bedford
	Ministry of Housing, Communities & Local Government (MHCLG)	UK government department responsible for housing, community and local government matters in England
	Midland Main Line (MML)	The main railway route between London St Pancras, Nottingham and Sheffield

	Term	Description
M	**Modal shift**	Change in travel behaviour that results in a journey being made by a different, usually more sustainable, mode of transport (for example, a car journey that is now made by cycle)
	Mph	Miles per hour
N	**National Infrastructure Commission (NIC)**	Executive agency responsible for providing the government with impartial, expert advice on major long-term infrastructure challenges facing the UK
	National Policy Statement for National Networks (NNNPS)	Sets out the need for, and the Government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national road and rail networks in England, and is the primary basis against which the Secretary of State for Transport will assess and determine DCO applications for new railways pursuant to section 104 of the 2008 Act
	Nationally Significant Infrastructure Project (NSIP)	A large-scale development (relating to energy, transport, water, or waste) of national significance that meets the thresholds set in Part 3 of the Planning Act 2008
	Network Rail (NR)	Network Rail Infrastructure Limited, the organisation which owns the majority of the railway infrastructure in England
	Net zero carbon	The approach of balancing greenhouse gas emissions, offsets or carbon sequestration (for example tree planting or carbon capture schemes), to achieve a net zero state
	Non-fare revenue	National Infrastructure Commission
	Non-fare revenue	Income from sources other than passenger fares
	Non-motorised users	People travelling on foot, by cycle or on horseback; or by any other means which is not motorised

	Term	Description
O	**Office of Rail and Road (ORR)**	A non-ministerial Government department which is the economic and safety regulator for Britain's railways
	Off-line alignment	An alignment that does not follow an existing railway or railway corridor, or in the case of a road, that is diverted from the existing alignment of the road
	Overhead Line Equipment (OLE)	The wires, known as catenary, suspended above railway lines to provide electrical power to trains, and their supporting structures
	On-line alignment	An alignment that follows an existing railway or railway corridor or, in the case of a road, the existing alignment of the road
	Operating costs	Costs incurred in the day-to-day running of the railway
	Operational resilience	The ability of the railway to respond to an adverse event (for example flooding or a failure of the infrastructure) while minimising the level of disruption to normal operations
	Option	In this report, 'option' is used to refer to a possible solution that has been considered and is being taken forward for further design and/or assessment
	Oxford Worcester and Wolverhampton Railway (OWWR)	The railway route between Oxford and Wolverhampton, via Worcester
P	**PA 2008**	Planning Act 2008
	Passing loop	A section of track used to allow one train to be passed by another train travelling behind it in the same direction
	Performance allowances	Extra time allowed within the timetable to provide a margin for late running
	Permitted Development Rights	Development that may be carried out by certain categories of (for example) statutory undertaker (such as Network Rail) under deemed planning permission ("Permitted Development Rights"), for certain types of work. Permitted Development Rights also benefit other statutory undertakers
	Plain line	A section of track without points/switches and crossings
	Points	A junction between two railway lines, that can be set to guide a train to or from either of those lines. Can also be referred to as a switch

	Term	Description
P	**Possession**	A temporary closure, or partial closure, of the railway to allow construction or maintenance works to be carried out
	Preferred Route Option E	The Route Option previously selected as the preferred area between Bedford and Cambridge in which to seek alignments in this phase of developing the Project
	Preliminary Environmental Information Report (PEIR)	A report which provides information about the expected impacts of the Project on the environment based on information that EWR Co has available to it at the time of the Statutory Consultation
	Programme-Wide Output Specification (PWOS)	A document containing detailed requirements for the Project, agreed with the Department for Transport
	Programme risk	The risk of a delay to the programme for design, procurement, construction and operation for a project
	The Project	The infrastructure, systems, rolling stock and organisational arrangements which need to be created or modified to deliver East West Rail and its intended outcomes
	Project Section	The infrastructure, systems, rolling stock and organisational arrangements which need to be created or modified to deliver East West Rail and its intended outcomes
	Public Rights of Way (PRoWs)	A way over which the public have a right to pass and repass
R	**Reference Alignment**	The alignment option against which the performance of other alignment options is assessed
	Regionally strategic utilities apparatus	Equipment related to the supply of power, water and telecommunications which has more than local significance – which may include pipelines, cables, overhead electricity transmission lines and substations
	Rolling stock	Any vehicle which can run on a railway track

	Term	Description
R	**Route Corridor, Route Option and Route Alignment**	Route Corridors are the broad areas within which the new railway might be located, identified as part of the initial 'sift' of possibilities in 2016. Within the preferred Route Corridor, several narrower Route Options were identified and a Preferred Route Option was announced in 2020. The Project is now at the stage of selecting a Route Alignment.
S	**Safety risk**	The risk of unsafe practices or situations occurring on the railway that may lead to accidents
	Scheme	A project or a group of projects being promoted or undertaken by a party or parties other than EWR Co with objectives which do not directly facilitate, but may be related to, East West Rail
	Scheduled monument	A historic building or site considered to be of national importance, placed on a list kept by the Government and requiring Government approvals for any works which might affect the scheduled monument
	Siphon	A pipe or tube that allows water to flow beneath an obstruction then up and out the other side
	Shepreth Branch Royston (SBR) line	The line that connects Cambridge to Hitchin via Shepreth
	Skew	The angle at which a structure passes over or under a railway, road or river
	Source Protection Zone (SPZ)	SPZs are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction
	Site of Special Scientific Interest (SSSI)	The land notified as an SSSI under the Wildlife and Countryside Act 1981, as amended. SSSI include the most important sites for wildlife and natural features in England, supporting many characteristic, rare and endangered species, habitats and natural features

	Term	Description
	Stabling point	A place where rolling stock can be stored when not in service
	Statutory Consultation	A stage of consultation which a promoter of a nationally significant infrastructure project is required to undertake, under section 42 the Planning Act 2008
	St Neots South Option A Station	Option for a new station in the St Neots area. Both St Neots station options would be located to the south of St Neots. This would be in addition to the existing St Neots station
	St Neots South Option B Station	Option for a new station in the St Neots area. Both St Neots station options would be located to the south of St Neots. This would be in addition to the existing St Neots station
	Subcatchment divide	Topographic ridge or ridges that separate distinct tributary areas in a river catchment
	Switch	A junction between two railway lines, that can be set to guide a train to or from either of those lines. Can also be referred to as points
T	**Tempsford Option A Station**	Option for a new station in the Tempsford area. Both Tempsford station options would be located to the north-east of Tempsford
	Tempsford Option B Station	Option for a new station in the Tempsford area. Both Tempsford station options would be located to the north-east of Tempsford
	Thameslink	Train operator running services between the south coast of England, Bedford and Cambridge
	Thameslink Core	The part of the Thameslink route between London St Pancras and London Blackfriars station
	The 2005 Act	The Railways Act 2005
	The 2020 Order	The Network Rail (East West Rail) (Bicester to Bedford Improvements) Order 2020 – a TWAO obtained by Network Rail authorising works to the railway to enable EWR services to run between Oxford and Milton Keynes
	Tph	Trains per hour
T	**Train path**	The planned timing and route of a train
	Turn around allowance	Time allowed within the timetable for trains to be prepared after completing one service before commencing another service
	TWA 1992	Transport and Works Act 1992
	Transport and Works Act Order (TWAO)	A Transport and Works Act Order made by the Secretary of State under the TWA 1992 alongside a deemed planning permission, allowing works to a railway or other transport project to be undertaken
U	**Utility company**	A company that owns equipment which carries and distributes water, electricity, gas or telecommunications. These commodities are collectively known as 'utilities'
W	**West Anglia Main Line (WAML)**	The main railway route between London Liverpool Street and Cambridge
	West Coast Main Line (WCML)	The main railway route between London Euston and Glasgow
	WLC	Whole Life Costs
	WTT	Working Timetable

01. Introduction

1.1 Chapter summary

1.1.1. This Technical Report contains detailed, technical information which supports the Consultation Document. It sets out how we have assessed options during design development, and how we have considered environmental factors.

1.1.2. Each Chapter in the report is introduced by a summary that highlights the main points of the section.

1.1.3. This Chapter introduces East West Rail (EWR), the work needed (the Project) to deliver EWR and the role of East West Railway Company (EWR Co) in the Project.

1.1.4. It explains the Project, which is being delivered in four stages that allow services to run between Oxford and Bicester (already completed); then between Oxford and Milton Keynes; then between Oxford and Bedford; and, finally between Oxford and Cambridge.

1.1.5 It summarises the scope of, and background to, the non-Statutory Consultation that this Technical Report informs and briefly describes the six Project Sections that are used to explain the infrastructure proposals included in the non-Statutory Consultation.

1.1.6. It sets out the purpose and structure of this Technical Report.

1.2 East West Rail

1.2.1. EWR is a proposed new rail link, which would connect communities between Oxford, Milton Keynes, Bedford and Cambridge.

1.2.2. By increasing connectivity across the Oxford-Cambridge Arc (the Arc) and boosting the local economy, the new railway line is part of the Government Agenda to create a range of opportunities for people right across the area and help to spread prosperity across the UK.

1.2.3. The East West Rail Consortium, formed in 1995, brought together local authorities and local enterprise partnerships in a collaborative partnership that has actively made the case for the development and delivery of East West Rail for over 20 years.

1.2.4. The Sponsor of the Project is the Secretary of State for Transport who, through his Department, owns the Project and has overall responsibility for its success.

1.2.5. EWR Co is a government-owned company set up by the Secretary of State for Transport in 2018. Previous plans for East West Rail were developed by the Department for Transport, Network Rail and the East West Rail Alliance (formed by Network Rail, Atkins, Laing O'Rourke and Volker Rail). EWR Co is now responsible for:

- Overseeing and developing work already underway between Oxford and Bletchley (delivered by the East West Rail Alliance);
- Developing all aspects of the Project between Bletchley and Cambridge.

1.2.6. In undertaking this role, EWR Co has been given a remit by the Government to challenge industry norms including seeking to implement new delivery and operational models.

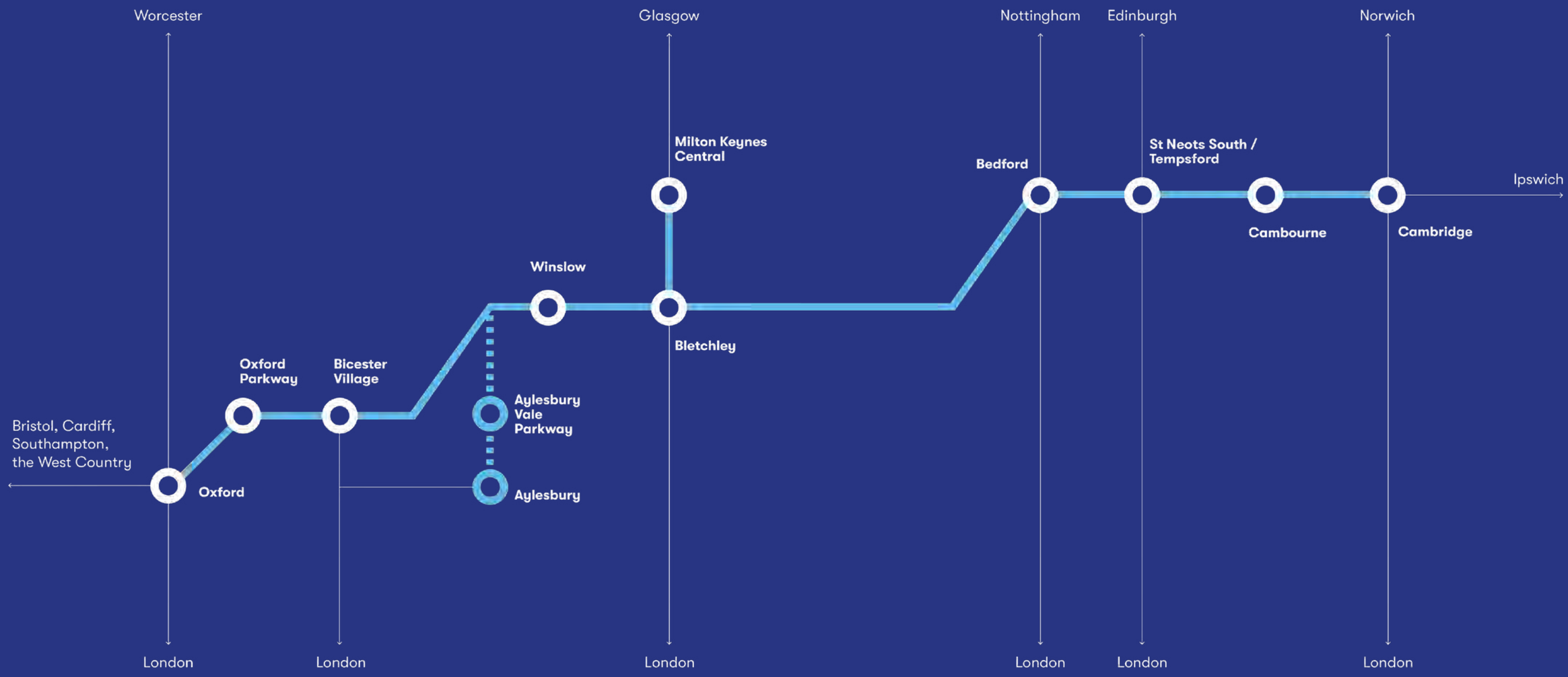
1.2.7. Although they are sometimes referred to as being part of EWR, proposals to improve the railway between Cambridge, Ipswich and Norwich, to enable EWR services to continue eastwards and to improve capacity for freight, are not part of the Project and are not in the remit of EWR Co.

1.3 The Project

1.3.1. Delivery of the Project is being promoted in four stages with an ambition for trains to be running the full length of the line between Oxford and Cambridge by the end of the decade.

1.3.2. The first stage (already in operation) has improved the link between Oxford and Bicester and was completed in 2016. This part of the Project was delivered by the Chiltern Railway Company Limited under the Chiltern

The full proposed East West Rail link



Key:

Proposed East West Rail route

Proposed East West Rail station

Potential future section of East West Rail

Note: Current and potential stations between Bletchley and Bedford not shown

Figure 1.1: Proposed East West Rail Route between Oxford and Cambridge

Railways (Bicester to Oxford Improvements) Order 2012, made under the Transport and Works Act (TWA) 1992.

1.3.3. The next stage will extend EWR further north and east, allowing services to run between Oxford and Milton Keynes. Creating this link requires the reinstatement of an out-of-use railway line between Gavray Junction at Bicester and Bletchley including a new bridge over High Speed 2 (HS2). It also requires an upgrade to the existing Bletchley Rail Flyover and addition of two new, high-level platforms at Bletchley station. In 2020, Network Rail obtained the Network Rail (East West Rail) (Bicester to Bedford Improvements) Order 2020 (the 2020 Order), made under the TWA 1992. The 2020 Order authorises the construction, operation and maintenance of works to the railway between Bicester and Bletchley and major civil engineering construction work has commenced. These works[1] will enable the introduction of two trains per hour in each direction between Oxford and Milton Keynes plus additional freight capacity and future EWR service capacity.

1.3.4. The third stage would upgrade the existing railway between Oxford and Bedford to meet the Project Objectives detailed in Chapter 3. These works go beyond those authorised by the 2020 Order obtained by Network Rail so will require a new, separate consent. Enhancements to the railway between Oxford and Bicester, to the Marston Vale Line between Bletchley and Bedford, and to Bedford station form part of EWR Co's proposals. Additional works to those being delivered in the previous stage may be required between Bicester and Bletchley.

1.3.5. The fourth stage would provide an entirely new railway infrastructure between Bedford and Cambridge. This would include two new stations: one in the vicinity of St Neots or Tempsford on the East Coast Main Line (ECML, the line between London, York and Scotland); and one at Cambourne. The Government has directed that the works required between Bedford and Cambridge are a nationally significant infrastructure project (NSIP). This means that they must be authorised by the process as set out in the Planning Act 2008 (PA 2008). EWR Co will apply to the Secretary of State for Transport for a Development Consent Order (DCO) to authorise the works.

1.3.6. EWR Co will include its proposals to upgrade the existing railway between Oxford and Bicester, and between Bletchley and Bedford, within the DCO application. Works between Oxford and Milton Keynes within the existing railway corridor may not require planning permission or development consent.

1.3.7. A potential new 'Cambridge South' station, which the new EWR railway could also serve, is being promoted by Network Rail[2] and will be subject to a separate consent process. There are also several schemes being developed in the Oxford area. EWR Co recognises that a number of these schemes may require further consultation by Network Rail and will be subject to a separate consent process.

[1] https://www.networkrail.co.uk/running-the-railway/railway-upgrade-plan/key-projects/east-west-rail/east-west-rail-western-section/east-west-rail-western-section-phase-2/

[2] https://www.networkrail.co.uk/running-the-railway/our-routes/anglia/cambridge-south-station/

1.4. Consultation

1.4.1. The PA 2008 requires the promoter of any NSIP to consult with stakeholders and communities on its proposals, providing an appropriate level of information to explain the project and its impacts upon the environment and local communities. This includes the provision of a Preliminary Environmental Information Report (PEIR). This is carried out through what is known as a Statutory Consultation. However, EWR Co is committed to early and ongoing engagement on its proposals as they develop and has therefore chosen to consult at this stage on options and alternatives which are being considered, before presenting a more detailed design at the Statutory Consultation. The current consultation is therefore described as a 'non-statutory' consultation.

1.4.2. This 'non-statutory' consultation includes EWR Co's proposals for the upgrade to the railway between Oxford and Bicester, and between Bletchley and Bedford, and the new railway between Bedford and Cambridge (i.e. the third and fourth stages of the Project). It also considers the way that services may be operated and accessed across the whole Project.

1.4.3. EWR Co has previously consulted on its proposals for works between Bedford and Cambridge. A Route Corridor, the broad areas within which the new railway might be located, was identified as part of the initial 'sift' of possibilities in 2016. Between January and March 2019, EWR Co asked for views on five potential Route Options for the new railway within the overall Route Corridor identified in 2016. These Route Options were still broad areas within which the stations and Route Alignment, i.e. the tracks and associated infrastructure, might be constructed to connect Bedford and Cambridge. Following a recommendation made by EWR Co, having regard to matters including feedback provided during the consultation exercise, the Government has since selected a Preferred Route Option (Route Option E). Further details about the process to get to and selection of Route Option E can be found in Chapter 5 - Approach to developing the designs. Public information events were held in early 2020 to understand the views, concerns and priorities of communities across the area, following the Secretary of State's announcement of Route E as the Preferred Route Option. When Government guidelines created in response to the Covid crisis made further in-person meetings impossible, we reached out to parishes across the area to understand how best we could communicate remotely, and have continued to work with these groups and local authorities over the past year.

1.4.4. Using their advice and feedback on how best to gather views, we are now publishing options for the proposed alignment of the railway and station locations between Bedford and Cambridge.. Now that Route Option E has been decided upon, we want to seek your views on the proposed alignment of the railway and station locations between Bedford and Cambridge.

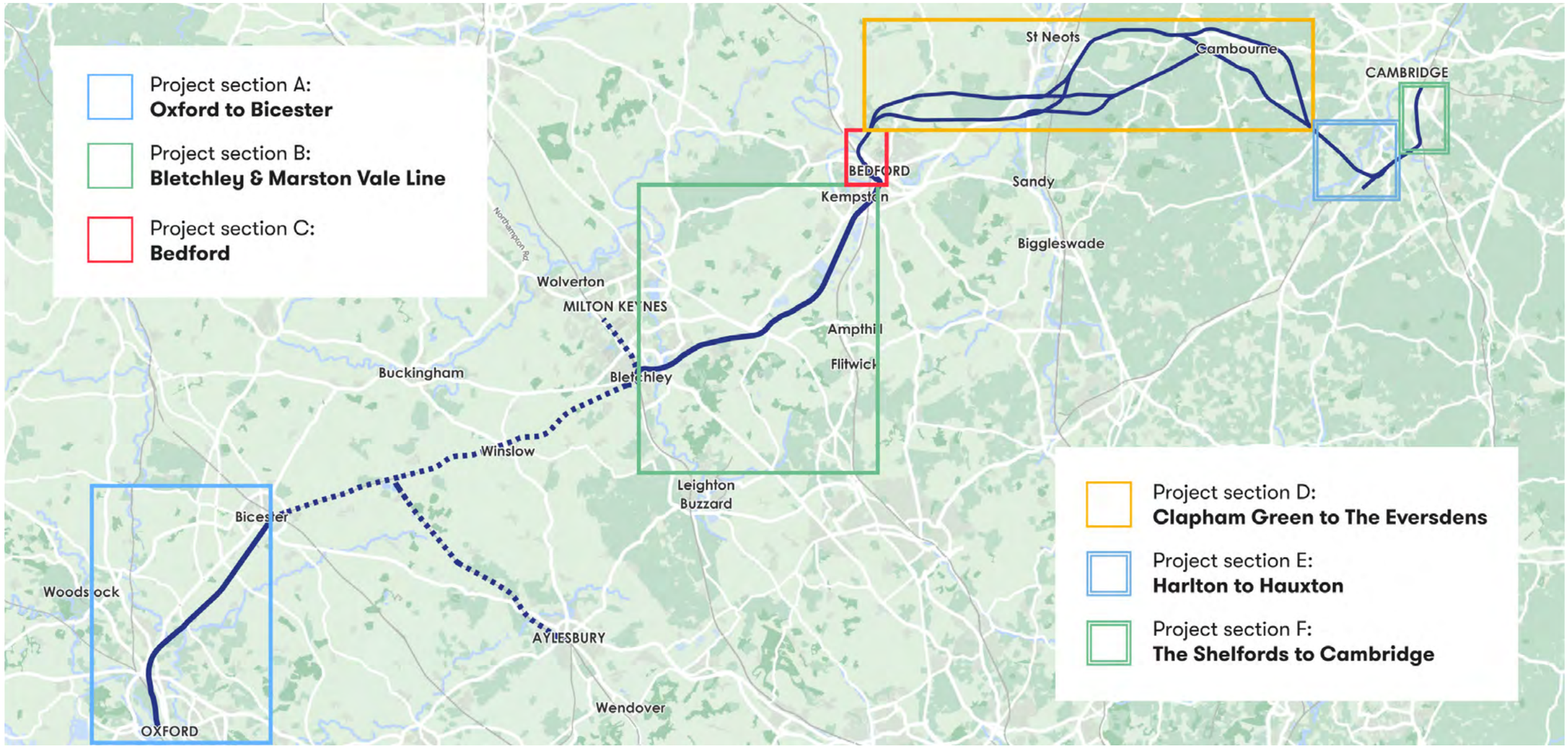


Figure 1.2: Project Sections Oxford to Cambridge

1.4.5. This is the first time that EWR Co has consulted on its own proposals for works between Oxford and Bicester and between Bletchley and Bedford (i.e. the proposals which would be the subject of EWR Co's DCO application, depending on the outcome of the consultation).

1.4.6. The infrastructure proposals in this consultation are divided into six Project Sections. Each of these Project Sections can be considered independently with all areas forming a single alignment for the railway between Oxford and Cambridge once preferred options have been identified. Figure 1.2 shows the Project Sections.

1.4.7. **Project Section A (Chapter 6): Oxford to Bicester: improvements to the existing railway and stations:**

- Improvements to Oxford, Oxford Parkway and Bicester Village Stations, to accommodate more trains and passengers;
- Changes to the way vehicles and pedestrians cross the railway around London Road in Bicester, to improve safety and ensure the trains run a faster, more reliable service.

1.4.8. **Project Section B: Bletchley and the Marston Vale Line (Chapter 7): improvements to the existing railway and stations:**

- Options for the pattern of train services between Bletchley and Bedford and possible changes to station locations so that the railway can benefit more people;
- Changes to the way vehicles and pedestrians cross the railway in the area, replacing level crossings with safer alternatives to ensure the trains run a faster, more reliable service;
- Improvements to track, including the reinstatement of a second track between Bletchley and Fenny Stratford.

1.4.9. **Project Section C: Bedford (Chapter 8): improvements to the existing railway and a new section of railway:**

- Changes to the track alignment south and west of Bedford, including addition of a second track;
- Relocated Bedford St Johns station, moved to fit with proposed new track alignment;
- Improvements to Bedford station including to create more platforms and a better experience for passengers;
- Works adjacent to the Midland Main Line (MML) north of Bromham Road;
- A section of new railway leaving the MML and heading eastwards past Clapham and the northern outskirts of Bedford.

1.4.10. **Project Section D: Clapham Green to The Eversdens (Chapter 9): new railway and new stations:**

- Construction of a new railway;
- A new station in the area near Tempsford and St Neots, in addition to the existing station on the ECML, which could provide an interchange between EWR and the ECML;
- A new station at Cambourne.

1.4.11. **Project Section E: Harlton to Hauxton (Chapter 10): new railway and a new railway junction:**

- New railway infrastructure southwest of Cambridge including a new railway junction near Harston and Hauxton.

1.4.12. **Project Section F: The Shelfords to Cambridge Station (Chapter 11): improvements to the existing railway and Cambridge Station**

- Improvements or closure of level crossings in the vicinity of The Shelfords;
- Additional tracks to the West Anglia Main Line (WAML) between Shepreth Branch Junction and Cambridge Station and modification of Shepreth Branch Junction;
- Additional platforms at Cambridge Station.

1.5. Technical Report

1.5.1. This Technical Report forms part of the 'non-statutory' consultation and should be read in conjunction with the Consultation Document and accompanying maps.

1.5.2. The objective of this Technical Report is to present details relating to the proposals in each Project Section being consulted upon. The overall case for EWR and its objectives are presented so that the reasons for the options presented and any emerging preferences can be understood. The Technical Report uses Assessment Factors to assist in identifying which options best meet the Project Objectives.

1.5.3. The report is structured as follows:

- Chapter 2 presents the case for EWR;
- Chapter 3 and Chapter 4 set out the Project Objectives, and considerations of additional works and construction, used to develop the options presented;
- Chapter 5 explains the Assessment Factors used to ensure options are consistent with the Project Objectives and the case for EWR, and it sets out how the design has been developed to reach the options presented;
- Chapter 6 to Chapter 11 present each of the Project Sections in turn – describing the area, the options being considered, any options that have been discounted, the assessment of the options, and a conclusion on the relative performance of the options;
- Chapter 12 summarises the next steps in the development of the proposals.

02. The case for East West Rail

2.1 Chapter summary

2.1.1. This Chapter explains the case for East West Rail (EWR) as a means of enhancing connectivity, expanding the employment catchments and supporting housing growth in the Oxford to Cambridge Arc ("the Arc"). It draws on work undertaken by the National Infrastructure Commission (NIC), which provides impartial, expert advice on major long-term infrastructure challenges.

2.1.2. The Chapter also summarises the benefits of new rail connections, rather than road connections, to serve this corridor.

2.2 The overall case for East West Rail

2.2.1. Oxford and Cambridge are centres of world-class education and together with Milton Keynes are collectively home to world-leading research, innovation and technology businesses and institutions. In addition to being economically highly productive, each of these places has seen considerable growth in recent times. However, the economic success of the Arc has led to a demand for homes that is not currently being met by supply, which has led to high house prices and is diminishing the ability of companies to attract talent, which is further exacerbated by poor east-west transport connections. This problem was identified by the NIC in their 2017 report "Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc".

2.2.2. In March 2016, the NIC was asked to consider how to maximise the potential of the Cambridge – Milton Keynes – Oxford corridor as a single, knowledge-intensive cluster that competes on a global stage, protecting the area's high-quality environment, and securing the homes and jobs the area needs. Recognising the national economic importance of the Arc, the NIC found that the Arc's economic potential is constrained by a lack of suitable housing and poor east-west connectivity – by around £93[3] billion (2020 prices) each year by 2050 without major intervention[4]. The Arc's economic success is in part driven by highly productive industries, which cluster in towns and cities across the Arc, providing employment opportunities and strengthening the UK's international competitiveness.

2.2.3. Making the case for EWR, the NIC concluded that it "will enhance connectivity across the Arc, expanding the labour markets of key towns and cities" and "can play a key role in tackling the Arc's housing crisis, unlocking major new development locations and enabling transformational growth around existing towns and cities[5]."

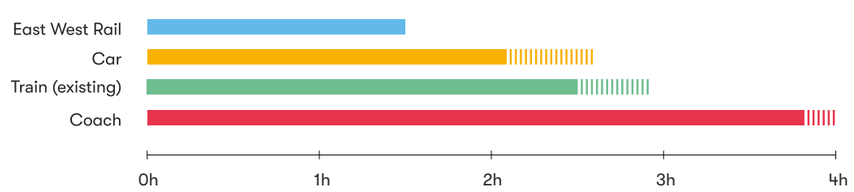
2.2.4. The NIC reached these conclusions before the recent Covid-19 outbreak. In the short-term, the Covid-19 outbreak has significantly cut demand for rail travel, but most of the sections of EWR being consulted on would not enter service until the end of the decade. The long-term impact on rail demand (amongst other uncertainties such as technological change) is uncertain and it is possible that some people will permanently change their travel patterns – this acts as a downside risk to the business case. As the purpose of EWR is to enhance connectivity across the Arc rather than to provide additional capacity on an existing service, it is expected that the impact of this would be relatively small. However, EWR Co, working with the Department for Transport (DfT), and will further investigate these risks in future business case iterations, in particular on the long-term trends for demand growth once the lockdown restrictions are eased. This analysis could use scenario planning techniques.

2.2.5. In any event, EWR will better connect Oxford and Cambridge which, with their world-class reputations in life sciences and biotech, are both now at the forefront of the global endeavour against Covid-19. For example, it is Oxford University and AstraZeneca (head-quartered in Cambridge) who were two of the world leaders in developing a vaccine for the virus. EWR will provide better connectivity between these globally significant business clusters.

2.2.6. Existing rail connections across the Arc are limited. The only existing east-west rail connection is a slow, stopping service between Bletchley and Bedford, provided on a branch between the West Coast Main Line (WCML, the route between London, the West Midlands, Northwest England and Scotland) and the Midland Main Line (MML, the route between London, Nottingham and Sheffield).

2.2.7. Currently, for example, the fastest route by rail between economic centres across the Arc is often via London. Travelling from Oxford to Cambridge by rail takes almost three hours and requires passengers change trains between London stations, which involves crossing London using another mode of transport, such as the London Underground or London Busses , adding to the journey's susceptibility to delay or cancellations as well as its inconvenience. Figure 2.1 compares the average range of journey times between Oxford and Cambridge using existing modes of transport, to the indicative EWR journey time assumption[6]. This demonstrates that a less sustainable mode of travel is favoured by the status quo. Journey times would also be improved by longer distance journeys traversing the Arc using interchange to and from EWR services.

Figure 2.1: Oxford to Cambridge minimum and maximum journey time comparison by mode



2.2.8. The benefits of EWR have been identified by the NIC in their report "Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc"(2017)[7]. It states on page 31: "National investment in the East West Rail project…present[s] a once in a generation opportunity." By improving connections through quicker journey times, the value of EWR rests on enabling it to:

- "Increase the labour market catchment areas for the Arc's key towns and cities, opening up new opportunities for collaboration and job growth" (page 31);
- "Open up new sites for development, improving the supply of accessible, developable land and supporting the delivery of new homes at affordable prices for all workers" (page 31) and, if delivered at pace, "tackle the Arc's housing crisis…aligned to the development of major new and expanded settlements" (page 32); and, with other strategic interventions,
- "Deliver a step-change in national connectivity, creating truly national level transport benefits", used as a link to "create an alternative strategic connection between East Anglia, southern and central England, as well as

[3] This has been converted into 2020 prices which is the equivalent of the NIC reported £85m in 2011 prices
[4] NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc, page 25 https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperity.pdf
[5] NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc, page 8 https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperity.pdf
[6] The Route Alignment design and therefore journey times are still in development so are subject to change as the Project progresses.
[7] NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc, pages 31-40 https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperity.pdf

South Wales – each providing the opportunity for passenger and freight movement at a national scale" (page 40).

2.2.9. By supporting local aspirations for, and the delivery of, new homes and communities, EWR would enhance the economic potential of the Arc. Housing growth in the Arc has failed to keep pace with demand, contributing to rapidly increasing house prices and pressure on firms to increase wages to attract skilled workers. The NIC's 'Partnering for Prosperity' report (page 59) notes that, in absence of new interventions, further population growth in suburbs combined with increasing labour demand in the key cities and towns in the region will place even greater demands on the existing infrastructure.

2.2.10. Well-placed transport links can unlock new areas of land for housing development that are constrained by existing infrastructure at present, as well as support further housing growth and town centre regeneration efforts in existing settlements.

2.2.11. The case for EWR includes its important role in supporting the wider transformation of the Arc. From its initial response to the NIC report in 2018[9], through to the Budget in March 2020, the Government has made public its commitment to the Arc. The Arc has been designated as a key economic priority. The Government has confirmed its support for the NIC's vision for up to a million additional homes and the additional infrastructure (including EWR) required to ensure communities and businesses are better served and better connected. Her Majesty's Treasury's (HMT) National Infrastructure Strategy[10], published in November 2020, additionally identified the need for supporting institutions to prioritise growth in the region – a Spatial Framework to develop a plan for long-term growth, and up to four Development Corporations[11].

2.2.12. Moreover, all the local authorities in the Arc support EWR as a vital enabler of transformation in the Arc, and it sits at the centre of England's Economic Heartlands' Transport Strategy.[12] Indeed, the new railway is seen by many stakeholders as a totemic strategic commitment by the Government to the wider plans.

[9] Government's response to NIC report: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/752040/Government_response_to_Partnering_for_Prosperity_a_new_deal_for_the_Cambridge-Milton__Keynes_Oxford_Arc.pdf

[10] HMT Treasury (2020), National Infrastructure Strategy https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938539/NIS_Report_Web_Accessible.pdf

[11] https://www.gov.uk/government/publications/budget-2020-documents/budget-2020

[12] Connecting People, Transforming Journeys - https://www.englandseconomicheartland.com/transport/our-strategy/

2.3 Benefits of railways

2.3.1. The development of stronger, more integrated transport networks across the Oxford to Cambridge Arc is a critical driver of economic growth. The East West Rail scheme enhances connectivity, links communities and reduces journey times. Interchange between road and rail will become easier and more convenient as a result of the scheme.

2.3.2. The particular benefits of providing east-west rail connectivity across the Arc include:

- Providing faster journey times into city centres, particularly for commuters and others at peak times when roads are increasingly congested;
- Providing faster journey times over longer distances, for example for business travel between Cambridge, Oxford, Bedford, and Milton Keynes, as well as through interchanging to the wider rail network;
- Enabling commuters and business passengers to spend their travel time on more productive work;
- Making the labour market more accessible for people who do not drive; and
- Spreading demand for housing outside of towns and cities, particularly benefitting younger workers (between a quarter and a third of whom do not hold driving license[13]).

2.3.3. Travelling by train is one of the most carbon-efficient ways to travel[14]; it is intended that EWR will help to reduce road congestion and pre-emptively help to avoid increases which may otherwise be associated with new housing or economic development, in favour of a more sustainable form of transport, as a result of quicker and more reliable journeys over long distances encouraging modal shift to rail from private vehicles.

2.3.4. These factors are reflected in the increasing popularity of rail travel among commuters and businesses passengers, particularly those working in highly productive industries such as those in the Arc's industry clusters. As noted in paragraph 2.2.4, work is still ongoing to understand how the Covid-19 pandemic may affect commuter travel patterns over the long-term.

[13] Driving licence holding and vehicle availability dataset (from the National Travel Survey), DfT - https://www.gov.uk/government/statistical-data-sets/nts02-driving-licence-holders#table-nts0201

[14] DfT (2020) Decarbonising Transport: setting the challenge, page 26 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/932122/decarbonising-transport-setting-the-challenge.pdf

03.
Project Objectives

3.1. Chapter summary

3.1.1. Development of the Project is guided by a range of Project Objectives, which are described in this Chapter.

3.1.2. The Project Objectives comprise the Sponsor's Requirements and the Programme Wide Output Specification (PWOS). The Sponsor of the Project is the Secretary of State for Transport who, through his Department, owns the Project and has overall responsibility for its success. The Sponsor's Requirements are therefore set by the Department for Transport (DfT) and cover the outcomes and benefits that the DfT expects EWR Co to deliver through delivery of the Project (which have built on the Strategic Objectives, as reported at the last consultation on the Bedford to Cambridge section). The PWOS provides a more detailed set of objectives.

3.1.3. This Chapter presents pertinent objectives from these two documents. They include requirements for safety and how the Project will perform environmentally. There are various operational objectives including the East West Rail (EWR) train service pattern; connectivity to other railway routes; the type of customer experience; how EWR train services are powered; consideration of freight services; the need to maintain and store trains at depots and stabling facilities; and the provision of telecommunications.

3.2 Introduction

3.2.1. Reflecting the findings of the NIC as referenced in paragraph 2.2 above, the DfT established Strategic Objectives applying both to elements of EWR between Oxford and Bedford and from Bedford to Cambridge. The Strategic Objectives set by the DfT and stated in the consultation in relation to Route Options were as follows:

- Improve east-west public transport connectivity by providing rail links between key urban areas (current and anticipated) in the Oxford-Cambridge Arc ("the Arc");
- Stimulate economic growth, housing and employment through the provision of new, reliable and attractive inter-urban passenger train services in the Arc;
- Meet initial forecast passenger demand;
- Consider and plan for future passenger demand, making provision where it is affordable;
- Contribute to improved journey times and inter-regional passenger connectivity by connecting with north-south routes and routes beyond Oxford and Cambridge;
- Maintain current capacity for rail freight and make appropriate provision for anticipated future growth; and
- Provide a sustainable and value for money transport solution to support economic growth in the area.

3.2.2. These Strategic Objectives underpinned the development of Route Options that prioritised serving locations that could support growth and new homes, over fast end-to-end journey times, while still resulting in significantly faster journey times than would otherwise be available (e.g. connections via London).

3.2.3. The Sponsor's Requirements, presented in Appendix A, are set by the DfT and cover the outcomes and benefits that the DfT expects EWR Co to deliver as a result of the Project.

3.2.4. The Sponsor's Requirements apply to the whole Project and build on the Strategic Objectives that were used to develop and decide on a Preferred Route Option between Bedford and Cambridge.

3.2.5. The PWOS, presented in Appendix B, has been developed by EWR Co and agreed with the DfT. This adds detail to the Sponsor's Requirements.

3.2.6. The versions of the Sponsor's Requirements and the PWOS presented in the Appendices were drafted to set the direction of the design and contain draft proposed requirements on the delivery of the Project which the Project, as described in this Technical Report,

has sought to meet. As the design is at an early stage, the PWOS does not contain formalised requirements that must be met, nor does it signify that decisions have already been taken. Indeed, this Technical Report considers options different from those in the PWOS because other approaches may be desirable and the DfT and EWR Co are evolving the solution to meet the Sponsor's Requirements. As such, there is scope for the PWOS to be amended.

3.2.7. Similarly, some of the objectives contained in these documents may not be achievable, for example due to budgetary or programme constraints to be decided by the Government, and may need to be traded-off against each other. The requirements on the delivery of the Project will be confirmed as the design evolves and option decisions are made.

3.2.8. Particularly relevant objectives from the Sponsor's Requirements and the PWOS are set out in the following paragraphs.

3.3. Other Government policy

3.3.1. In 2021, the Ministry of Housing, Communities and Local Government (MHCLG) published its report, "Planning for sustainable growth in the Oxford-Cambridge Arc: An introduction to the Oxford-Cambridge Arc Spatial Framework"[15].

3.3.2. This document sets out how the Government proposes to develop a spatial framework for the Arc. The document describes how the spatial framework will be both a planning policy and a transport policy. EWR Co intends to work with MHCLG in order to ensure that the policy reflects the evolution of EWR. As EWR Co continues to develop the Project it will take account of the emerging spatial framework.

3.4 Safety

3.4.1. Safety is of vital importance. EWR Co would deliver a safe railway, for passengers, staff and all those that would live near or interact with it.

3.4.2. Level crossings have a significant impact on the safety of the railway. The Office of Rail and Road (ORR) (the safety regulator for the railway industry) acknowledged, in 2011[16], that "level crossings account for nearly half of the catastrophic train accident risk on Britain's railways". For this reason, in line with ORR guidance (and the need to comply with outcomes of the ORR's consultation), EWR Co is not proposing to provide any new level crossings. EWR Co is proposing to close existing level crossings between Oxford and Bedford and, where required, will provide new rights of way to replace those affected by these crossing closures.

3.5 Environment

3.5.1. In terms of sustainability, the Arc's attractive natural and built environment is one of its key assets. EWR Co has taken a proactive approach to environmental considerations and put them at the core of the Project, using environmental data as a fundamental part of developing proposals that avoid, mitigate and compensate for potential impacts on the environment. Under the Network Rail (East West Rail) (Bicester to Bedford Improvements) Order 2020, covering Connection Stage 1, this part of the scheme committed to a 10% biodiversity net gain and consistent with this, as well as current and developing Government policy for biodiversity net gain, EWR Co will achieve biodiversity net gain in the construction of EWR.

3.5.2. EWR Co also aims to deliver a net zero carbon railway, in line with existing and developing net zero carbon policy, legislation and commitments at a global, national and local level. These commitments include The Climate Change Act 2008 (2050 Target Amendment) Order 2019 which requires the UK to reach net zero greenhouse gas emissions by 2050. In 2018, the Government challenged the rail industry to produce a vision for the removal of all diesel-only trains from the network by 2040. At a local level, Bedford Borough Council has pledged to become Carbon Neutral by 2030. Cambridge City Council has also declared similar net zero carbon aspirations. Any decision to grant development consent for the Project will need to demonstrate that it would not have a material impact on the ability of the Government to meet its carbon reduction targets. This will also include having regard to the Paris Agreement on Climate Change.

3.5.3. EWR Co will consider the importance of environmental sustainability in its activities and the decisions it makes, as specified in the PWOS in Appendix B.

3.5.4. EWR Co has followed the environmental mitigation hierarchy and implemented a decision-making process which seeks to 'design out' potential for environmental impacts. This has been done at the earliest stage of design to ensure that all aspects of environmental sustainability are robustly addressed, through embedding environmental design principles into the design requirements. In implementing this, all alignments have avoided direct impacts on key national features including ancient woodland, listed buildings, scheduled monuments and registered parks and gardens. Where it has not been possible to avoid impacts, design development of the alignments has applied a hierarchical approach to minimising and reducing environmental impacts.

[15] HM Government (2021): Planning for sustainable growth in the Oxford-Cambridge Arc https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/962455/Spatial_framework_policy_paper.pdf

[16] Level Crossings: A guide for managers, designers and operators, ORR, December 2011 (https://www.orr.gov.uk/media/10713)

3.6 EWR services

3.6.1. EWR services would be introduced in Connection Stages (CS) as follows, in each direction:

- CS1: Two passenger trains per hour between Oxford and Milton Keynes; Connection Stage 1 will be achieved when the current project to construct the new railway between Bicester and Bletchley is completed. The works to establish this connection stage do not form part of this consultation exercise.
- CS2: An additional two passenger trains per hour between Oxford and Bedford; and
- CS3: Extension of the two passenger trains per hour between Oxford and Bedford to Cambridge and an additional two passenger trains per hour between Bletchley and Cambridge.

3.6.2. EWR Co aims to develop an attractive, predictable 'clock-face' service at regular intervals. This means that trains would call at most stations at the same minutes past each hour all day, and that train services would be evenly spaced as far as possible.

3.6.3. EWR Co aims to provide a frequent passenger service through designing a flexible railway, with two railway tracks for EWR service use throughout, allowing the new services to offer attractive journey times. The indicative target maximum journey times are set out in Figure 3.1. These are based on indicative route and infrastructure studies and are being validated as the Project progresses.

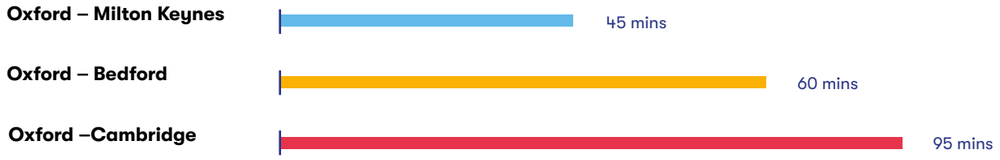


Figure 3.1: Indicative target maximum journey times

3.6.4. EWR Co aims to provide a reliable service and, to help protect EWR services and customers from the impact of wider railway disruption, the new railway lines would be independent from the existing rail network as far as possible, whilst maximising connectivity.

3.6.5. Extending EWR services east of Cambridge is not in the remit of EWR Co. However, the development and assessment of options seeks to ensure that decisions taken now do not create obstacles to this in the future. This is important because, otherwise, what EWR Co decides could make it more difficult to extend EWR services eastwards due to the cost and disruption associated with changing what has been constructed.

3.6.6. Final decisions on the frequency of services, station calling patterns and journey times will depend on further development and consideration of operational issues and the likely demand for EWR services.

3.7 Connectivity

3.7.1. EWR would connect to six north-south routes, including provision for a potential new passenger interchange with the East Coast Main Line (ECML) at either Tempsford or St Neots (as a new station, not replacing the existing station). This would provide passengers going to and coming from destinations beyond the Arc with alternative options to the longer routes via London.

3.8 Customer experience and stations

3.8.1. EWR Co aims to set new standards for customer experience. Delivering a better customer experience has been embedded into designing and developing the Project. The proposed overall customer journey experience, including the experience at stations, is presented in the 'Shaping customer experience and railway operations' section of the Consultation Document. Station locations are discussed within the relevant Project Sections below.

3.9 Powering EWR services

3.9.1. EWR Co is aiming to deliver a net zero carbon railway and will be considering conventional and emerging technological solutions for powering trains when all EWR services are fully operational. Operating electric trains powered by overhead electric lines is one way that carbon emissions can be reduced. It is not yet clear if other technologies are likely to be sufficiently mature by the time a firm decision needs to be taken on EWR's long term fleet and so it is not yet known whether such conventional electrification is required.

3.9.2. For the purposes of appraising the environmental impacts of each option (and particularly options in Section D), the reasonable worst-case scenarios of electrification or diesel-powered trains have been used. This is to ensure that for each topic the reasonable worst-case approach is adopted when considering the impacts arising from each alignment. The use of diesel-powered trains is not a Project Objective.

3.9.3. To inform the next stage of design, including potential land requirements, the assumption is that overhead electrification may be provided for the Project. EWR Co will develop the proposed approach and provide more details at the Statutory Consultation.

3.10 Freight on EWR

3.10.1. EWR is being designed to maintain current capacity for freight trains on the existing railway and the design is considering the potential for future growth in demand for rail freight both as a result of, and independent of, EWR.

3.10.2. The capacity for freight trains is defined by the number of "freight paths" made available in the timetable such that freight and passenger trains can run along the same tracks whilst minimising the risk of delay to passenger services. The capacity can be enhanced by providing additional sections of track known as "passing loops" to make it possible for passenger trains to overtake freight trains (or slower passenger trains).

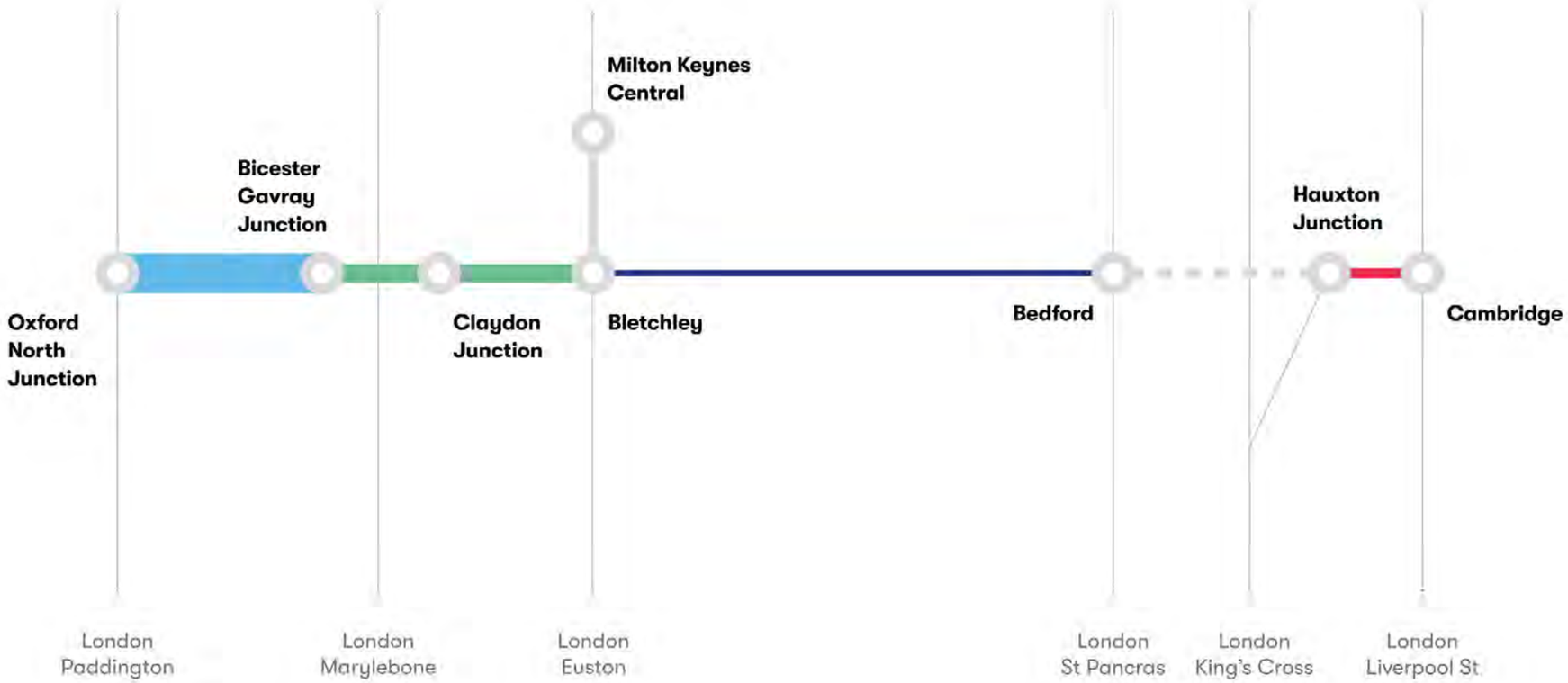
3.10.3. The capacity for freight trains can vary during the day and the number of freight paths available is not necessarily the number of freight trains that run. Rail freight is operated on an "open access" basis, which means that where freight paths are available, operators such as freight operating companies can seek to take advantage of that capacity when there is demand for freight to be moved by rail. In addition to demand, the number of freight trains that run can be limited by the infrastructure, in particular the connections between lines, and the policies of the infrastructure operator and the Government.

3.10.4. The current number of freight paths per day, combined with the additional capacity being delivered in Connection Stage 1 by works authorised under the 2020 Order between Bicester and Bletchley, is shown in Figure 3.2. The number of freight paths per hour is shown as an average to provide an indicator of the number of freight trains that could use the railway if they were spread across an 18-hour operational day and that level of demand existed.

3.10.5. At this stage of the Project, timetable modelling is not sufficiently advanced to be able to quantify the freight paths that might be available once EWR is completed and no decisions have been made on the times of day that freight (and passenger) trains would run. More detailed timetabling and consideration of the need for passing loops will be undertaken at the next design stage, considering how the railway would be operated and maintained, and feedback received from this non-Statutory Consultation on matters such as Route Alignment and passenger train service provision. Engagement has been undertaken and will continue with the rail freight industry to help EWR Co understand the interest in running freight services on EWR. The number of freight paths that could be available should be known by the time of the Statutory Consultation but, as explained above, the number of trains that would use EWR is dependent on market forces and Government policy, as well as the infrastructure.

3.10.6. Whilst the objectives for EWR are focused on provision of passenger services, new infrastructure would be capable of accommodating freight trains with a height and width up to and including that required to carry full size shipping containers on standard height railway wagons, and with a length of up to 775m. The maximum gradient of the railway would be no steeper than 1 in 80 to allow most types of freight train to use the railway without significant risk of operating at such slow speeds that passenger trains might be delayed. New passing loops would only be provided if demonstrated to be affordable and value for money, including evidence of future growth in demand.

3.10.7. It is reasonable to expect that there will be demand for freight paths on the new railway between Bedford and Cambridge. The extent of this demand, and the actual number of freight trains that would run between Bedford and Cambridge, would be dependent on additional changes to the existing railway network, such as alternative connections to and from EWR at Bletchley and Bedford, which do not currently form part of the Project. Network Rail has advised



Oxford North to Gavray (sum of both directions)		Gavray to Bletchley (sum of both directions)*		Bletchley To Bedford (sum of both directions)		Hauxton to Cambridge (sum of both directions)	
Paths/day	Paths/hour	Paths/day	Paths/hour	Paths/day	Paths/hour	Paths/day	Paths/hour
49	2.7	23	1.3	5	0.3	9	0.5

Figure 3.2: 2024 Freight Paths[17]

that, if these additional changes to the existing railway network are made, there may be demand by 2043/2044 for around 24 freight trains per day in each direction, which equates to about 1.3 freight trains per hour in each direction if they were spread across an 18-hour operational day. This is based on unconstrained growth forecasts and it has not yet been decided whether EWR will provide the capability (i.e. necessary infrastructure) to meet this demand. As discussed in Project Section D (9.2.9), the design of the infrastructure has taken a reasonable worst-case approach to considering the number of passing loops that may be required. Passing loops are allowed for at two locations, with a passing loop either side of the main route at each location.

3.10.8. Further detail will be provided on the freight strategy, and the approach to avoiding or reducing potential impacts from freight trains which may run on EWR, at the Statutory Consultation.

[19] Path data provided by Network Rail (2020)

3.11 Depots and stabling

3.11.1. Stabling and depot facilities are required along the Route Alignment to facilitate the maintenance and storage of infrastructure and rolling stock. Three types of stabling or depot site have been identified which are detailed below.

Infrastructure maintenance depot(s)

3.11.2. One or more depots could be needed to store materials, equipment and rolling stock needed to maintain the railway. These depots would need to be connected to the railway. When identifying suitable depot locations, potential impacts on local communities and the environment will be considered, as well as operational requirements.

Rolling stock maintenance depot

3.11.3. This depot is needed to carry out maintenance of the passenger trains for the railway. The current assumption is that Bletchley Train Maintenance Depot, an existing depot facility, will be modified and used as the main depot location for the EWR fleet. Currently, the scope of work for the depot is being jointly designed, developed and delivered with West Midlands Trains, the Depot Facility Owner, and it is assumed that this will be carried out using existing powers available to Network Rail and the Depot Facility Owner (Permitted Development Rights).

Train stabling location(s) or sidings

3.11.4. Train or rolling stock sidings provide space to store trains when they are not in use, such as overnight, and for carrying out light servicing activities. These sidings would need to be connected to the railway and have provision for various activities for example interior and exterior cleaning of the trains, refilling water tanks and servicing the train toilets. When identifying suitable locations for sidings, potential impacts on local communities and the environment have been taken into account, as well as operational requirements.

3.11.5. Currently we believe that the most suitable location for stabling some of EWR's trains is in the general Cambourne area. We would try to avoid impacts on the existing community when we are deciding where this would go. Further details will be shared during the Statutory Consultation when the alignment of the Project in that area has been established.

3.12. Telecommunications

3.12.1. Telecommunications masts are likely to be placed along the new railway between Bedford and Cambridge where essential to support the operation of the railway. As design progresses EWR Co will be mindful of the impacts of telecommunication masts and would consider environmental issues and local communities when choosing where to place them. Details about the placement of telecommunications masts will be provided at the Statutory Consultation.

04. Additional works and construction

4.1. Chapter summary

4.1.1. This Chapter outlines the works needed to highways, other Public Rights of Way (PRoW), private access roads and utilities as a result of construction of the railway, and how EWR Co would construct all elements of the Project.

4.2. Additional works

Introduction

4.2.1. To meet the Project Objectives, the Project would need to include further works in addition to those needed to deliver the railway, in particular works to highways, PRoW, private access roads and utilities. As is usual for this stage of project development, consideration of these works is still at an early stage, so assumptions have been made in developing the options presented in this non-Statutory Consultation. The need for additional works, their extent and design will be examined in more detail at the next stage of design and will be contained in the proposals presented at the Statutory Consultation.

Highways, PRoW and private access roads

4.2.2. EWR Co has considered the impact of the Project on existing highways, PRoW and private access roads as part of the design and assessment of Route Alignment Options for the new railway between Bedford and Cambridge. EWR Co is seeking to maintain existing highway connections wherever feasible. EWR Co is not proposing to provide any new level crossings, as explained in paragraph 3.4.2. Where it is not feasible to retain existing highways, PRoW and private access roads in their current location, EWR Co will ensure that a suitable alternative is available which minimises the impact on communities.

4.2.3. EWR Co is still considering its approach for maintaining highways and PRoW which cross the existing railway between Bicester and Bedford. Options are outlined in Project Sections A and B (Chapters 6 and 7) of this Technical Report.

4.2.4. Provision will be made during construction to maintain connections that are intended to be retained after the Project is completed, even if they have to be temporarily diverted. Arrangements for these diversions will involve discussion with appropriate parties at relevant stages with the aim of both mitigating disruption to the local community and enabling reasonable conditions for the progression of the works.

4.2.5. EWR Co will consult in more detail on proposals for individual highways, PRoW and private access roads at the Statutory Consultation.

Statutory utility works

4.2.6. It is inevitable that in constructing a project of this type, existing underground and overhead services (such as electricity, gas, water and communications) will need to be relocated. This work is usually, but not always, undertaken in advance of the main construction works.

4.2.7. EWR Co will engage with utility companies with the aim of minimising any disruption that may be associated with utility works. This will cover both existing utility supplies to local communities and extension of services to contractor worksites. Any necessary interruptions to services will involve liaison with relevant parties in advance to discuss appropriate mitigation.

4.2.8. Designs for any utility diversions that may be required to deliver the Project will be discussed and agreed with the relevant utility companies and will be set out at the Statutory Consultation where appropriate.

4.3. Construction

Introduction

4.3.1. This part of the Chapter explains how EWR Co would construct the Project, looking to minimise disruption to local people, communities and the natural environment whilst ensuring that the works are carried out in a safe, efficient and cost-effective manner.

4.3.2. At this stage in the development of the Project, the construction methodology has not been considered in detail, so this Chapter focuses on the general principles which EWR Co expects would be applied.

General principles

4.3.3. All major construction projects require the movement of people, equipment, and materials to and from the worksite and inevitably this will cause a degree of inconvenience to people and communities at certain stages in the delivery of the project. However, the way in which the team delivering the Project consult and engage with those affected by the works to establish ways of working that minimise inconvenience and disturbance, can have a very significant effect upon communities and their experience of the works.

4.3.4. Major construction works also present potential risks to the environment. However, again, through good planning and an effective understanding of the critical environmental issues, much can be done to mitigate the effect of construction works on the surrounding area.

4.3.5. EWR Co will ensure that the needs, expectations and concerns of the neighbouring communities and businesses are considered at every stage in the construction of this railway. This means engaging early, during the planning stages, to build up a clear understanding of what is important to local people and to develop an approach to construction which addresses the concerns that have been expressed.

4.3.6. EWR Co will employ experienced and capable contractors to construct the works and will select as its partners only those companies who can demonstrate a mature and considerate approach to delivery, considering people, communities and the environment first when deciding how to construct the works.

4.3.7. EWR Co will prepare a Code of Construction Practice (CoCP) which will set out its expectations of those it employs to deliver the works. The CoCP will provide contractors and suppliers with details of the measures, controls, and standards of work that they must follow to minimise their impacts upon existing railway users, businesses, other people and the natural and historic environment. It will also set out how they must work with local communities and their representatives throughout the construction and testing periods.

4.3.8. The CoCP will be a public document that all those with an interest in the Project will be able to access and read.

Planning and logistics

4.3.9. EWR Co will work closely with its contractors and suppliers to plan the construction activities to minimise their impact on people, communities, and businesses and to mitigate damage to the natural and historic environment.

4.3.10. EWR Co will develop a comprehensive logistics strategy that must be adopted by all contractors and suppliers. This will enable EWR Co to plan the way in which people, materials and equipment are moved to and from the various worksites along the route of the proposed railway, working with local authorities and other developers to ensure that EWR Co's use of the local highway network is managed and to ensure that construction traffic is restricted to those routes which have the capacity to safely accommodate the additional traffic.

4.3.11. EWR Co will ensure that, wherever possible, its contractors move materials and equipment within the site itself, constructing temporary access roads to avoid using the public highway where possible and using the railway itself as a means of transporting construction materials.

4.3.12. EWR Co will encourage its contractors to make use of components which are manufactured at locations away from the construction site wherever possible, to reduce the number of activities which have to be carried out at site. This will help to minimise noise, dust and vibration whilst also being a cost-effective way to deliver. Where operations need to be undertaken on site, EWR Co will consider the noise, vibration, and other impacts that these activities might have and plan the work to minimise these effects.

4.3.13. Highway routes to and from the site will be carefully planned, in consultation with the local highway and planning authorities, and permitted routes for construction traffic will be agreed. Where it becomes necessary to temporarily close or divert a highway or other PRoW, EWR Co will communicate its plans well in advance and consult locally to ensure that suitable options have been considered. This will incorporate arrangements at level crossings, which will be managed in conjunction with planning construction logistics.

4.3.14. Construction compounds, depots and site offices will be sited at locations which take into consideration not only convenience to the Project but also locations which are able to minimise congestion, disruption and other nuisance for people and communities. Light pollution from construction compounds can sometimes be an issue and EWR Co will work with the contractors to ensure that this is avoided.

4.3.15. Where it is necessary to obtain materials for constructing railway embankments and other earthworks features EWR Co will, where possible, obtain materials from locations on or adjacent to the site rather than transporting them from remote locations.

4.3.16. EWR Co will set the working hours within which its contractors and suppliers are permitted to carry out construction activities on site, to manage its impact on local people and communities. For example, site activities may be generally limited to the hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays, excluding public holidays. Occasionally EWR Co will need to work at other times, but it will always keep individuals and communities informed of any plans to do this. Exceptions to this are likely to be required where major overnight possessions of the railway or a motorway might be needed. Usually, there will be start-up and shut-down periods of no more than an hour at either end of the working day to maximise the productivity of the supply chain.

4.3.17. This is a major project which will employ a large number of people during the course of its delivery. A green travel plan will be drawn up prior to the start of main works to determine the best way for the workforce to travel to, from and around worksites. EWR Co will control the use of offsite parking to minimise the impact on residential areas and is likely deploy bus services to bring much of the workforce to site.

Communities and people

4.3.18. EWR Co wants to minimise the impact of construction works as far as reasonably possible and will work with people, businesses and the community to thoroughly understand the issues and concerns of those people who are likely to be affected by its activities.

4.3.19. EWR Co and its contractors will deploy suitably experienced personnel whose role will be to work with the community to manage the impacts of construction. It is important that communications between the EWR Co team and the community are effective and that EWR Co's plans and activities are explained, allowing individuals and community representatives the opportunity to work with EWR Co in a proactive way to minimise disruption.

4.3.20. EWR Co and its contractors will ensure that advance notice is given of the works planned and that the scope and expected duration of the works will be explained. It will provide this information using a variety of physical and online methods and a community helpline will be set up to deal with queries on the plans. Information will also be provided using the local media and a process for handling complaints will be set up prior to the start of works.

Impacts on the environment

4.3.21. The potential temporary environmental impacts associated with the Project will be controlled and managed through the CoCP as far as is reasonably practicable. It will outline the site controls and monitoring processes that will be implemented to protect the environment and limit nuisance. Examples of impacts to be covered are construction noise and vibration, air quality, contaminated land, ecology, historic environment, construction traffic, tree protection,

surface and groundwater management, waste management and general site operations. In addition, it will state permissible contractor working hours.

4.3.22. EWR Co will employ Best Practicable Means to minimise noise and vibration impacts during the construction phase and schedule activities which are likely to produce high levels of noise to weekday daytime hours wherever possible. Occasionally it will be necessary to work at other times and EWR Co will engage with local people and communities to agree on arrangements which are least disruptive.

4.3.23. Dust from construction activities can sometimes be a problem, particularly in dry weather, and EWR Co will work with its contractors to ensure that appropriate dust suppression measures are introduced. This will often include the use of bowsers to spray roads which are used by construction plant, but where possible EWR Co will find ways of working that minimise the amount of dust which is generated.

4.3.24. Other air quality impacts in the vicinity of EWR worksites will also be carefully controlled. EWR Co will maximise the use of sustainable energy sources to provide on-site power supplies and to minimise the use of diesel for local generation of power. It will require contractors to deploy electric vehicles and plant wherever possible. EWR Co will monitor air quality and emissions throughout the Project and will prohibit the lighting of open fires to dispose of construction waste.

4.3.25. Construction sites can often become muddy and EWR Co is conscious of the need to ensure that the surrounding road network is kept clean and free of mud from construction vehicles. It will therefore ensure that contractors deploy wheel-washing facilities at exits from EWR sites and that road-cleaning equipment is deployed on surrounding roads.

4.3.26. Vibration can sometimes be a nuisance, particularly for those residents and businesses who are closest to the worksite. Again, EWR Co will seek ways to construct the works that minimise vibration but inevitably some activities, such as piling (the construction of deep foundations for structures), will be necessary. In such instances, EWR Co will ensure that working hours are limited and that where properties are likely to be affected, surveys will be carried out to assess and manage the risk to homeowners.

4.3.27. Care will be taken to ensure that contractors work in ways which avoid risk of pollution to watercourses and groundwater. Contractors will need to demonstrate that for each activity in which there is a risk of possible pollution, they have properly assessed the risks and introduced satisfactory measures to manage those risks. This will include consideration of the methodology for that activity and the use of physical barriers to prevent the unplanned leakage of contaminants. Monitoring will be carried out to ensure that water quality is maintained, and plans will be drawn up to ensure that an accidental run-off or discharge can be mitigated quickly and effectively.

4.3.28. EWR Co will ensure that measures are in place to protect the flora and fauna of the corridor through which construction works will take place. Extensive surveys are already being undertaken to identify the species which inhabit these areas and contractors will be provided with comprehensive information on the particular species that are present and the measures that will need to be taken to protect them and their habitats. Often this will involve the use of physical barriers and occasionally will require the relocation of species to an alternative location.

4.3.29. EWR Co will take all relevant precautions to protect listed buildings adjacent to the railway, working with associated authorities to ensure compliance with regulations and best practice.

4.3.30. EWR Co will take all relevant precautions around handling materials which may have become contaminated, for example from previous industrial activities. Relevant regulations and best practice will be adhered to with regard to safe disposal of any contaminated or hazardous waste.

4.3.31. In addition to the temporary measures which EWR Co will enforce during the construction of the works, the longer-term environmental impacts will also be considered in the design solution. The design of the works, therefore, will consider specific measures to minimise the impact of the Project on the surrounding environment – for example the use of landscaping and screening to minimise visual intrusion, and bunds or noise barriers to reduce railway noise.

Works on existing railways

4.3.32. The Project works will affect different sections of the existing railway network to varying extents. EWR Co will plan all works at the major stations including Oxford, Bedford and Cambridge such that reasonable and safe access can be maintained for the travelling public. Works are anticipated to make use of times when fewer trains are running, for example at night and over weekends and public holidays.

4.3.33. Other examples of works interfacing with existing railway operations are the likely rearrangement of Thameslink train stabling close to Bedford station, and the junction with the Shepreth Branch Royston (SBR) line (the line between Cambridge and Hitchin via Shepreth). The interface with the East Coast Main Line (ECML) will also be complex and important to manage. Due consideration of relevant factors for these and other existing railway activities will be explored and consulted upon with associated organisations before decisions are made; these plans often need to be developed well in advance to gain maximum efficiencies with other railway works.

4.3.34. Opportunities are being sought to establish how best to access the Project works via the existing railway network and thus reduce the amount of construction road traffic required. As an example, rail-connected materials facilities in the Bletchley area could serve the construction both east of Bletchley, in Project Section B, as well as to the west in Project Section A. The impact of modifying existing trackside facilities on other parties will be weighed up with the merits of establishing totally new facilities which may have less impact on third parties but possibly attract higher set up or maintenance costs.

4.3.35. The impact of all works on the live railway is considered for all construction stages. This is because it is difficult to carry out works to a functioning railway line without effects on safety and the timetable of trains that are using it. The easiest way to manage these key interfaces is through periods of time when the railway is closed to public trains, sometimes just locally. These periods are sometimes referred to as “possessions” or “blockades” depending upon their duration.

4.3.36. Studies are being undertaken to explore the optimum number and length of railway closures bearing in mind the impact on local communities and overall costs and timetable. The following paragraphs outline how the proposals are being developed.

4.3.37. The works on the existing Marston Vale Line between Bletchley and Bedford consist of an upgrade to the existing line, potential rationalisation and configuration of stations, and dealing with existing level crossings so that planned train paths and line speed increases can be accommodated. These works will require access to the railway infrastructure across one or more significant periods, the length of which will vary based on how construction is ultimately planned to proceed.

4.3.38. There are many factors to consider in deciding the nature of railway closures for construction works. One aspect is the time taken to establish a safe working environment and then to return it as a safe operational railway at the end of the period; another is the level of disruption to railway users if trains are cancelled or replaced temporarily by other transport modes (such as buses, which may themselves be delayed or disrupted by project works on public highways). Noise from construction activities during unsociable hours and various costs are potential factors too. Periods of closure can be anything from a few hours long overnight to many months and even in excess of a year. One option being considered for works on the Marston Vale Line is to close much or all of it over an extended period so that works can be carried out as efficiently and quickly as possible and thus minimise the overall period of disruption along the length. The merits of this are being considered, across many factors, versus using a number of shorter closures. Multiple parties will be engaged before deciding on the eventual strategy for temporary closures to undertake works on the Marston Vale Line.

Working with other scheme promoters

4.3.39. It is almost inevitable that other construction works will be undertaken in the same general corridor as EWR during the period of construction. EWR Co will work with local authorities and other scheme promoters to ensure that works are coordinated and that the combined impacts are minimised.

4.3.40. EWR Co is already engaging closely with High Speed 2 and Highways England (HE) in relation to their schemes in the region to ensure that works are coordinated and the cumulative impacts of development are controlled.

4.3.41. HE is promoting a scheme to extend the A428 trunk road between the A1 Black Cat Roundabout, to the north-east of Bedford, with the existing trunk road at Caxton Gibbet. EWR Co is, as described elsewhere in this report, considering Route Alignment Options which follow this corridor and is working closely with HE to identify opportunities to work in ways which reduce the cumulative impact of the two projects. This is likely to include plans to coordinate works done to relocate statutory utilities and in the overall sequencing of construction activities.

Woburn Sands station

05. Approach to developing the designs

5.1 Chapter summary

5.1.1. This Chapter describes the approach EWR Co has taken to developing the designs for the Project.

5.1.2. It explains the Assessment Factors which form part of the design development process and have been used to assess the performance of options that are presented in this report. They provide a consistent framework and basis for decision-making around design options and a framework for identifying preferred options. The Chapter explains why the Assessment Factors are needed and describes what they cover. It also summarises how the Assessment Factors have been applied in each of the Project Sections A to F.

5.1.3. The Chapter then sets out how options have been developed, discussing first the approach to developing options that upgrade existing railway in Project Sections A and B (from Oxford to Bedford), then the approach to developing options for the new infrastructure (Project Sections C, D and E from Bedford to Hauxton Junction), and finally, the approach to developing Project Section F (from The Shelfords to Cambridge).

5.2. Assessment Factors

Approach and history

5.2.1. **Why and what**: In order to ensure the options being developed and consulted on meet the Project Objectives, and that there is a robust evidence base and consistent approach supporting decision-making, a range of Assessment Factors have been developed. Assessment Factors are a set of topics in relation to which relative performance of options can be compared. The Assessment Factors (and underlying Considerations that support them) are listed in paragraph 5.2.10, and further details are available in Appendix C. The outcome of the appraisal of options against each Assessment Factor is presented in each Project Section Chapter (Chapters 6 to 11).

5.2.2. **Considerations**: Each Assessment Factor is supported by a number of 'Considerations' that represent particular aspects or issues relating to that Factor. Each Consideration is examined individually; for a given Assessment Factor the performance of an option against each of the relevant Considerations is considered in the round (with no particular weighting applied) and forms the basis for drawing conclusions on overall performance against that Assessment Factor. Further details of Considerations and the assessment approach are contained in Appendix C.

5.2.3. **Application**: The Assessment Factors can be applied to the new infrastructure and changes to existing infrastructure. Alternatives that do not meet the DfT's Programme Wide Output Specification (PWOS), a series of objectives that ensure the Project meets the DfT's 'Sponsor's Requirements', or that are likely to perform worse against the Assessment Factors, may in some cases be discounted prior to applying Assessment Factors. Remaining options have been assessed against the Assessment Factors to determine how well they perform. All Assessment Factors are taken into account, although some may assist to a greater extent than others in differentiating between options. Where that is the case, this is clearly noted.

5.2.4. **Approach to assessment**: Where assessments have been undertaken, technical experts have made qualitative assessments of the performance of options against Assessment Factors using some supporting quantitative indicators. The assessment was undertaken by experts for each Assessment Factor and were checked by a reviewer. The results were then reviewed as a whole by the multidisciplinary project team to ensure a consistent approach as far as possible and proportionality. In preparing for the Statutory Consultation and Outline Business Case submission to the Government, which will show the case for the preferred option, further quantitative analysis will be undertaken.

5.2.5. **Reference Case**: Where there are options to choose between, each option is compared on a consistent basis. This requires a reference option against which to assess its performance. Where there is an existing scenario such as an existing railway line, then this forms the reference option. However, where there is no comparable existing scenario, a reference option is used that is derived from an initial engineering proposal. A scenario of 'no railway' is not used to compare against because the comparison across options (the focus of this stage of project development and this report) would not differentiate between options. Alternatives can be compared with the reference option to establish whether the alternatives perform better, the same, or less well than the engineering proposal contained in the reference option. This comparison against a reference option is used in presenting options in Project Section D (Clapham Green to The Eversdens) and Project Section E (Harlton to Hauxton).

5.2.6. **Other schemes in the Reference Case**: The options have been assessed on the basis that other identified and planned infrastructure changes will have gone ahead (or will be progressing) as planned. For example, it is assumed that the Highways England A428 Improvement Scheme between the A1 Black Cat roundabout and Caxton Gibbet will be underway and that EWR infrastructure enabling services from Oxford to Milton Keynes, and the Cambridge South Station scheme, are progressed as planned.

5.2.7. **Differentiators**: How every Assessment Factor may apply has been or will be considered for every option assessed. In many cases, the performance of alignment options may be closely clustered for a given Assessment Factor. In those circumstances, the appraisal of the Assessment Factor in question does not assist in differentiating between alignment options. This report focuses on those Assessment Factors that differentiate or will assist in differentiating between options. Therefore, Assessment Factors that do not differentiate significantly (i.e. are more or less the same for all options) are not generally presented in this report, which is explained in each Project Section Chapter (Chapters 6 to 11).

5.2.8. **Weight**: The Assessment Factors and the Considerations that underpin them will all be taken into account in relation to decisions made in respect of EWR. In addition, decisions will take account of responses to consultation and other representations, as well as any other important and relevant considerations that come to light. When taking Assessment Factors and other matters into account, some Assessment Factors will be more useful in making decisions – these are differentiators. This is because they allow decision-makers to distinguish between options where the application of Assessment Factors has not produced a clear preferred option. Among these, there may be different performance between options so that one may perform better than another in relation to one Assessment Factor, but less well in respect of a different Assessment Factor. To resolve this, some Assessment Factor results may be

attributed greater weight than others because they are considered to be particularly important. This weighting considers the purpose of EWR, the Project Objectives and outcomes of previous consultations. A decision-maker (like EWR Co, in making its recommendation) and the Secretary of State (in making a decision) can apply weight to Factors in this way, and the amount of weight it decides to apply is a matter of discretion. It may be the case that lesser or greater weight would be applied to one or more Factors depending on the element of the Project being considered. Where weighting has been applied in decision-making this is explained in the relevant Chapter.

5.2.9. **History**: The Assessment Factors have been agreed with the Government and are designed to apply throughout the development of EWR. For the new infrastructure between Bedford and Cambridge, the same Assessment Factors were used to decide upon Route Option E (see map in Figure 5.3 below) as the Preferred Route Option to ensure consistency in decision-making. As the design for the new infrastructure has moved on a stage, the information and Considerations supporting each factor are more detailed (for example vertical and horizontal alignment design enabling earthworks quantities to be estimated which leads to improved cost estimation accuracy).

The Assessment Factors

5.2.10. The full list of Assessment Factors is given here with further detail in Appendix C:

- Transport user benefits – the benefits experienced by passengers particularly in terms of journey time savings and modal shift (where users change the mode of transport they use to make a journey);
- Contribution to enabling housing and economic growth including best serving areas benefitting from developable land;
- Capital costs – the upfront costs, including consideration of risk, to implement each option;
- Operating costs – the costs incurred in the delivery of the train service;
- Overall affordability – the financial implications of the options in terms of costs and incomes, over the whole life of the railway, also encompassing capital and operating costs;
- Short distance connectivity to support commuting travel into key employment hubs (current and future);
- Short distance passenger services;
- Rail passenger connectivity to existing main lines – the ease of interchange;
- Long distance passenger services – the extent to which EWR facilitates long distance passenger services beyond Oxford and Cambridge;
- Satisfying existing and future freight demand;
- Performance – the ability of the railway to meet or exceed customer expectations in terms of service reliability;
- Alignment with wider railway strategy / infrastructure;
- Safety risk (construction and operation);
- Environmental impacts and opportunities; and
- Consistency with Local Plans[20].

Application of the Assessment Factors

5.2.11. This Technical Report presents options at varying stages of development and Assessment Factors apply in different ways according to the stage of development.

5.2.12. In Project Sections A, B and the Bedford St Johns and Bedford station parts of Project Section C, designs are at an early stage of development. Although there are emerging options and a narrative is provided around potential performance against differentiating Assessment Factors (or what the differentiating Assessment Factors may be where options are far enough advanced to do this) a full appraisal against Assessment Factors has not yet been completed. This will take place in continuing design of the Project, with the outcomes being presented for consultation when the Statutory Consultation takes place. In respect of those options, consultation presents information that is available, the initial thinking developed by EWR Co and the Considerations and Assessment Factors that seem likely to inform differentiation and decision-making between emerging options. The outputs from the further development of the options will be presented at the Statutory Consultation.

5.2.13. In the North Bedford part of Project Section C, the need to balance the objectives of the railway against EWR Co's aim to avoid or minimise residential land acquisition and the demolition of properties is such that all options are presented and discussed using differentiating Assessment Factors. Discounted variants of the options are presented and explained in relation to the Assessment Factors. A single preferred option is emerging as the best performing option.

5.2.14. For Project Sections D and E (Clapham Green to The Eversdens and Harlton to Hauxton), the Assessment Factors have been applied to the options presented in this report and they are discussed in full in Chapters 9 and 10.

5.2.15. For Project Section F (The Shelfords to Cambridge Station) Assessment Factors have not been considered because the option decisions are likely to rest on operating constraints and the constraints of the existing Network Rail infrastructure.

[20] This has been expressed previously (in the Preferred Route Option Report and the 2019 Consultation Technical Report) as "Consistency with plans for the location of settlements"

5.3. Developing designs in Project Sections A and B: identifying the need for upgrade works (Oxford to Bedford)

5.3.1. EWR Co has examined the capabilities of the existing railway infrastructure between Oxford and Bedford (including those elements of it that are currently being constructed to provide the Oxford to Milton Keynes services, the subject of the 2020 Order) and compared this to infrastructure required to deliver the level of services that are planned between Oxford and Cambridge reliably and safely. Those services are derived from the Project Objectives described in Chapter 3 above.

5.3.2. This work included considering capacity, potential services, the condition of the existing infrastructure and undertaking safety risk assessments. In addition, the current use of the railway was reviewed and potential demand for rail services in the area that EWR will serve was considered. In doing this, planned housing (and other) development in the areas served by the existing railway was taken into account.

5.3.3. This process has identified the need for a number of changes to the railway between Oxford and Bedford, including stations, level crossings and railway infrastructure to make it suitable for its future role to ensure:

- The railway has adequate capacity for additional EWR services;
- EWR services can operate reliably and not interfere with other services already operating (or proposed to operate) at key node points along the Route Alignment, such as at Oxford, Bedford and Cambridge;
- Existing freight services that use the Marston Vale Line can continue to operate;
- EWR services offer attractive journey times consistent with the business case for the EWR Project; and
- That stations along the Route Alignment provide appropriate facilities for the numbers of people that are expected to use them, the types of journeys those people are expected to make and that meet the Project Objectives.

5.3.4. Using the outputs of this consultation, EWR Co will further develop options where needed and identify a preferred option for each Project Section to be presented in the Statutory Consultation.

5.4. Developing designs in Project Sections C, D and E: new railway development from Bedford to Cambridge

5.4.1. The proposed new railway to connect Bedford and Cambridge (Project Sections C, D and E) has been developed sequentially.

5.4.2. The option development process for the new railway from Bedford to Cambridge described above is summarised in Figure 5.1.

5.4.3. The remainder of this Chapter covers:

- an explanation of how the Preferred Route Option (Route E) for the new railway between Bedford and Cambridge was selected;
- How an initial proposal for an alignment was identified within Route Option E and the process to develop the new railway alignment options presented in this report.

Figure 5.1: Design Development and DCO Process Summary for Bedford to Cambridge

Process for selecting the Preferred Route Option – Route E

5.4.4. Network Rail developed the Project in the earlier stages prior to EWR Co being established in 2017. Network Rail initially identified twenty potential broad 'Route Corridors' which could serve a new east-west railway between Bletchley and Cambridge, spanning the broad area between St Albans and Harlow to Peterborough. After appraising the potential Route Corridors against the initial strategic objectives, five corridors were taken forward for further work. A quantitative assessment of the potential costs and benefits of these five corridors was undertaken before Route Corridor C via the broad area around Sandy, shown in Figure 5.2, was selected as the Preferred Route Corridor in 2016 [21].

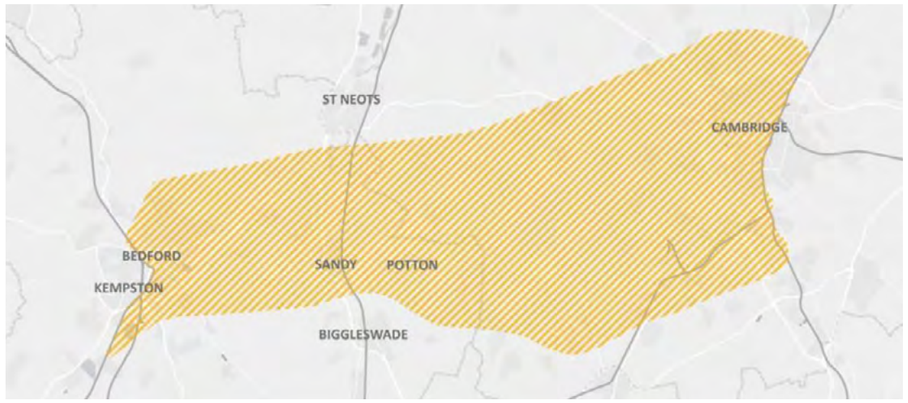


Figure 5.2:
Route Corridor C

5.4.5. 'Route Options' were then developed within the Preferred Route Corridor. Route Corridor C covered a wide area (up to 15km) through which the railway would run, allowing various possibilities to be explored. For example: Route Options to the south via the Bassingbourn area or to the north near Cambourne; potential station locations both north and south of Cambourne; and a choice of approaches to Cambridge which could be from the north, west or south.

5.4.6. As part of the Route Option development process, Network Rail and EWR Co considered how the three different potential approaches to Cambridge compared and how they performed when considered against the Strategic Objectives at that stage of the design. This analysis concluded that an approach into Cambridge from the south should be preferred and a final shortlist of Route Options was prepared on this basis.

[21] The Preferred Route Corridor covered a wide area (up to 15km) through which the railway would run.

5.4.7. Using the Strategic Objectives for EWR and the set of route selection Assessment Factors agreed with the Department for Transport (DfT) and local stakeholders, eleven potential Route Option areas within the Preferred Route Corridor C were identified. Six of these eleven Route Options were not taken forward on the basis that they performed less favourably than the other five Route Options against the Assessment Factors and offered no additional benefits.

5.4.8. The five remaining Route Options were included in EWR Co's initial non-Statutory Consultation between January and March 2019. Two of these – Route Options B and E – would serve Cambourne and an indicative station location was assumed provided on the south side of the town near Caxton. This indicative location was identified in part because a station location north of Cambourne would have required the railway to cross the A428 – at least once in order to approach Cambridge from the north and twice in order to approach Cambridge from the south – which would add both complexity and cost to the Project's design, construction and maintenance.

5.4.9. The Technical Report supporting the 2019 consultation also set out the reasons why approaches to Cambridge from the north had been previously ruled out by Network Rail. Respondents were invited to give their views on whether they agreed that EWR Co was right to prioritise Route Options that approached Cambridge from the south rather than from the north on this basis. Responses to this question were evenly split both ways and a significant proportion of respondents took a neutral position.[22]

5.4.10. EWR Co's further analysis after the consultation focused on how the Route Options performed against the Assessment Factors that were identified as being most likely to differentiate between Route Options. They were reported[23] in the following way in the Preferred Route Option Report[24]:

- **Benefits for transport users** – the potential benefits from improved journey times, lower fares and less road congestion;
- **Supporting economic growth** – the potential wider employment and productivity benefits of improved east-west connectivity;
- **Supporting the delivery of new housing** – the opportunity for stations served by EWR to support housing growth within their catchment areas;
- **Capital and operating costs and overall affordability** – the expected upfront capital costs, whole life and operating costs, and revenue streams associated with EWR; and
- **Environmental impacts and opportunities** – the key environmental features which fall within the boundaries of each route option and associated challenges and opportunities.

[22] https://eastwest-rail-production.s3.eu-west-2.amazonaws.com/public/ListsBlock-Media/66959d6763/Preferred-Route-Option-Announcement-Public-Feedback-Report.pdf

[23] The titles of these Assessment Factors, as reported in the Preferred Route Option Report, are slightly different to the Assessment Factors listed above in paragraph 5.2.10. However, the underlying content of the assessment was the same, and the outcome is the same, as if they had been titled in the same way as paragraph 5.2.10. The "Contribution to enabling housing and economic growth including best serving areas benefitting from developable land" factor (para 5.2.10) was divided and reported under two headings: "supporting economic growth" and "supporting the delivery of new housing". This is because there are two separate approaches to analysing these (as set out in DfT's Transport Appraisal Guidance – relating to 'Level 2' and 'Level 3' stages of analysis and benefits capture).

[24] Preferred Route Option Report

5.4.11. In relation to costs, the Consultation Document noted[25] that at that early stage, costs estimates were indicative only. The Consultation Document relied on estimates provided by Network Rail based on information that was available at the time[26]. These indicative upfront construction costs ranged from £2.0 billion[27] (for Route Option A) to £3.4 billion (for Route Option E). These costs would continue to be developed, as the Consultation Document explained: "Cost estimates will continue to be refined as route development work progresses towards identifying a final Preferred Route Alignment."[28]

5.4.12. Following the consultation, the cost estimates continued to be updated and revised by Network Rail. Estimates were also prepared by Atkins, an independent consultant retained by EWR Co. In particular, they were updated to include[29]:

- More detailed consideration of how environmental and heritage risk areas could be avoided, and the potential additional land requirements for ecological habitat creation and relocation;
- Consideration of how properties and buildings could be avoided to minimise adverse impacts on local communities and land acquisition and compensation costs;
- An assumption that viaducts would be required to mitigate known areas of floodplain risk in advance of detailed flood risk assessments; and
- Seeking to respect existing rights of way by including provision to maintain access through appropriate structures (e.g. bridges, underpasses).

5.4.13. This was a conservative approach which resulted in the indicative estimates of upfront capital costs being revised upwards, ranging from £3.6 billion[30] (for Route Option A) to £4.3 billion (for Route Option C). The further development work also resulted in changes to the relative costs of each option, with Route Option E now having an estimated upfront capital cost of £3.7 billion. The five Route Options ranked in the same order for both the Network Rail and Atkins sets of estimates.

5.4.14. Following consideration of the consultation feedback and the further analysis of each Route Option including the most up-to-date cost estimates, EWR Co identified Route Option E (shown in Figure 5.3) as its recommendation for the Preferred Route Option for the new section of railway between Bedford and Cambridge. Having considered EWR Co's recommendation, the Secretary of State announced Route Option E as the Preferred Route Option on 30 January 2020. The analysis and assessment work that led to EWR Co making its recommendation was presented in the Preferred Route Option Report published in January 2020.[31]

[25] See page 12 of the 2019 Consultation Document
[26] See page 59 of the Preferred Route Option Report
[27] These figures are real values (adjusted for inflation) in 2015 prices, and do not account for discrepancies in price inflation between construction and the general economy
[28] See page 59 of the Preferred Route Option Report
[29] See page 59 of the Preferred Route Option Report
[30] Preferred Route Option Report see page 15, real values (adjusted for inflation) in 2015 prices, and do not account for discrepancies in price inflation between construction and the general economy
[31] For further detail, please see the East West Rail Bedford to Cambridge Preferred Route Option Report, found here: https://eastwestrail-production.s3.eu-west-2.amazonaws.com/public/Preferred-Route-Option-Announcement/a72dbd2d81/Route-Option-Report.pdf

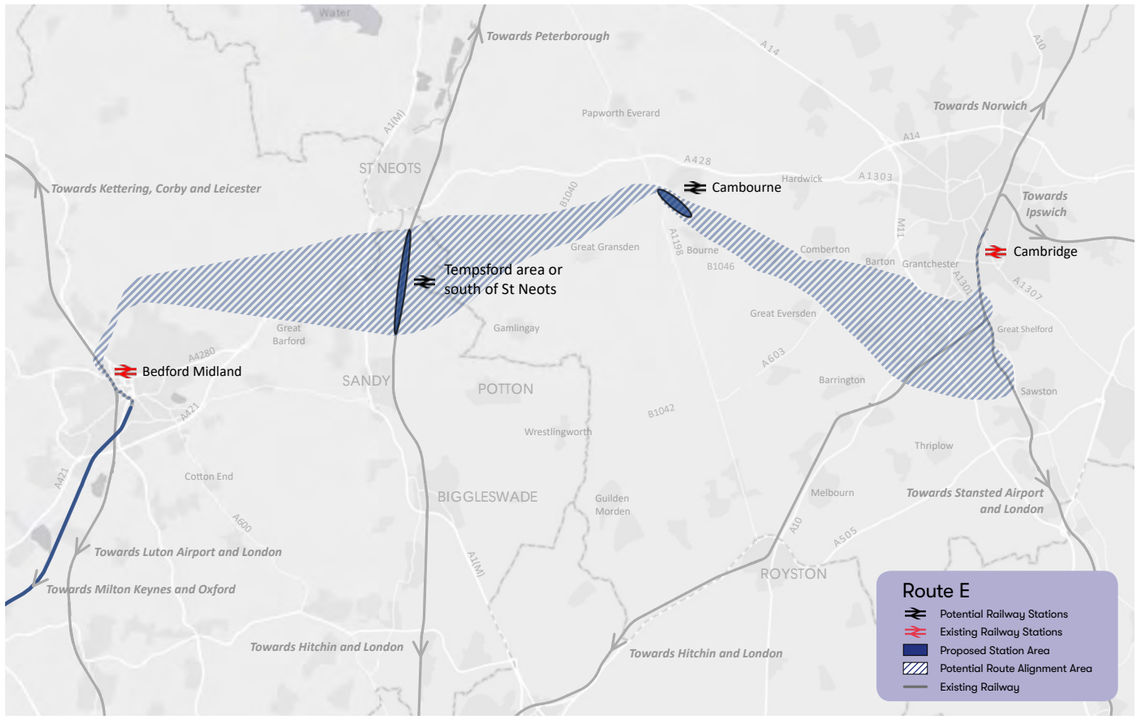


Figure 5.3: Broad area for the preferred route between Bedford and Cambridge (Route Option E)

5.4.15. EWR Co's analysis concluded that when considering differentiating factors, Route Option E was most likely to deliver against the strategic objectives for EWR and provide the best overall value for money for the Government's investment in the railway.

5.4.16. The key reasons why Route Option E was identified as being the Preferred Route Option are presented below, with more detail available in the Preferred Route Option Report[32]:

- It achieved the highest score based upon responses to the 2019 consultation on four out of five key criteria: benefits for transport users, environmental considerations, supporting economic growth and supporting new homes;
- Taking a route via Cambourne offers the greatest opportunity to avoid the most environmentally challenging areas and potential direct impacts on irreplaceable or sensitive environmental features, including heritage assets, with good opportunities to achieve biodiversity net gain;

[32] For further detail, please see the East West Rail Bedford to Cambridge Preferred Route Option Report, found here: https://eastwestrail-production.s3.eu-west-2.amazonaws.com/public/Preferred-Route-Option-Announcement/a72dbd2d81/Route-Option-Report.pdf

- New links to Thameslink and the Midland Main Line (MML) at Bedford, the East Coast Main Line (ECML) in the vicinity of Sandy/St Neots and the West Anglia Main Line (WAML) in Cambridge will provide convenient additional inter-regional connectivity for people, making it easier to get to towns and cities like Kettering, Leeds, Norwich, Ipswich and Nottingham;
- By serving Bedford station it provides easy connectivity into Bedford town centre and provides an opportunity for other bodies such as Bedford Borough Council to bring forward regeneration plans in this area of Bedford;
- It also connects the growing population of Cambourne with environmentally sustainable transport and could integrate with proposed improvements to the local transport network in south Cambridgeshire such as the busway extension and Cambridgeshire Autonomous Metro;
- The Route Option could support much needed development of more affordable housing in areas including Bedford, between Sandy and St Neots and at Cambourne; and
- Most responses from local authorities in the Bedford to Cambridge area supported this route.

Generating alignment options from selection of Route Option E

5.4.17. Following the identification of Preferred Route Option E, alignment options were generated in three stages.

5.4.18. First, an initial design proposal provided a "Route Option E Indicative alignment". This Route Option E Indicative Alignment was developed to test the viability of how to connect Bedford to Cambridge within the Route Option Area using desktop data that allowed the environment and heritage features to be understood and taken into account early in the design lifecycle. Data on built-up areas was also gathered, as well as the location of roads and Public Rights of Way (PRoW) enabling these considerations to inform the Route Option E Indicative Alignment. This allowed key risks and opportunities to be identified early which could then be used as the basis for work in the next design phase.

5.4.19. Second, the Route Option E Indicative Alignment went through a phase of design updates (Value Management). These updates began to improve the alignment's design in relation to its operational characteristics and impact on the landscape. This resulted in a "value managed alignment".

5.4.20. Third, the value managed alignment was used as a basis to generate new Route Alignment Options through three key steps:

- Consideration of emerging requirements for operations and maintenance, including provision of passing loops;
- Identification of hotspots and opportunities to drive improvements and optimisation of the Route Alignment Options; and
- Consideration of potential station locations.

5.4.21. The development of options included consideration of:

- Indicative locations and potential requirements for passing loops, using design parameters that would facilitate the loops being capable of accommodating freight services;
- Indicative locations and potential requirements for connections between the tracks to improve operational flexibility; and
- Indicative track options at the interfaces with existing Network Rail infrastructure (i.e. junction arrangements).

5.4.22. The activity to identify hotspots (areas of critical engineering or environmental constraints or areas where there were multiple constraints in close proximity to the alignment being developed) and opportunities for improvements resulted in refinements such as:

- Reducing skew, which is the angle at which one railway crosses another, over the ECML and other major infrastructure crossings (reducing skew reduces design and construction complexity making it quicker and cheaper to build);
- Providing a sufficient length of straight track through the potential stations to ensure that stepping distances from platforms to trains are minimised;
- Consideration of clearances over highways and watercourse crossings; and
- Further avoidance of environmental, heritage and community assets.

5.4.23. In some cases, addressing hotspots was realised through refinement of the Route Alignment Options. In other cases, new Route Alignment Options emerged through the process of identifying solutions to the hotspots.

5.4.24. This process resulted in the identification of the Route Alignment Options described in Chapter 8 (Project Section C: Bedford), Chapter 9 (Project Section D: Clapham Green to The Eversdens) and Chapter 10 (Project Section E: Harlton to Hauxton).

5.4.25. Alignment options were generated from the Route Option E Indicative Alignment. The subsequent options are an improvement from it, better meeting operational requirements and taking account of hotspots and opportunities.

5.4.26. In addition, as part of the Route Alignment option development process, EWR Co has examined the potential performance of alignments following the route of the A428 Improvement Scheme being promoted by Highways England between Black Cat and Caxton Gibbet. The preferred alignment for this Scheme had not been announced when the Preferred Route Corridor was selected or the Route Options were being developed.

5.4.27. The preferred alignment was confirmed by Highways England in February 2019 – part way through EWR Co's 2019 consultation on the Route Options – and differed from the options that Highways England had previously published. The preferred alignment selected for the A428 Scheme is largely located on land just to the north of the Preferred Route Corridor. As a result, this land also lies outside all five of the short-listed Route Option areas included in EWR Co's 2019 consultation.

5.4.28. In light of the new information from Highways England and following comments received from respondents during the 2019 consultation regarding the A428 Scheme, EWR Co has considered how potential alignments in this area might perform compared to alignments wholly within the Preferred Route Option area.

5.4.29. Moreover, if an alignment that runs to the north of the A428 Scheme is selected, this would remove the need for at least one of the potential crossings of the A428 required in order to serve a station located north of Cambourne. As a result – and also following stakeholder feedback – EWR Co has considered potential station locations to the north and to the south of the town, both of which would remain proximate to the Preferred Route Corridor E area.

5.4.30. Should a station be provided at Cambourne North rather than Cambourne South potential alternative options for accessing Cambridge (assumed from the south) may exist.

5.4.31. For completeness, EWR Co has assembled up-to-date information about a northern approach into Cambridge in case this would change conclusions that a southern approach to Cambridge should be favoured, especially in light of a station location to the north of Cambourne. The information continues to favour a southern approach strongly, and EWR Co remains of the view that a southern approach into Cambridge is preferable to a northern approach. The analysis of the performance of a northern approach to Cambridge and the consequences for the design of the Project is contained in Appendix F to this Technical Report.[34] The matters on which EWR Co is seeking views include that the advantages of approaching Cambridge from the south is the better option and that a number of challenges remain for a northern approach even with a Cambourne North station.

Selecting preferred station and alignment options

5.4.32. The outputs of this consultation will be considered before a preferred alignment is recommended to the Secretary of State for Transport. The preferred alignment will then be subject to further design and will be the subject of the Statutory Consultation.

Developing designs in Project Section F: the Shelfords to Cambridge station

5.4.33. In this Project Section Network Rail is the infrastructure owner and is developing infrastructure solutions in the area for a number of schemes, notably the development of the Cambridge South Station scheme. Therefore, EWR Co has worked with Network Rail and identified further enhancements that would be required to also accommodate EWR services into Cambridge station. These enhancements are being driven by operational need. A key element of these operational assessments is understanding what services use the existing infrastructure today, what is proposed in the future and what impact the introduction of EWR services have on these services. This drives the identification of the infrastructure changes that are required, including changes to Cambridge Station.

[34] Further detail regarding the review – including analysis of the constraints, challenges and opportunities for both northern and southern approaches – is set out in Appendix F of this report.

06.
Project Section A: Oxford to Bicester

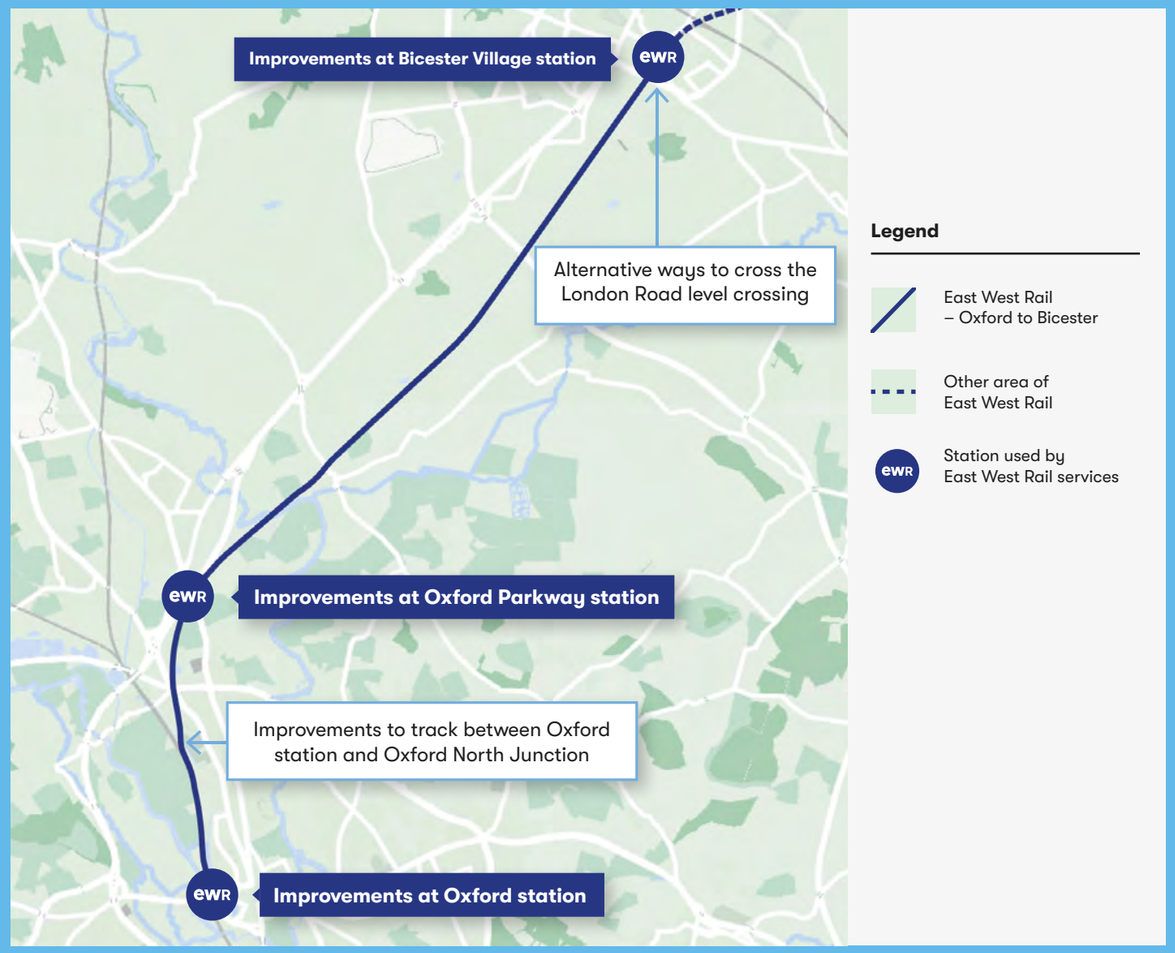


Figure 6.1: Oxford station area

6.1. Chapter summary

6.1.1. This Chapter describes the proposals for the section of the Project between Oxford and Bicester.

6.1.2. Changes may be required to the existing railway in the Oxford area, to facilitate EWR services. This Chapter sets out the options and key issues that are being considered by EWR Co for this area.

6.1.3. The Chapter goes on to address the potential need for modifications at Oxford Parkway and Bicester Village stations and the key constraints that need to be considered in planning for EWR services.

6.1.4. EWR Co is looking at the implications of increased train services on the operation of the level crossing at London Road in Bicester. The Chapter describes the issues that are being considered and sets out six high-level conceptual options for this location. It also explains the site-specific factors that will be taken into account as those concepts are developed further.

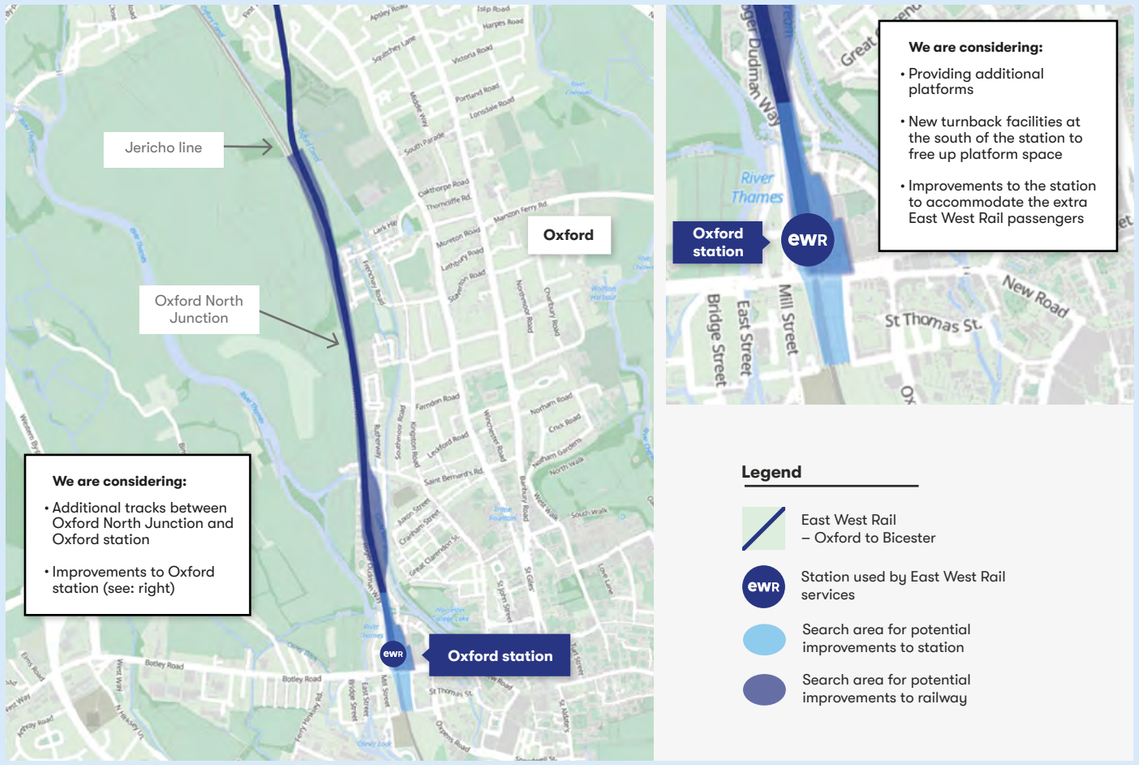
6.2 Oxford area

Introduction

6.2.1. This section of the Chapter discusses Oxford station and the surrounding area, shown in Figure 6.2. It provides a general description of the current station environment, the existing railway network and its associated facilities. It then outlines:

- The pattern of train services to/from Oxford station;
- The potential issues that may arise as a result of the introduction of EWR services;
- Potential enhancements at Oxford station;
- Potential enhancements between Oxford North Junction and Oxford station; and
- The options to upgrade the railway infrastructure that EWR Co is considering.

Figure 6.2: Oxford station area



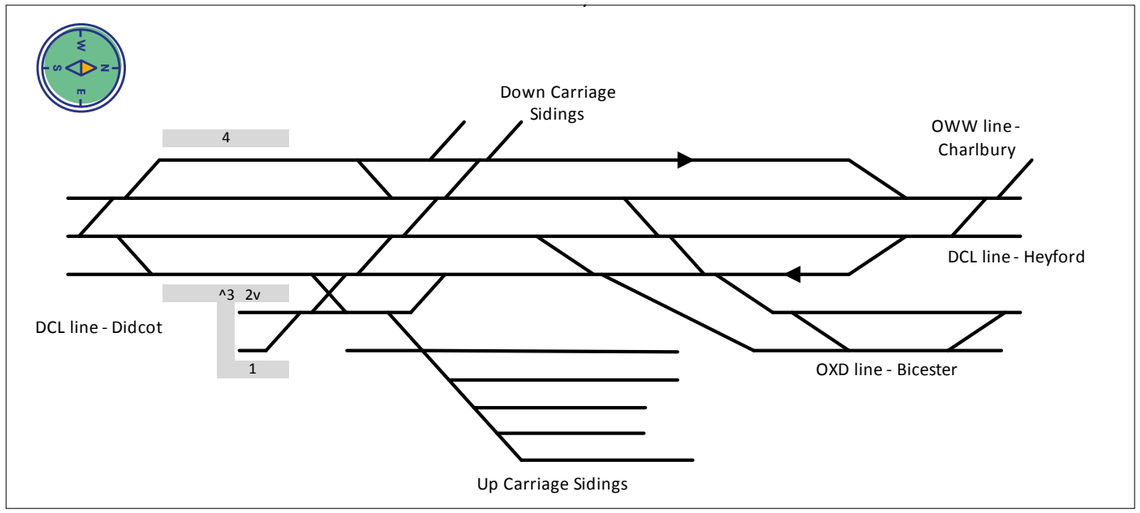
Current station

6.2.2. Oxford is one of the two key stations on the EWR route that would serve as the starting and terminus station for customers using EWR services to and from Cambridge and Milton Keynes. It is therefore a key part of the EWR customer experience, even more so because of its iconic presence and its purpose as a gateway to the city. In 2018/19 over eight million passengers started or finished their train journey at Oxford station, and a further 500,000 people changed trains.

6.2.3. Oxford station is owned by Network Rail and operated by Great Western Railway as part of its franchise agreement. Figure 6.3 shows a schematic layout of the station and its northern approaches. The route from Oxford to Cambridge leaves the station in a northbound direction.

6.2.4. Oxford station has four platforms, two through platforms (Platform 3 and 4) and two bay platforms (Platforms 1 and 2), facing north. Great Western Railway and CrossCountry services almost exclusively use the through platforms, and Chiltern almost exclusively operates from the bay platforms, except during peak hours when some trains exceed the available length of the bays. Carriage sidings are used for stabling trains. This is an important function at Oxford, which acts as an end-point for a number of services, as described below.

Figure 6.3: Schematic of Oxford station and approaches from the north of the station



6.2.5. Oxford is at the heart of the rail corridor that links the Great Western Main Line (GWML) at Didcot with the London Marylebone to Birmingham 'Joint Line' at Aynho Junction, south of Banbury. This corridor, which forms the southern-most section of the Didcot to Chester Line (DCL), is vital for inter-regional passenger and freight services. It connects customers to a range of destinations to the south and north regions and further afield to destinations in Scotland and South Wales. It is a designated part of the national Strategic Freight Network, with Oxford station being the hub of the rail network in Oxfordshire.

6.2.6. Oxford itself is a key origin and destination for outer Thames Valley passenger services using the GWML, North Cotswolds services using the Oxford, Worcester and Wolverhampton railway (OWWR) for connectivity into London and, when works under the 2020 Order are complete, the EWR services using the Oxford Branch from Oxford to Bletchley. There is also an important local rail market centred on Oxford from all surrounding lines.

6.2.7. North of Oxford station, the railway gives access to the Oxford Branch, which provides passenger and freight links with the Chilterns Line and the East Midlands, and the OWWR, which provides passenger links to West Oxfordshire, Worcestershire, and Herefordshire.

Bicester to Oxford North Junction

6.2.8. EWR services would approach from the direction of Bicester and connect into the main route into Oxford at Oxford North Junction. The lines from Bicester to Oxford North Junction were upgraded as part of the first stage of delivering EWR and consist of two tracks throughout.

Oxford approach from Bicester

6.2.9. The approach tracks from the Bicester direction into Oxford comprise two tracks from Bicester to Oxford North Junction where access is available onto the up 'Jericho' line (the slow line providing local services) or up main line into Oxford. Services using the bay platform then have to leave the Jericho line or main line and cross over into the bay platforms.

6.2.10. Services leaving the bay platforms conflict with southbound services and have to make complex movements to access the northbound tracks to Oxford North Junction.

Train services

6.2.11. The EWR services at Oxford will be delivered in two phases. Connection Stage 1 will see the introduction of two trains per hour (tph) between Oxford and Milton Keynes following the completion of the upgrade of the railway between Bicester and Bletchley by Network Rail.

6.2.12. The next stage for EWR services will be the introduction of 2tph between Oxford and Bedford following delivery of the Marston Vale Line upgrade as part of Connection Stage 2.

6.2.13. It is planned that these Oxford to Bedford services will be extended through to Cambridge following the completion of Connection Stage 3 between Bedford and Cambridge. It is fundamental to the overall EWR business case and the Project Objectives that the 4tph can be accommodated at Oxford.

Issues and constraints

6.2.14. Oxford is recognised as a challenging location due to its constrained site, environmental restrictions and high level of use by the rail industry. Oxford station and the surrounding area is highly congested and capacity to operate additional services for Connection Stages 2 and 3 of EWR is presently limited.

6.2.15. Other challenges include:

- Environmental impacts, including flooding, noise and emissions;
- Interfaces with numerous train and freight operating companies;
- Interfaces with other modes of transport for customers' end-to-end journeys; and
- Capacity in the Carriage Sidings for additional train stabling.

6.2.16. EWR Co is also considering the following factors as it develops the plans in this area:

- The effects on residents living in properties next to the railway, such as noise and disturbance;
- The potential need to purchase neighbouring properties;
- Protecting the historic LNWR swing bridge and its setting;
- The proximity to Port Meadow Special Area of Conservation; and
- Minimising the impact of on current train services during construction.

6.2.17. As part of Connection Stage 1, enhancements are already underway between Oxford and Bletchley to enable the start of services from Oxford to Milton Keynes. However, to provide services to Bedford and Cambridge, additional works are required on this section of railway to provide the necessary further capacity for the extra trains and the passengers that would use them. The additional works needed to achieve the services to Bedford and Cambridge are discussed in this report.

6.2.18. This work also includes timetable development to create flexibility around available capacity and/or additional infrastructure. This is needed to ensure existing services, planned services and EWR trains can run reliably and punctually, as the rail network grows for both passenger and freight.

6.2.19. Sufficient capacity for EWR at Oxford station is necessary to deliver the full EWR connectivity between Oxford and Cambridge. This connectivity is recognised by the National Infrastructure Commission (NIC), local authorities and the Government as a strategic enabler for the wider transformation of the Oxford-Cambridge Arc. In that context, therefore, achieving the right solution at Oxford is essential in railway capacity terms, but also because the station masterplan redevelopment at Oxford presents an opportunity to reinforce the wider economic benefits that are at the heart of the Project. This is pertinent given the important part played by Oxford University as part of the knowledge economy.

6.2.20. EWR is one of a number of enhancement programmes that will rely on increased capacity at Oxford; others include the aspiration for services to run to Cowley, the work of the North Cotswolds Line Taskforce[35] and potential electrification from Didcot to Oxford. Indeed, the long-term aspirations for the railway in and around Oxford have been identified in the Network Rail Oxfordshire Rail Study that has recently been completed.

6.2.21. The introduction of EWR services to Milton Keynes would use much of the remaining spare capacity in the rail network approaching Oxford from the north. Moreover, the additional passengers that are expected to use these new services would place additional pressure on the existing station facilities at Oxford.

6.2.22. Recognising that the plans to introduce additional services linking Oxford to Bedford and Cambridge would place further pressure on the station and on the rail network in the vicinity of the station, EWR Co needs to undertake works in the Oxford area to ensure that these services, and the others that serve Oxford, can operate reliably. EWR Co also needs to ensure that the station can safely handle the numbers of people expected to use it while offering a passenger experience befitting a major interchange and gateway station.

6.2.23. EWR Co has developed some indicative options for the capacity required at Oxford to run its full service, for example by doubling the Jericho line on the approach into Oxford station. However, it is important that the infrastructure intervention to enable EWR is coherent with the long-term solution for Oxford station; to avoid abortive cost, minimise disruption to communities and passengers, and to fulfil the wider economic opportunity there.

6.2.24. For that reason, EWR Co is working closely with Network Rail, as well as with the Department for Transport (DfT), to develop a joined-up approach to developing Oxford station and its approaches.

6.2.25. Development of the potential timetable options for EWR services has identified that capacity at Oxford is limited and is unlikely to be able to facilitate the full range of EWR services with a level of robustness. Capacity into and out of the bay platforms at Oxford for use by EWR services is constrained through both the use and occupation by Chiltern services (typically 2tph) and the limited track capacity between Oxford North junction and Oxford Station. The combination of infrastructure and timetable inflexibility limits the ability for the creation of suitable capacity to enable the introduction of EWR services. It is also acknowledged that changes to infrastructure in the Oxford area are restricted by planning constraints and available space.

EWR interfaces with other schemes under consideration

6.2.26. To enable an application for DCO to allow the Project to be delivered, EWR Co needs to consider and determine its needs at Oxford to the extent that are additional to, or require adjustment to, improvements already in development by others.

6.2.27. Network Rail is also developing options for improvements at Oxford station and its vicinity to improve safety, capacity, connectivity and journey times which may include additional platforms, additional tracks, signalling optimisation and high-speed crossovers to the north of Oxford station, some of which form part of the wider Oxfordshire Rail Study.

6.2.28. In addition, there are several schemes and concepts currently being considered, developed or under way in the Oxford area. EWR Co recognises that due to the complexities and number of options being explored by stakeholders for improvements at Oxford, a number of these additional schemes may require further consultation by Network Rail and coordination with other stakeholders.

6.2.29. These include:

- Oxford to Didcot electrification[36];
- Oxford Corridor Phase 2[37]– including additional platform capacity and line speed improvements;
- The North Cotswold Line Transformation[38];
- Oxford station masterplan[39]; and
- Midlands Engine Rail schemes[40].

6.2.30. In May 2020 DfT and Network Rail embarked on Project SPEED (Swift, Pragmatic and Efficient Enhancement Delivery), which reviewed infrastructure projects at different stages of development, including the Oxford area, to identify how government funding could go further and work could be carried out faster.

6.2.31. EWR will work closely with Network Rail, other promoters and stakeholders to ensure that its requirements at Oxford are joined up with the other initiatives and that the outcomes achieved work together for the benefit of the whole railway and its passengers.

[35] The North Cotswold Line Task Force is a group of five county councils and Local Enterprise Partnerships https://researchbriefings.files.parliament.uk/documents/CDP-2020-0004/NORTH-COTSWOLD-LINE-TASK-FORCE-STRATEGIC-BUSINESS-CASE-DEC-2019_ISSUE_110120-(002).pdf

[36] https://www.networkrail.co.uk/running-the-railway/our-routes/western/oxfordshire/ North Cotswold Line Transformation - Strategic Outline Business Case, North Cotswold Line Task Force, December 2019

[37] North Cotswold Line Transformation - Strategic Outline Business Case, North Cotswold Line Task Force, December 2019 (https://researchbriefings.files.parliament.uk/documents/CDP-2020-0004/NORTH-COTSWOLD-LINE-TASK-FORCE-STRATEGIC-BUSINESS-CASE-DEC-2019_ISSUE_110120-(002).pdf)

[39] https://www.oxford.gov.uk/info/20182/regeneration_and_development/949/oxford_station_masterplan

[40] https://www.midlandsconnect.uk/key-projects/midlands-engine-rail/midlands-engine-rail/

Options to be considered

6.2.32. EWR Co's objective is to resolve the need for change in the Oxford area and to investigate the requirements associated with the introduction of the Connection Stage 2 and Connection Stage 3 train services. This will allow for the options to be thoroughly investigated and a greater understanding of what the interventions might need to be. EWR Co aims to provide details of the infrastructure and facilities it believes are necessary to operate the EWR railway.

6.2.33. Several infrastructure options are being considered to increase capacity on the railway and at the station. These include additional track between Oxford and Oxford North Junction, additional platforms at Oxford station and capacity improvements to the south of Oxford station.

6.2.34. In addition, concept train service planning is ongoing to identify how available capacity can be used to deliver a robust and standard ('clock face') pattern timetable without adversely impacting existing trains and operations. This means that trains would call at most stations at the same minutes past each hour all day and that train services would be evenly spaced, as far as is possible. These concepts will be matched with the evolving infrastructure option development to identify the optimum industry solution whilst recognising customer needs.

6.2.35. At Oxford station the options being considered include:

- The provision of additional platform faces to increase the number of trains that can use Oxford station at the same time;
- The provision of additional platforms to increase the ability for some services to continue through Oxford rather than turning back;
- The provision of additional infrastructure south of Oxford station to provide improved facilities to turn back trains outside the station, freeing up platform space; and
- Station specific improvements to accommodate the increase in passengers generated by EWR.

6.2.36. On the approaches to Oxford station the options being considered include:

- Additional tracks between Oxford North Junction and the bay platforms; and
- Additional track between Oxford North Junction and the Jericho line.

6.2.37. Figure 6.4 illustrates indicative interventions that are under consideration, in red.

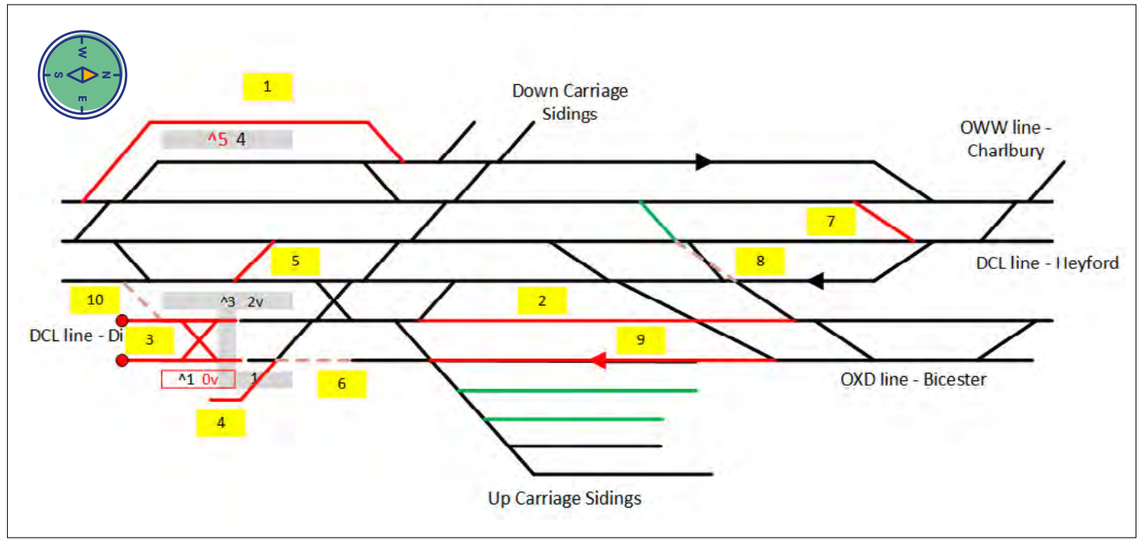


Figure 6.4: EWR Co indicative option to support EWR trains terminating at Oxford (potential changes shown in red and green)

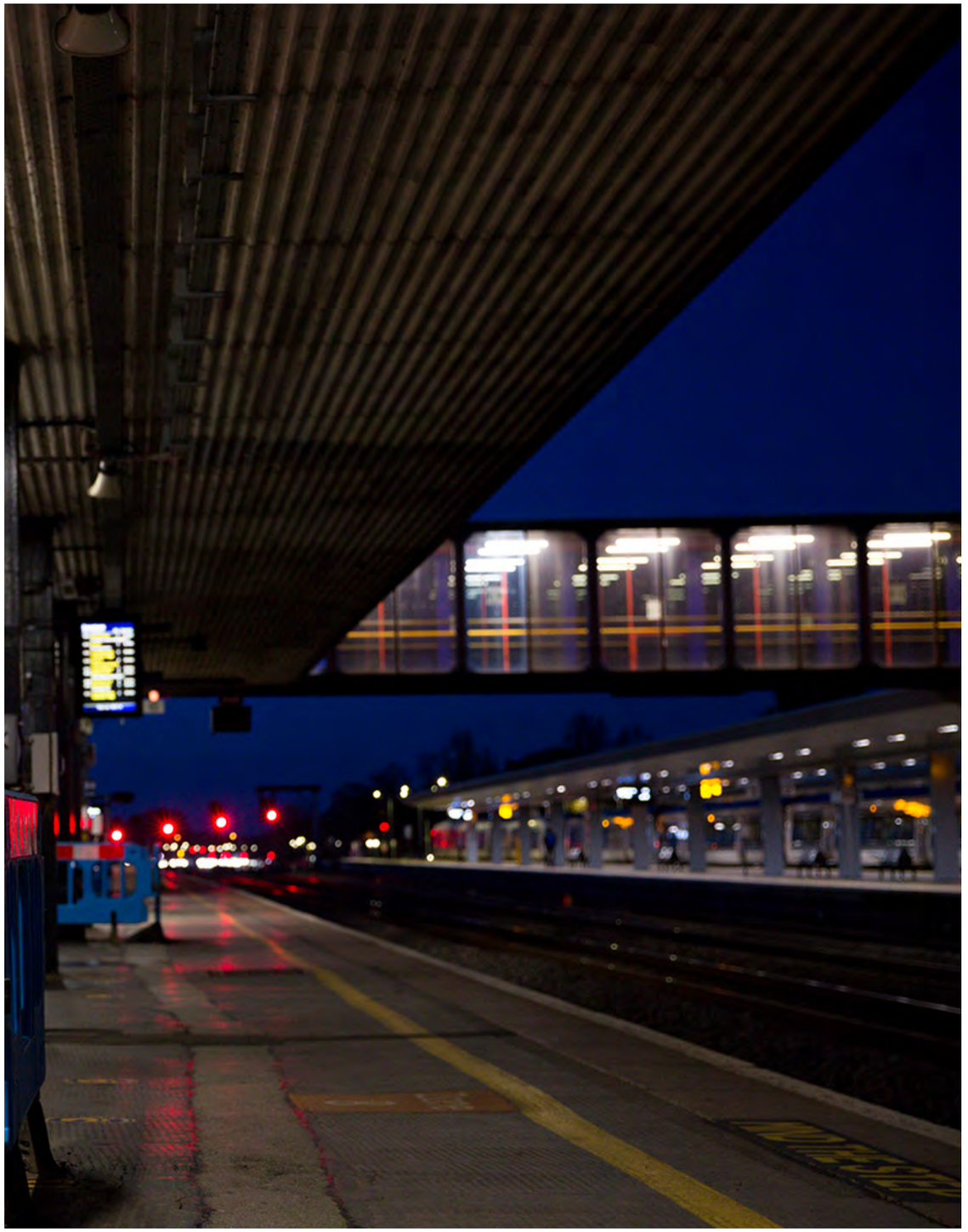
Factors to be considered

6.2.38. EWR Co's objective is to maximise the use of the station and enhance the customer experience for those using EWR services.

6.2.39. When deciding which options to take forward, in addition to the outcomes of this consultation, EWR Co expects there to be a need to pay particular attention to the following Assessment Factors which are likely to assist in differentiating between options:

- Environmental impacts and opportunities;
- Transport user benefits – especially with regard to journey times and connectivity to the region and beyond;
- Contribution to enabling housing and economic growth including best serving areas benefitting from developable land – encouraging regeneration and improving employment and productivity benefits arising from existing and proposed development;
- Capital costs (of the infrastructure required to enable each option);
- Operating costs;
- Short distance passenger services;
- Rail passenger connectivity to existing mainlines;
- Long distance passenger services; and
- Performance.

6.2.40. Feedback from consultees in relation to the 'Customer experience and railway operations' section of the Consultation Document will also inform the development of EWR Co's plans for Oxford station and the surrounding area in order to establish a new benchmark in customer experience.



Oxford station platform

6.3. Oxford Parkway station

Introduction

6.3.1. This section of the Chapter discusses Oxford Parkway station and the surrounding area. It provides a general description of the current station environment, which is shown in Figure 6.5, and then outlines:

- The pattern of train services from Oxford Parkway station;
- The key constraints; and
- Potential enhancements at Oxford Parkway station.

6.3.2. Oxford Parkway station was built in 2015 in connection with the introduction of new services between Oxford and London Marylebone. Oxford Parkway station is located immediately to the north of Oxford, adjacent to the A4165 and A34 roads. A park and ride site serving Oxford city centre is located adjacent to the station.

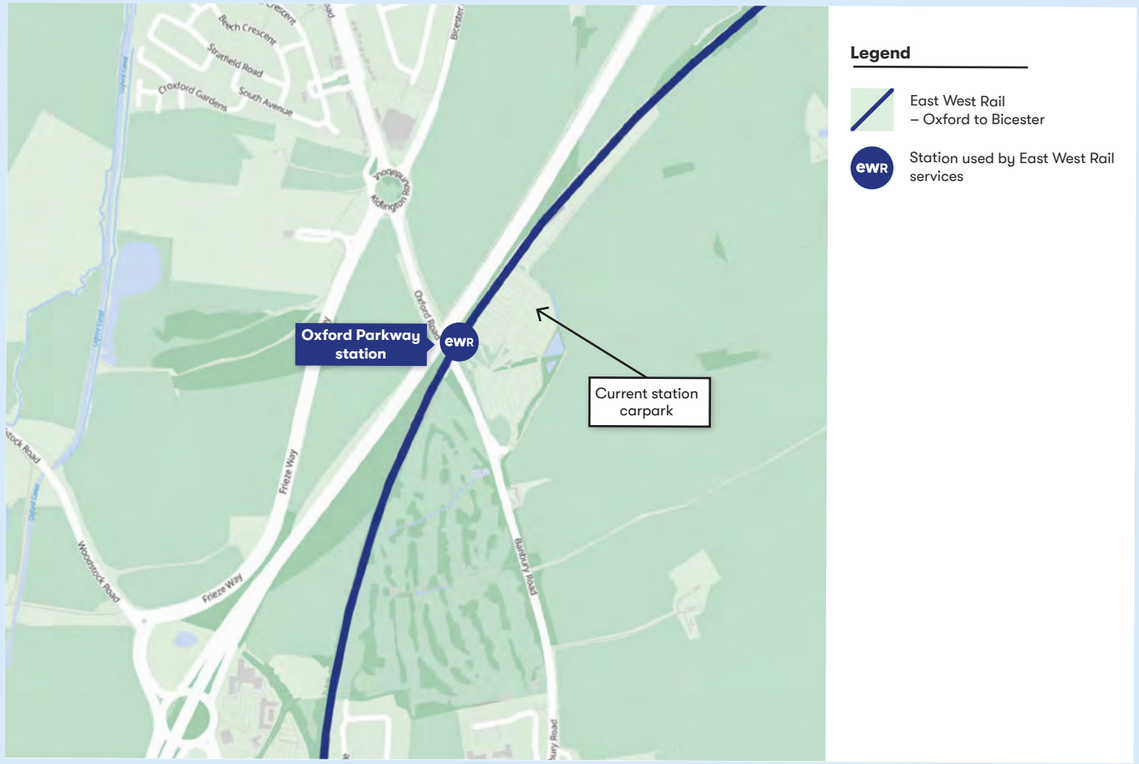


Figure 6.5: Oxford Parkway station

6.3.3. The station is currently served by Chiltern Railways with 2tph to Oxford and London Marylebone. The station lies on the National Cycle Route 51 and has a large car park to cater for park and ride traffic. The number of passengers who used the station in 2018/19 was in excess of one million.

6.3.4. Although the station was designed and built with EWR in mind, at that point in time the prospective timing of services beyond Bedford to Cambridge was less certain and was not therefore fully accounted for.

Key constraints

6.3.5. Oxford Parkway station is located within the Green Belt, adjacent to open countryside. The station site is constrained by the adjacent highways, park and ride site and an aggregates depot.

Potential need for changes

6.3.6. Because of the increased number of people that are expected to use the station once EWR services to destinations east of Bletchley commence, EWR Co is reviewing the facilities which impact the customer experience at the station. Although the work done to date shows that the majority of the station facilities would be adequate for the expected number of users once EWR services are introduced, the station car park is known to be regularly full, meaning that potential users are unable to access the railway.

6.3.7. EWR Co will investigate options to expand the parking facilities at the station, together with options to encourage access to the station via sustainable modes, such as walking and cycling. EWR Co will also examine whether improvements to the local highway networks are required to deal with the expected increase in traffic accessing the station.

6.3.8. In addition, EWR Co will investigate further options to improve the overall customer experience at Oxford Parkway station.

6.3.9. When deciding which options to take forward, in addition to the outcomes of this consultation, EWR Co expects there to be a need to pay particular attention to the following Assessment Factors, which are likely to assist in differentiating between options:

- Environmental impacts and opportunities;
- Transport user benefits – especially with regard to journey times;
- Contribution to enabling housing and economic growth including best serving areas benefitting from developable land – encouraging regeneration and improving employment and productivity benefits arising from existing and proposed development;
- Capital costs (of the upgrades required to enable each option);
- Short distance passenger services;
- Rail passenger connectivity to existing main lines; and
- Long distance passenger services.

6.3.10. The work on the above options is currently at a very early stage of development. Detailed proposals will be presented at the Statutory Consultation.

6.4. Bicester Village station

Introduction

6.4.1. This section of the Chapter discusses Bicester Village station and the surrounding area. It provides a general description of the current station environment, which is shown in Figure 6.6, and then outlines:

- The pattern of train services from Bicester Village station;
- The key constraints; and
- Potential enhancements at Bicester Village station.

6.4.2. Bicester Village station was built in 2015 in connection with the introduction of new services between Oxford and London Marylebone. It is located to the south of Bicester town centre. It is close to London Road level crossing and also to the Bicester Village retail complex.

6.4.3. The station is currently served by Chiltern Railways with 2tph to Oxford and London Marylebone. The station is located adjacent to the site of "Bicester Village" shopping centre and has an Information Hub and walkway to the Village, providing direct access for customers who are visiting the retail outlets. The number of passengers who used the station in 2018/19 was in excess of 1.7 million.

Figure 6.6: Bicester Village station

6.4.4. Although the station was designed and built with EWR in mind, at that point in time the prospective timing of services beyond Bedford to Cambridge was uncertain and was not therefore fully accounted for.

6.4.5. In addition, the station has proved to be very popular and has attracted a large number of users.

Key constraints

6.4.6. Bicester Village is within the built-up area of Bicester and is surrounded by development. The London Road level crossing is located a short distance to the northeast of the station, adjacent to Station House, which is a Grade II listed building.

Potential need for changes

6.4.7. Because of the increased number of people that are expected to use the station once EWR services to destinations east of Bletchley commence, EWR Co is reviewing the facilities which impact the customer experience at the station. Although the work done to date shows that the majority of the station facilities would be adequate for the expected number of users once EWR services are introduced, there may be a requirement for additional facilities, for example waiting areas. EWR Co will investigate options to expand the parking facilities at the station together with initiatives to encourage access to the station via sustainable modes, such as walking and cycling. EWR Co will also examine whether improvements to the local highway networks are required to deal with the expected increase in traffic accessing the station.

6.4.8. In addition, EWR Co will investigate further options to improve the overall customer experience at Bicester Village station.

6.4.9. When deciding which options to take forward, in addition to the outcomes of this consultation, EWR Co expects there to be a need to pay particular attention to the following Assessment Factors, which are likely to assist in differentiating between options:

- Environmental impacts and opportunities;
- Transport user benefits – especially with regard to journey times;
- Contribution to enabling housing and economic growth including best serving areas benefitting from developable land – encouraging regeneration and improving employment and productivity benefits arising from existing and proposed development;
- Capital costs (of the upgrades required to enable each option);
- Short distance passenger services;
- Rail passenger connectivity to existing main lines; and
- Long distance passenger services.

6.4.10. The work on the above options is currently at a very early stage of development. Detailed proposals will be presented at the Statutory Consultation.

6.5. Level crossing at London Road, Bicester

Introduction

6.5.1. EWR Co is examining the capacity of the rail infrastructure between Oxford and Bicester to enable fast, frequent services between Oxford and Cambridge, as set out in the Project Objectives. A key element is the level crossing at London Road in Bicester, where EWR Co is investigating measures to mitigate the effects of the planned increase in train services, including the way vehicles and pedestrians cross the railway, so that safety can be improved, a more reliable service can be operated and congestion arising from prolonged barrier down times can be minimised.

6.5.2. The B4100 London Road is a two-lane single carriageway road, which runs north-south and intersects the Oxford to Bicester Railway line just south of Bicester Town centre and just east of Bicester Village station (OS Grid reference E458636, N 222034). The intersection is an at-grade manually controlled barrier locally monitored by CCTV (MCB CCTV) level crossing. The route provides an important link for local movements between the south east sector of Bicester and the rest of the town, from which it is separated by the railway, and serves as an important route for local bus services. It is one of only three roads that cross the railway in Bicester, the other two being the A41 to the west and the A4421 to the east, which are located on the perimeter of Bicester Town. Figure 6.7 shows the location of the crossing and the surrounding area.

6.5.3. In order to ensure the safety of road users and of the railway, a Manually Controlled Barrier (MCB) crossing is provided with barriers, operated by the signaller, that are remotely monitored through CCTV by a signaller and automatically linked with the railway signalling system, meaning that barriers cannot be raised if there is a train proceeding across the level crossing. In order to ensure the safe operation of the crossing, the barriers are closed for sufficient time to allow the safe passage of trains in either direction, which can be up to several minutes every time a train needs pass.

6.5.4. The crossing was examined as part of the previous phase of EWR which secured powers to carry out works in relation to the Network Rail (East West Rail) (Bicester to Bedford Improvements) Order 2020 (the 2020 Order). The rail traffic assumed in promoting the 2020 Order included services between Oxford and Milton Keynes (two trains per hour) and Oxford and Bedford (one train per hour) as well as additional freight services. However, it did not include the additional future train services to Cambridge, which were not committed at that time. In light of this, the inspector considering the application for the 2020 Order ruled that Network Rail was not required to provide an alternative crossing to replace the level crossing at London Road.

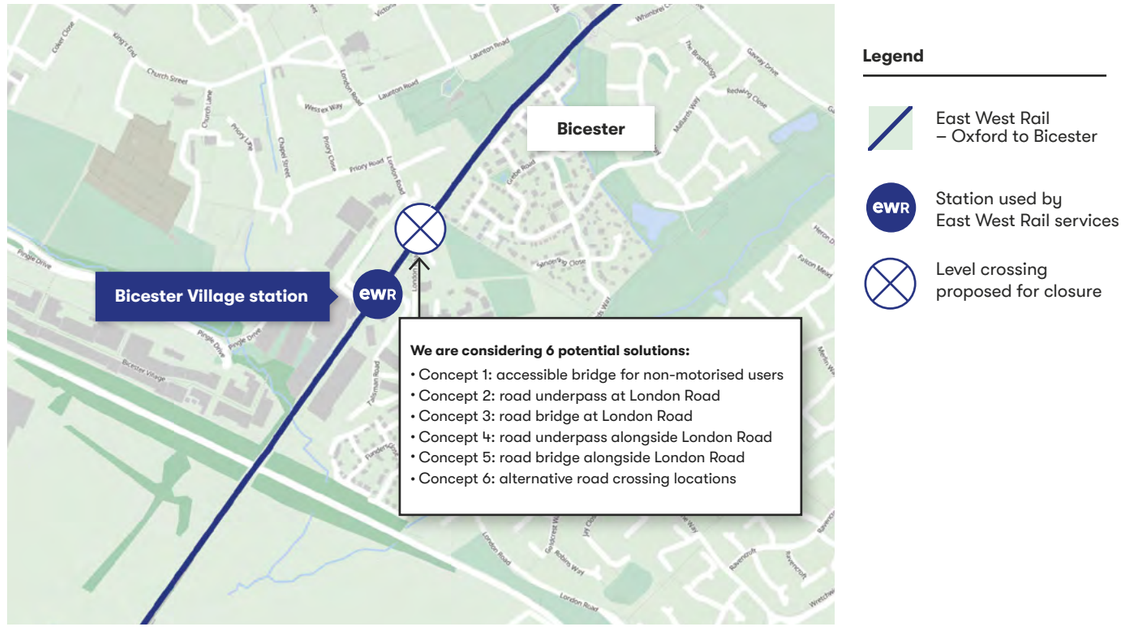


Figure 6.7: Site Plan of London Road crossing

6.5.5. Nevertheless, the introduction of the Oxford to Milton Keynes services following implementation of the works authorised by the 2020 Order will increase the barrier down-time from its current 10.6 minutes per hour to 21.7 minutes per hour, following signalling alterations by Network Rail to mitigate the effects in 2021.

6.5.6. Barrier down-time would increase again with the introduction of EWR Oxford to Cambridge train services. It is estimated that the barrier would be down for a significant period each hour, potentially up to 50 minutes, though this figure is subject to further assessment. This would result in motorists, cyclists and pedestrians using the crossing experiencing delays to their journeys, which EWR Co considers is unlikely to be acceptable and therefore a number of solutions to address this have been considered.

6.5.7. The possibility of providing an alternative railway crossing via a bridge at this location has been considered in the past. However, the location of the crossing within a built-up area means that the construction of a road bridge or underpass, and the associated changes to the layout and alignment of London Road, would be very challenging and have a significant impact on residents and businesses in the adjacent area. Elevating the railway or construction of a rail underpass would be even more intrusive since the shallow gradients required to achieve this would necessitate much greater areas of works, disrupt the operational railway for a considerable time, and require the reconstruction of the recently upgraded Bicester Village station.

6.5.8. Due to the high level of barrier down-time in each hour, there is a risk that users will abuse the crossing, which is supported by evidence of 111 incidents of deliberate misuse of this crossing over the past five years identified by Network Rail. All level crossings are subject to risk review and it is recognised by both the ORR and Network Rail that the most effective way to control level crossing risk is to close the crossing.

6.5.9. Due to the expected further increase in the number of minutes in each hour for which the crossing would be closed to road users due to the introduction of additional EWR train services, it is necessary to review and build upon previous studies to see if there is a case for permanently closing the level crossing and providing an alternative means of traversing the railway.

Stakeholders

6.5.10. There are a number of stakeholders who may be affected by the proposed solutions to mitigating the effects of East West Rail on the level crossing.

6.5.11. The Bicester Village outlet retail park is located just to the southwest of Bicester village station and attracts a large number of visitors, especially during weekends and the holiday season. In addition to the site of the Village, parking facilities for the Outlet are located west of the railway line adjacent to the station. These facilities include a two-storey car park and an open area for further over-spill parking.

6.5.12. There are a number of business parks and residential estates in the area with direct links to London Road or Station Approach that may be affected. Some of the potential stakeholders are:

- Talisman Business Centre which is located on the east side of the railway line opposite the railway station and has access to London Road via the roundabout just outside the business park;
- McKay Trading Estate which is located west of the station and has direct access to Station Approach;
- Westholmes Court, a residential estate located opposite Station Approach on the north side of the level crossing. London Road provides the only access to the estate;
- Coach House Mews, a residential estate located adjacent to the petrol filling station on the south side of the level crossing. London Road provides the only access to this estate;
- There are a number of other residences and businesses with direct access to London Road along its length; and
- Communities to the south of Bicester: Potential station infrastructure measures may be required (subject to further assessments) to ensure that they can retain access to Bicester Village station if London Road is severed. This may need to include changes to access arrangements and car parking provisions.

Key objectives

6.5.13. In addition to the Project Objectives detailed in Chapter 3, EWR Co will consider how the mitigation of effects on the crossing will address the six objectives defined by Oxfordshire County Council in a paper to the EWR Consortium Strategic Board concerning the potential closure of London Road Crossing on 9 Dec 2020. The objectives identified are:

1. To facilitate expansion of rail services while maintaining connectivity across the town and promoting town centre vitality and accessibility;
2. To encourage the development of a high-quality, innovative and resilient integrated transport system that promotes active travel provision and supports healthy place-shaping;
3. To promote opportunities for pedestrians and cyclists in Bicester;
4. To reduce carbon emissions from transport in Bicester and improve air quality in the town, particularly within the designated Air Quality Management Area;
5. To improve connectivity between key employment and residential areas and their access to the strategically important transport networks, including rail services; and
6. To encourage and facilitate the efficient operation of bus services in Bicester and the surrounding area.

6.5.14. In addition to the objectives shown above EWR Co recognises that maintaining a safe railway and user activity is a fundamental objective of all parties.

6.5.15. To enable these objectives to be met, should it be necessary to close the level crossing, measures would need to be implemented to provide an alternative means for existing users to cross the railway and undertake their journeys.

Options to be considered

6.5.16. The concepts to mitigate the effects of the crossing arising from East West Rail services, outlined in this section of the Chapter, were assessed against high level cost, engineering and environmental factors commensurate with their early stage of development.

6.5.17. If the level crossing were to be retained in its current form whilst the next EWR Connection Stage is in operation, the barriers would be down for a significant period during each hour and would not provide sufficient time for road traffic to use the crossing. This suggests that closure and alternative access is necessary. Further, the policy of the Office of Rail and Road (ORR) and Network Rail risk review is likely to recommend closure, especially given the level of crossing misuse identified by Network Rail in this particular location.

6.5.18. The limited time available for road users to use London Road if the crossing remains in place, and the risk of misuse and associated safety implications, means that closure is favoured. Furthermore, the ability to operate a clock-face service without delays (and consequences elsewhere on the railway network), suggests that the Project Objectives may not be achieved in the absence of measures to mitigate the effects of the crossing.

6.5.19. Many studies have been undertaken over several years to investigate the impacts of closing the level crossing and to examine the case for replacement measures, the most recent by Oxfordshire County Council in 2020. EWR's own early investigation of options has identified potential concepts for further investigation, engineering development and assessment over the next few months. The main options identified are:

- **Concept 1:** non-motorised user bridge;
- **Concept 2:** road underpass at London Road (online);
- **Concept 3**: road overbridge at London Road (online);
- **Concept 4:** road underpass alongside London Road (offline);
- **Concept 5:** road overbridge alongside London Road (offline); and
- **Concept 6:** alternative road crossings locations.

6.5.20. Taking the feedback from this consultation into account, these concepts will be further developed to assess their viability. At this stage, the following Assessment Factors are envisaged to be of particular relevance in determining the preferred solution from the options available:

- Transport user benefits – primarily in respect of the impact on road users;
- Capital costs;
- Operating costs – in particular for the underpass options;
- Overall affordability;
- Safety risk (construction and operation);
- Environmental impacts and opportunities – including the potential severance effects and the extent to which these can be mitigated; and
- Consistency with Local Plans.

Concept 1: non-motorised user bridge

6.5.21. The first concept is the closure of the London Road level crossing without the provision of an alternative road railway crossing. However, a fully accessible bridge crossing of the railway for non-motorised users (including pedestrians, cyclists and horse riders) would be provided.

6.5.22. Current vehicular users would be diverted around the southern perimeter of the town via the A41 and then Oxford Road, King's End and Queen's Avenue into the centre of Bicester. Vehicular access would still be possible along either end of London Road, but traffic would not be able to cross the railway. Traffic assessments and further work will need to carried out during the next stage of development to ascertain the traffic impact on the diversionary routes, including community and environmental impacts, as well as the journey time impacts for individual road users.

6.5.23. For this concept to be developed into a viable design, further work is required to confirm the impact in the constrained location of the existing level crossing, given the requirement to create a fully accessible solution with ramps to meet modern standards and community needs. Potential impact on the station southern entrance and car-park facilities will also need to be assessed.

6.5.24. Overall, this solution is likely to have the lowest capital and operating cost of the six concepts.

6.5.25. Other key Assessment Factors for this option are the environmental impacts and opportunities and consistency with Local Plans, in particular the following considerations:

- The ability of the A41 and other local roads to accommodate an increase in traffic arising from the termination of London Road at the railway, and any additional measures required;
- The impact of severance on the local community in south-east Bicester and whether an additional route, with a crossing over the railway, is required (and indeed feasible) to the north-east of London Road; and
- Measures required to accommodate traffic requiring access to Bicester Village station from the south-east, including car parking and drop-off facilities on the eastern side of the railway.

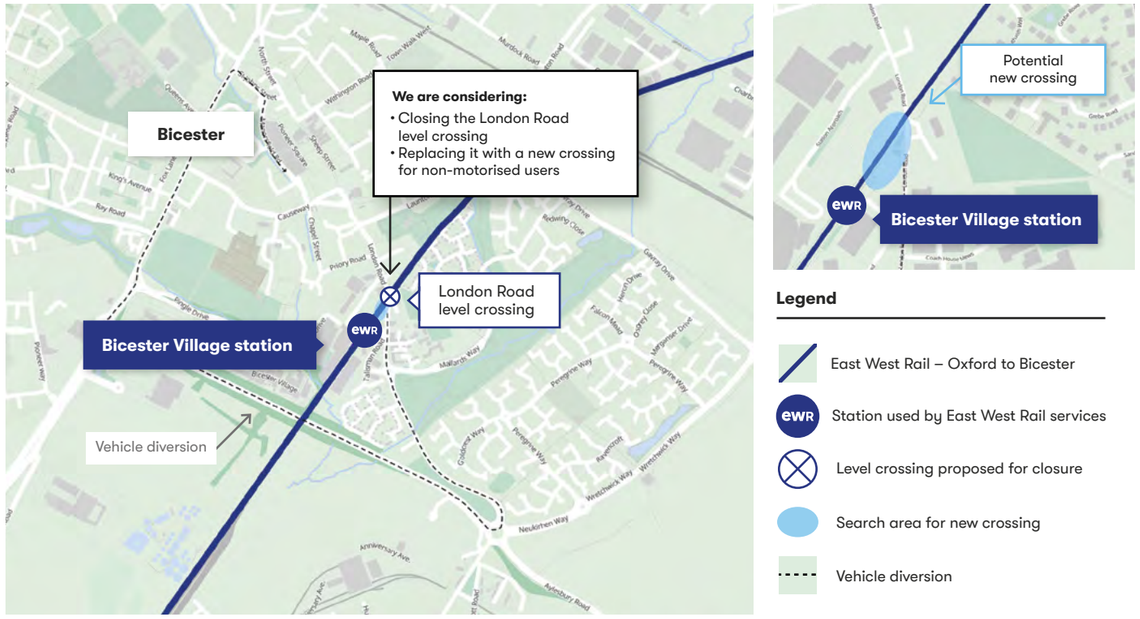


Figure 6.8: Concept 1: non-motorised user bridge

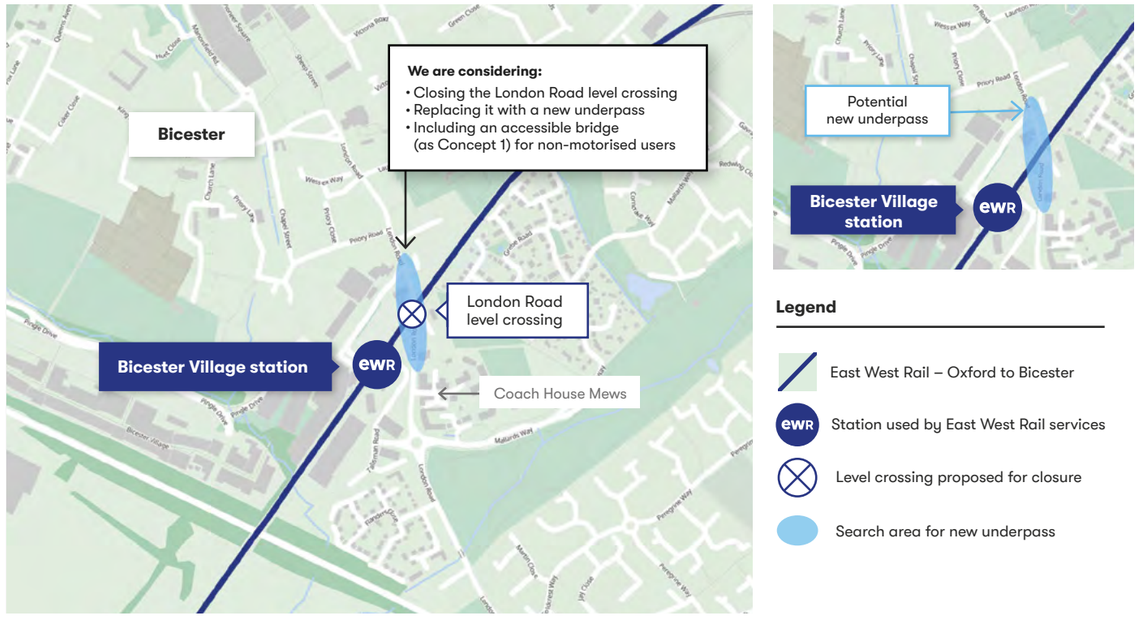


Figure 6.9: Concept 2: road underpass at London Road (online)

Concept 2: road underpass at London Road (online)

6.5.26. A road underpass beneath the railway at the site of the existing crossing along the horizontal alignment of London Road is possible and can be designed to meet required highway standards for a 30mph road. Pedestrian facilities could be provided alongside the road tunnel, although this may result in an unattractive underground pedestrian route over 300m long; consideration should be given to alternative routes for pedestrians, possibly combining this concept with a pedestrian overbridge. The concept is shown in Figure 6.9.

6.5.27. The highway vertical alignment would fall from the Talisman Road roundabout, reducing to 0.5m below existing ground level at Coach House Mews. North of the rail crossing, the levels of T-junctions connecting London Road to the Station Approach would be reduced by approximately 5.4m and at Priory Road by approximately 1.7m. The access into Westholme Court, and to Alchester Terrace (south of the existing crossing) could not be maintained, as the road here would be lowered in the region of 5-6m: alternative accesses for these premises would have to be located elsewhere. Accesses to Coach House Mews, Station Approach, Priory Road and Garth Court could be maintained. The tie-in points are based on vertical and horizontal alignments compliant with a 50kph design speed, as these are minor side roads.

6.5.28. Capital cost will be an important factor for this option, with the cost of underground construction being typically greater than that of overbridges. Complex construction in such a constrained environment and significant environmental impacts would need to be considered:

- The groundwater table is relatively high in this location and an underpass would be prone to flood risk, which means that a pumping system would be likely to be required. This would increase both capital expenditure and maintenance costs;
- London Road is a major corridor for utility apparatus such as gas, electricity and water cables and pipes due to it being one of the few existing places where utilities can cross the railway in Bicester. Implementation of an underpass would be likely to result in significant conflicts with existing electric, gas, water, sewer and telecoms apparatus which may require diversion prior to commencement of the main works. This would add to cost and engineering complexity;
- The ground conditions are expected to be challenging for construction as historical ground investigation has shown sub-artesian groundwater conditions. This means that groundwater is held under pressure below ground by an impermeable layer of soil. If the soil is disturbed by excavation, potentially significant groundwater abstraction or soil stabilisation measures would be required to permit excavation;

- The means of construction of the underpass are to be confirmed. The most economical construction methodology would necessitate the removal of the tracks for excavation and construction of the underpass to occur. This would result in prolonged closure of the operational railway;
- Impact to property may be substantial with access severed to several properties. Access to these premises would have to be re-provided with alternative routes yet to be identified. Buildings in close proximity of the carriageway may need to be demolished during the works; and
- The new infrastructure would significantly impact the heritage setting of the conservation area and local listed buildings.

6.5.29. Transport user benefits should also be considered in light of local aspirations for the future of Bicester city centre. The fact that London Road would have to be closed for the duration of the works (which could be up to two years), causing severance between communities in the short and medium term, will be an important consideration.

Concept 3: Road overbridge at London Road (online)

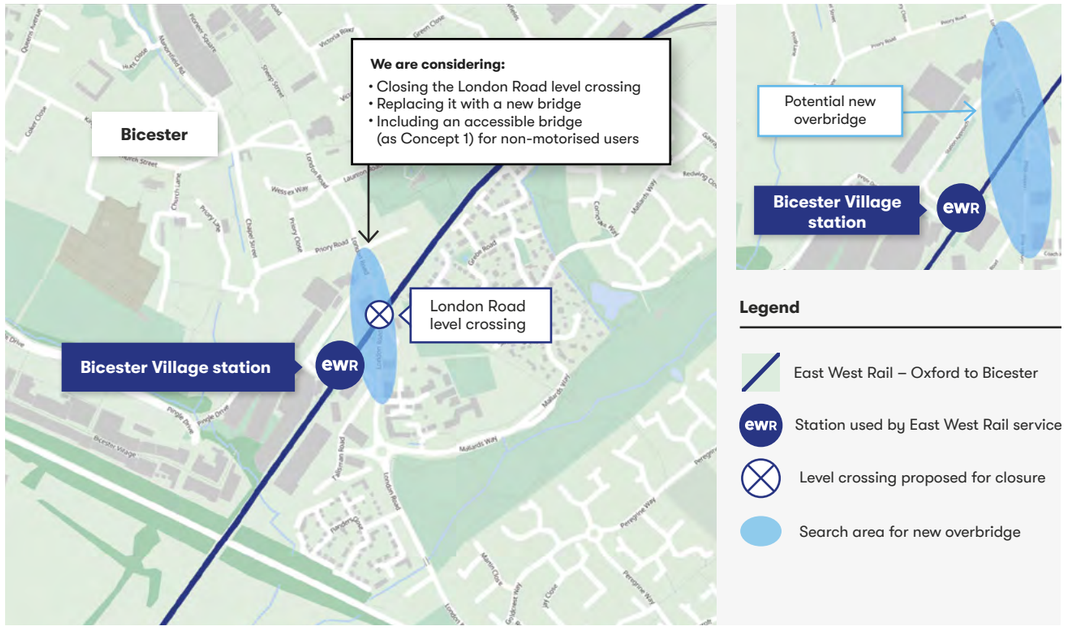
6.5.30. An alternative solution would be a road overbridge along the same alignment as the road underbridge. In this case, in order to achieve a compliant road geometry and to terminate the ramps before the Talisman Road and Wessex Way crossings, the speed limit would have to be reduced below 30mph. A separate pedestrian footbridge would probably be required to avoid pedestrians having to face steep gradients over a significant length.

6.5.31. An overbridge solution would obviate some of the construction challenges presented by an underpass, and, in particular, it could reduce ground concerns and issues with groundwater drainage once in operation. It is possible that conflicts with utilities could be reduced, although this would require an assessment of the impact of the bridge foundations on the existing apparatus, which is yet to be undertaken. Impact on the operational railway could also be reduced as bridge installation techniques are likely to take less time than the construction of an underpass, although the overall construction severance of traffic along London Road would be likely to remain broadly the same as per the underpass option (up to approximately two years).

6.5.32. Impacts on access to premises would be likely to be the same as the road underpass option.

6.5.33. Environmental impacts on adjoining properties, including noise and visual intrusion, would be likely to be more significant in the bridge option than in the underpass, given the constrained urban location.

Figure 6.10: Concept 3: road overbridge at London Road (online)



Concept 4: road underpass alongside London Road (offline)

6.5.34. Concept 4 would provide an underpass to the south-west of the existing level crossing, diverting London Road from its current alignment. The underpass would be expected to achieve highway standards for a 30mph road. Pedestrian facilities could be provided alongside the road tunnel, although this may result in an unattractive underground pedestrian route over 300m long; consideration would be needed of alternative routes for pedestrians, possibly combining this concept with a pedestrian overbridge. The concept is shown in Figure 6.11.

6.5.35. The alignment of this concept would require a new arm to be constructed off the Talisman Road roundabout, removing the original London Road and Talisman Road arms, with these elements of carriageway re-formed into T-junctions off the new alignment. Coach House Mews, the unnamed access to Alchester Terrace and the petrol station forecourt would all be accessible from the existing alignment.

6.5.36. The highway vertical alignment would be lowered from the realigned arm of the Talisman Road roundabout. North of the underpass, the carriageway would be in cut, below ground level, across the junctions of Station Approach by approximately 4.1m and Priory Road by approximately 0.3m. The position of the existing access to Westholme Court would be lost and a new separate access would have to be identified.

6.5.37. All issues considered for concept 2 also apply to this option, however the impact on utilities apparatus would be likely to be reduced, as the majority of London Road would remain unaffected, and impacts on access to properties are reduced at least to the south of London Road. Importantly, this option should not cause two years of severance to the road connection during the works, although shorter interruptions to complete the junctions to the existing London Road would still likely be required.

6.5.38. Environmental impacts such as noise and visual intrusion for properties to the west of London Road would be substantially increased, as several buildings would directly clash with the proposed infrastructure. Impacts on the recently upgraded Bicester Village railway station would also be also likely to be more significant.

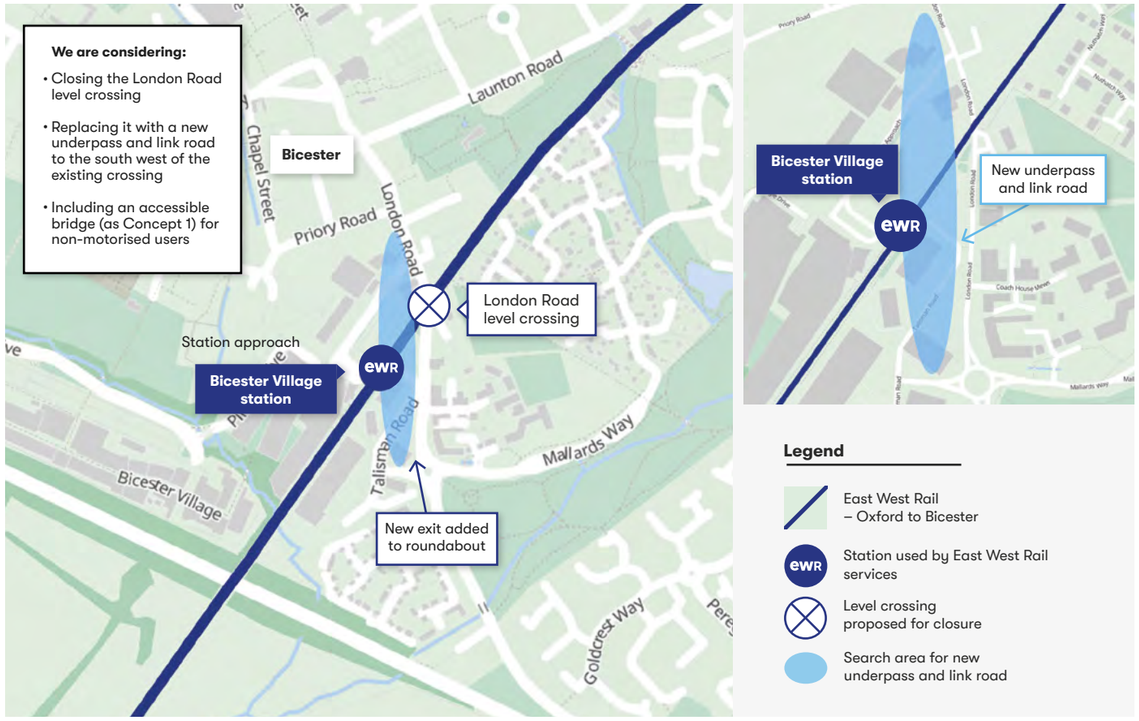


Figure 6.11: Concept 4: road underpass alongside London Road (offline)

Concept 5: Road overbridge alongside London Road (offline)

6.5.39. This concept follows the alignment of concept 4, and again the same comparison made between the online underpass and overbridge for concepts 2 and 3 apply to the offline concepts 4 and 5. Also in this case, in order to achieve a compliant road geometry and to terminate the ramps before the Talisman Road and Wessex Way crossings, speed would have to be reduced to below 30mph. A separate pedestrian footbridge would be likely to be required to avoid pedestrians having to face steep gradients over a significant length. The concept is shown in Figure 6.12.

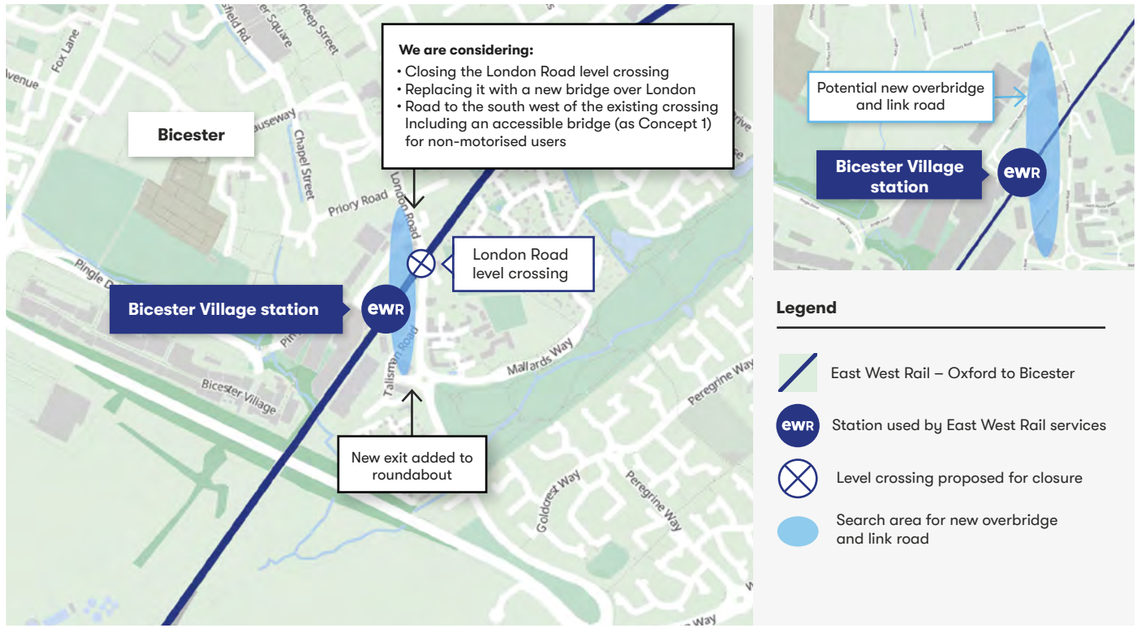


Figure 6.12: Concept 5: Road overbridge alongside London Road (offline)

Concept 6: alternative road crossing locations

6.5.40. Historically, further options have been investigated by Network Rail for crossings – either bridges or underpasses – located to the west in between London Road and the A41 or to the east in between London Road and the A4421 (Charbridge Lane). The concept is shown in Figure 6.13.

6.5.41. Options to the west have become more challenging because of the upgrades to the Bicester Village shopping mall and railway station since these were assessed. All the options in this area would require substantial demolitions and re-configuration of the shopping mall facilities, railway station and of the Talisman buildings complex and, for these reasons, Network Rail had discounted them from further development.

6.5.42. Options to the east have included consideration of crossings at Gavray Drive, a new road parallel to the London to Birmingham railway line, or further north at Charbridge Way. The option at Gavray Drive poses design challenges to achieve a satisfactory road geometry to the north and would potentially impact residential and commercial properties. The options further to the north are expected to have a limited transport benefit, as whilst they intercept traffic in the northern section of Launton Road, they do not replace the connectivity provided by London Road in full.

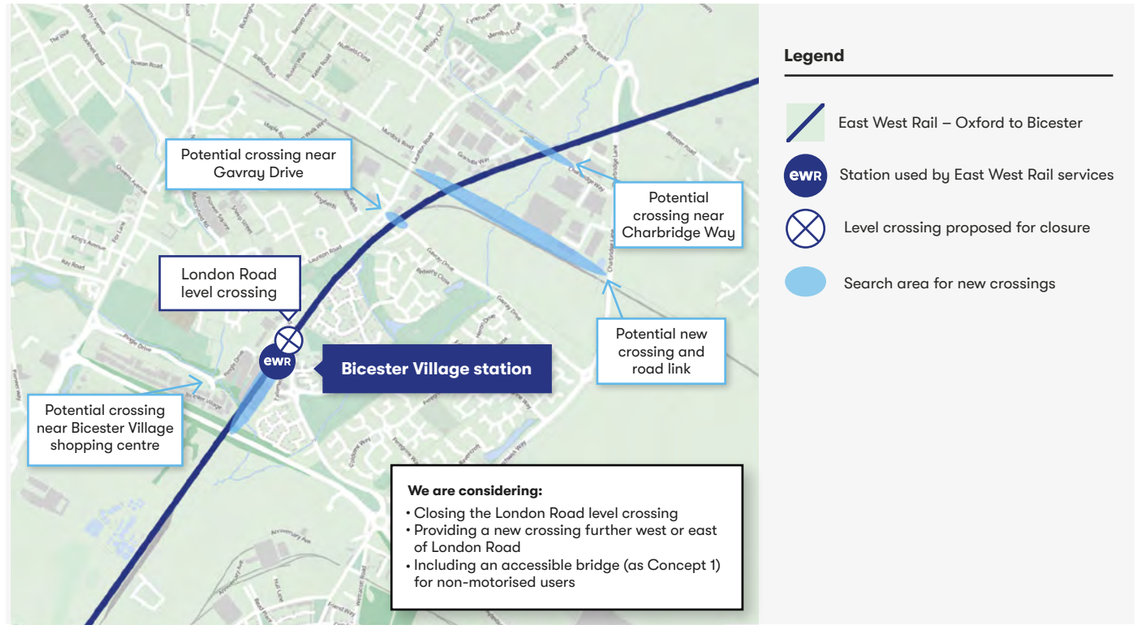
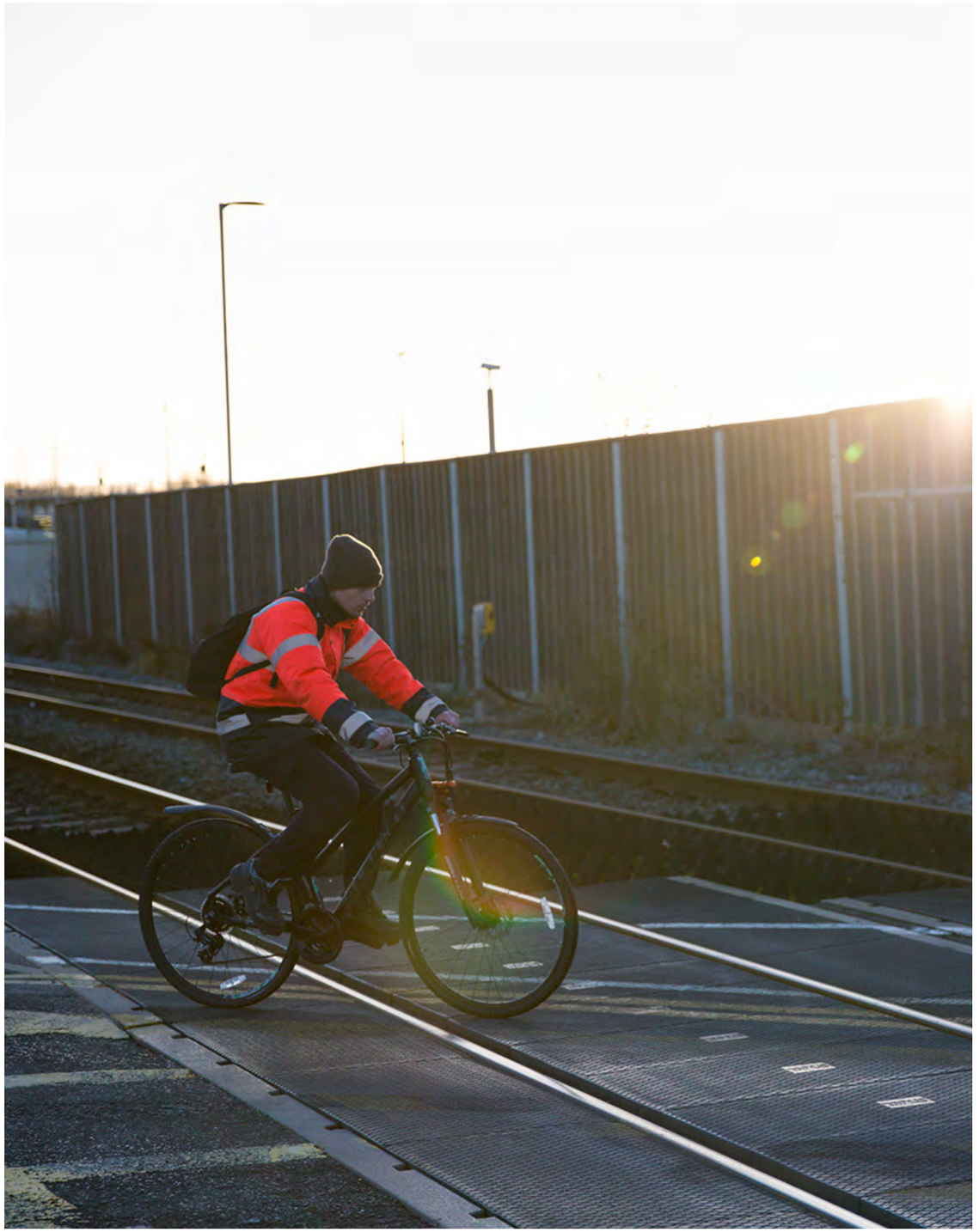


Figure 6.13: Concept 6: alternative road crossing locations

Site-specific factors

6.5.43. Further work is required to develop the concepts above into viable options. The following specific considerations will need to be made in developing the design:

- Maintenance of access to residential property and businesses in the area during construction and following the completion of the works;
- The effect on properties, including listed buildings, with the aim of avoiding, or minimising, any adverse impacts;
- The requirement for the temporary and/or permanent diversion of utilities;
- The risk and impact of ground conditions and water table constraints;
- The environmental impact of proposals;
- The traffic and severance impacts of the proposals; and
- Alignment with stakeholder requirements.



London Road, Bicester

07.
Project Section B: Bletchley and the Marston Vale Line

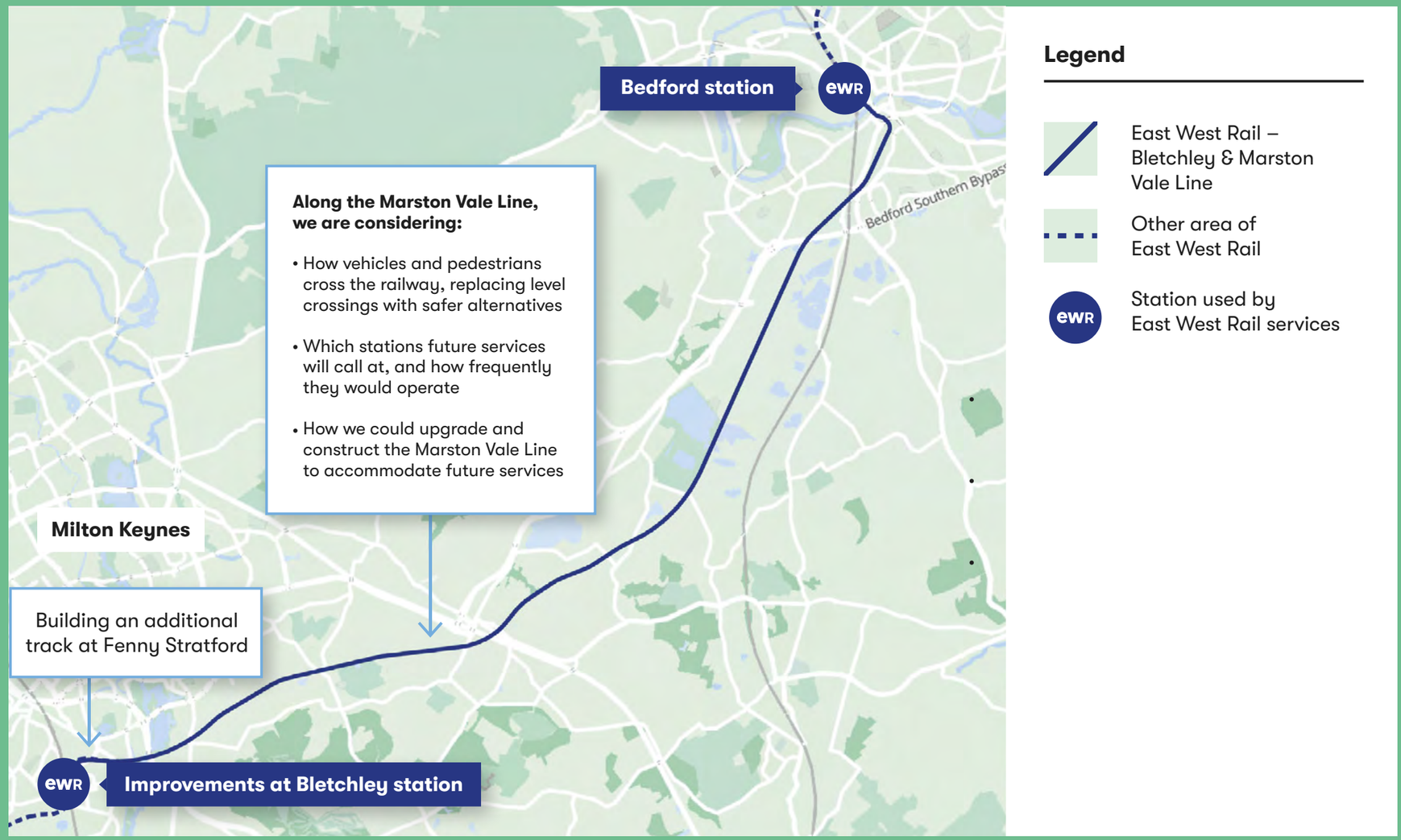


Figure 7.1: Project Section B

7.1 Chapter summary

7.1.1 This Chapter describes the proposals for the section of the Project east of Bletchley and along the Marston Vale Line as far as Bedford St Johns station.

7.1.2. Two service concepts are being considered for the way in which services are configured on this part of EWR once EWR trains are operating. These are to retain and modify the existing 'all-stations' train service and introduce limited-stop EWR services; or focused services on a smaller number of better located stations to allow an increased number of stopping services. While further work will be done to decide which concept to take forward, this Chapter explains the concepts and provides a comparison between them, with a preliminary assessment of how they may perform against the Assessment Factors. We expect that more detailed information in relation to the design, environmental impacts and opportunities of both concepts will be presented at Statutory Consultation in relation to the project. At this non-

Statutory Consultation stage, EWR Co is seeking to understand the views of respondents in relation to the overall service patterns and station distribution.

7.1.3. EWR Co is considering a range of options to improve Bletchley station to make it fit for its future role as a hub on the EWR route and an interchange with services on the West Coast Main Line (WCML) between London, the West Midlands, North-west England and Scotland. Design is at a very early stage and this Chapter explains the types of improvement that EWR Co might undertake.

7.1.4. At Fenny Stratford, east of Bletchley, a section of the railway is currently only single track. A second track is needed to increase capacity to allow for the additional EWR services. This Chapter describes what is likely to be required and the way in which options are being developed at this stage.

7.1.5. There are 31 level crossings on the railway between Bletchley and Bedford. This Chapter provides background to the safety risks and operational issues associated with level crossings. EWR Co has reviewed all the level crossings on the Marston Vale Line. This Chapter explains the options being considered at each location, with a view to removing the level crossing and, where necessary, providing of an alternative means of crossing the railway. These changes would be required regardless of which train service concept is selected (see paragraph 7.1.2).

7.1.6. The Chapter considers the proposed approach to upgrading the railway between Bletchley and Bedford, including track replacement, drainage improvements, repair or strengthening of existing earthworks (cuttings and embankments) and replacement of the signalling system. It explains the way in which options for these works will be considered as they are developed in further detail. The approach to upgrading the railway is not dependent on, or materially changed by, whichever of the two service concepts is selected.

7.2 Introduction

7.2.1 This section of the Chapter discusses the line between Bletchley and Bedford, which is known as the Marston Vale Line. It provides a general description of the Marston Vale Line and then goes on to describe options that EWR Co is considering for:

- The pattern of EWR train services and stations (starting at paragraph 7.3.1);
- Potential enhancements at Bletchley station (starting at paragraph 7.4.1);
- The reinstatement of a second track in the Fenny Stratford area (starting at paragraph 7.5.1);
- Level crossings (starting at paragraph 7.6.1); and
- General upgrading of the railway infrastructure between Bletchley and Bedford (starting at paragraph 7.7.1).

7.2.2. The final section of the line Marston Vale Line through Bedford St Johns station and into Bedford station is covered in the Chapter of this report dealing with Bedford (Chapter 8).

7.2.3. The Marston Vale Line is approximately 27km (16.5 miles) in length and dates back to 1846. It developed to become part of the cross-country route between Oxford and Cambridge known as the 'Varsity Line'. During the 1950s and 60s the line was threatened with closure on several occasions but survived and is still in operation today.

7.2.4. Passenger services between Bletchley and Bedford provide a roughly hourly service that operates between 05.16 and 23.51 Monday to Friday. The service also runs on Saturdays but the last train runs roughly half an hour earlier. No services currently run on Sundays. All passenger trains call at all ten of the intermediate stations on the line. This service is operated by West Midlands Trains under their London Northwestern Railway brand through a contract with the Department for Transport (DfT). The passenger service trains typically take 42 minutes to complete the end-to-end journey.

7.2.5. All of the intermediate stations along this route are unstaffed. A basic level of facilities is provided at each station. The Marston Vale Community Rail Partnership has worked with the operator of the stations to deliver improvements to station facilities and to generally improve the maintenance and appearance of the stations. The facilities at each station generally comprise:

- an open waiting shelter (on most platforms)
- ticket vending machine;
- real-time train departure and train running information at each platform; and
- Help points that enable passengers to contact railway staff for information or for use in an emergency.

7.2.6. A coffee shop is located adjacent to Woburn Sands station in the former station building (now privately owned). Ridgmont also benefits from a tea shop located within the heritage centre operated by the Community Rail Partnership (see paragraph 7.2.11). However, neither of these facilities are controlled by the train operator.

7.2.7. The stations have little or no formal car parking provision and no formal provision for pick-up and drop-off of passengers. Most have no facilities for cycle parking and no specific arrangements are available to facilitate interchange with local transport. It is also recognised that pedestrian access routes to some stations are unattractive to potential users. One of the worst examples of this is Kempston Hardwick, where pedestrian access is from a busy, unlit rural road that has no footways.

7.2.8. As a result of the historical context of the development of the line some stations, such as Woburn Sands and Lidlington, are located within the settlements from which they take their names. Others, such as Millbrook and Kempston Hardwick, are located a considerable distance from the nearest centres of population.

7.2.9. Based on data available through the Office of Rail and Road (ORR) it is evident that usage of the existing train service and of the intermediate stations on the Bletchley to Bedford line is relatively low. According to the annual station usage data published by ORR, six of the ten intermediate stations are amongst the least used 20% of stations in Great Britain, with three being amongst the least used 10%. Several stations have typically less than 50 passengers per day, and only two (Stewartby and Bedford St Johns) typically exceed 200 passengers a day. The usage has been relatively stable over the last 4 years, with significant growth only at Woburn Sands and Stewartby.

7.2.10. Usage of the stations based on Office of Rail and Road (ORR) entry and exit data between 2016/17 and 2019/20 is shown in Table 7.1.

Station	2016/17	2017/18	2018/19	2019/20	2019/20 Ranked in usage[41]
Fenny Stratford	24974	22632	26292	26446	2174
Bow Brickhill	40626	38846	43410	41340	2065
Woburn Sands	38942	46606	51606	46704	2013
Aspley Guise	9454	9962	11636	9408	2340
Ridgmont	34338	36450	31532	26208	2175
Lidlington	27326	27510	26888	19628	2241
Millbrook	13654	11324	12504	12250	2311
Stewartby	36976	48412	61542	72748	1874
Kempston Hardwick	11806	9842	9692	10494	2329
Bedford St Johns	183826	186638	189276	180520	1451

Table 7.1: Usage of the stations based on ORR passenger entry and exit data between 2016/17 and 2019/20

7.2.11. In 2007 the Marston Vale Community Rail Partnership was established, which seeks to involve communities in adopting and looking after stations and providing marketing and initiatives with the operator to increase patronage and revenue.

7.2.12. The Community Rail Partnership has set up station adoption groups for most of the stations on the line and has worked hard to bring about improvements to the stations. Of particular note is the restoration of the former station building at Ridgmont to create a heritage centre and tea rooms.

7.2.13. In recent years there have been modest improvements to the train service and a gradual improvement in the quality of facilities at stations, but overall, the service provided today by this section of the railway is little changed from that provided in 1968 (i.e. immediately after the withdrawal of through trains to Oxford and Cambridge). This is in spite of the significant changes that have occurred within the corridor served by the railway, such as the development of Milton Keynes (which grew from a population of around 40,000[42] at its designation as a New Town in 1967 to a population of more than 260,000 by 2016[43]), the demise

[41] This is out of 2,567 stations in Great Britain
[42] ''Modern Milton Keynes: A plan for a new City''
[42] Milton-Keynes.gov.uk

of the brick-making industry in the Marston Vale, particularly around Stewartby, which at its height was producing over 500 million bricks a year[44] and the construction of new housing at various locations in the corridor. Further growth is expected within the area in the coming decades, including significant numbers of new homes near Lidlington and on the site of the former Stewartby Brickworks (as referenced in the Central Bedfordshire Local Plan) and in the South East Milton Keynes Strategic Urban Extension (as referenced in the development plan for Milton Keynes ("Plan:MK")[45]).

7.2.14. The line has suffered increasing problems with infrastructure reliability in recent years. These problems have, in part, been related to the signalling and level crossing equipment, which is of a type that is not widely used and for which spare parts are difficult to source. There were also problems with the reliability of new trains introduced in 2019 but the reliability of the new trains has improved considerably over time. As a result of staff shortages related to the Covid-19 pandemic, train services were replaced, either wholly or in part, by buses for much of 2020 and, at the time or writing, there continues to be no train service.

7.2.15. Today, the railway is used by people making a number of different types of journey. While some people use the line as part of longer-distance journeys (by changing trains at Bletchley or Bedford), the majority of journeys are of a short distance. Analysis undertaken on behalf of EWR Co shows that the majority of journeys undertaken on the line are for leisure purposes, with approximately 30% of journeys on the line for the purposes of commuting to or from a place of works. A much smaller, but nonetheless significant, proportion of journeys are for the purpose of accessing education.

7.2.16. In addition to the passenger service outlined above, it is EWR Co's intention, at this time, to replicate (as a minimum) the existing provision for freight paths between Bletchley and Bedford, not all of which are currently utilised, in any upgrades to the line. EWR Co is currently working on the wider freight strategy between Oxford and Cambridge and this will inform future option development.

7.2.17. The Project will deliver a step-change in the number of trains using the railway infrastructure between Bletchley and Bedford and its hours of operation. Significant investment in the infrastructure of the Marston Vale Line is required to make it suitable for its future role as an integral part of the railway between Oxford and Cambridge. The scale of investment that will be necessary offers, and requires viewing as, a "once in a generation" opportunity to think afresh about how the railway can best serve local residents, businesses, local events and economic development in the area both now and in the future.

7.2.18. EWR Co has examined how the railway could be developed and improved as part of the EWR Project. As part of the option development, careful consideration has been given to ways that existing journeys can be facilitated while providing attractive journey times and train frequencies for the longer-distance journeys (such as Oxford to Cambridge) that would be made in the future. These options are explored in more detail below, but relate in particular to two aspects:

- Service concepts, relating to the way that train services operate on this section of EWR as well as which stations they serve; and
- Level crossing closures in order to enable EWR to operate at its fullest capability.

7.3 Service Concepts

7.3.1. There is what may be a once in a generation opportunity to invest in upgrading the Marston Vale Line to meet the needs of the community and railway customers, now and in the future. The existing line, which was built in the nineteenth century to serve a very different customer base, now suffers from poor reliability and low usage, although EWR Co recognises the importance of this line to some parts of the community.

7.3.2. Therefore, in this section of the Chapter, we consider two alternative concepts for the train service that could operate in the future. In the first, the current service would continue to run between Bletchley and Bedford calling at all existing stations with EWR services providing faster through services to Oxford and Cambridge, calling at Woburn Sands and Ridgmont. In the second concept, the existing stations would be replaced with a new pattern of stations along the Marston Vale Line, which would be designed to be more conveniently located for twenty-first century travellers and communities, and proving a faster through service with fewer changes for longer journeys. In this second option, new stations with better facilities for pedestrians, cyclists and car drivers would be located in Woburn Sands, Ridgmont, Lidlington, Stewartby and Bedford St Johns. Some trains would call at all five stations whilst others would only stop at Woburn Sands and Ridgmont.

7.3.3. In this consultation EWR Co is seeking views on the merits of both concepts, considering the benefits of maintaining the status quo versus the opportunities that might exist with a different configuration of stations and services. EWR Co expects to develop both concepts further, so that more details of both can be presented when it undertakes Statutory Consultation.

7.3.4. In devising these two concepts, EWR Co has considered:

- The anticipated needs of users of the railway (both current and future);
- The importance of minimising journey times for longer-distance journeys while reducing the impact on shorter-distance travel; and
- The operational requirements of the railway with a particular focus on providing a safe, reliable and attractive service.

[44] bedfordbrickworks.co.uk
[45] "Plan:MK" adopted version, Milton Keynes Council, March 2019 https://www.milton-keynes.gov.uk/planning-and-building/plan-mk

7.3.5. The Assessment Factors to be considered in deciding which concept to take forward are described in paragraph 7.3.103.

7.3.6. Further consideration will be given to these concepts at a subsequent consultation exercise, which will precede the submission of an application for development consent. Regardless of which service concept is taken forward, following this Statutory Consultation, a base level of significant improvements to other infrastructure on the Marston Vale Line, described in the remainder of Chapter 7 and in Chapter 8, would need to be undertaken.

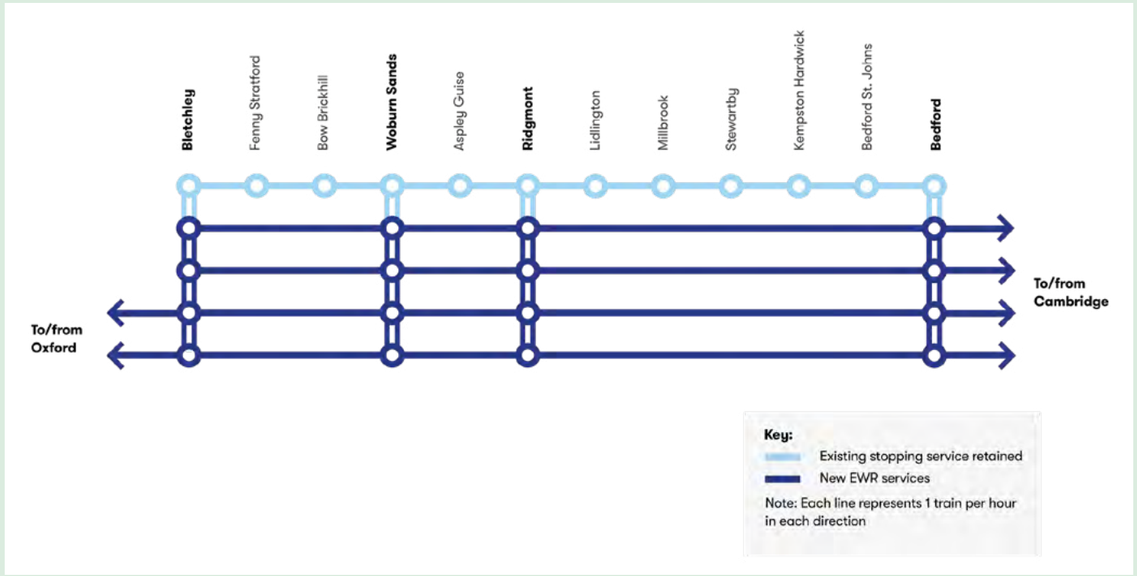
7.3.7. The two service concepts are described below.

Concept 1 – retain existing stopping service and introduce limited-stop EWR services calling at just two intermediate stations on the Marston Vale Line

7.3.8. In this concept, the existing hourly service would continue to operate (albeit with some journey times increased – see below), calling at the existing intermediate stations from Bletchley and terminating at Bedford. Faster limited-stop EWR services between Oxford and Cambridge would operate alongside the existing hourly service, calling at Woburn Sands and Ridgmont. An opportunity to interchange between the "all-stations" service and the faster EWR services would be provided at Woburn Sands and Ridgmont.

7.3.9. It is anticipated that four EWR services per hour would be provided once the new railway between Bedford and Cambridge is complete. Two of these would operate between Oxford and Cambridge and two further EWR services would operate between Bletchley and Cambridge. The combined service pattern is represented in Figure 7.2.

Figure 7.1: The combined service pattern between Bletchley and Cambridge



7.3.10. In order to minimise journey times for longer-distance travellers (and, therefore, attract sufficient numbers of users to justify the investment in the overall EWR Project), the EWR services need to complete the journey between Bletchley and Bedford in 24 minutes or less. This is roughly half the time taken by today's hourly services.

7.3.11. A standard pattern of departures across the hour (sometimes referred to as a "clock-face timetable") is preferred as this provides an easy-to-understand and memorable service for customers. It also allows the new services to fit more easily around existing train services at Cambridge and Oxford.

7.3.12. EWR Co has developed an indicative timetable to demonstrate the pattern of services and journey times that would be available with this concept. This is shown in Figure 7.3. As the timetable is developed further, EWR Co will endeavour to ensure that services are, where practical, timed such that they continue to cater for journeys to and from educational establishments along the route.

7.3.13. In order for the faster limited-stop EWR services to operate alongside the existing hourly service, it would be necessary, in both directions, for the faster services to overtake the slower service somewhere between Bletchley and Bedford. In the indicative timetable above, this overtaking happens at Ridgmont, because the best opportunity for maximising connectivity on the route is achieved if faster trains are allowed to overtake slower trains at a station where both trains call and where passengers can transfer. As can be seen from the indicative timetable above, the hourly service arrives first at Ridgmont, closely followed by the faster limited-stop EWR service. Passengers have the opportunity to interchange between the two services following which the limited-stop EWR service leaves first, closely followed by the slower hourly service.

7.3.14. The existing stopping service would have to wait at Ridgmont for around 6 minutes for the faster limited-stop EWR service to overtake. The resulting increase in journey time would be offset by the infrastructure improvements described in this and the subsequent Chapters and by taking advantage of the operating characteristics of the new trains introduced to the line in 2019.

7.3.15. For some journeys to or from stations that are only served by the existing service, a shorter journey time would be possible by changing to or from a fast service at Ridgmont. A comparison of train frequency and journey times by rail today with the frequency and indicative journey times in each of the two concepts can be found in paragraph 7.3.89.

7.3.16. There are several constraints that make the provision of passing loops at the current Ridgmont station site difficult. These include the listed former station building (now a heritage centre and tea rooms), the bridges carrying

OXFORD	d	10:26			10:56	
Oxford Parkway	d	10:33			11:03	
Bicester Village	d	10:40			11:10	
Winslow	d	10:51			11:21	
BLETCHLEY High Level	a	10:59			11:29	
	d	11:00			11:30	
BLETCHLEY Low Level	d	↓	11:14	11:21	↓	11:44
Fenny Stratford	d	↓	↓	11:24	↓	↓
Bow Brickhill	d	↓	↓	11:27	↓	↓
Woburn Sands	d	11:06	11:21	11:31	11:36	11:51
Aspley Guise	d	↓	↓	11:33	↓	↓
Ridgmont (relocated)	a	11:09	11:24	11:35	11:39	11:54
	d	11:10	11:25	11:43	11:40	11:55
Lidlington	d	↓	↓	11:46	↓	↓
Millbrook	d	↓	↓	11:49	↓	↓
Stewartby	d	↓	↓	11:52	↓	↓
Kempston Hardwick	d	↓	↓	11:55	↓	↓
Bedford St Johns (relocated)	d	↓	↓	12:00	↓	↓
BEDFORD	a	11:20	11:35	12:02	11:50	12:05
	d	11:21	11:36		11:51	12:06
ECML Interchange	d	11:31	11:46		12:01	12:16
Cambourne Area	d	11:41	11:56		12:11	12:26
Cambridge South	d	11:54	12:09		12:24	12:39
CAMBRIDGE	a	11:57	12:12		12:27	12:42

CAMBRIDGE	d	10:35	10:50		11:05	11:20
Cambridge South	d	10:39	10:54		11:09	11:24
Cambourne Area	d	10:53	11:08		11:23	11:38
ECML Interchange	d	11:01	11:16		11:31	11:46
BEDFORD	a	11:12	11:27		11:42	11:57
	d	11:14	11:29	11:30	11:44	11:59
Bedford St Johns (relocated)	d	↓	↓	11:33	↓	↓
Kempston Hardwick	d	↓	↓	11:38	↓	↓
Stewartby	d	↓	↓	11:42	↓	↓
Millbrook	d	↓	↓	11:45	↓	↓
Lidlington	d	↓	↓	11:48	↓	↓
Ridgmont (relocated)	a	11:24	11:39	11:52	11:54	12:09
	d	11:25	11:40	11:59	11:55	12:10
Aspley Guise	d	↓	↓	12:02	↓	↓
Woburn Sands	d	11:30	11:45	12:04	12:00	12:15
Bow Brickhill	d	↓	↓	12:08	↓	↓
Fenny Stratford	d	↓	↓	12:10	↓	↓
BLETCHLEY Low Level	a	11:36	↓	12:12	12:06	↓
BLETCHLEY High Level	a		11:51			12:21
	d		11:52			12:22
Winslow	d		12:00			12:30
Bicester Village	d		12:09			12:39
Oxford Parkway	d		12:16			12:46
OXFORD	a		12:23			12:53

Figure 7.3: An indicative timetable demonstrating the pattern of services and journey times available with Concept 1

the A507, M1 and Bedford Road over the railway and a pipeline that runs alongside the railway for a short distance to the south of the station. Taking all of these considerations into account, we would propose to build the loops to the west of the current Ridgmont station, on the section of line between Berry Lane Level Crossing and the bridge carrying Bedford Road over the railway. The passing loops would need to be approximately 1000m in length. This is because they would also need to be used by freight trains that currently use the Marston Vale Line or which could do in future.

7.3.17. To facilitate interchange between the existing stopping service and faster limited-stop EWR service, we would need to relocate Ridgmont station to be on the part of the railway where the passing loops would be. This would mean relocating the station to a new site to the west of Bedford Road.

7.3.18. The approximate area within which the passing loops would be built and approximate location of the new station is shown in Figure 7.4. Further work is required to determine the precise location and layout of the passing loops and re-sited station.

7.3.19. The new station would have four platforms and improved station facilities including a station building, with potential for staffing, a secure station car park and improved amenities and facilities in line with a modern station. Pedestrian and cycle links would be provided between the new and current station sites to facilitate journeys to and from the heritage centre and employment sites located close to the current station. Platforms at the new station would be long enough to accommodate four-car trains but would be designed to allow for extension to accommodate eight-car trains in the future. The proposed site for the relocated station is on a straight section of track that improves boarding and alighting from trains and reduces the risk of accidents when compared to a curved platform.

7.3.20. In order to build the new station and the passing loops, privately owned agricultural land would need to be acquired. EWR Co has not yet determined the extent of land that would need to be acquired; this would depend on the size and layout of the station facilities, access routes to the station and the length of the passing loops that need to be provided.

7.3.21. In addition to the works described above, it might also be necessary to provide an additional platform at Bletchley station (adjacent to the current platform 6). This would be necessary if the timetable structure is such that one terminating train arrives at Bletchley station before the previous terminating train has departed. This platform would be in addition to the two new high-level platforms that are being constructed for the train services to and from Oxford.

7.3.22. Regardless of which Service Concept is taken forward, proposed changes to level crossings (described in paragraphs 7.6.1 to 7.6.341) would be required. As a result of these changes, it would be necessary to

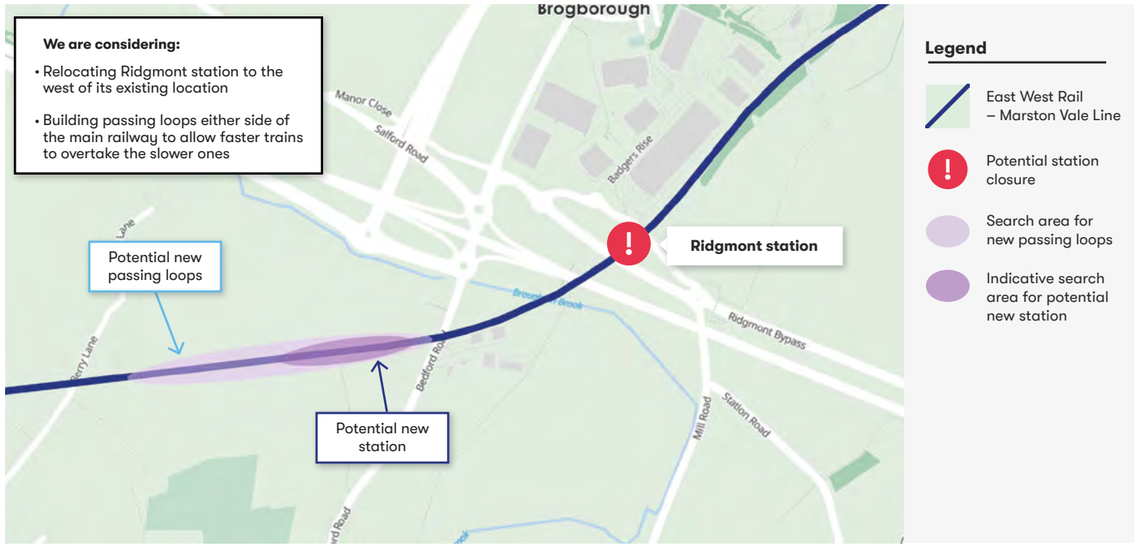


Figure 7.4: Map showing approximate location for passing loops and the relocated Ridgmont station

change the access arrangements at some of the existing stations for Concept 1. The precise details would vary by station and would depend on which option is taken forward for each level crossing or group of crossings. The changes would typically involve new pedestrian access routes from the street to the platforms and, at some stations, a new footbridge might be required to provide access between the two station platforms. We would expect to provide further details on any necessary changes to station access as part of the next round of public consultation.

7.3.23. In connection with the proposed construction of a second track in the Fenny Stratford area (see paragraphs 7.5.1 to 7.5.7), it would be necessary in Concept 1 to build a second platform at Fenny Stratford station. The precise location of the platform and the access route(s) to it would, in part, depend on the option taken forward for the adjacent Fenny Stratford level crossing. We would expect to provide further details on any necessary changes to station access as part of the next round of public consultation.

7.3.24. In this Service Concept, the platforms at Woburn Sands station would need to be lengthened in order to accommodate four-car EWR trains. The extended platforms would be designed to allow for further extension to accommodate eight-car trains in the future. If this concept is taken forward, EWR Co will review the current facilities available at this station and consider how they might be expanded and improved to deal with future demand and provide an improved customer experience within the constraints of the current station site.

7.3.25. As well as the enhancements described above, the infrastructure improvements detailed in paragraphs 7.7.1 to 7.7.13 below are also required to facilitate sufficient capacity and the reliable operation of the train service for this concept. (These works would be required for both Concept 1 and Concept 2). The works in the Bedford area, described in Chapter 8, including the proposed relocation of Bedford St John's station, would also be required regardless of which Service Concept is taken forward.

Concept 2 – provide more people with EWR services that are more frequent and enable quicker journeys, using a consolidated set of new stations

7.3.26. In this concept, EWR Co would review station locations and service patterns along the Marston Vale Line to:

- provide better connectivity for more people
- deliver a more reliable train service
- provide more frequent trains by doubling the number of services every hour at intermediate stations
- deliver quicker journeys over both short and long distances
- provide direct trains to more destinations for more users
- focus investment to provide better-quality stations with more facilities
- provide stations with future growth in mind, thereby reducing the risk of increased station traffic driving through villages and/or parking on residential streets

Station locations

7.3.27. The existing service and station locations were designed to meet the historic needs of communities as they existed quite some time ago. Over time travel patterns and preferences have changed significantly, and communities such as Milton Keynes have altered the overall travel needs of the area. This may explain the low usage on the existing services. For that reason, it makes sense to at least consider an alternative concept that revisits the existing station locations to better serve existing and future communities.

7.3.28. This concept proposes that the ten current intermediate stations on the Marston Vale Line would be consolidated into five relocated stations. The existing stopping service between Bletchley and Bedford would be replaced by a more frequent EWR stopping service, with two services every hour calling at all five of the new intermediate stations. This would provide a half-hourly service, direct to a wider range of destinations for more people. This would be in addition to the two fast EWR services every hour, that would call at two of the five stations as well.

7.3.29. By consolidating the number of stations on the line, it would be possible to operate the more frequent EWR stopping service every half hour without the need for faster trains to overtake the slower ones. This would mean that the additional tracks (passing loops) that are required near Ridgmont station in Concept 1 would not have to be built. It would also avoid the need to provide new access routes (including, in some cases, new footbridges) at some of the existing stations that would otherwise be necessary because of the changes affecting the adjacent level crossings (see paragraphs 7.6.1 to 7.6.341 below). The money saved from not building the additional tracks and altering the existing stations could instead be used to provide a greatly improved range of facilities at the five new intermediate stations, as well as ensuring they are

better connected to the communities they serve.

7.3.30. The work EWR Co has undertaken to date indicates that the maximum number of intermediate stations which could be supported with the proposed pattern of EWR stopping services is five. Limiting the number of intermediate stations to five allows the operation of a reliable train service without the need for trains to overtake one another. By adding additional station calls to some EWR services, those trains will take longer to travel from Bletchley to Cambridge than in Concept 1 but, by limiting the number of station calls between Bletchley and Bedford to five, the overall impact on journey time remains acceptable. The impact on the longer journey times for some trains is off set by the improved accessibility of EWR services leading to more people using the railway.

7.3.31. EWR Co has identified five approximate locations where it believes relocated stations could be built. These locations are based on a review of existing and likely future travel patterns between Bletchley and Bedford. In choosing the new locations we have also considered the location of existing communities as well as proposed new housing and employment developments along the route, and we have sought to provide stations that can be accessed from the new developments without increasing traffic through existing villages.

7.3.32. The locations of the stations would be refined based on on-going technical development of the proposals and feedback from this consultation. Each of the locations proposed is described in more detail in paragraphs 7.3.49 to 7.3.74 below.

7.3.33. No proposals are being made in relation to the names of any of the proposed relocated stations at this stage, but for ease of identification, the stations are described in this consultation as follows:

- A relocated station at Woburn Sands
- A relocated station at Ridgmont
- A relocated station at Lidlington
- A relocated station at Stewartby
- A relocated Bedford St Johns station

7.3.34. EWR Co would welcome stakeholders' views on the eventual station names that may be used.

7.3.35. EWR Co has engaged with representatives of the three local authorities along the route to consider how to best serve both the present and future needs of communities along the Marston Vale Line. The proposed locations are based on current and planned locations of homes and jobs and are designed to provide enhanced connectivity for as many people as possible. EWR Co would be open to consider alternative locations for intermediate stations but any proposed alternative station location(s) would need to meet a number of criteria:

- There can be no more than five intermediate stations between Bletchley and Bedford – as further stops extend the journey time, which reduces the number of passengers that would use EWR overall.
- Any alternative location would need to be accessible for existing users of the Marston Vale Line
- The five stations along the Marston vale Line would need to adequately take into account the needs of existing and planned new communities
- Any station location must have acceptable impacts on the environment, ecology and heritage features and there must be a reasonable prospect that any such impacts can be adequately mitigated to the satisfaction of the relevant statutory body.
- The alternative location(s) would need to deliver the same (or better) outcomes when compared to the five locations proposed in this consultation.
- Any station location should, as far as possible, be located on a straight section of railway. (This avoids excessive gaps between the train and the platform and ensures that as many users as possible can board and alight from trains without assistance).

7.3.36. To supplement the changes to the railway, between Bletchley and Bedford, EWR Co would also seek to improve the options available for journeys to and from the stations (sometimes referred to as "first mile / last mile connectivity") to support and improve sustainable travel and user experience. EWR Co is currently engaged with England's Economic Heartland (the Sub-National Transport Body for the region) in a joint study in first/last mile connectivity to help inform the options. This work aims to ensure existing and future communities can easily access one or more of the proposed relocated stations and, where practicable, would ensure point to point journey times (including those parts of the journey not made by train) are similar to or better than those of today, even if a station has been relocated.

7.3.37. The details of the options for first mile/last mile connectivity that are developed will be consulted on at the Statutory Consultation. However, the options could include:

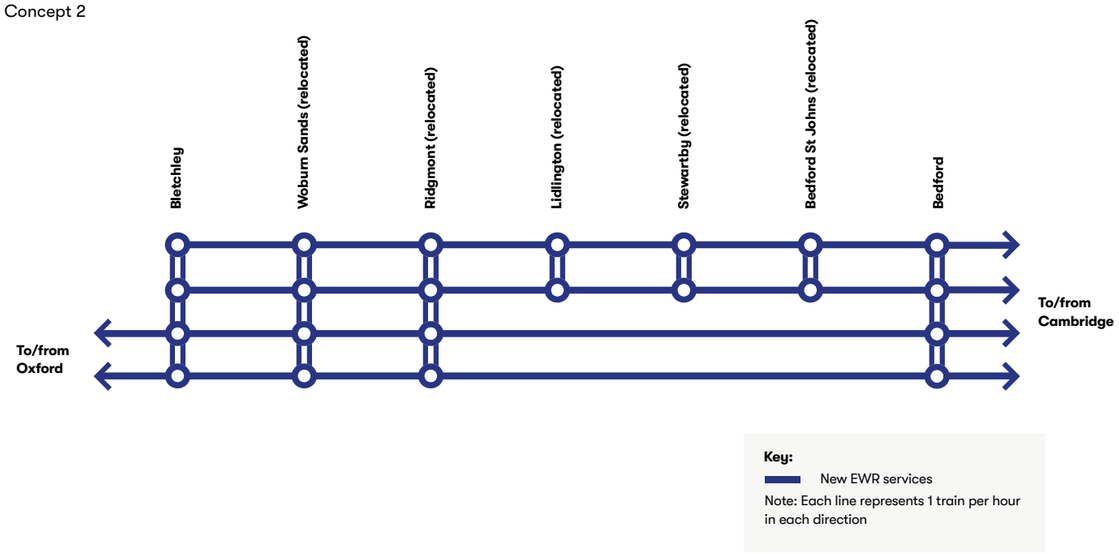
- new and improved walking and cycling routes (which could bring benefits to the wider community, not just those accessing the relocated stations);
- new or altered bus services;
- dedicated taxi or minibus services that could provide a door-to-door service between the station and a customer's home (or other destination), timed to connect with the train service. These services could operate on a fixed route and to a fixed schedule or could be operated on-demand with customers requesting journeys via a smartphone app or by phone. (Such services are sometimes referred to as "demand-responsive" services);
- In future, autonomous vehicles operating within a defined area, providing an on-demand, door-to-door service.

7.3.38. EWR Co would also aim to provide an integrated journey booking system and fares structure that allows for end-to-end journeys using multiple modes of transport to be booked and paid for in a single transaction.

Service patterns

7.3.39. The pattern of train services that would operate in Concept 2 between Bletchley and Bedford once the section of EWR through to Cambridge is open is shown in the diagram in Figure 7.5. Prior to the opening of the line through to Cambridge, a different pattern of services might be operated.

Figure 7.5: Diagram showing the pattern of passenger train services that would operate on the Marston Vale Line in Concept 2



7.3.40. Two EWR services would run each hour in each direction between Oxford and Cambridge. A further two EWR stopping services would run between Bletchley and Cambridge. The intention is that these trains operate at regular times throughout the day and that, between Bedford and Cambridge, the trains would be evenly spaced throughout each hour - a so-called "clock face" service.

7.3.41. In this concept, it is proposed that the EWR services between Bletchley and Cambridge would call at all of the new intermediate stations and the EWR services between Oxford and Cambridge would call at Woburn Sands (relocated) and Ridgmont (relocated) only. This means that all stations would be served by at least two EWR trains each hour Woburn Sands (relocated) and Ridgmont (relocated) would be served by four) and all of those trains would extend beyond Bedford to Cambridge.

7.3.42. Every other train from Woburn Sands (relocated) and Ridgmont (relocated) would extend to Oxford. Journeys between the other intermediate stations (Bedford St Johns (relocated), Stewartby (relocated) or Lidlington (relocated) and Oxford would also be available with only one change.

7.3.43. EWR Co has developed an indicative timetable to demonstrate the pattern of services and journey times that would be available with this concept. This is shown in Figure 7.6.

7.3.44. Under this concept, two of the four trains each hour may not achieve the Bletchley to Bedford target journey time of 24 minutes, instead taking in the region of 27 to 28 minutes based on current modelling. However, this increased journey time would be offset by improved accessibility to direct trains to Cambridge for a greater number of people, avoidance of the need to build additional tracks at/near Ridgmont and reduced operating costs resulting from the withdrawal of the current stopping service. In addition, all intermediate stations would benefit from an improved frequency of service with at least two EWR services per hour (in each direction) serving all-stations. A comparison of train frequency and journey times by rail today with the frequency and indicative journey times in each of the two concepts can be found in paragraph 7.3.89.

7.3.45. Unlike Concept 1, Concept 2 does not require the provision of additional tracks at/near Ridgmont. This is because the slower services that call at all five stations have a shorter journey time than the current "all-stations" service (that would continue to operate in Concept 1) and can complete the journey from Bletchley to Bedford (or vice versa) in the time between two of the faster services. It is therefore not necessary for the faster trains to overtake the slower ones in this concept.

7.3.46. If this concept were taken forward, it would be necessary for EWR Co to secure the powers to close the existing intermediate stations from the Secretary of State for Transport and/or to carry out other network changes. Normally, closure of stations is achieved by way of the statutory process set out in the Railways Act (2005) (the 2005 Act). As described in Chapter 1, EWR Co intends to seek consent for this next stage of the Project through the Development Consent Order (DCO) process under the Planning Act 2008 (PA 2008). The DCO process can be used so that a number of otherwise separate processes are grouped together, acting as an alternative to the 2005 Act process to secure powers for station closures. Because the station closures are intrinsically linked to the works for which EWR Co is seeking consent through the DCO process, it would be appropriate for EWR Co to also seek consent for the station closures (and other network changes) through this process rather than through the 2005 Act process at the same time. This allows the station closures to be considered at the same time as the powers to upgrade the railway.

7.3.47. EWR Co and the DfT have discussed how to use the DCO process to effect station closures. EWR Co has agreed that, where practicable, it will use the same consultation periods as would be used under the 2005 Act in preparing its application to effect closures pursuant to the DCO. EWR Co will also engage the Office of Rail and Road in relation to its proposals.

Station location: detailed information

7.3.48. The following paragraphs describe the five potential locations that EWR Co has identified as being suitable for new stations.

OXFORD	d		10:53		11:23
Oxford Parkway	d		11:00		11:30
Bicester Village	d		11:07		11:37
Winslow	d		11:18		11:48
BLETCHLEY High Level	a		11:26		11:56
	d		11:27		11:57
BLETCHLEY Low Level	d	11:05	↓	11:35	↓
Woburn Sands (relocated)	d	11:12	11:33	11:42	12:33
Ridgmont (relocated)	d	11:16	11:37	11:46	12:37
Lidlington (relocated)	d	11:20	|	11:50	|
Stewartby (relocated)	d	11:25	|	11:55	|
Bedford St Johns (relocated)	d	11:30	↓	12:00	↓
BEDFORD	a	11:32	11:47	12:02	12:17
	d	11:33	11:48	12:03	12:18
ECML Interchange	d	11:43	11:58	12:13	12:28
Cambourne Area	d	11:53	12:08	12:23	12:38
Cambridge South	d	12:06	12:21	12:36	12:51
CAMBRIDGE	a	12:09	12:24	12:39	12:54

CAMBRIDGE	d	10:24	10:39	10:54	11:09
Cambridge South	d	10:28	10:43	10:58	11:13
Cambourne Area	d	10:42	10:57	11:12	11:27
ECML Interchange	d	10:49	11:04	11:19	11:34
BEDFORD	a	11:01	11:16	11:31	11:46
	d	11:03	11:18	11:33	11:48
Bedford St Johns (relocated)	d	|	11:20	|	11:50
Stewartby (relocated)	d	|	11:26	|	11:56
Lidlington (relocated)	d	↓	11:31	↓	12:01
Ridgmont (relocated)	d	11:14	11:36	11:44	12:06
Woburn Sands (relocated)	d	11:19	11:41	11:19	12:11
BLETCHLEY Low Level	a	↓	11:46	↓	12:16
BLETCHLEY High Level	a	11:25		11:55	
	d	11:26		11:56	
Winslow	d	11:34		12:04	
Bicester Village	d	11:43		12:13	
Oxford Parkway	d	11:50		12:20	
OXFORD	a	11:57		12:27	

Figure 7.6: An indicative timetable demonstrating the pattern of services and journey times available with Concept 2

Woburn Sands (relocated)

7.3.50. The current station site is heavily constrained by surrounding development and the adjacent level crossing and offers relatively few opportunities for expansion and improvement. Moving the station to the west would unlock greater potential to provide a modern station with improved facilities and better options for interchange with other modes of transport. The proposed relocation would also allow easier access from the proposed Milton Keynes Southeast development area (SD11), where 3,000 new homes are expected to be built in future years. The proposed relocation of the station would mean that users accessing the station from the new development would not need to travel via the existing streets within Woburn Sands to reach the station.

7.3.51. EWR Co is keen to enable easy access to the station from Woburn Sands, from the planned housing to the west and from Aspley Guise (to the east) and will work with the local authorities to secure improvements to access routes.

7.3.52. The relocation of the station would also fit well with some of the options being considered for improving the safety of Woburn Sands level crossing (see paragraphs 7.6.99 to 7.6.140).

7.3.53. Construction of a new station in this locality would require the permanent acquisition of privately owned land. The precise details of which land would be affected cannot be determined until a definite site for the relocated station has been determined and further work is undertaken to confirm the layout of the station and associated infrastructure (such as car parks and access roads). If this concept is taken forward, this will be done at the next stage of design and details will be consulted upon at the Statutory Consultation.

Figure 7.7: Map showing search area for relocated Woburn Sands station

Ridgmont (relocated)

7.3.54. A new station would be provided between the current Aspley Guise and Ridgmont stations, replacing these stations, and located to the west of Bedford Road. The approximate area in which the station could be located is shown in Figure 7.8, below.

7.3.55. The station would be located to the west of the M1 and Bedford Road bridges. This is close to the site of the former Husborne Crawley Halt that closed in 1941 and is the same location that is described above for the relocation of Ridgmont station in Concept 1.

7.3.56. The relocated station would be adjacent to an area (known as "Aspley Triangle") that has been identified as being potentially suitable for development in the future as part of the South East Milton Keynes Area of Future Growth (AFG). The development of the Aspley Triangle area could provide a significant number of new homes as well as employment areas.

7.3.57. Like the current Ridgmont station, the proposed area for the relocated station is close to junction 13 of the M1, where the motorway is intersected by the A421.

7.3.58. A new station at this site could be configured to provide interchange with other modes of transport. It would offer convenient access from the M1 and A421 roads and could offer potential for a park and ride facility for wider connectivity, which supports proposals by Milton Keynes Council. Unlike the current Ridgmont station, the new station would be located on a straight section of track. This would allow for easier boarding and alighting from trains and reduces the risk of accidents because of the smaller gap between the train and the platform when compared to a curved platform.

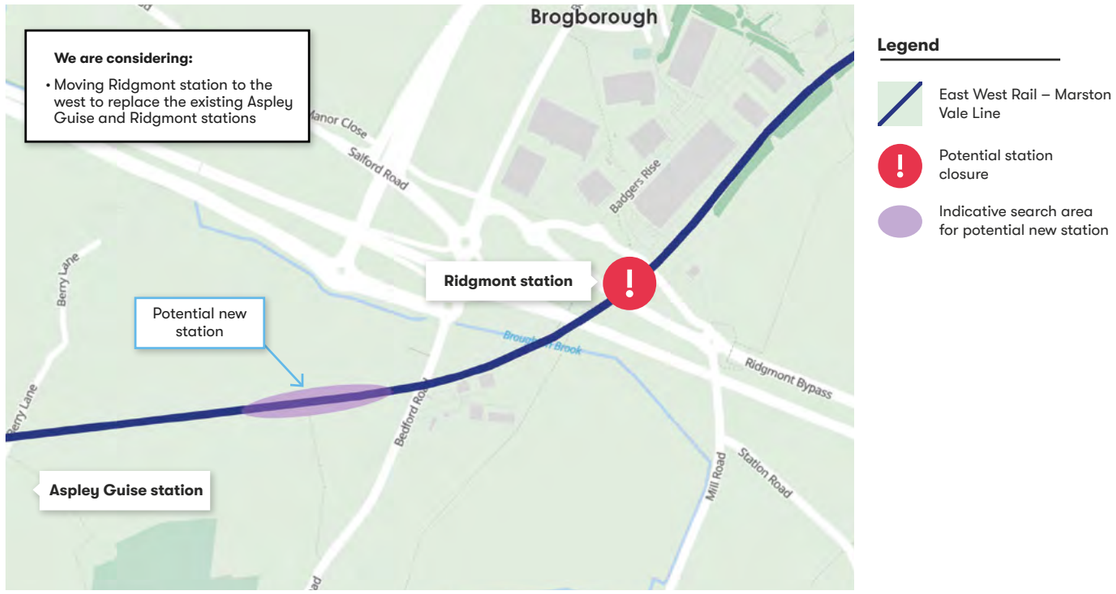


Figure 7.8: Map showing search area for new station to replace Aspley Guise and Ridgmont stations

7.3.59. The precise layout of a station in this location would require careful consideration and to fit with proposals for the Milton Keynes – Bedford Waterway. As the land to the south of the railway is designated as Green Belt, the station would need to be designed in a way that respects the character of the Green Belt.

7.3.60. Development of a station at this location would allow a modern, multi-modal interchange to be provided without harming the setting of the heritage centre and tea rooms located in the listed former station building at Ridgmont.

7.3.61. However, it would place the station further away from these facilities and also from the businesses located close to the current Ridgmont station. EWR Co would propose that a good-quality pedestrian and cycle route is developed to link the new station site to the current Ridgmont station site. The walking time between the two would be in the region of 10 to 15 minutes, depending on walking speed and the final location of the new station.

7.3.62. The station would also be further from the village of Aspley Guise than the current Aspley Guise station. The current station is around 900m from the centre of the village (taken as being The Square). EWR Co would also seek to establish new pedestrian and cycling links to Aspley Guise. With the new links in place, the distance from the centre of the village to Aspley Guise station could increase by between 700m and 1km (depending on the precise station location and the route of any new pedestrian and cycle paths). Coupled with proposed links to alternative modes of transport, the proposed relocation would encourage increased traffic flows away from the centre of Aspley Guise and village roads.

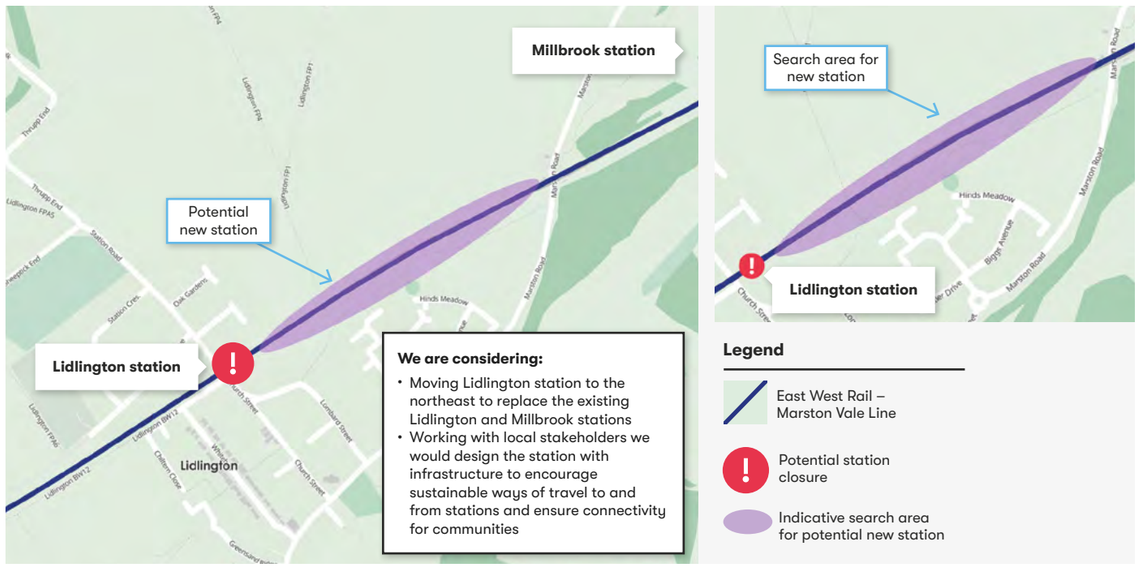
7.3.63. Options for demand-responsive services (such as on-demand taxi or minibus services) would also be investigated, to link the station to surrounding areas.

7.3.64. Construction of a new station in this locality would require the permanent acquisition of privately owned land. The precise details of which land would be affected cannot be determined until a definite site for the re-sited station has been determined and further work is undertaken to confirm the layout of the station and associated infrastructure (such as car parks and access roads). If this concept is taken forward, this will be done at the next stage of design and details will be consulted upon at the Statutory Consultation.

Lidlington (relocated)

Figure 7.9: Map of search area for proposed new station to replace Lidlington and Millbrook stations

7.3.65. A new station would be provided between the current Lidlington and Millbrook stations, replacing those stations, and located to the west of Marston Road. The approximate area in which the station could be located is shown in Figure 7.9, below.



7.3.66. 5,000 new homes are proposed to be built to the north of Lidlington over the next 20 years under SA2 outline planning applications submitted by O&H Properties. The development of these homes would potentially lead to significant additional use of Lidlington station. However, the station is located within the built-up area of the village and has no space around it to allow for improvement and expansion. The proposed site for the relocated Lidlington station would allow for a better station to be created that is more able to deal with the expected future levels of use and provide a modern customer experience. Access to the new station from the new development would be possible without passing through the existing village at Lidlington thereby avoiding increased traffic flows.

7.3.67. A station at this location would be designed as a facility for the local community rather than a station to encourage access from a wider catchment and it would be designed to encourage access by sustainable means. EWR Co would work with the local authority and the developer of the Marston Valley development to develop high-quality pedestrian and cycle access routes between the station and the new homes. Direct access for pedestrians and cyclists would also be provided from the site of the current Lidlington station. The walking and cycling distance from the current Lidlington station to the relocated Lidlington station could be in the region of 500 to 800m (depending on the precise station location and the route of any pedestrian and cycle path).

7.3.68. EWR Co will also seek opportunities for improved links to the new station for residents of Marston Moretaine, currently served by Millbrook station. The distance from the village to the new station would be approximately 2.3km (approximately 600m further than the distance to the current Millbrook station).

7.3.69. Construction of a new station in this locality would require the permanent acquisition of privately owned land. The precise details of which land would be affected cannot be determined until a definite site for the re-sited station has been determined and further work is undertaken to confirm the layout of the station and associated infrastructure (such as car parks and access roads). If this concept is taken forward, this will be done at the next stage of design and details will be consulted upon at the Statutory Consultation.

Stewartby (relocated)

7.3.70. A new station would be provided between the current Stewartby and Kempston Hardwick stations, replacing these stations, and located close to Broadmead Road. The approximate area in which the station could be located is shown in Figure 7.10, below.

Figure 7.10: Map showing search area for new station to replace Stewartby and Kempston Hardwick stations

7.3.71. Under Policy 25 of the Bedford Borough Local Plan the site of the former Stewartby Brickworks, to the southwest of the proposed new station, is proposed to be redeveloped for a mix of residential, employment and community uses. Proposals put forward by developer Cloudwing propose up to 1,000 homes being built on the site.

7.3.72. Cloudwing has also submitted an outline planning application for an employment-led mixed-use development (known as Bedford Business Park) to be built on land immediately to the northeast of the new station site. This development would extend along both sides of the railway towards Bedford and is expected to bring around 15,000 new jobs to the area. The proposed relocation of the station would provide better connectivity to both of these developments.

7.3.73. A station at this site would be well placed to provide access to the railway from both existing and new residential areas at Wootton and on the west side of Bedford (thereby taking pressure off the road network linking these areas to Bedford station). Access to the relocated station would also be possible from developments at Wixams. The distance between the proposed area for the relocated Stewartby station and the proposed location for the new Wixams station on the Midland Main Line (which is on the western edge of the Wixams development) is around 4.5km via existing roads. New roads that are planned as part of the Bedford Business Park development would reduce the length of the journey to around 2.5km. This would mean the journey would take around eight minutes by bike, 30 minutes on foot or less than five minutes by car.

7.3.74. The relocated station would be a similar distance from the centre of Stewartby village as the existing Stewartby station. However, the distance between the relocated station and Kimberley Sixth Form College would increase from around 450m to approximately 1400m (depending on the precise location of the new station and the layout of roads and footpaths within the new development on the brickworks site). It would take around four to five minutes to cycle between the relocated station and the college or around 17 minutes on foot.

7.3.75. EWR Co would investigate a range of options for providing access between the relocated station, surrounding residential and commercial areas and Kimberley College. If this Service Concept is taken forward, EWR Co would work with the developers of the adjoining sites to seek to provide high-quality walking and cycling routes that link to the station. Options for demand-responsive services (see 7.3.64 above) would also be investigated, to link the station to surrounding areas, including the Wixams development.

7.3.76. Construction of a station in this locality would require the permanent acquisition of privately owned land. The precise details of which land would be affected cannot be determined until a definite site for the re-sited station has been determined and further work is undertaken to confirm the layout of the station and associated infrastructure (such as car parks and access roads). If this concept is taken forward, this will be done at the next stage of design and details will be consulted upon at the Statutory Consultation.

Bedford St Johns (relocated)

7.3.77. EWR Co's proposals in respect of the relocation of Bedford St Johns station are described in Chapter 8 of this document, which deals with proposals in the wider Bedford area (see paragraphs 8.3.1 to 8.3.46).

Summary of station alternatives

7.3.78. Under Concept 2, the alternatives described below would be available to users of existing Marston Vale Line stations.

7.3.79. Improvements to Bletchley station (including a new eastern entrance on Saxon Way) (see paragraph 7.4.1) and possible improvements to other public transport in the area would allow users of the current **Fenny Stratford**

station to access the railway at Bletchley. The new entrance at Bletchley station would be around 1.4km from the current Fenny Stratford station. On average, this distance could be covered in around six minutes by bike or 18 minutes on foot. EWR Co would also work with Milton Keynes Council to investigate opportunities for improvements to local bus services linking the Fenny Stratford area to Bletchley station.

7.3.80. Users of the current **Bow Brickhill** station would be able to use Bletchley station or the relocated Woburn Sands station instead. The new eastern entrance at Bletchley would be around 4km from Bow Brickhill station. The relocated Woburn Sands station would be around 4.5km from Bow Brickhill station but this distance is likely to be reduced by the construction of new roads and cycle paths within the MKSE development. EWR Co would work with Milton Keynes Council and developers of sites adjoining the railway to secure new and improved pedestrian and cycle routes. EWR Co would also work with Milton Keynes Council to investigate opportunities for improvements to local bus services to link the area around Bow Brickhill station to Bletchley and the relocated Woburn Sands stations. Options for demand-responsive services (see 7.3.64 above) from the relocated Woburn Sands station to connect with the area around Bow Brickhill station would also be considered.

7.3.81. Users of **Woburn Sands** would be able to access the railway at the improved, Woburn Sands (relocated) station. The relocated station would be linked to the site of the current station (and hence to the town) via a new stretch of pedestrian and cycle path. In addition, depending on the final location and configuration of the station and the option taken forward for Woburn Sands level crossing (see 7.6.99) a new vehicular access route might also be provided.

7.3.82. EWR Co would also investigate options for improving walking and cycling routes from the Woburn Sands (relocated) station to **Aspley Guise**. In addition, links from Aspley Guise to the relocated Ridgmont station would be created. EWR Co would also consider the provision of a demand-responsive transport options (see 7.3.64 above) to link to Ridgmont (relocated) station. With new footpath and cycle links, the distance from Aspley Guise (The Square) to the relocated Ridgmont station would be around 1.8km (roughly double the distance to the current Aspley Guise station), taking an extra few minutes by bike or 11 minutes on foot. The journey by car using existing roads would take less than five minutes.

7.3.83. The current **Ridgmont** station would be linked to the relocated Ridgmont station by a new pedestrian and cycle path. This path would need to be co-ordinated with other proposals affecting the area such as the Milton Keynes – Bedford Waterway. The demand-responsive services (see 7.3.64 above) that would be considered to link Aspley Guise to Ridgmont (relocated) station could also serve the area currently served by Ridgmont station.

7.3.84. The relocated Lidlington station would be a relatively short distance from the site of the current Lidlington station and would be linked to it by a new or improved pedestrian and cycle route. For some residents of the village, the journey to the station would become slightly longer but for others it would become shorter.

7.3.85. Residents of Marston Moretaine (the nearest settlement to **Millbrook** station) would have access to the relocated Lidlington station via Station Road and Marston Road. EWR Co would also work with the local authority (Central Bedfordshire Council) and the developer of the proposed Marston Valley development to secure improved pedestrian and cycle links between Marston Moretaine and the new station. The relocated Lidlington station would be around 2.3km from the centre of Marston Moretaine (taken as the junction of Station Road and Woburn Road), which is around 700m further than the distance to the current Millbrook station.

7.3.86. Users of **Stewartby** station would be able to access the railway via the relocated Stewartby station. EWR Co would work with the local authority (Central Bedfordshire Council) and the developer of the former Stewartby Brickworks site to secure new pedestrian and cycle links to Stewartby village and to Kimberly College. For residents of Stewartby, the distance to the station would be similar, with some residents being slightly further from the relocated station but others being slightly closer. The distance between the relocated station and Kimberley College would increase from around 450m to around 1400m (depending on the final location of the relocated station and the precise configuration of new roads and pedestrian and cycle routes within the planned Stewartby brickworks redevelopment). The journey from the relocated station to the college would take around four to five minutes by bike and 10-12 minutes longer on foot compared to today.

77.3.87. The relocated Stewartby station would also provide a replacement facility for users of the current **Kempston Hardwick** station. The existing road network already provides routes to the new station for users of the current station and additional, shorter routes would be provided if the business park development on land between the two stations goes ahead.

7.3.88. The relocated **Bedford St Johns** station would be a short distance from the current station. Access to the new station site from the current one would be possible via the existing network of streets and footpaths within this part of Bedford.

7.3.89. The options for new pedestrian and cycle routes, new access routes and potential improvements to other public transport (including the potential provision of new, demand-responsive services) would be developed in time for the Statutory Consultation.

Comparison of Concepts 1 and 2

7.3.90. Table 7.2 below provides a comparison of train frequency and journey times by rail today with the frequency and indicative journey times in each of the two concepts for a sample range of journeys. Where a journey between two points cannot easily be undertaken by rail today (for example, journeys that are only currently possible by rail by travelling via London), no current journey time is shown. For concept 2 (and for journeys to or from Ridgmont or Bedford St Johns in concept 1), the journey time for the equivalent journey to or from the nearest new station is shown and this journey time does not take account of any additional time that might be taken to reach the alternative station. For some journeys in concept 1, a faster journey time is possible by changing trains at Ridgmont. Where this is the case, the faster journey time is shown in brackets after the journey time that can be achieved without changing trains. The journey times shown in this table are indicative and may be subject to change as the Project develops.

Table 7.2: Comparison of current train frequencies and journey times with those in concepts 1 and 2

Journey	Current		Concept 1		Concept 2	
	Frequency (journey opportunities per hour)	Journey time (minutes)	Frequency (journey opportunities per hour)	Journey time (minutes)	Frequency (journey opportunities per hour)	Journey time (minutes)
Bow Brickhill to Bedford St Johns						
Bow Brickhill to Bedford St Johns	1	31				
Bow Brickhill to Bedford St Johns (relocated)			1	33		
Woburn Sands (relocated) to Bedford St Johns (relocated)					2	18
Woburn Sands to Bedford						
Woburn Sands to Bedford	1	31	4	14		
			1	31		
Woburn Sands (relocated) to Bedford					4	14
Aspley Guise to Bedford						
Aspley Guise to Bedford	1	28	1	29/17		
Ridgmont (relocated) to Bedford					4	10

Journey	Current		Concept 1		Concept 2	
	Frequency (journey opportunities per hour)	Journey time (minutes)	Frequency (journey opportunities per hour)	Journey time (minutes)	Frequency (journey opportunities per hour)	Journey time (minutes)
Aspley Guise to Stewartby						
Aspley Guise to Stewartby	1	14	1	19		
Ridgmont (relocated) to Stewartby (relocated)					2	9
Ridgmont to Oxford						
Ridgmont (relocated) to Oxford			2	43	2	43
Ridgmont to Cambridge						
Ridgmont (relocated) to Cambridge			4	47	2	47
					2	53
Lidlington to Oxford						
Lidlington to Oxford (changing at Bletchley)			1	65		
Lidlington (relocated) to Oxford (changing at Ridgmont)					2	56
Lidlington to Cambridge						
Lidlington to Cambridge (changing at Bedford)			1	56		
Lidlington (relocated) to Cambridge (by direct train)					2	49
Stewartby to Bletchley						
Stewartby to Bletchley	1	29	1	30/24		
Stewartby (relocated) to Bletchley					2	20
Bedford to Bletchley						
Bedford to Bletchley	1	42	4	22	2	22
			1	42	2	27

7.3.91. The following paragraphs compare the two concepts and highlight some of the advantages and disadvantages associated with each concept.

7.3.92. Concept 1 would retain the existing intermediate stations in their current locations - other than at Ridgmont and Bedford St Johns where the stations would be relocated - and as a result, access to the railway would remain largely unchanged to what is seen and available today. However, the shape of the communities in and around the Marston Vale Line is set to change rapidly – regardless of the introduction of EWR services – given the scale of proposed new developments in the area. Under this concept, access to stations for those living or working in both existing communities and new developments could be less convenient as locations would encourage increased traffic from new developments on longer routes through existing towns and villages along the railway.

7.3.93. Concept 2 would provide alternative station sites that attempt to strike a balance between the needs of those who use the railway today and those who may be attracted to use it in the future, meaning that more people would have convenient access to an EWR station. While, in Concept 2 some existing users may have to travel further to reach a station, this increase in travel time would be offset by faster train journey times.

7.3.94. It would provide stations that could be accessed from new developments without the need to travel into or through existing settlements.

7.3.82. As part of Concept 2, EWR Co would seek to provide new and improved pedestrian and cycle links to the new station sites. These new links would allow quicker, safer access to the new station sites and would also be available for the use of the whole community as part of the wider footpath and cycleway network in the area. Other than at Ridgmont, these links would not be provided in Concept 1.

7.3.95. Existing stations have relatively poor facilities for access other than on foot and, in the majority of cases, site constrains prevent comprehensive access improvements from being implemented. In Concept 1 potential users from new developments could be dissuaded from using the railway and might choose to use less sustainable modes of transport to undertake their journeys. However, the greater distances that some existing users would need to travel to reach a station in Concept 2 could cause them to switch to alternative, less sustainable modes of transport.

7.3.96. As part of Concept 2, EWR Co would seek to provide new and improved pedestrian and cycle links to the new station sites. These new links would allow quicker, safer access to the new station sites and would also be available for the use of the whole community as part of the wider footpath and cycleway network in the area. Other than at Ridgmont, these links would not be provided in Concept 1, due to constraints in and around the existing station locations.

7.3.97. Concept 2 provides four trains per hour (in each direction) with at least two trains per hour serving each station. The more frequent service at some stations in Concept 2 might make the train a more attractive option for more journeys. Concept 1 requires five trains per hour (in each direction) and the majority of stations would be served by just one train per hour.

7.3.98. In Concept 1, only Woburn Sands and Ridgmont would be served by direct trains to Oxford and Cambridge. In Concept 2, all stations would have a direct service to Cambridge. Woburn Sands (relocated) and Ridgmont (relocated) would also have direct services to Oxford. In Concept 2, some stations would have direct trains to a wider range of destinations than in Concept 1 and that could make the train a more attractive option for some longer-distance journeys.

7.3.99. In Concept 1, station facilities would remain largely unchanged (although EWR Co would consider improvements at Woburn Sands and at the relocated Ridgmont station). The new station sites in Concept 2 would provide greater scope for the provision of better facilities, potentially including facilities that would benefit the whole community, not just those travelling by train. Concept 1 would require the construction of passing loops near Ridgmont, which would require additional land in this area compared to Concept 2, in which passing loops would not be required to operate the passenger service. However, Concept 2 would require land for the re-sited stations that would not be required for Concept 1.

7.3.100. If Concept 2 were taken forward, the cost of the passing loops would be saved and could instead be invested in better facilities at the relocated stations. The changes to level crossings (described further on in this Chapter) would result in the need for new and changed access routes at the existing stations, possibly including new footbridges at some stations. These works would not be required for Concept 2.

7.3.101. The Concept 1 train service would require more trains (and hence more train crew) to operate than the Concept 2 service. This would make the Concept 1 train service more expensive to operate than the Concept 2 service.

7.3.102. In Concept 1, the pattern of train services means that faster EWR services would need to overtake the slower “all-stations” service. The structure of the timetable that would be required to facilitate this overtaking would be make it inherently less reliable. This is because, at certain points on their journeys, the faster and slower trains would have to be scheduled to be much closer together than in Concept 2. This increases the risk of a delay to one train resulting in a delay to the following service.

Assessment Factors to be considered

7.3.87. When deciding which concept to take forward, in addition to the outcomes of this consultation, EWR Co expects that it will be necessary to pay particular attention to the following Assessment Factors and Considerations which are expected to differentiate between concepts:

- Transport user benefits – especially with regard to journey times;
- Contribution to enabling housing and economic growth including best serving areas benefitting from developable land – encouraging regeneration and improving employment and productivity benefits arising from existing and proposed development;
- Environmental impacts and opportunities – including impacts on local communities;
- Capital costs (of the infrastructure required to enable each concept);
- Operating costs;
- Short distance connectivity to support commuting travel into key employment hubs (current and future) – with particular reference to the impact on journeys that are currently undertaken on the route;
- Short distance passenger services;
- Rail passenger connectivity to existing main lines;
- Long distance passenger services; and
- Performance.

7.3.88. The following paragraphs set out a preliminary assessment of how these Assessment Factors may apply to the concepts at the next stage of the Project.

7.3.89. Concept 1 may perform worse than Concept 2 in respect of **Transport User Benefits** as the slower service would need to wait at Ridgmont to allow the faster service to pass. The service is also likely to be less reliable in Concept 1 because of the way in which the faster and slower trains interact. However, in Concept 1, journey times to and from stations are unchanged for users that live (or work) close to an existing station (except at Ridgmont and Bedford St Johns). Concept 2 is expected to be an improvement on Concept 1 as the service would be more reliable (due to passenger services not needing to overtake one another) and more stations have direct services to Cambridge. Journey times on the slower services would be shorter in Concept 2. Concept 2 may mean that some existing users are further from their nearest station compared to Concept 1 but EWR Co would aim to make overall journey times from home to destination (or vice versa) similar to or shorter than Concept 1. Stations would, though, be more easily accessible from new developments. As Concept 2 has better station facilities at all stations, it is more likely to encourage more people to use rail. The new station sites are likely to offer more opportunities for integration with other modes of transport

7.3.90. Concept 2 is expected to perform better than Concept 1 in terms of **contribution to enabling housing and economic growth**. This is because the existing station locations do not optimally serve anticipated future developments across the corridor, and the slower service patterns and lack of onward connectivity lowers the probability that current and future residents use public transport. EWR Co expects that the new or relocated stations could better serve existing and future developments because they would be located in places that are more easily accessible from sites that are likely to be developable. The improvement in connectivity (in terms of faster journey times to key centres across the Arc) would be more conducive to growth.

7.3.91. Concept 1 could perform less well in terms of **Environmental impacts and opportunities** because of the impacts associated with the new infrastructure (passing loops) around Ridgmont. Concept 1 could support existing communities by retaining the existing stations which could be more accessible for some existing communities. Concept 2 could have more negative impacts due to the development of stations on undeveloped land. Concept 2 could support existing and future communities by providing a better service with shorter journey times, but it could be less accessible for some existing communities.

7.3.92. Further work is required to understand the **capital costs** of building the infrastructure required to support the two Concepts. However, EWR Co's initial assessment is that the costs could be broadly similar. This is because the savings in Concept 2 from not having to build passing loops at Ridgmont would be countered by the additional costs associated with the new stations and the associated access improvements.

7.3.93. Concept 1 could have higher **operating costs** than Concept 2 due to the greater amount of track infrastructure required (to provide passing loops) and the higher number of stations compared to Concept 2.

7.3.94. In terms of **short distance connectivity to support commuting travel into key employment hubs (current and future)**, Concept 1 would maintain the journeys that people currently take although they would be slower in this Concept. Concept 2 could attract more people to use the railway as a whole because of the better station facilities, stations being better located to serve existing and future development, more frequent trains and faster journey times for some journeys. However, with relocated stations, the journey to the station for some users may take longer and become unattractive.

7.3.95. Concept 1 could be worse than Concept 2 in terms **short distance passenger services (regional journeys, station to station)** because many shorter journeys would be slower in Concept 1 than in Concept 2.

7.3.96. Concept 1 could impact the reliability of **long-distance passenger services** as the faster long-distance services are more likely be delayed by the slower services (because of the interactions between services that occur as the result of the faster services having to overtake the slower services). Concept 2 offers direct services to Cambridge from more locations and therefore more readily facilitates longer-distance journeys.

7.3.97. **Performance** is likely to be worse in Concept 1 because there would be more trains using the railway and the interactions between trains are more complex leading to an increased risk of an incident leading to more widespread delay. Concept 1 could also be worse because the increased amount of track and number of stations means that there are more opportunities for the infrastructure to fail.

7.4 Bletchley Station

Introduction

7.4.1. This section of the Chapter describes additional works that EWR Co is considering carrying out at Bletchley station, the location of which is shown in Figure 7.11.

7.4.2. In February 2020, Network Rail obtained the 2020 Order which included the expansion of Bletchley station by providing two new platforms (for trains to and from Oxford) and a new footbridge span to link these platforms with the rest of the station.

7.4.3. With the extension of EWR services to Bedford and Cambridge, Bletchley station would become an important hub. It is expected that the station would provide an important interchange, not only between different EWR services but also between EWR services and those on the West Coast Main Line (WCML, the route between London, the West Midlands, the Northwest of England and Scotland). The station is also expected to be used by more people from the local area and by more people accessing Bletchley from locations newly connected to the town via EWR.

Options to be considered

7.4.4. Works to expand Bletchley station (by adding two additional platforms for trains between Oxford, Milton Keynes and Bedford) were authorised by the 2020 Order. However, in connection with the additional services to Bedford and Cambridge now proposed by EWR Co, additional works may be required at Bletchley to provide for the extra trains and the passengers that would use the station. EWR Co is reviewing the works authorised by the 2020 Order and considering what additional works might be required to provide an improved customer experience throughout the station area and to provide for additional demand in the future.

Figure 7.11: Location of Bletchley station

7.4.5. EWR Co is considering a range of options to improve the station. The design process is currently at a very early stage but the types of improvements EWR Co might wish to undertake include:

- Provision of a new station entrance on the east side of the station near the Saxon Street / Buckingham Road roundabout. This new entrance would be more convenient for access to and from the bus station, the town centre and Fenny Stratford;
- Improvements to access routes within the station, including alterations to or replacement of the current station footbridge and provision of step-free access to platform 6;
- Improvements to or replacement of the current station building on Sherwood Drive;
- Improvement and enlargement of the station car park;
- Alterations to the proposed design of the new platforms for trains to and from Oxford to make boarding and alighting of trains easier for all passengers;
- Provision of a further additional platform, next to the current platform 6. This platform would be used by trains to and from Bedford and Cambridge that start or terminate at Bletchley and it would provide additional platform capacity to allow more trains to operate in future; and
- Improvements to the current pick-up / drop-off area on the west side of the station.

7.4.6. EWR Co will engage with Bletchley Town Council and Milton Keynes Council to ensure synergy with the emerging plans for the redevelopment of Bletchley town centre.

Assessment Factors to be considered

7.4.7. When deciding which options to take forward, in addition to the outcomes of this consultation, the following Assessment Factors (of those agreed with DfT to be used for optioneering relating to the overall Project Objectives as described in Chapter 3) are expected to be of particular relevance:

- Transport user benefits
- Contribution to enabling housing and economic growth including best serving areas benefitting from developable land;
- Capital costs
- Operating costs
- Overall affordability
- Rail passenger connectivity to existing main lines
- Alignment with wider railway strategy / infrastructure;
- Safety risk (construction and operation);
- Environmental impacts and opportunities; and
- Consistency with Local Plans

Bletchley station

7.5 Fenny Stratford additional track

Introduction

7.5.1. This section of the Chapter describes works that EWR Co needs to undertake in the Fenny Stratford area, shown in Figure 7.12, to reinstate a second track that was removed in the 1970s. It describes the options being considered and the factors that will be taken into account when choosing which option to take forward.

Figure 7.12: Map highlighting the section of railway over which a second track is proposed

7.5.2. The railway from Bletchley station towards Bedford currently includes a section of single track between Bletchley station and a point immediately to the east of the A5 road near Fenny Stratford. In this section there is a junction where the railway to and from Oxford diverges from the railway to and from the current platforms at Bletchley station. This section of single track would not be able to accommodate the additional train services, which would run between Oxford and Bedford / Cambridge, and would prevent them from operating reliably without significantly affecting other services.

7.5.3. To increase capacity and reliability of the service a second track is needed in this area and the junction between the two routes needs to be redesigned. EWR Co is confident that this can be built within the existing railway boundary because this section of railway previously had two tracks and the land on which the second track was located is still owned by Network Rail. However, more land may be needed on a temporary basis to do some of the work required, like repairing and improving the existing embankments. EWR Co will consult further on this as part of the Statutory Consultation.

7.5.4. In this section of the line, there are four bridges that carry the railway line over the River Ouzel and local roads (the V7 Saxon Street dual carriageway in Bletchley (2 bridges) and the A5 dual carriageway east of Fenny Stratford). These bridges were built to carry only one track, therefore changes would be needed allow for reinstatement of the second track. (The bridge carrying the railway over the Grand Union Canal at Fenny Stratford has adequate space for a second track and does not need to be rebuilt).

Options to be considered

7.5.5. EWR Co is considering several potential track layout options for the redesigned junction, each of which have differing impacts on the design of the replacement bridge structures that would be required and on the existing railway embankments. The layouts also have differing impacts on the speed at which trains are able to travel at within this section of the line and they could also impact on the future reliability of the train services.

7.5.6. Further development of the detail of the track layout options is required and this will need to take account of the train service pattern that would operate in future (see paragraphs 7.3.1 to 7.3.113).

Assessment Factors to be considered

7.5.7. When deciding the options for the revised junction design and the design of the replacement bridge structures in this area, in addition to the outcomes of this consultation, the following Assessment Factors are expected to be of particular relevance:

- Transport user benefits – with particular reference to the impact of each option on journey times;
- Capital costs;
- Operating costs;
- Overall affordability;
- Satisfying existing and future freight demand;
- Performance;
- Safety risk (construction and operation); and
- Environmental impacts and opportunities

7.6. Level crossings on the Marston Vale Line

Introduction

7.6.1. This section of the Chapter looks at the level crossings on the railway between Bletchley and Bedford. It describes the crossings and EWR Co's proposals for them. It also describes options to mitigate the impacts of those proposals. The closure of level crossings is expected to be required regardless of the service concept eventually selected as the frequency and speed of new services would make crossings less safe than they are today and could mean considerable delays for road users. The progressive replacement of level crossings with bridges and underpasses is government policy in the UK.

7.6.2. There are currently 31 level crossings on the railway between Bletchley and Bedford. Their locations are shown in Figure 7.13. At these level crossings, rights of way of various kinds cross the railway on the level. These rights of way include public highways, private access roads, public footpaths and bridleways and agricultural access routes that facilitate access between different parts of farms that are bisected by the railway. Of these crossings, there are 11 that are already due to be altered or closed pursuant to the 2020 Order secured by Network Rail. A further three crossings (in addition to the 31 considered here) have already been closed by Network Rail pursuant to the 2020 Order.

Figure 7.13: Level crossings on the Marston Vale Line

Intermediate stations between Bletchley and Bedford not shown

7.6.3. The level crossings can be subdivided as follows:

- 11 road crossings of which two will be closed under the 2020 Order;
- 14 public footpath and bridleway crossings of which four will be closed under the 2020 Order; and
- Six[46] private access crossings of which five[45] will be closed under the 2020 Order.

7.6.4. The Office of Rail and Road (ORR) (the safety regulator for the railway industry) acknowledged, in 2011[46], that "level crossings account for nearly half of the catastrophic train accident risk on Britain's railways". Despite continued effort by the railway industry to improve the safety of level crossings, in Great Britain in 2019/20:

- Two pedestrians died after being struck by trains in accidents at level crossings.
- There were six train collisions with road vehicles at level crossings.
- Pedestrian near misses at passive crossing types are increasing.
- The number of operating incidents resulting in users becoming trapped on or in a level crossing also increased.
- There were 24 suicides at level crossings.[48]

7.6.5. In addition to the safety risk posed by level crossings, a significant proportion of train delays are attributable to level crossings, either as a result of accidents or incidents or because of the failure and or misuse of level crossing equipment. On the Bedford to Bletchley line, train services had to be suspended on a number of days during 2020 because of an ongoing technical problem with two of the level crossings.

7.6.6. Many factors influence safety risk at level crossings. However, it is clear that as the number and speed of train movements over a crossing increase, the risk of an accident or safety-related incident at that crossing increases and the consequences of accidents potentially become more serious. Therefore, whenever changes are proposed to the speed, type and frequency of trains on a section of railway, it is necessary to review the risk at each level crossing and undertake any necessary works to reduce or remove the risk.

7.6.7. When considering improvements to level crossings, ORR states that "The primary objective should be to close level crossings permanently, following the closure or diversion of a highway, road or by the provision of a bridge or under-pass" and "Simple renewal and retention of existing crossings should be seen as a last resort"[48].

7.6.8. As stated above, Network Rail has previously consulted on and obtained

[45] Includes one level crossing at which both a private access and public footpath cross the railway
[46] "Level Crossings: A guide for managers, designers and operators", ORR, December 2011
[47] Accident data from "Level crossings 2019/20", RSSB,
[48] "Level Crossings: A guide for managers, designers and operators", ORR, December 2011

consent for proposals to close 11 of the remaining 31 level crossings on the Marston Vale Line. This was in connection with the proposals authorised under the 2020 Order to introduce an hourly Oxford to Bedford service as part of earlier proposals for EWR.

7.6.9. The current proposals, which will see the introduction of train services from Oxford to Bedford and Cambridge, will result in a greater increase in the number of passenger trains using the Bletchley to Bedford line than was envisaged at the time of Network Rail's application for the 2020 Order. The frequency of passenger trains will increase from the current level of one train per hour in each direction to up to five trains per hour in each direction. Unlike in the previous proposals, the maximum speed of trains will also increase, from 60mph to up to 100mph.

7.6.10. In addition to the passenger services, the line will continue to cater for freight traffic. Currently, up to five freight paths per day are timetabled over the Marston Vale Line, although many of the paths are often not used.

7.6.11. The most noticeable impact of this change on level crossings, if they were retained, would be at crossings at which public highways cross the railway. At these crossings, there would be a significant increase in the amount of time in each hour during which the crossings are closed to road traffic to allow trains to pass. The exact duration of closure each hour would depend on a number of location-specific factors and, at this stage in the design process, it is not possible to give precise timings. However, in some cases, the level crossing barrier could be closed for as much as 40 minutes in each hour[50]. This would lead to longer journey times for pedestrians and road users and could result in more traffic delays in the vicinity of some crossings.

7.6.12. EWR Co has therefore reviewed all the level crossings on the Marston Vale Line and intends to implement the crossing closures authorised by the 2020 Order. EWR Co is also proposing to close the remaining 20 crossings on the Marston Vale Line that were not previously proposed for closure under Network Rail's plans. This will be necessary regardless of which train service concept (see paragraphs 7.3.1 to 7.3.113) is taken forward.

7.6.13. Where necessary, alternative means of crossing the railway are proposed. Although mitigation measures have already been proposed and authorised in respect of the 11 crossing closures authorised by the 2020 Order, EWR Co is reconsidering these mitigation measures in the context of the need to close a greater number of crossings. As a result, in some locations, alternative connectivity options are now being considered by EWR Co.

7.6.14. Because many of the crossings are located in close proximity to one another, in some cases crossings have been considered in groups with the aim of identifying packages of connectivity measures that could compensate for the closure of more than one crossing.

7.6.15. In some cases, it has been relatively easy to identify potential connectivity options. However, some of the level crossings are located at highly constrained sites and, in the case of these crossings, EWR Co has sought to balance often conflicting requirements when developing its connectivity proposals.

7.6.16. Each crossing, or group of crossings, and the connectivity options that have been considered are described in the following paragraphs. Each crossing is identified by its official name (as used within the railway industry) and, where appropriate, by the name of the road which crosses the railway. The Ordnance Survey grid reference is also given to aid identification.

[50] This figure is based on a service pattern of five trains per hour in each direction and a closure of up to four minutes for the passage of each train, which is a reasonable worst-case assumption for a full-barrier level crossing, remotely monitored by railway staff using CCTV (which is the type of crossing that is already in place at some sites and which would need to be provided where other types of crossing currently exist on public highways).

Closure and connectivity proposals for each crossing or group of crossings

Fenny Stratford (Simpson Road) (SP 882 342)

Site description

7.6.17. Fenny Stratford level crossing is a vehicular highway level crossing. It is located just to the north of the centre of Fenny Stratford and immediately to the east of Fenny Stratford station. At the crossing, Simpson Road crosses the railway. Simpson Road is a single-carriageway urban road with a 30mph speed limit that leads north from Watling Street. It provides a link between the village of Simpson (a village within Milton Keynes) to both Fenny Stratford and Bletchley.

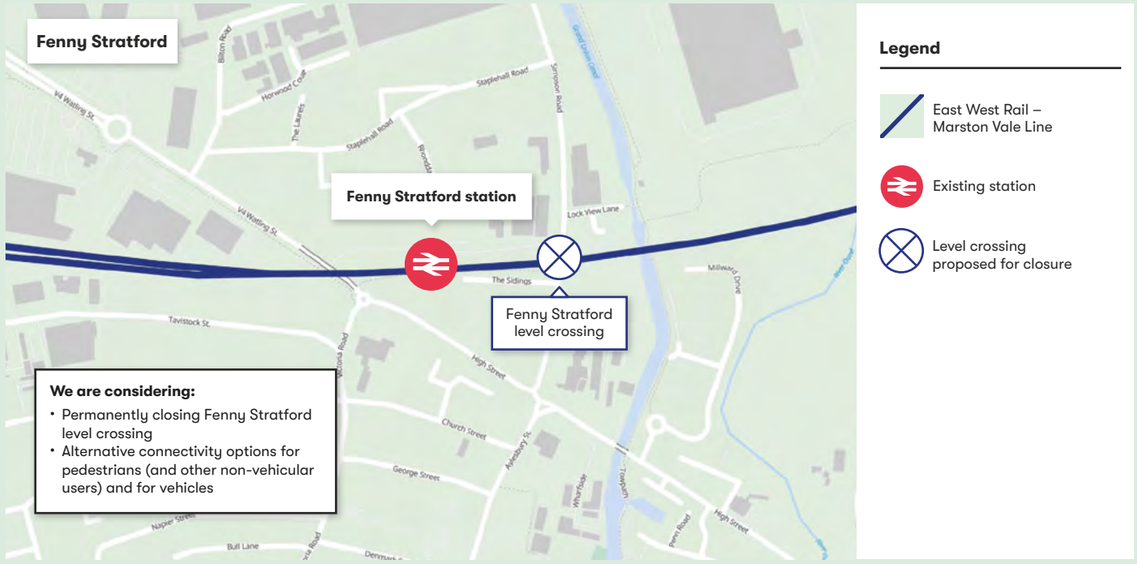


Figure 7.14: Fenny Stratford level crossing

7.6.18. The crossing is of the full-barrier type with CCTV provided so that the signaller can confirm the barrier has correctly lowered and the crossing is clear of obstructions before authorising trains to proceed over the crossing.

7.6.19. To the south of the railway, a mixture of residential and commercial properties abut the road. To the north of the railway, there are a number of commercial premises adjoining the road. These comprise offices and two separate builders' merchants. One of the builders' merchants has recently relocated and the site occupied by the other one is identified in development plan for Milton Keynes ("Plan:MK") as a proposed site for housing development. Beyond the commercial premises there is further, established residential development. To the north of the junction Staple Hall Road, lorries over 7.5t are prohibited (except for access) from Simpson Road. Simpson Road is served by bus route 18, which operates at hourly intervals (Mondays to Saturdays).

7.6.20. At the site of the level crossing, the railway comprises a single track. As part of proposals to upgrade the Bletchley to Bedford line, EWR Co proposes to reconstruct this section of railway and provide a second track at this location. An increase in the speed limit for rail traffic is also proposed at this location from the current 60mph up to 100mph.

EWR Co proposals

7.6.21. EWR Co proposes to permanently close Fenny Stratford level crossing. This means that connectivity options to accommodate displaced traffic will need to be considered.

7.6.22. EWR Co is considering a number of connectivity options to deal with displaced vehicular and pedestrian traffic. These are described in the following paragraphs. Three options are examined for pedestrian traffic and three options are examined for vehicular traffic. Should approval be secured for the closure of Fenny Stratford level crossing, EWR Co would implement one of the vehicular connectivity options and one of the pedestrian connectivity options.

7.6.23. EWR Co has not yet identified a preferred option for either vehicular or pedestrian connectivity. This will be presented at Statutory Consultation.

Vehicular Connectivity Option 1

7.6.24. In this option, no connectivity works are proposed. Vehicular traffic would be diverted via Staple Hall Road, which provides an alternative route between Simpson Road and Watling Street. This alternative route is shown in Figure 7.15 below.

Figure 7.15: Fenny Stratford Level Crossing, Vehicular Connectivity Option 1

7.6.25. This option would have the lowest cost. Compared to the other vehicular connectivity options, it would cause more traffic to use Staple Hall Road, including heavy vehicles over 7.5t. It would have less of an impact on ecology as it does not involve the construction of new sections of road across green areas.

Vehicular Connectivity Option 2

7.6.26. Given that Staple Hall Road is a relatively narrow residential street, consideration has been given to the option of also providing a short section of new link road joining Simpson Road to H10 Bletcham Way. This would provide an alternative route for lorries (and other vehicles) to continue to access the commercial properties situated on Simpson Road to the north of the railway. The proposed new link road is shown in Figure 7.16.

7.6.27. The precise layout and alignment of the road would be subject to further development work, including discussion with the highway authority. The link road starts at a new junction with Simpson Road to the south of the bridge carrying H10 Bletcham Way over Simpson Road and terminates at a new junction with H10 Bletcham Way located between the bridge over Simpson Road and the Fenny Lock roundabout. The land on which this road would be situated is owned by Milton Keynes Council.

7.6.28. To allow lorries (and other heavy vehicles) to reach the new link road, the current 7.5t weight restriction that is in place on Simpson Road would need to be revoked between Staple Hall Road and the new link road.

7.6.29. This alternative route would also involve lorries crossing the bridge that carries Simpson Road over the Grand Union Canal. This bridge has just a single traffic lane and traffic lights are provided to control traffic using the bridge. If EWR Co were to proceed with the option of providing this alternative route, further work will be required to investigate the suitability of the canal bridge to handle the increase in volume and weight of traffic. Such work may either identify that this option is not suitable or require a solution to the constraint imposed by the canal bridge.

Figure 7.16: New link road between Simpson Road and H10 Bletcham Way (Vehicular Connectivity Option 2)

7.6.30. This option would reduce the amount of additional traffic that would need to use Staple Hall Road compared to Vehicular Connectivity Option 1. It would involve building a new section of road across vegetated land and would therefore have a negative impact on ecology. It would create new T-junctions on Bletcham Way and Simpson Road.

Vehicular Connectivity Option 3

7.6.31. As an alternative to the above arrangement, the new link road could instead be provided to the north of H10 Bletcham Way. In this option, the new road would connect into the Fenny Lock Roundabout. This option is shown in Figure 7.17.

Figure 7.17: New link road between Simpson Road and H10 Bletcham Way (Vehicular Connectivity Option 3)

7.6.32. As with Vehicular Connectivity Option 2, this option requires the current 7.5t weight restriction that is in place on Simpson Road to be revoked between Staple Hall Road and the new link road. It would also require further work to investigate the suitability of the canal bridge to handle the increase in volume and weight of traffic to which it would be subjected, and any necessary mitigation.

7.6.33. As with Vehicular Connectivity Option 2, this option would reduce the amount of additional traffic that would need to use Staple Hall Road compared to Vehicular Connectivity Option 1. It would involve building a new section of road across vegetated land and would therefore have a negative impact on ecology. It would create a new T-junction and Simpson Road but it would feed traffic into an existing roundabout on Bletcham Way.

7.6.34. Unlike Vehicular Connectivity Option 1, this option crosses an area classified as deciduous woodland.

Pedestrian Connectivity Option 1

7.6.35. In this option, no connectivity works are proposed. Alternative pedestrian routes between the northern part of Simpson Road and Watling street are already available via either Staple Hall Road or via Lock View Lane and the tow path on the east side of the Grand Union Canal. These are shown in Figure 7.18.

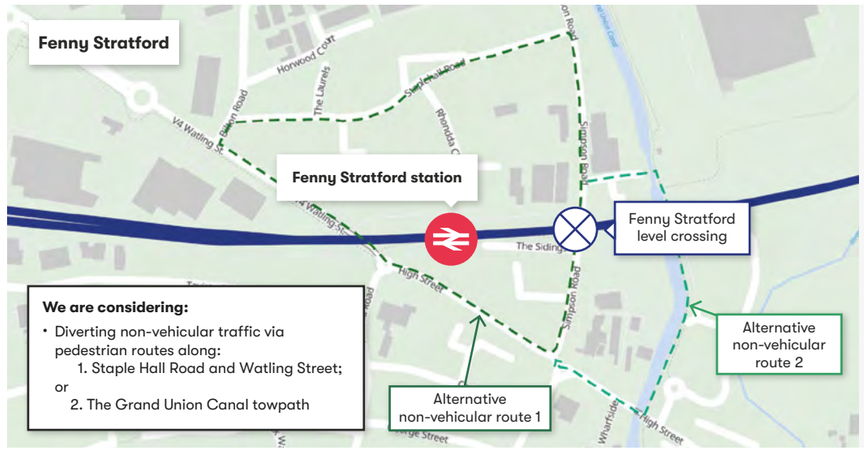


Figure 7.18: Map showing existing alternative pedestrian routes (Pedestrian Connectivity Option 1)

7.6.36. This has the lowest cost of the pedestrian connectivity options. It would avoid the need to create new sections of footpath and the building of any new structures. However, it would result in longer walking times for journeys that are currently made via the level crossing.

Pedestrian Connectivity Option 2

7.6.37. To supplement the existing pedestrian routes, EWR Co has considered two options (Pedestrian Connectivity Options 2 and 3) to maintain pedestrian links across the railway at (or close to) the site of the current Fenny Stratford level crossing. Pedestrian Connectivity Option 2 would involve the provision of a footbridge at the site of the crossing.

7.6.38. The bridge would be provided with stairs. Ramps would also be provided so that pedestrians that are unable to use the stairs could access the bridge. In order to provide the necessary space for the ramp on the north side of the railway, it might be necessary to acquire and demolish a number of commercial properties located adjacent to the railway.

7.6.39. The proposed new footbridge could also provide a means of access between the platforms of Fenny Stratford station, if the station were to be retained (see paragraphs 7.3.90 to 7.3.113). A plan of this option is in Figure 7.19.

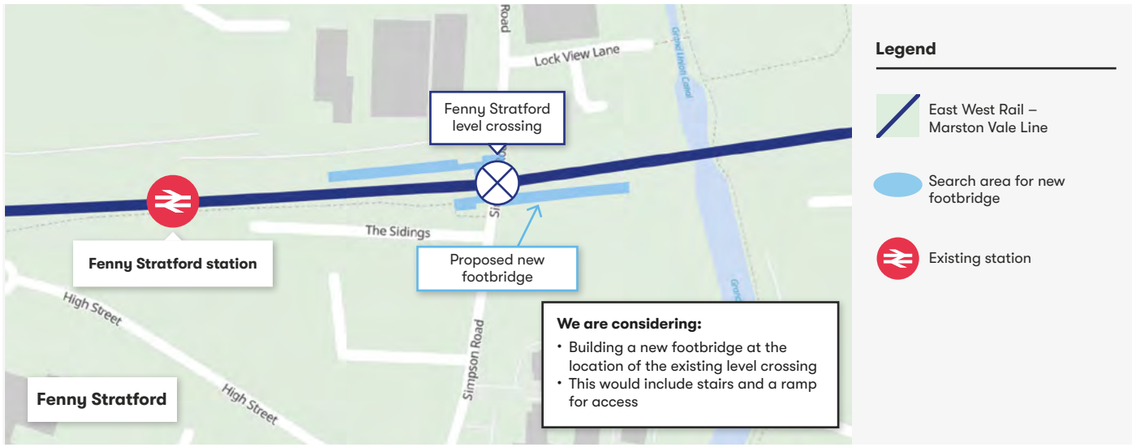


Figure 7.19: Map showing the indicative area for the proposed footbridge at Fenny Stratford crossing (Pedestrian Connectivity Option 2)

7.6.40. This option provides the shortest route for pedestrians, although mobility-impaired users would still experience a noticeable increase in the length of their journey due to the length of the ramps that are required to reach the footbridge. However, it entails the construction of a large footbridge structure that would necessitate the acquisition and demolition of commercial premises to the north of the railway and would have visual impact on the immediate surroundings of the crossing.

Pedestrian Connectivity Option 3

7.6.41. As an alternative to the footbridge described above in Pedestrian Connectivity Option 2, a new pedestrian route could be provided linking the two parts of Simpson Road. This new link would entail the construction of a new section of footpath adjacent to the railway on its south side, linking Simpson Road to the Grand Union Canal. The new path would then pass beneath a presently un-used span of the bridge that carries the railway over the canal and would then link to the section of tow path on the west side of the canal that leads to Lock View Lane and, in turn, the northern part of Simpson Road. This alternative route is shown in Figure 7.20.

Figure 7.20: Proposed alternative footpath link (Pedestrian Connectivity Option 3

7.6.42. The new section of path would be built on land that is mostly owned by Network Rail. The existing section of canal tow path might need to be improved to make it suitable for all potential users. The new pedestrian route would need to be lit at night.

7.6.43. This option would have less of a visual impact on the area compared to the footbridge option and would not involve the demolition of any buildings. It would, however, increase the number of people walking past the houses located on the canal adjacent to Fenny Lock and have a negative impact on the canal-side residential properties as a result of the new lighting that would be provided.

Bow Brickhill (V10 Brickhill Street) (SP 896 347)

Site description

7.6.44. Bow Brickhill level crossing is a vehicular highway level crossing located on the south side of Milton Keynes, immediately to the south of Caldecotte and Tilbrook. Bow Brickhill station straddles the level crossing with the platform for trains towards Bletchley being to its west and that for trains towards Bedford being to the east.

7.6.45. The crossing is of the full-barrier type with CCTV provided so that the signaller can confirm the barriers have correctly lowered and the crossing is clear of obstructions before authorising trains to proceed over the crossing.

7.6.46. V10 Brickhill Street crosses the railway at this level crossing. Brickhill Street is a single carriageway road and links a number of areas in the southern part of Milton Keynes to the A5 and A4146 at Kelly's Kitchen Roundabout. To the north of the crossing, it is urban in character while to the south the road has a more rural appearance. Roundabouts are situated a short distance from the crossing to both the north (junction with Caldecotte Lake Drive, 100m from crossing) and south (junction with Station Road, 80m from the crossing). Bus stops (with laybys) are located immediately to the north of the level crossing although no bus services currently use this section of Brickhill Street.

7.6.47. The speed limit for road traffic on Brickhill Street is 40mph at the site of the level crossing but this increases to 60mph just to the south of the junction with Station Road. The maximum speed of rail traffic at the crossing is currently 60mph but it is proposed to increase this up to 100mph.

7.6.48. A private access leads off Brickhill Street immediately to the south of the crossing on the east side of the road. This serves an equestrian establishment. Beyond this, two residential properties are situated, which face onto Station Road. The land to the east of the residential properties is agricultural, as is that to the south of Station Road. The land to the southwest of the crossing is currently in agricultural use but is subject of a planning application for a warehousing and distribution park. To the north of the crossing, the sites immediately adjacent to the crossing are undeveloped but beyond these lie the industrial area of Tilbrook and commercial and residential areas of Caldecotte. The land to the northeast of the crossing is subject of a proposal for a new access to the Tilbrook industrial area.

EWR Co proposals

7.6.49. EWR Co proposes to permanently close Bow Brickhill level crossing and divert V10 Brickhill Street via a new bridge over the railway. This means that connectivity options to accommodate displaced traffic will need to be considered.

7.6.50. EWR Co has considered four options for a new bridge to replace this level crossing. These options are described in the following paragraphs.

7.6.51. EWR Co has not identified a preferred option.

Connectivity Option 1

7.6.52. Connectivity Option 1 provides a new bridge over the railway to the west of the current level crossing. The bridge would be linked to the current road network at the Station Road roundabout south of the railway and at Water Mill roundabout (on Caldecotte Lake Drive) to the north of the railway. This is shown in Figure 7.21.

Figure 7.21: Bow Brickhill Connectivity Option 1

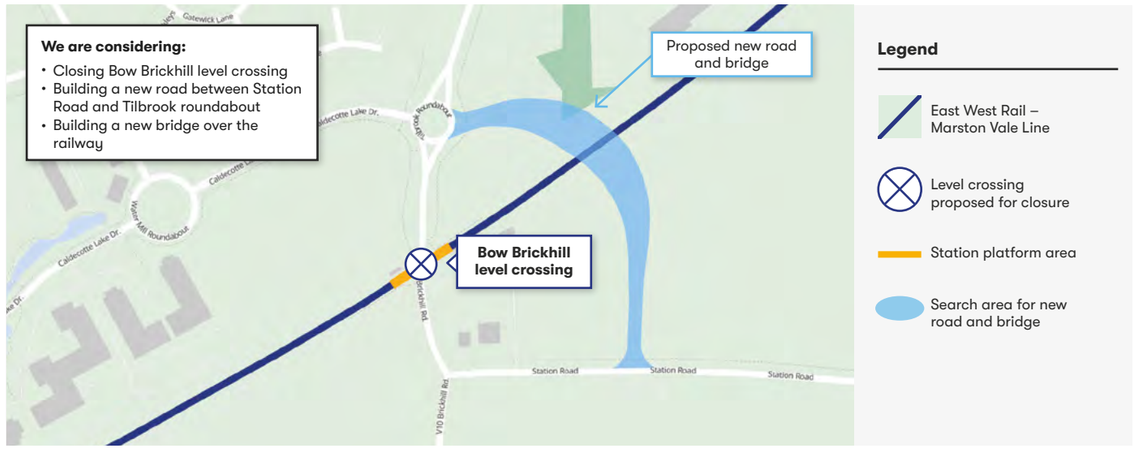
7.6.53. In addition to the construction of the bridge, the Station Road roundabout would need to be upgraded and the Water Mill roundabout would require resurfacing (because the current block paving would be unsuitable for the increased volume of traffic using it).

7.6.54. This option would require the acquisition of third-party land for the construction of the ramped approaches to the new bridge and for the enlargement of the Station Road roundabout. Some of this land is the subject of current planning applications for development. It would also result in an increase in traffic on the eastern part of Caldecotte Lake Drive, which is currently used for parking by people accessing the Caldecotte Lake Business Park. The gradients of the approaches to the new bridge would need to be steeper than the normal standard for roads of this type due to the relatively short distances in which the road needs to rise from the existing levels of the roundabouts at each end.

Connectivity Option 2

7.6.55. Connectivity Option 2 provides a new bridge to the east of the current level crossing. A new section of road would pass over the bridge, starting on the south side of the railway at a new junction on Station Road (located east of the residential properties near the existing roundabout) and ending on the north side of the railway at the Caldcotte Lake roundabout. This option is shown in Figure 7.22.

Figure 7.22: Bow Brickhill Connectivity Option 2



7.6.56. This option would require the acquisition of third-party land on which the ramped approaches to the new bridge would be built. To the north of the railway, it would conflict with the proposed new access to Tilbrook and the design of the new road over the bridge would need to be developed further to take account of this new access. The curve of the new section of road is tighter than the usual standard for this type of road. The gradients of the approaches to the new bridge are also steeper than the usual standard for the type of road.

7.6.57. This option would require the removal of a small area of deciduous woodland on the north side of the railway.

Connectivity Option 3

7.6.58. Connectivity Option 3 is similar to Connectivity Option 2 but instead of providing a bridge over the railway, a new bridge would be provided to allow the road to pass under the railway. The road would follow a similar alignment to that for Connectivity Option 2. This option is shown in Figure 7.23.

7.6.59. As with Connectivity Option 2, this option would require the acquisition of third-party land. To the north of the railway, it would conflict with the proposed new access to Tilbrook and the design of the new road over the bridge would need to be developed further to take account of this new access. The curve of the new section of road is tighter than the usual standard for this type of road. The gradients of the approaches to the new bridge are also steeper than the usual standard for the type of road.

7.6.60. As with Connectivity Option 2, this option would require the removal of a small area of deciduous woodland on the north side of the railway.

7.6.61. Unlike the other connectivity options, in this option the new ramped approach down to the bridge on the south of the railway conflicts with a high-pressure gas main, which would need to be re-routed. As the road level would be below ground level, a pumped drainage system would be required together with an underground attenuation tank. Such a system would introduce an undesirable long-term on-going maintenance liability and cost.

Figure 7.23: Bow Brickhill Connectivity Option 3

Connectivity Option 4

7.6.62. Connectivity Option 4 provides a bridge over the railway on a similar alignment as the current road. This option is shown in Figure 7.24.

Figure 7.24: Bow Brickhill Connectivity Option 4

7.6.63. Unlike the other three options, all of which can be built without significant disruption to road traffic, this option would require the closure of V10 Brickhill Street for around one year. This option has a reduced impact on adjoining development sites. Although it still requires some areas of development land, the overall impact on development potential is less than in the other options.

7.6.64. This option is likely to require the removal of a small area of deciduous woodland on the north side of the railway to facilitate the revised link to Bradbourne Drive.

Browns Wood (SP906355)

Site description

7.6.65. Browns Wood foot crossing is located at the southern edge of Milton Keynes between the Browns Wood and Old Park Farm residential areas. At the crossing, a public footpath crosses the railway. Kissing gates are provided on either side of the line to allow users to access the crossing. The footpath that crosses the railway at this crossing connects an area of open space (located off Holst Crescent) to Station Road in the village of Bow Brickhill. Throughout its length, the footpath is unsurfaced. Although EWR Co has not undertaken a formal count of users, the footpath appears to be relatively lightly used.

7.6.66. To the south of the railway, the path crosses agricultural land. It is unsurfaced and, in places, it is uneven. Some sections of the path can become muddy.

7.6.67. The area to the south of the railway is identified in the development plan for Milton Keynes ("Plan:MK") as a strategic site for the future expansion of Milton Keynes.

7.6.68. To the north of the railway, there is a gap in the surrounding housing development that is used as informal recreational space. This gap has been left to allow for the possibility of a future southward extension of V11 Tongwell Street. If this extension of Tongwell Street were to be implemented, it would cross the railway on a bridge at the site of Browns Wood foot crossing.

EWR Co proposals

7.6.69. EWR Co proposes to permanently close Browns Wood foot crossing. This means that connectivity options to accommodate displaced pedestrians will need to be considered.

7.6.70. In the absence of any firm proposals to extend V11 Tongwell Street (which would obviate the need for further mitigation of this crossing closure), EWR Co has considered three options to provide a pedestrian bridge at or close to the site of the crossing.

7.6.71. EWR Co has not yet identified a preferred option. This will be presented at Statutory Consultation.

Connectivity Option 1

7.6.72. Connectivity Option 1 provides a footbridge at the site of the existing crossing. The footbridge would be accessed by means of stairs on both sides of the railway. The nature of the footpath to the south of the railway (see paragraph 7.6.66 above) makes it unsuited to use by persons of restricted mobility. Therefore, in this option, ramps to access the bridge are not proposed, although it would be possible to design the bridge in a way that allows these to accommodate groups able to access the location despite restricted mobility or added later if circumstances change. In addition, to ensure this ability, land would need to be acquired for the purpose to ensure this could actually take place. (The other connectivity options do make provision for mobility-impaired users). This option is shown in Figure 7.25 below.

Figure 7.25: Browns Wood Connectivity Option 1

7.6.73. This option would have a reduced footprint compared to the other connectivity options which means that it would be more likely that it could be constructed without the need to permanently acquire any land outside of the current railway boundary (although this would need to be confirmed following further survey and design work). However, additional land would be required temporarily to facilitate construction of the new bridge.

7.6.74. The visual impact of this option would be less than that of Connectivity Option 2 but is likely to be greater than that of Connectivity Option 3. It requires the removal of less mature vegetation than Connectivity Option 2. It has less of a negative impact on the recreation area to the north of the railway than Connectivity Option 3.

Connectivity Option 2

7.6.75. Connectivity Option 2 is a development of Connectivity Option 1 that would include ramps to facilitate access to the bridge by people with reduced mobility. This option is shown in Figure 7.26 below.

Figure 7.26: Browns Wood Connectivity Option 2

7.6.76. This option would be likely to require the permanent acquisition of a strip of land on each side of the railway in order to locate the ramps. This might include a small area of land within the allotment site to the northeast of the crossing. If this option is taken forward, EWR Co will investigate options to avoid the need for this area of land.

7.6.77. This option would require the removal of more mature vegetation than Connectivity Option 1, but this could be mitigated by replacement planting. This option would have a greater visual impact than Connectivity Option 1 and would cost more.

Connectivity Option 3

7.6.78. Connectivity Option 3 would provide a pedestrian underbridge at the site of the crossing, allowing the footpath to pass beneath the railway. This option is shown in Figure 7.27.

Figure 7.27: Browns Wood Connectivity Option 3

7.6.79. The new bridge and the connections to it have been configured to provide good forward visibility along the footpath so as to improve security for users of the footpath.

7.6.80. This option has less visual impact than the other two options, but it would require the permanent acquisition of more land, including a larger area of the open space to the north of the railway. As the new footpath under the railway would be below ground level, it is likely that drainage would be an issue for this option. If this option is taken forward, EWR Co will investigate options for a suitable drainage system, but it is possible that a pumped drainage system would be required, and an underground attenuation tank might also have to be provided to temporarily store water at times of heavy rain to avoid overwhelming the local drainage system.

Pony (SP 912 359)

Site description

7.6.81. Pony crossing is located on the south side of Milton Keynes, at the southeast corner of the Old Park Farm residential area. At the crossing, a public bridleway crosses the railway. To the south of the railway, this bridleway provides links across agricultural land to a wider network of bridleways providing connections to Bow Brickhill village, Browns Wood, Bow Brickhill Park, Bow Brickhill Heath and a number of other areas of heath and woodland. A number of equestrian properties adjoin the bridleway between the railway and Bow Brickhill Road.

7.6.82. To the north of the railway, the bridleway has a more formal, semi-urban character. It connects with bridleways to Wavendon and through the Browns Wood residential area. It also connects with the Milton Keynes Redway network.

7.6.83. The site of the crossing is mostly surrounded by agricultural land. However, on the north side of the railway, houses are located immediately to the east of the bridleway. The land to the south of the crossing is identified in the Local Plan as a strategic development site for future housing growth.

EWR Co proposals

7.6.84. EWR Co proposes to permanently close Pony crossing. This means that connectivity options to accommodate displaced pedestrians, cyclists and equestrian users will need to be considered.

7.6.85. EWR Co has developed three connectivity options that provide a bridge at, or close to, the site of the crossing

7.6.86. EWR Co has not yet identified a preferred option. This will be presented at Statutory Consultation.

Connectivity Option 1

7.6.87. Connectivity Option 1 provides a new bridge over the railway at the site of the current crossing. This is shown in Figure 7.28.

7.6.88. To the south of the railway, the bridleway would be placed on a ramped embankment. To the north of the railway, in order to minimise the amount of land required, a steel structure is proposed to support the ramped approach to the bridge. This structure would be provided with a sound-deadening, non-slip surface to enable its use by horses. A strip of planting is proposed between the northern ramp and the neighbouring residential properties to reduce the visual impact of the structure and restrict opportunities for overlooking.

7.6.89. This option would require the permanent acquisition of third-party land. EWR Co believes the land required to the north of the railway is in the ownership of Milton Keynes Council. Some of the land required to the south of the railway forms part of the strategic development area. EWR Co would also need to temporarily acquire further land to facilitate the construction of the new bridge.

7.6.90. This option would have a more significant negative visual impact on nearby residential properties (particularly those located at the end of Beethoven Close and Davenport Lea) than Connectivity Options 2 and 3 but is likely to require the acquisition of less third-party land outside of the existing bridleway corridor.

Figure 7.28: Pony Connectivity Option 1

Connectivity Option 2

7.6.91. Connectivity Option 2 is a minor variation on Connectivity Option 1 that moves the northern approach slightly further away from the neighbouring residential properties. This is shown in Figure 7.29.

Figure 7.29: Pony Connectivity Option 2

7.6.92. As this option moves the northern approach ramp to the new bridge slightly further to the east, it would require the permanent acquisition of a narrow strip of agricultural land to the east of the current bridleway in addition to the land identified as being required for Connectivity Option 1.

7.6.93. This option would have a reduced visual impact on nearby residential properties and would create a larger area on which screening vegetation could be planted.

Connectivity Option 3

7.6.94. Connectivity Option 3 provides a new underbridge allowing the bridleway to pass beneath the railway at the site of the crossing. This is shown in Figure 7.30.

Figure 7.30: Pony Connectivity Option 3

7.6.95. The bridge would have sufficient headroom to allow equestrian users to pass beneath the railway without the need to dismount. The bridge would be constructed to minimise noise from trains passing over it so as to reduce the risk of "spooking" horses using the bridleway.

7.6.96. Because the new length of bridleway would be below the existing ground level, if this option is taken forward EWR Co will need to further investigate potential drainage solutions. It is likely that a pumped drainage system would be required, and an underground attenuation tank (or similar) may also be needed to temporarily store water at times of heavy rainfall to avoid overwhelming the local drainage system.

7.6.97. This option would have a lesser visual impact than Connectivity Options 1 and 2. It also prevents overlooking of adjacent residential properties by users of the bridleway.

7.6.98. In common with the overbridge solutions (Connectivity Options 1 and 2), this option would require the permanent acquisition of third-party land, including land within the strategic development area to the south of the railway and potentially a small strip of the agricultural land located to the east of the bridleway on the north side of the railway.

Woburn Sands area crossings

Description of the group of crossings

7.6.99. There are a number of level crossings in the Woburn Sands area in relatively close proximity to one another. Because of the proximity of the crossings to one another, the options for one crossing potentially influence the options for other crossings. The crossings in this area have therefore been considered as a single group.

7.6.100. This group of crossings comprises five crossings of which:

- One is a road crossing
- Three are public footpath crossings of which one will be closed under the 2020 Order; and
- One is a private access crossing, which will be closed under the 2020 Order.

7.6.101. The crossings in this group are:

- **Woodleys Farm (SP 917 362):** an accommodation crossing to the west of Woburn Sands that provides a private access route between two parts of an agricultural holding. This is authorised to be closed by the 2020 Order.
- **Fisherman's Path (SP 921 363):** a foot crossing immediately to the west of Woburn Sands at which a public footpath linking Bow Brickhill Road (to the south of the railway) to Wavendon (to the north of the railway) (Woburn Sands Footpath No. 2) crosses the railway. This crossing is authorised to be closed by the 2020 Order.
- **Woburn Sands (SP 924 363):** a public highway crossing, located adjacent to Woburn Sands station, at which the A5130 Station Road / Newport Road crosses the railway.
- **Mill Farm (SP 929 365):** a foot crossing immediately to the east of Woburn Sands at which a public footpath linking Vandyke Close on the north of the railway to a network of paths to the south of the railway that connect to Aspley Guise (Aspley Guise Footpath No. 3) crosses the railway. This path forms part of the Milton Keynes Boundary Walk.
- **Sewage Farm (SP 932 365):** a foot crossing to the east of Woburn Sands at which a public footpath (Aspley Guise Footpath No. 13) crosses the railway. This footpath connects into the wider footpath network to the south of the railway, but the public right of way ends in a field just over 300m to the north of the railway, at the border between Central Bedfordshire and Milton Keynes.

7.6.102. Woburn Sands crossing is located within the built-up area of Woburn Sands. The junction of Newport Road and Cranfield Road is located immediately to the north of the crossing. Beyond this junction on the northeast side of Newport Road is a residential area. A group of business premises are located on the southwest side of Newport Road, beyond which is a wooded area which gives way to agricultural land beyond.

7.6.103. Woburn Sands station is located immediately to the west of the crossing. To the southwest of the crossing is the (Grade II) listed former Woburn Sands station building, which is now used a coffee shop. Further along Station Road is a small private car park, the Station Tavern (a bar and restaurant) and the Summerlin Community Centre. To the west of the properties fronting Station Road is a modern housing development.

7.6.104. On the opposite side of Station Road, a small Network Rail maintenance compound adjoins the railway. To the southeast and east of this compound is a used-car sales business. Further along Station Road is a community building ("The Old Fire Station") and recreation ground.

7.6.105. The remainder of the crossings in this group are surrounded by agricultural land, although Fisherman's Path crossing leads into an area of woodland to the south of the railway, immediately to the west of the built-up area of Woburn Sands.

7.6.106. Fisherman's Path and Woodleys Farm crossings are located is within the proposed South East Milton Keynes Strategic Urban Extension area, detailed within the development plan for Milton Keynes ("Plan:MK").

EWR Co proposals

7.6.107. EWR Co wishes to permanently close all of the level crossings in this group. This means that connectivity options to accommodate displaced traffic, pedestrians and other crossing users will need to be considered.

7.6.108. Two connectivity options have been developed, which provide bridges over which diverted rights of way would be routed. Because of the difficulty involved in providing suitable mitigation for the closure of Woburn Sands level crossing, the second of the two options includes the retention of that level crossing.

7.6.109. In addition to these two connectivity options, an alternative connectivity proposal has been considered but discounted. The two connectivity options and the discounted alternative are described below.

7.6.110. EWR Co has not yet identified a preferred option. This will be presented at Statutory Consultation.

Connectivity Option 1

7.6.111. Connectivity Option 1 comprises a new by-pass road to the west of Woburn Sands that would cross the railway on a new bridge located close to the current Woodleys Farm level crossing. This option is shown in Figure 7.31 and Figure 7.32 below.

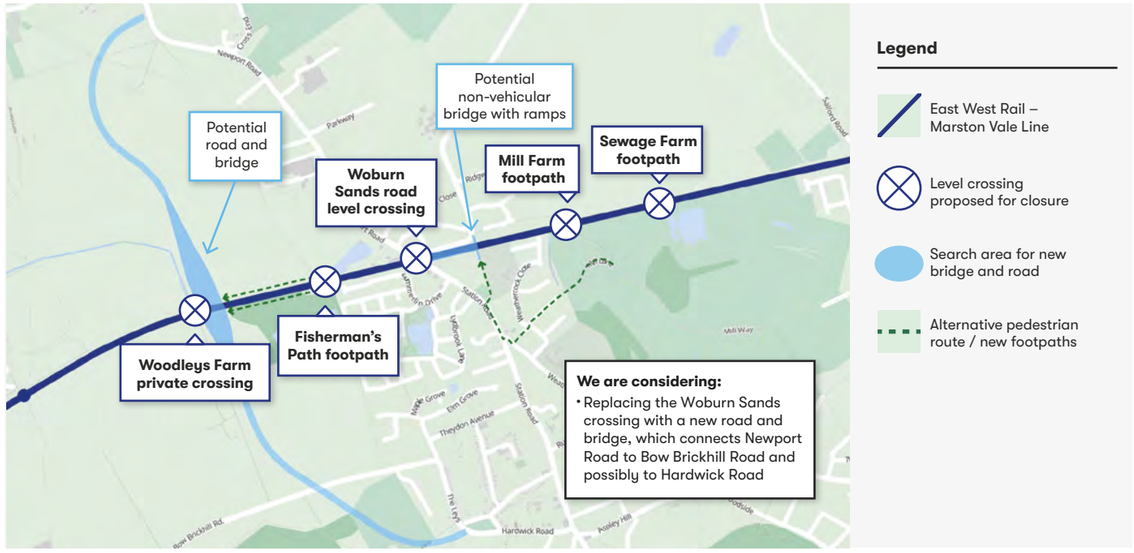


Figure 7.31: Woburn Sands Connectivity Option 1

7.6.112. To the north of the railway, the new road would commence at a new junction with Newport Road at a point between Wavendon and the entrance to Wavendon Fields (to the south of Wavendon). The precise location and layout of the new junction would be subject of further development work at the next stage of design. From here, the new road would cross agricultural land to reach the site of the new bridge over the railway.

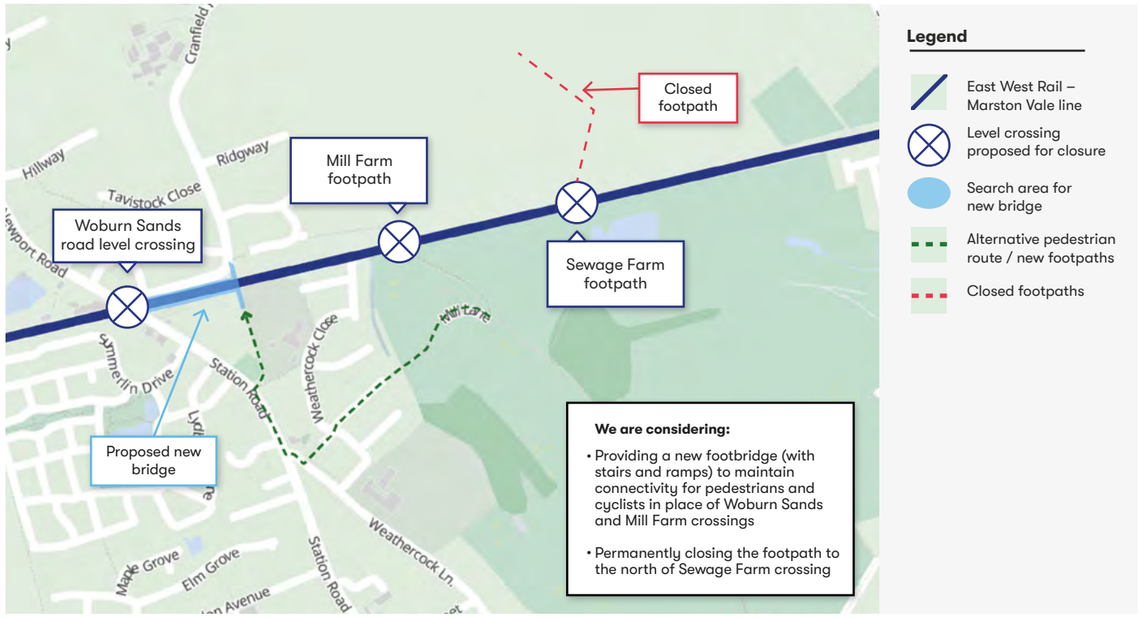


Figure 7.33: Proposed footbridge at Woburn Sands crossing (Connectivity Option 1)

7.6.113. To the south of the railway, the road would continue across agricultural land to Bow Brickhill Road. From the junction with Bow Brickhill Road, traffic could proceed via The Leys and Hardwick Road to re-join the current A5130 at the Hardwick Road/High Street roundabout. The total length of the new road would be around 1.5km.

7.6.114. A variant of this option would involve extending the new road to the south of Bow Brickhill Road to connect with The Leys to the south of the Woodland Way junction. This would extend the length of the new road to around 2km. The extension of the new road to The Leys would pass through allotments. This is in order to avoid the higher ground immediately to the west of the allotments.

7.6.115. It is possible that The Leys and Hardwick Road would need to be improved to deal with the additional traffic that would use these roads. Additional parking restrictions might also have to be imposed on some streets.

7.6.116. As part of this connectivity option, the rights of way over Woodleys Farm and Fisherman's Path crossing would be diverted to link to the new highway bridge over the railway. This would be in place of the proposals in respect of these two crossings authorised by the 2020 Order.

7.6.117. In order to maintain connectivity between the areas of Woburn Sands on each side of the railway for pedestrians and cyclists, a new bridge would be provided at the site of the recently closed School Crossing (a former footpath crossing to the east of Woburn Sands crossing). The bridge would be provided with steps linking to Cranfield Road on the north side of the railway and to the existing footpath on the south side of the railway.

7.6.118. Ramps would be provided for the use of cyclists and mobility-impaired users. The bottom end of the ramp on the south side of the railway would be located just off Station Road, adjacent to the current Woburn Sands level crossing. On the north side, the bottom end of the ramp would be on the south side of Cranfield Road, opposite the junction with Turnpike Court. This option is shown in Figure 7.33.

7.6.119. On the north side of the railway, alterations would be required to Cranfield Road to make space for the new ramp. These alterations would include changes to the layout of the road where it meets Newport Road to reconfigure the junction following the removal of Woburn Sands level crossing.

7.6.120. The public footpath that currently crosses the railway at Mill Farm crossing would be diverted as shown in Figure 7.32 to connect with the new bridge at the site of the recently closed School Crossing.

7.6.121. The footpath that currently crosses the railway at Sewage Farm crossing would be extinguished from a point immediately to the south of the crossing to the end of the footpath to the north of the railway. This is because this path ends shortly after the crossing and appears to serve no purpose.

7.6.122. In addition to the bridges described above, this Connectivity Option might also require an additional footbridge to provide access between the platforms of Woburn Sands station. The precise location of this bridge would depend on whether Woburn Sands Station remains in its current location or is moved slightly to the west as described in paragraphs 7.3.49 to 7.3.53 of this Chapter.

7.6.123. This connectivity option would significantly reduce traffic flows through Woburn Sands on Newport Road, Station Road and High Street. However, it would significantly increase traffic on Hardwick Road and The Leys (south and east of the Woodland Way junction). If the additional section of new road south of Bow Brickhill Road was not provided, it would also result in increased traffic on the eastern part of Bow Brickhill Road and the section of The Leys north of the Woodland Way junction. Traffic modelling needs to be undertaken to better understand the change in traffic flows and any resulting impacts. This will be done as part of the next design stage of EWR.

7.6.124. This option would require the permanent acquisition of a significant amount of third-party land, most of which is currently in agricultural use. However much of this land is within the area identified in the Milton Keynes Local Plan for the Southeast Milton Keynes strategic urban extension. The possible extension of the new road to the south of Bow Brickhill Road would require the permanent acquisition of part of the allotments site on the southwest of the town. The new footbridge would require the acquisition of part of the land occupied by the second-hand car dealer on Station Road.

7.6.125. This option would work well with the concept for the proposed expansion and re-siting of Woburn Sands station (see paragraphs 7.3.49 to 7.3.53) but the re-siting of the station does not require this option to be implemented.

7.6.126. The construction of the new road bridge might require the removal of a small area of deciduous woodland immediately adjacent to the railway.

7.6.127. The construction of the new footbridge would require the removal of some of the mature vegetation on the south side of Cranfield Road to make space for the ramp leading to the bridge on the north side of the railway.

7.6.128. The new footbridge structure and the ramps would have a visual impact on the surrounding area, including on residential properties on the north side of Cranfield Road. EWR Co will investigate options to mitigate this impact in the next stage of design. Mitigation could include planting to partially screen the bridge or possibly the development of an alternative design of bridge structure (although this might increase the amount of land required).

7.6.129. The new footbridge would mitigate the recent closure of School Crossing.

7.6.130. The diversion of the footpath away from Mill Farm crossing would increase the length of journeys that are currently made via Mill Farm crossing.

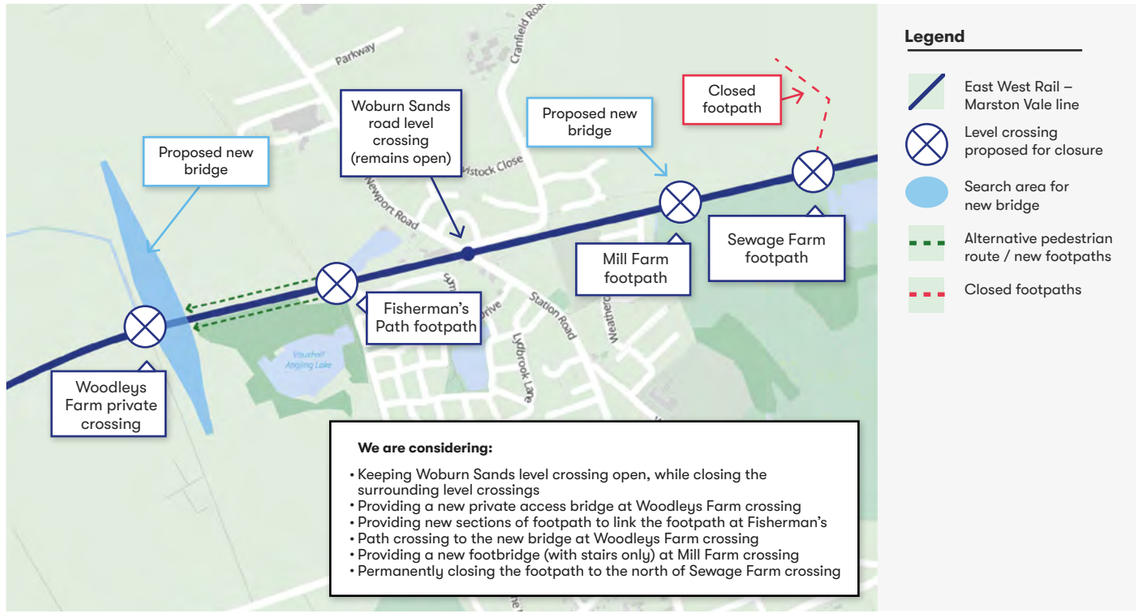
Connectivity Option 2

7.6.131. In this option, the existing Woburn Sands level crossing could be retained (but this would only be possible if acceptable from a safety and performance perspective) and improved. However, further work is required to determine whether upgrading the crossing equipment would sufficiently reduce the safety risk at this crossing to allow it to remain open. Also, further work needs to be undertaken to better understand the impact on traffic flows on the A5130 and Cranfield Road of the increased duration each hour in which the level crossing would be closed to allow the passage of trains (as described in paragraph 7.6.11).

7.6.132. If this option were taken forward, EWR Co would implement the mitigation measures for Woodleys Farm and Fisherman's Path crossings that were authorised by the 2020 Order. These involved providing a bridge suitable for use by agricultural traffic over the railway, close to the site of Woodleys Farm crossing. The public footpath from Fisherman's Path crossing would be diverted over this bridge. However, proposals in respect of these two crossings would depend on emerging proposals in relation to highways and other public rights of way within the Southeast Milton Keynes strategic urban extension. EWR Co will continue to work with Milton Keynes Council to understand the emerging proposals and the proposals within this option will be developed accordingly.

7.6.133. A footbridge with steps would be provided at the site of Mill Farm crossing. Ramps would not be provided at this bridge. Although this approach would mean that people whose mobility was impaired could not use the footbridge, EWR Co believes it would not be possible for them to access the bridge using the footpaths leading up to it and so, in practice, mobility impaired people would not use the bridge. However, the footbridge could be designed to allow ramps to be added at a later date if circumstances change. This site of the proposed bridge is shown in Figure 7.35.

Figure 7.35: Woburn Sands Connectivity Option 2



7.6.134. As with Connectivity Option 1, EWR Co would extinguish the footpath that crosses the railway at Sewage Farm crossing from a point immediately to the south of the railway to the end of the footpath to the north of the railway. This is because this path ends shortly after the crossing and appears to serve no purpose.

7.6.135. This option requires significantly less third-party land than Connectivity Option 1 because it does not require the construction of the new road to the west of Woburn Sands. However, land would still need to be permanently acquired for the new private access bridge at the site of Woodleys Farm crossing. A small amount of land might also be required for the new footbridge at the site of Mill Farm crossing.

7.6.136. This option is likely to cost significantly less than Connectivity Option 1 but it would not achieve EWR Co's aim to close all level crossings on the line between Bletchley and Bedford.

7.6.137. This option would avoid routing additional traffic via The Leys and Hardwick Road but the amount of time for which the barriers at Woburn Sands level crossing would be down for would cause significant disruption to traffic flows along Station Road and Newport Road and could also adversely affect traffic movements on adjoining roads.

Alternative connectivity proposal

7.6.138. In addition to the two options described above, EWR Co has considered a variation of Connectivity Option 2 in which Woburn Sands level crossing would be closed and replaced with a new road bridge over the railway at the site of the current level crossing.

7.6.139. In order to build a bridge at this location and avoid the demolition of residential properties, it would be necessary to build a heavily skewed, and therefore very large (approximate span of 125m), bridge at the site of the crossing. The ramped approach to the bridge on the south side of the bridge would need to be sited, in part at least, on the recreation ground on the northeast side of Station Road. On the north side of the railway, the approach ramp would require the demolition of commercial properties and would impact on the wooded area and a pond located on the southwest side of Newton Road. The junctions with Summerlin Drive, Cranfield Road, Turnpike Court and possibly Chantry Close would need to be significantly altered and this would have further adverse impacts on nearby properties.

7.6.140. As a result of the scale of the anticipated adverse impacts the new bridge structure would have on surrounding properties, this option has been discounted.

Aspley Guise / Husborne Crawley area crossings

Description of the group of crossings

7.6.141. There are a number of level crossings located between Aspley Guise and Bedford Road (to the east of Aspley Guise) in relatively close proximity to one another. Because of the proximity of the crossings to one another, the options for one crossing potentially influence the options for other crossings. The crossings in this area have therefore been considered as a single group.

7.6.142. This group of crossings comprises six crossings of which:

- One is a road crossing;
- Two are public footpath crossings, of which one will be closed under the 2020 Order; and
- Three are private access crossings, all of which will be closed under the 2020 Order.

7.6.143. The crossings in this group are:

- **Aspley Guise (Salford Road) (SP 939 367):** a public highway crossing at which Salford Road crosses the railway. Aspley Guise station station straddles the crossing, and the crossing provides the soles means of access between the station's two platforms.
- **Old Manor Farm (SP 942 367):** a foot crossing at which a public footpath (Aspley Guise Footpath No. 12) crosses the railway. This footpath links Aspley Guise (to the south of the railway) to a network of paths to the north of the railway that connect to Lower End, Salford and a range of other destinations.
- **Berry Lane (SP 944 368):** a private vehicular crossing at which a private access road (known as Berry Lane) crosses the railway. The 2020 Order authorises this crossing to be closed.
- **Long Leys (SP 950 369):** an accommodation crossing to the northeast of Aspley Guise that provides a private access route between two parts of an agricultural holding. The 2020 Order authorises this crossing to be closed.
- **Husborne Crawley Footpath No. 6 (SP 954 369):** a foot crossing at which a public footpath linking Husborne Crawley to Salford Road (to the north of the M1) crosses the railway.
- **Matey Boys (SP 954 369):** an accommodation crossing to the west of Bedford Road that provides a private access route between two parts of an agricultural holding. The 2020 Order authorises this crossing to be closed.

7.6.144. Because of the proximity of the crossings to one another, choices relating one crossing will influence choices relating to one or more of the others. EWR Co has therefore considered these crossings as a single group.

EWR Co proposals

7.6.145. EWR Co proposes to implement the closures previously authorised by the 2020 Order and to close the remaining crossings in this group. This means that connectivity options to accommodate displaced traffic, pedestrians and other crossing users will need to be considered.

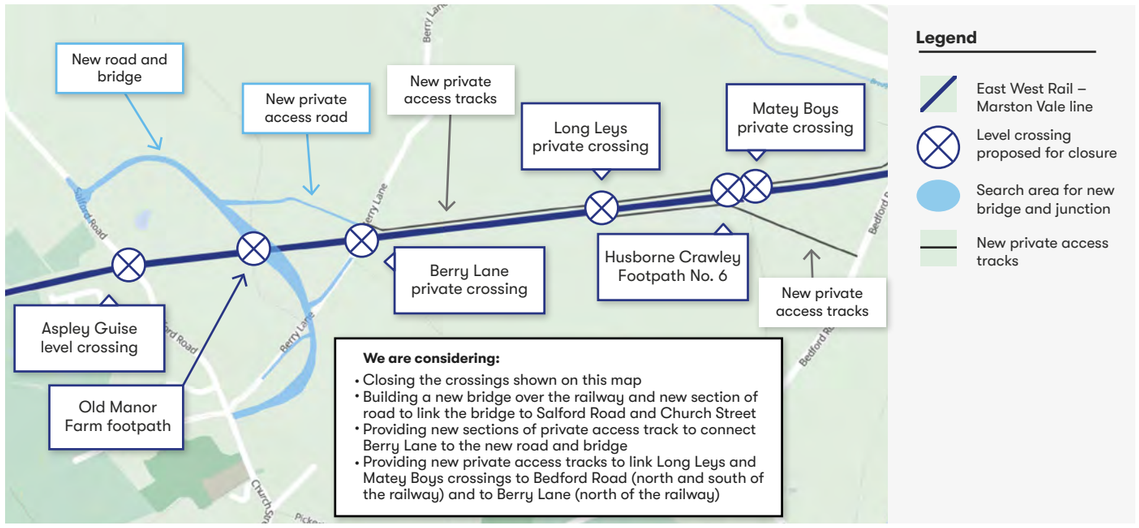
7.6.146. Two connectivity options have been developed, which modify the mitigation works authorised in the 2020 Order to provide mitigation for the additional crossing closures. The options, which are described below, provide bridges and access tracks over which diverted rights of way would be routed.

7.6.147. EWR Co has not yet identified a preferred option. This will be presented at Statutory Consultation.

Connectivity Option 1

7.6.148. In this option, traffic from Aspley Guise crossing would be diverted via a new bridge over the railway located to the east, close to the site of the current Manor Farm foot crossing. New sections of road would be required to link the new bridge to Salford Road. On the north side of the railway, the new section of road would commence around 200m to the north of the current Aspley guise level crossing and would pass through agricultural land around Crossinglands Business Park to reach the bridge. On the south side of the railway, the road would commence just to the south of the junctions of Salford Road with Mill Way and Berry Lane. The road would pass between the houses on the east side of Salford Road before curving to the north and crossing the current alignment of Berry Lane to reach the bridge. This is shown in Figure 7.36.

Figure 7.36: Aspley Guise Connectivity Option 1



7.6.149. Berry Lane would be locally realigned at the intersection with new road (on the south side of the railway) to provide a staggered junction. A new section of private access road would be built linking the new road to Berry Lane on the north side of the railway. Traffic that currently crosses the railway at Berry Lane crossing would therefore be able to cross the railway via the new road bridge.

7.6.150. If Aspley Guise station is retained (as per train service pattern concept 1 – see paragraphs 7.3.1 to 7.3.113) a new footbridge would be required at the station to provide access between the two platforms. (This is not shown in the drawing in Figure 7.36) The precise location and arrangement of the footbridge would be determined at the next stage of design development and would be described at the Statutory Consultation.

7.6.151. Aspley Guise Footpath No. 12, which currently crosses the railway at Old Manor Farm foot crossing, would be diverted between Berry Lane and the north side of the railway to follow the new road and cross the railway via the new bridge.

7.6.152. New access tracks on both the north side of the railway (running from Berry Lane to Bedford Road) and south side of the railway (running from a point adjacent to Long Leys crossing to Bedford Road) were authorised by the 2020 Order. These tracks provide alternative routes for the users of Long Leys and Matey Boys crossings. EWR Co would provide these new access tracks but their precise alignment would need to be modified to take account of the concept to relocate Ridgmont station to the west of Bedford Road and to provide passing loops (as part of train service concept 1, described in paragraphs 7.3.16 to 7.3.20) also to the west of Bedford Road. The details of the changes to the alignment of the access tracks would be determined as part of the next design stage and would be described at the Statutory Consultation.

7.6.153. Husborne Crawley Footpath No. 6 would be diverted over a new footbridge that would be constructed at (or very close to) the site of the current foot crossing. The concept to relocate Ridgmont station to the west of Bedford Road and to provide passing loops (as part of train service concept 1, described in paragraphs 7.3.16 to 7.3.20) also to the west of Bedford Road would impact on the precise location and configuration of the footbridge. The interface between these aspects of the Project will be developed further at the next stage of design and would be described at the Statutory Consultation.

7.6.154. The proposals described in this connectivity option would require the permanent acquisition of third-party land and rights of access across land. Additional land would need to be used temporarily during the construction of the connectivity works. The vast majority of the land required is agricultural land. However, a small area of land that is required to provide the connection between the new section of public highway and Salford Road to the south of the railway appears to be within the curtilage of residential properties. If this option is taken forward, EWR Co will look at whether use of this land can be avoided or reduced as part of the next stage of design development.

7.6.155. The land on the south side of the railway that is affected by these proposals is within the Green Belt. If this option were taken forward, EWR Co would need to ensure that the proposed connectivity works did not harm the character of the Green Belt or demonstrate that very special circumstances applied to their construction.

Connectivity Option 2

7.6.156. In this option, no new route would be provided for traffic that currently uses Aspley Guise level crossing. Instead, traffic would need to use the existing road network to travel between locations on either side of the railway.

7.6.157. If Aspley Guise station is retained (as per train service pattern concept 1 – see paragraphs 7.3.1 to 7.3.113) a new footbridge would be provided at the station to maintain access between the two platforms. (This is not shown in the drawing in Figure 7.37). The precise location and arrangement of the footbridge would be determined at the next stage of design development and would be described at the Statutory Consultation.

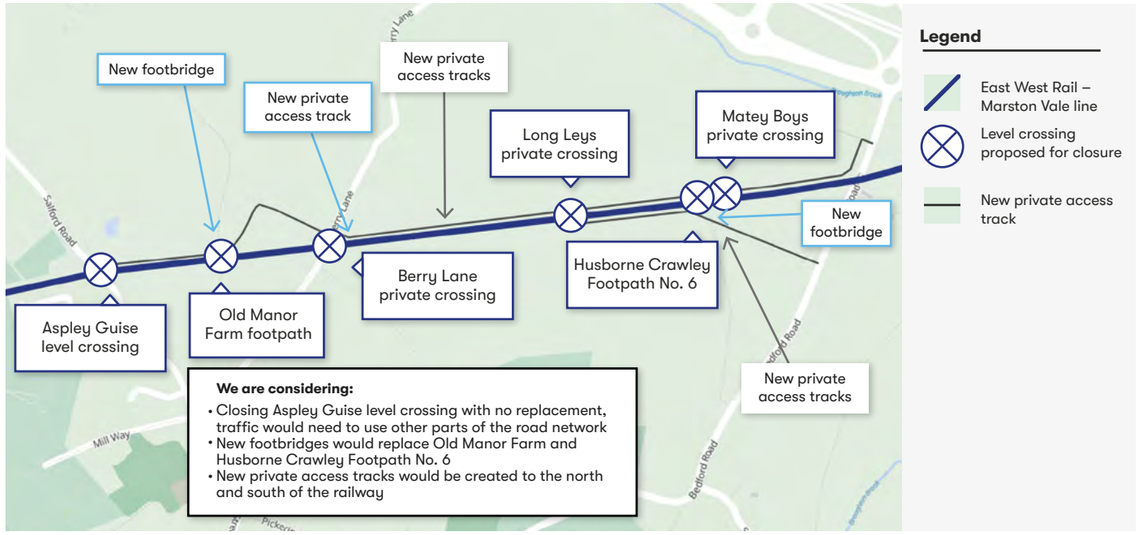
7.6.158. Aspley Guise Footpath No. 12, which currently crosses the railway at Old Manor Farm foot crossing, would be diverted over a new footbridge that would be provided at the site of the current crossing. The footbridge would be accessed by stairs only and no ramps would be provided. Although this approach would mean that people whose mobility was impaired could not use the footbridge, EWR Co believes it would not be possible for them to access the bridge using the footpaths leading up to it and so, in practice, mobility impaired people would not use the bridge.

7.6.159. EWR Co would implement the works previously authorised by the 2020 Order to mitigate Berry Lane, Long Leys and Matey Boys level crossings. The precise alignment of the access tracks would need to be locally modified to accommodate the footbridge at the site of the current Old Manor Farm crossing (described above). The alignment would need to be modified to take account of the concept to relocate Ridgmont station to the west of Bedford Road and to provide passing loops (as part of train service concept 1, described in paragraphs 7.3.16 to 7.3.20) also to the west of Bedford Road. The details of the changes to the alignment of the access tracks would be determined as part of the next design stage and would be described at the Statutory Consultation.

7.6.160. As in Connectivity Option 1, Husborne Crawley Footpath No. 6 would be diverted over a new footbridge that would be constructed at (or very close to) the site of the current foot crossing. The option to relocate Ridgmont station to the west of Bedford Road and to provide passing loops (as part of train service concept 1, described in paragraphs 7.3.16 to 7.3.20) also to the west of Bedford Road would impact on the precise location and configuration of the footbridge. The interface between these aspects of the Project will be developed further at the next stage of design and would be described at the Statutory Consultation.

7.6.161. The connectivity works described above are shown in Figure 7.37.

Figure 7.37: Aspley Guise Connectivity Option 2



7.6.162. The connectivity proposals described in this option would require the permanent acquisition of third-party land and rights of access across land in order to provide the new access tracks described above. In addition, small areas of land may need to be permanently acquired to accommodate the new footbridges at the sites of Old Manor Farm and Husborne Crawley No. 6 Footpath crossing. However, EWR Co will seek to remove or reduce the need for this land in subsequent design stages. Additional land would need to be used temporarily during the construction of the connectivity works. All of the land required for this option is agricultural land. The amount of land required for this option is less than for Connectivity Option 1.

7.6.163. The land on the south side of the railway that is affected by these proposals is within the Green Belt. As with Connectivity Option 1, if this option were taken forward, EWR Co would need to ensure that the proposed connectivity works did not harm the character of the Green Belt or demonstrate that very special circumstances applied to their construction.

7.6.164. A key difference between this option and Connectivity Option 1 is that traffic displaced from Aspley Guise and Berry Lane level crossings is required to use the existing road network to cross the railway. This would remove the need for the construction of the new road bridge and associated sections of new road that form part of Connectivity Option 1 but it would mean that road users would have to use alternative routes. For the majority of journeys that are likely to use Aspley Guise level crossing at present, end-to-end journey times would not be significantly altered.

7.6.165. Connectivity Option 2 would be likely to have less of a visual impact than Connectivity Option 1 because of the absence of the new road bridge and associated sections of road.

Husborne Crawley Footpath No. 10 (SP 962 372) and Ridgmont (Station Road) (SP 965 374) level crossings

Description of the crossings

7.6.166. Husborne Crawley Footpath No. 10 crossing is a foot crossing located next to and on the west side of the bridge carrying the M1 motorway over the railway, a short distance to the west of the existing Ridgmont station. The crossing enables a public footpath (Husborne Crawley Footpath No. 10) to cross the railway. This footpath links Husborne Crawley (to the south of the railway) with Station Road and Ridgmont station (to the north of the railway). A further footpath (Brogborough Footpath No. 4) provides an onward link to the village of Brogborough via the Prologis Park Marston Gate industrial area. The 2020 Order authorises this crossing to be closed.

7.6.167. Ridgmont level crossing is a public highway level crossing, located adjacent to Ridgmont station. The Grade II listed former Ridgmont station building is located adjacent to the crossing on the southeast side of the line, on the southwest side of Station Road, which is now used as a Heritage Centre and Tea Rooms.

7.6.168. At the crossing, Station Road crosses the railway. The crossing also provides the sole means of access between the two platforms at Ridgmont station. Station Road is a single-carriageway road that formerly linked Bedford Road (the former A421) and Salford to the northwest of the crossing with Ridgmont to the southeast. However, in 2008 the A507 Ridgmont By-Pass opened and this now provides an alternative route, via a new bridge over the railway to the southwest of Ridgmont station. Station Road is linked to the A507 by roundabouts located either side of the railway, a short distance from the crossing. Since the opening of the A507, the route over the level crossing has served no purpose other than to provide an alternative route (to that via the A507) for accessing the business premises adjoining Station Road and as means of access between Ridgmont station's two platforms. Ridgmont level crossing is located in a mostly industrial area.

EWR Co proposals

7.6.169. EWR Co proposes to implement the closure of Husborne Crawley Footpath No. 10 crossing previously authorised by the 2020 Order and to also close Ridgmont level crossing. This means that connectivity options to accommodate displaced traffic, pedestrians and other crossing users will need to be considered.

77.6.170. Three connectivity options have been developed, which modify the mitigation works authorised in the 2020 Order to provide mitigation for the additional crossing closure. The options, which are described below, provide bridges and new sections of public footpath.

7.6.171. EWR Co has not yet identified a preferred option. This will be presented at Statutory Consultation.

Connectivity Option 1

7.6.172. Connectivity Option 1 would divert Husborne Crawley No. 10 Footpath to cross the railway via the A507 bridge. On the southeast side of the railway, the diverted footpath would run alongside the railway, passing beneath the M1 and A507 bridges. On the northeast side of the A507 bridge, a ramp would be provided to give access from the level of the railway to the elevated roadway. The verge on the northeast side of the A507 bridge would be improved to provide a footway. A further ramp would be provided on the opposite side of the railway to provide access between the bridge and the current route of the footpath.

7.6.173. Station Road would be stopped up either side of Ridgmont level crossing and vehicular traffic would be diverted via the existing A507. A new section of public footpath would be created on the southeast side of the railway to link Station Road to the diverted Husborne Crawley No. 10 footpath at the A507 bridge. This would provide an alternative route for pedestrians to cross the railway. This option is shown in Figure 7.38.

Figure 7.38: Ridgmont Connectivity Option 1

7.6.174. This option would require alterations to the A507 bridge to provide a suitable footway and to relocate the vehicle restraint system ("crash barriers") to the roadside of the new footpath. Further work is required to determine whether this would necessitate structural alterations to the bridge to support the revised restraint system.

7.6.175. This option is likely to require the permanent acquisition of small amounts of third-party land to accommodate the turning heads that would be provided on Station Road. This will be confirmed following further design development. New rights of way would be required across third-party land. Additional land would need to be used temporarily during the construction of the connectivity works.

Connectivity Option 2

7.6.176. Connectivity Option 2 would provide a new footbridge at the site of Husborne Crawley Footpath No. 10 crossing, over which the footpath would be diverted. The footbridge would be accessed by stairs only and no ramps would be provided. Although this approach would mean that people whose mobility was impaired could not use the footbridge, EWR Co believes it would not be possible for them to access the bridge using the footpaths leading up to it and so, in practice, mobility impaired people would not use the bridge. However, it may be possible to design the bridge in a way that allows ramps to accommodate groups able to access the location despite restricted mobility.

7.6.177. As with Connectivity Option1, vehicular traffic from Station Road would be diverted via the A507. This option is shown in Figure 7.39.

Figure 7.39: Ridgmont Connectivity Option 2

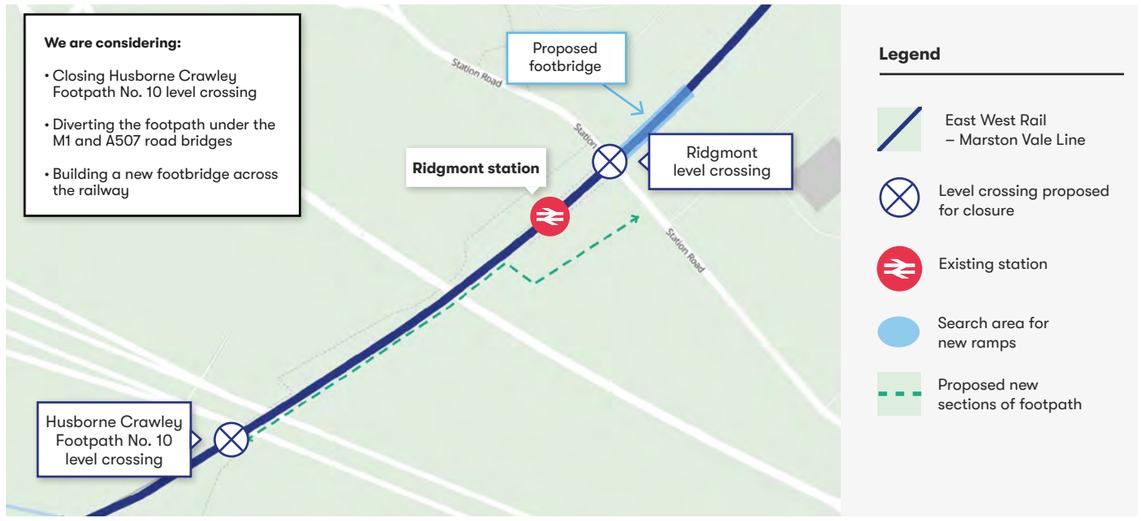
7.6.178. A footpath connection between Station Road and Husborne Crawly Footpath No. 10 on the southeast side of the railway is not presently included as part of this option. If there were found to be sufficient need for such a connection, one could be provided. However, it should be noted that the length of the revised pedestrian route between the two parts of Station Road would be around twice that in Connectivity Option 1 (around 700m in Connectivity Option 2 compared to around 350m in Connectivity Option 1).

7.6.179. This option is likely to require the permanent acquisition of small amounts of third-party land to accommodate the new footbridge and the turning heads that would be provided on Station Road. This will be confirmed following further design development. New rights of way would be required across third-party land. Additional land would need to be used temporarily during the construction of the connectivity works.

Connectivity Option 3

7.6.180. Connectivity Option 3 entails the diversion of Husborne Crawley Footpath No. 10 along the southeast side of the railway, passing beneath the M1 and A507 bridges, to join Station Road close to the Ridgmont station Heritage Centre and Tea Rooms. A new footbridge would be provided at the site of the current Ridgmont level crossing. This new bridge would be provided with both stairs and ramps and would provide a route across the railway for both users of the footpath and pedestrian users of Station Road. As with the other two options, vehicular traffic from Station Road would be diverted via the A507. This option is shown in Figure 7.40.

Figure 7.40: Ridgmont Connectivity Option 3



7.6.181. This option is likely to require the permanent acquisition of small amounts of third-party land to accommodate the new footbridge and the turning heads that would be provided on Station Road. This will be confirmed following further design development. New rights of way would be required across third-party land for all three options. Additional land would need to be used temporarily during the construction of the connectivity works.

7.6.182. The new footbridge proposed in this option could have an adverse impact on the setting of the Grade II listed former station building at Ridgmont station, which is now used as a Heritage Centre and Tea Rooms.

Interface with Ridgmont station proposals and the Milton Keynes – Bedford Waterway

7.6.183. It should be noted that both of the train service concepts described in paragraphs 7.3.1 to 7.3.113 propose the relocation of Ridgmont station to a new site to the west of the M1 and Bedford Road. As concepts for the relocated station are developed, EWR Co will examine how best to provide links for pedestrians and cyclists between the existing and new station sites. Some of the options developed could serve to mitigate the closure of Husborne Crawley Footpath No. 10 and Ridgmont level crossings. At the next stage of design development, EWR Co will consider whether any such options could obviate the need for or require modification of the three connectivity options described above.

7.6.184. EWR Co is aware of the proposals for the Milton Keynes – Bedford Waterway in this area. At the next stage of design, EWR Co will also look at how the proposals for new and diverted footpaths in this area fit with the waterway proposals with a view to developing an integrated solution.

Lidlington area level crossings

Description of the group of crossings

7.6.185. There are a number of level crossings located in the Lidlington area in relatively close proximity to one another. Because of the proximity of the crossings to one another, the options for one crossing potentially influence the options for other crossings. The crossings in this area have therefore been considered as a single group

7.6.186. This group of crossings comprises five crossings of which:

- One is a road crossing; and
- Four are public footpath crossings of which one will be closed under the 2020 Order.

7.6.187. The crossings in this group are:

- **Broughton End (SP 979 385):** A foot crossing to the west of Lidlington at which Lidlington Footpath No. 20 crosses the railway. Lidlington Footpath No. 17 commences by the crossing on the north side of the railway. Lidlington Footpath No. 21 runs along the southern side of the railway in this vicinity and intersects Lidlington Footpath No. 20 immediately south of the foot crossing.
- **Forty Steps (SP 981 386):** A foot crossing to the west of Lidlington at which Lidlington Footpath No. 16 crosses the railway. Stairs are provided on each side of the railway to enable pedestrians to ascend the railway embankment slopes to reach the crossing. Lidlington Footpath No. 21 runs along the southern side of the railway in this vicinity and intersects Lidlington Footpath No. 20 immediately south of the foot crossing.
- **Playing Field (SP 984 387):** A foot crossing to the west of Lidlington at which Lidlington Footpath No. 15 crosses the railway. Steps are provided on each side of the railway to enable pedestrians to reach the crossing. Lidlington Footpath No. 21 runs along the southern side of the railway in this vicinity and intersects Lidlington Footpath No. 20 immediately south of the foot crossing.
- **Lidlington (Station Road / Church Street) (SP 989 391):** A public highway crossing at which the main north-south road through the village of Lidlington crosses the railway. This is a single-carriage road, known as Station Road to the north of the railway and Church Street to the south. The junction with Bye Road is located immediately to the south of the crossing. Accesses to a number of residential properties lead off Station road and Church Street in the immediate vicinity of the crossing. The crossing provides the sole means of access between the two platforms of Lidlington station, which straddles the crossing with one platform located either side of the road.
- **Pilling Farm South (SP 990 392):** A foot crossing located on the northern edge of Lidlington, to the east of the current Lidlington station at which Lidlington footpath No. 1 crosses the railway. This footpath forms part of the Marston Vale Trail. This crossing is authorised to be closed under the 2020 Order.

EWR Co proposals

7.6.188. EWR Co proposes to permanently close all the foot crossings in this group and possibly also Lidlington public highway crossing. Two options have been developed to maintain connectivity in the area.

7.6.189. EWR Co proposes to implement the closure of Pilling Farm South crossing previously authorised by the 2020 Order. EWR Co also proposes to permanently close the remaining foot crossings in this group and possibly also Lidlington road level crossing. This means that connectivity options to accommodate displaced traffic, pedestrians and other crossing users will need to be considered.

7.6.190. Two connectivity options have been developed, which include and build upon the mitigations authorised in the 2020 Order. The options, which are described below, provide bridges, new sections of public footpath and bridleway and, in the case of Connectivity Option 1, a section of new road.

7.6.191. EWR Co has not yet identified a preferred option. This will be presented at Statutory Consultation.

7.6.192. In addition, EWR Co has considered an alternative solution, which is also described below. However, EWR Co does not currently believe this alternative is viable, primarily on grounds of affordability.

Connectivity Option 1

7.6.193. Connectivity Option 1 would provide a new stretch of public highway immediately to the west of Lidlington running from Sheeptick End on the north side of the railway to Greensand Ridge to the south of the railway. A new bridge would be provided to allow the road to pass over the railway. In this option, Lidlington (Station Road / Church Street) crossing would be permanently closed and vehicular traffic would be diverted via this new road. The topography of the land which the new road would cross, combined with the need for the road to climb to reach the new bridge over the railway, means this road would have a gradient of around 1 in 20 over much of its length.

7.6.194. Lidlington Footpath No. 15, which currently leads to Playing Field foot crossing, would be diverted on the north side of the railway to intersect with the new road.

7.6.195. Lidlington Bridleway No. 12, which runs alongside the south side of the railway, would be diverted to connect with the new road. A new link between the two sides of Playing Field crossing would thus be created.

7.6.196. A link could also be created between the new road and Lidlington Footpath No. 6 on the north side of the railway to create additional connectivity.

7.6.197. Lidlington Footpath No. 10, which intersects the course of the proposed new road to the south of the railway, would need to be locally modified to provide a connection across the new road.

7.6.198. A new footbridge would be provided at the site of Lidlington (Station Road / Church Street) crossing to maintain a pedestrian route between the areas of Lidlington on either side of the railway. This footbridge would be provided with steps and ramps. The ramps would be located on the west side of the bridge and would run parallel to the railway and Bye Road. In order to make space for the ramp on the north side of the railway, it would be necessary to demolish the house at 1A Station Road.

7.6.199. In order to provide space for the ramp on the south side of the railway, it would be necessary to reduce the width of Bye Road at its eastern end. As a result, the road would not be wide enough for two-way traffic. The road would therefore need to be made a one-way road between Church Street and Whitehall. An alternative route between Bye Road and Church Street is available via Whitehall and High Street. However, the southern end of Whitehall (past the Village Hall and the Green Man public house) is not made up to normal highways standards and EWR Co would therefore need to carry out improvements to this short section of road.

7.6.200. This new footbridge would provide a route between the two platforms of Lidlington station (if it is retained in its current location – see paragraphs 7.3.1 to 7.3.113).

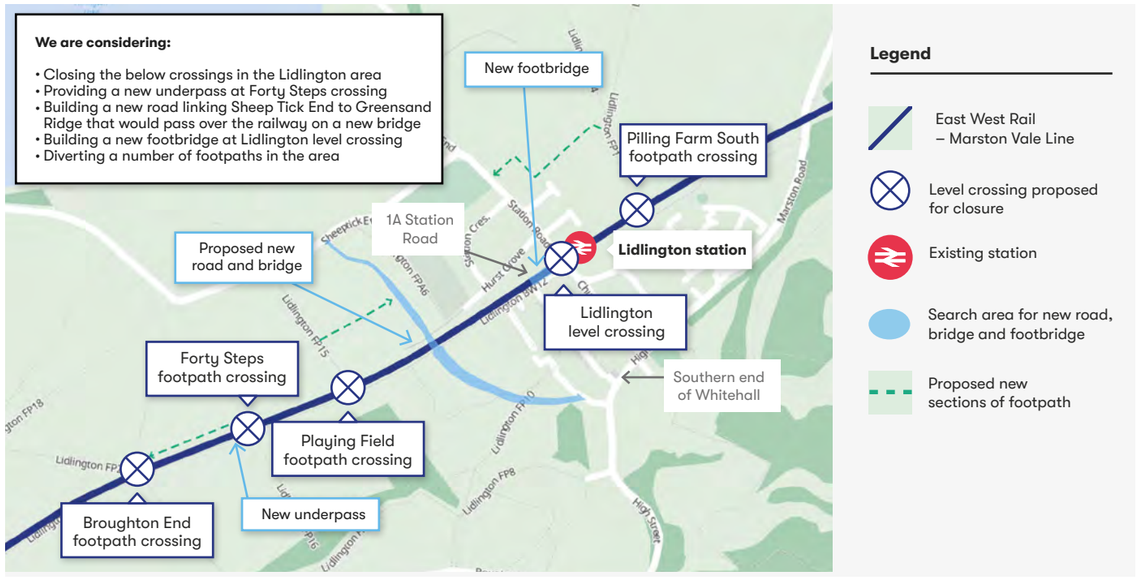
7.6.201. A new bridge under the railway would be provided at the site of Forty Steps crossing, through which Lidlington Footpath No. 16 would be diverted. Because of the height of the railway relative to the surrounding land at this point, the level of the new footpath would be close to the level of the surrounding land and would avoid the need for pedestrians to climb stairs to cross the railway at this point. The path would also drain freely, and it is anticipated that no pumped drainage would be required (as is sometimes the case with bridges beneath the railway).

7.6.202. Lidlington Footpath No. 20 would be diverted along the north side of the railway from the site of Broughton End crossing to the new bridge at the site of Forty Steps crossing. On the south side of the railway, Lidlington Footpath No. 21 already provides a link between the sites of Forty Steps and Broughton End crossings. EWR Co would consider extinguishing Lidlington Footpath No. 17 over its full length from Sheeptick End to Broughton End crossing as Lidlington Footpath No. 16 already provides link from the north end of Lidlington Footpath No. 17 to the proposed new bridge at the site of Forty Steps crossing.

7.6.203. EWR Co would implement the mitigation measures previously authorised by the 2020 Order in respect of Pilling Farm South foot crossing. These comprise a diversion of Lidlington Footpath No. 1 on the north side of the railway from a point close to the junction with Lidlington Footpath No. 4 to Station Road. The new section of footpath would join Station Road at the edge of Lidlington and would connect into the end of the footway on the east side of Station Road. The section of Lidlington Footpath No. 1 on the south side of the railway would be extinguished. The point at which the footpath currently commences could be reached via Station Road, the proposed new footbridge at the site of Lidlington (Station Road / Church Street) crossing, Church Street and Lombard Street.

7.6.204. This option is shown in Figure 7.41.

Figure 7.41: Lidlington Connectivity Option 1



7.6.205. This option would require the permanent acquisition of third-party land for the construction of the new road to the west of the village. As noted above, one residential property would need to be acquired and demolished to make room for the new footbridge. New and amended rights of way would need to be acquired over third-party land. Additional land would need to be used temporarily in connection with the construction of the new road and the new bridges over and under the railway.

7.6.206. The new road bridge and connecting sections of road would have a negative visual impact. Options to mitigate this impact would be investigated at the next stage of design.

7.6.207. The new road to the south of the new bridge over the railway might require the removal of a small area of deciduous woodland.

7.6.208. The new footbridge and, in particular, the ramps leading to it would have a visual impact on residential properties along Bye Road. Because of the limited space at the site of the bridge, it would be difficult to mitigate this impact.

Connectivity Option 2

7.6.209. In this option, all of the footpath crossings would be closed but Lidlington (Station road / Church Street) public highway crossing would remain open.

7.6.210. In this option, the existing Lidlington (Church Street / Station Road) level crossing could be retained and improved. However, further work is required to determine whether upgrading the crossing equipment would sufficiently reduce the safety risk at this crossing to allow it to remain open. Also, further work needs to be undertaken to better understand the impact on traffic flows on Church Street / Station Road of the increased duration each hour in which the level crossing would be closed to allow the passage of trains (as described in paragraph 7.6.11).

7.6.211. A new pedestrian bridge under the railway at the site of Forty Steps crossing would be provided as described for Connectivity Option 1 above. The modifications to Lidlington Footpaths Nos. 16, 17 and 20 described above would also be undertaken as part of this option.

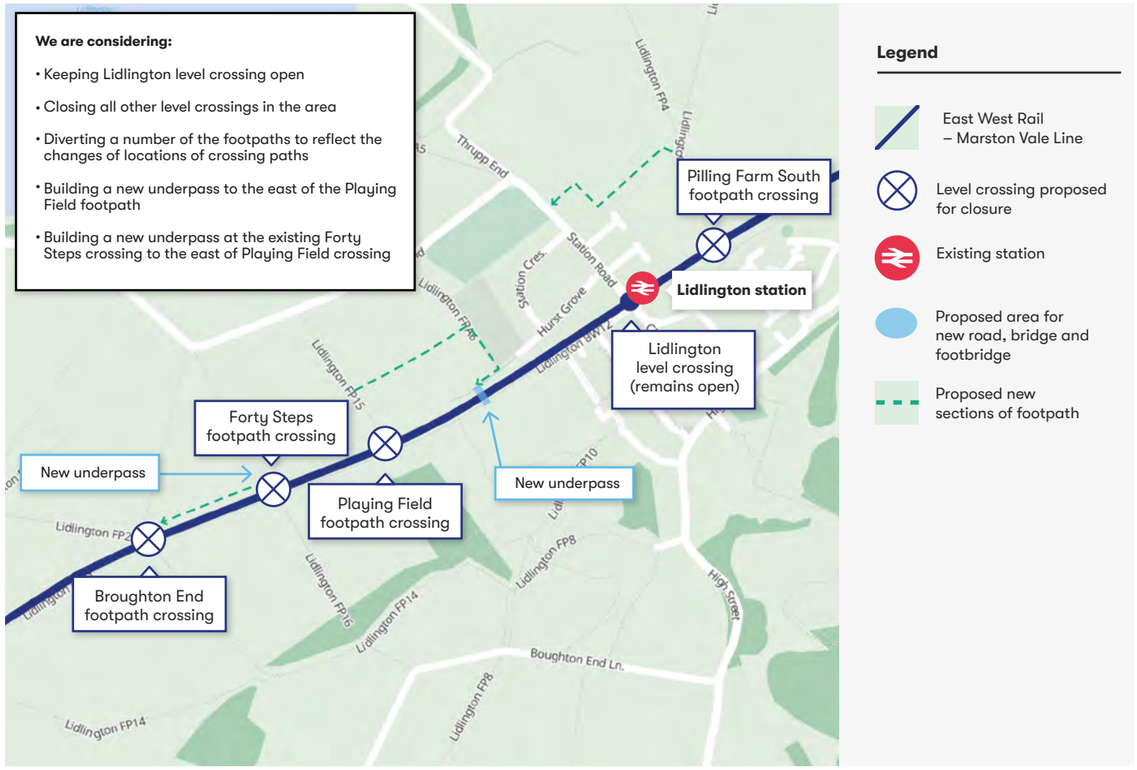
7.6.212. A second bridge under the railway would be provided roughly halfway between Playing Field crossing and the site of the recently closed School Crossing. To the north side of the railway, Lidlington Footpath No. 6 would be diverted to run along the side of the railway to reach the new bridge. On the south side of the railway, Lidlington Bridleway No. 12 provides a link from the new bridge to the south side of School Crossing. To the north of the railway, Lidlington Footpath No. 15 would be diverted along the field boundary to the north of the playing fields and then via Lidlington Footpath 6A and the diverted section of Lidlington Footpath 6 to reach the new bridge. On the south side of the railway, Lidlington Bridleway No. 12 and Lidlington Footpath No. 21 provide a link back to the south side of Playing Field crossing.

7.6.213. The changes to Lidlington Footpath No. 1 authorised by the 2020 Order and described above as part of Connectivity Option 1 would also be undertaken as part of this option. This option is shown in Figure 7.42.

7.6.214. This option avoids the visual impacts of the proposed new road bridge and the new footbridge at Church Street / Station Road that are included in Connectivity Option 1. However, although the Lidlington (Station Road / Church Street) public highway level crossing would remain open, it should be noted that the barriers could be closed across the road for up to approximately 40 minutes each hour as a result of the increased frequency of train service. This would mean that there would be a moderately high risk of users of this crossing experiencing an increased journey time.

7.6.215. A limited amount of third-party land would need to be permanently acquired as part of this option in connection with the construction of the new bridge between Playing Field and School crossings. New rights of way would need to be acquired over third-party land. Additional land would need to be used temporarily in connection with the construction of the new bridges. All of the land required is currently used for agricultural or amenity purposes.

Figure 7.42: Lidlington Connectivity Option 2



Alternative solution

7.6.216. EWR Co has also considered an alternative solution that would divert the Marston Vale Line to the north of the village. This alternative route for the railway would avoid all the level crossings in this group. It would also result in changes to the proposals for Marston Road level crossing (below).

7.6.217. The total length of diverted railway would be 3.8km as shown in blue in Figure 7.43 with a significant proportion being in deep cutting.

Figure 7.43 Alternative solution diverting the railway to the north of Lidlington

7.6.218. The new railway alignment would deviate from the current alignment to the west of Broughton End foot crossing. The new railway would initially be on embankment before dropping into a cutting. It would run roughly parallel with and to the south of Sheeptick End. It would pass through the current allotments site meaning that the allotments would need to be relocated.

7.6.219. The alternative alignment is capable of having a new station adjacent to the Station Road Bridge, which would support housing development to the north. This would replace the current Lidlington station if train service concept 1 were selected (see paragraphs 7.3.1 to 7.3.113). If train service concept 2 were taken forward, a station at this site could be provided as an alternative to the Ridgmont (relocated) station proposed in that concept.

7.6.220. Having passed beneath Station Road, the new alignment would pass to the south of the Thrupp End scheduled monument before curving to the south to re-join the existing alignment to the east of Marston Road.

7.6.221. Station Road would possibly need to be lifted by up to 2m and Marston Road would possibly need to be lifted by up to one metre to permit the new alignment to pass under them with adequate clearances whilst maintaining railway gradients no steeper than 1 in 80. The works to raise Station Road would potentially also affect Thrupp End and Sheeptick End in the vicinity of the junction with Station Road.

7.6.222. Where the new railway intersects existing public footpaths, new bridges would be provided to allow the paths to pass over or under the railway. Local diversion of the footpaths would be necessary to take account of the new bridges.

7.6.223. Such an alignment would remove the tracks through Lidlington village, allowing all the crossings to be removed and roads or footpaths reinstated at ground level. It would also mean that the land within the current railway corridor would be available for other uses.

7.6.224. Noise and vibration through the village would be reduced and the areas of cutting would reduce the noise impact and visual impact of the railway.

7.6.225. The alternative alignment and the associated bridge works would require the permanent acquisition of more land than the two connectivity options described above. This would include land that is currently allotments and land that is proposed for development.

7.6.226. The alternative alignment passes approximately 100m away from Thrupp End scheduled monument. Further work would be required to determine the impact of the railway on the scheduled monument and on any associated archaeology.

7.6.227. The works required to raise Station Road and Marston Road would impact on a small number of residential properties. The extent of this impact has not been fully determined at this stage.

7.6.228. The alternative alignment would be very expensive to construct in comparison to the two options described above.

7.6.229. EWR Co does not believe that the additional benefits that this option delivers are great enough to justify the significant additional cost. A compelling case that performs at least as well as the options proposed and meets the Project Objectives would be needed for it to be considered further.

Marston (Marston Road) (SP 994 394)

Site description

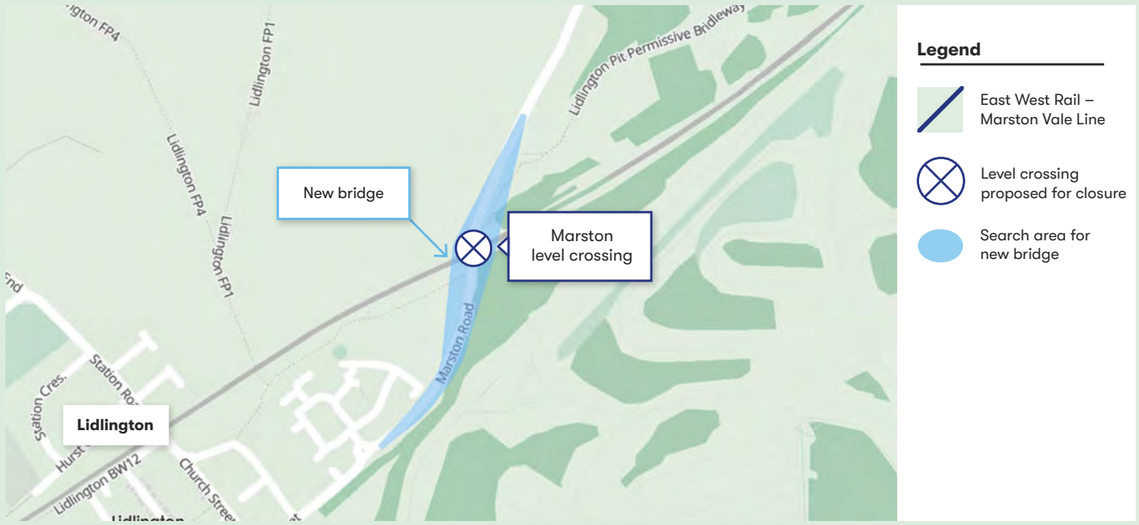
7.6.230. Marston level crossing is located between Lidlington and Millbrook stations, to the east of the village of Lidlington.

7.6.231. The level crossing is an automatic half-barrier level crossing. This type of crossing is protected by road traffic light signals and a lifting barrier on both sides of the railway. When lowered, the barriers only extend across the entrances to the crossing leaving the exits clear. The crossing equipment is activated automatically by an approaching train. The lowering of the barriers is preceded by the display of road traffic light signals.

7.6.232. Marston Road, a single carriageway road linking Lidlington to Marston Moretaine, crosses the railway at the crossing. The speed limit on Marston Road is 40mph. The site of the crossing is relatively rural in nature. A house is located at the northwest corner of the crossing. Further houses front onto Marston Road to the north of the railway with the closest being around 160m from the level crossing.

7.6.233. In February 2020, consent was granted in the 2020 Order to close the level crossing and replace it with a bridge over the railway at the site of the crossing. This new bridge is shown in Figure 7.44. The closure of the crossing and provision of the new bridge has not yet taken place.

Figure 7.44: Proposed bridge at Marston level crossing



EWR Co proposals

7.6.234. EWR Co proposes to incorporate Network Rail's consented proposals in respect of this crossing and would permanently close Marston Level crossing and implement the bridge scheme.

Millbrook (Station Lane) (TL 006 404)

Site description

7.6.235. Millbrook level crossing is a public highway level crossing located around 850m to the southeast of Marston Moretaine, adjacent to Millbrook station. At the crossing, the railway is crossed by Station Lane, a single carriageway road leading from Marston Moretaine to the village of Millbrook, which is around a mile to the south of the crossing. The maximum speed limit on this road is 60mph.

7.6.236. Millbrook station's two platforms are located immediately to the northeast of the level crossing. The crossing provides the only route between the two platforms. Immediately to the east of the crossing is the former Millbrook Station Master's house, now a private dwelling. Opposite this is a large, derelict house ("Morteyne House"), immediately beyond which is the northern extremity of the Millbrook Vehicle Proving Ground. A group of four houses ("Pillinge Cottages") are located slightly further to the east along Station Lane together with a private access road leading off Station Lane to a farm ("Pillinge Farm South"). A high-voltage electricity transmission line crosses the railway just to the southwest of the level crossing and passes between the derelict house and vehicle proving ground.

7.6.237. To the north of the level crossing is the Millennium Country Park, comprising 225 hectares of publicly accessible woodlands, grasslands, meadows and a Wetlands Nature Reserve.

EWR Co proposals

7.6.238. EWR Co proposes to permanently close Millbrook level crossing.

7.6.239. This means that connectivity options to accommodate displaced road traffic, pedestrians and other crossing users will need to be considered.

7.6.240. EWR Co has developed three connectivity options that provide a bridge close to the site of the current crossing.

7.6.241. EWR Co has not identified a preferred option.

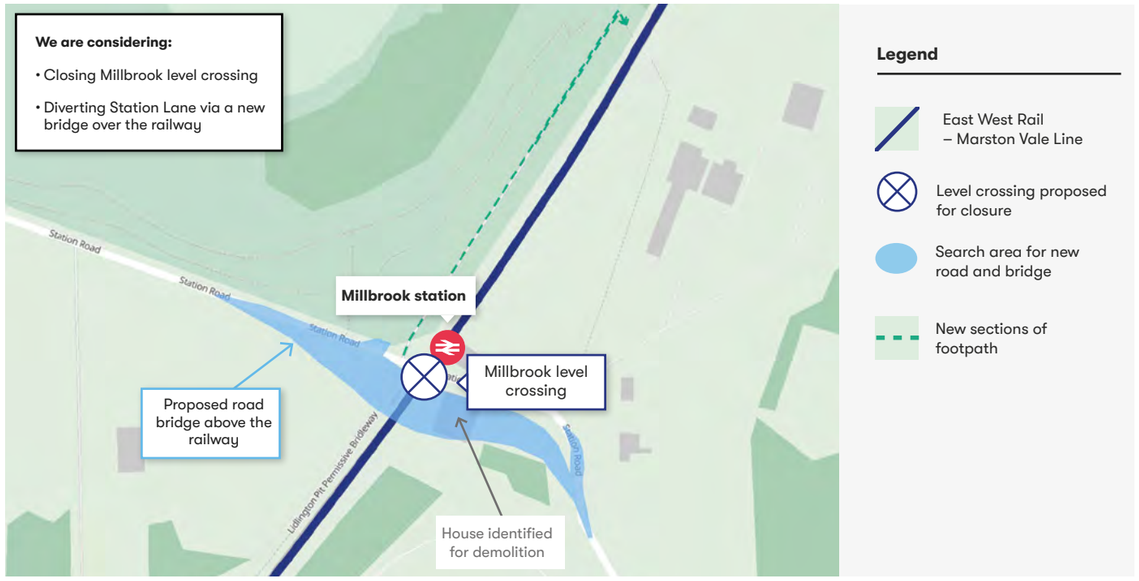
Connectivity Option 1

7.6.242. Connectivity Option 1 would provide a new public highway bridge over the railway immediately to the southwest of the current Millbrook level crossing. Station Lane would be diverted over this bridge, connecting with its existing alignment around 220m from the level crossing on each side of the railway.

7.6.243. To the east of the railway, access to residential and agricultural properties currently accessed from Station Lane and, if Millbrook station is retained (see paragraphs 7.3.1 to 7.3.113), access to the Bletchley-bound platform at Millbrook station the existing Station Lane would be provided via an access road on the current alignment of Station Lane. To the west of the railway, an access road on the current alignment of Station Lane would be provided to give access to the (private) vehicular access track into the country park, the strip of land between the country park and Millbrook station and, if Millbrook station is retained, access to the Bedford-bound platform at Millbrook station.

7.6.244. This option is shown in Figure 7.45.

Figure 7.45: Millbrook Connectivity Option 1



7.6.245. The provision of this new bridge would necessitate the acquisition and demolition of the derelict house. It would also require the permanent acquisition of an area of agricultural land to the west of the crossing and possibly a very small area of land within the country park (although it is likely that further design development will remove the need for this piece of land). The section of embankment supporting the new road on the east side of the railway conflicts with the embankment supporting the roadway with the vehicle proving ground and would necessitate the permanent acquisition of a small area of land with the proving ground site. EWR Co will seek to remove this conflict during the next stage of design development. In addition to the land that is required permanently, further land would need to be used temporarily during the construction of the new bridge.

7.6.246. It is likely that the high-voltage electricity transmission line would need to be locally diverted and the pylon supporting it just to the south of the crossing would need to be relocated. However, EWR Co will investigate this further during the next stage of design with a view to avoiding the need to interfere with the transmission line if possible.

7.6.247. The new bridge would have a visual impact on the surrounding area but most notably on the residential properties located on Station Lane to the east of the level crossing.

Connectivity Option 2

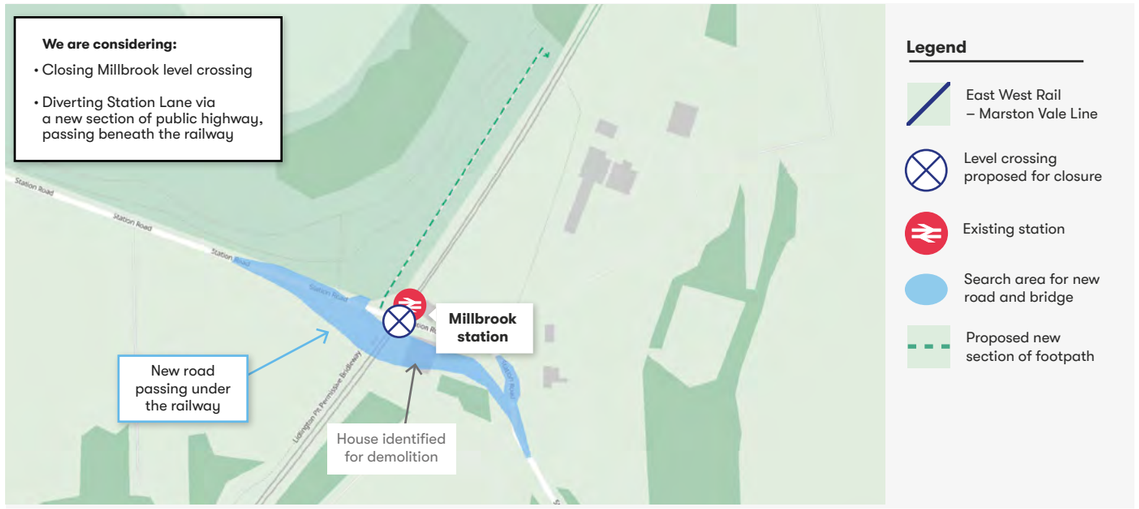
7.6.248. Connectivity Option 2 would provide a new section of public highway passing beneath the railway. The (horizontal) alignment of the new road would be very similar to that in Connectivity Option 1. As with Connectivity Option 1, access roads would be provided to maintain access to properties in the vicinity of the crossing that are currently accessed from Station Lane and, if it is retained (see paragraphs 7.3.1 to 7.3.113), access to the platforms at Millbrook station. This option is shown in Figure 7.46.

7.6.249. As with Connectivity Option 1, the provision of this new road and bridge would necessitate the acquisition and demolition of the derelict house adjacent to the crossing. It would also require the permanent acquisition of an area of agricultural land to the west of the crossing and possibly a very small area of land within the country park (although it is likely that further design development will remove the need for this area of land). The section of cutting adjacent to the new road on the east side of the railway conflicts with the embankment supporting the roadway with the vehicle proving ground and would necessitate the permanent acquisition of a small area of land with the proving ground site. EWR Co will seek to remove this conflict during the next stage of design development. In addition to the land that is required permanently, further land would need to be used temporarily during the construction of the new bridge.

7.6.250. It is likely that the high-voltage electricity transmission line would need to be locally diverted and the pylon supporting it just to the south of the crossing would need to be relocated. However, EWR Co will investigate this further during the next stage of design with a view to avoiding the need to interfere with the transmission line if possible.

7.6.251. The new bridge would have a reduced visual impact on the surrounding area and neighbouring residential properties compared to Connectivity Option 1.

Figure 7.46: Millbrook Connectivity Option 2



7.6.252. Because the new road passing under the bridge would be below ground level, a pumped drainage system would be required. It is possible that an underground attenuation tank might also be required to avoid overwhelming the local drainage system at times of heavy rainfall. This would require additional land compared to Connectivity Option 1 and would also result in higher on-going maintenance costs. Suitable land for the siting of the pumping equipment and, if required, the attenuation tank would be identified at the next stage of design if this option is taken forward.

Connectivity Option 3

7.6.253. Connectivity Option 3 provides a new bridge over the railway to the northeast of Millbrook crossing and Millbrook station. On the east side of the railway, Station Lane would be diverted to pass behind Pillinge Cottages and Station House to reach the new bridge. On the west side of the railway, the diverted section of Station Lane would pass through the southern corner of the country park.

7.6.254. Access to Station House, Morteyne House and Pillinge Cottages would be provided via an access road on the existing Station Lane alignment. If required, a similar access would be provided to maintain access on the west side of the railway. Access to Millbrook station, if it is to be retained (see paragraphs 7.3.1 to 7.3.113) would be provided via these access roads. At the next stage of design development, EWR Co will investigate if access would be better provided via steps and / or ramps from the platforms to the new bridge. (This would shorten the route from Marston Mortaine to the Bletchley-bound platform). The diverted road would sever the current access to South Pillinge Farm and a new access would be formed off the diverted Station Lane.

7.6.255. This option is shown in Figure 7.47.

7.6.256. The total length of new road in this option is greater than in the other two options. It would require the permanent acquisition of a larger area of agricultural land and the permanent acquisition of land within the country park. It would also have a visual impact on the surrounding properties and on the country park. However, it would avoid the need to acquire and demolish the derelict house, it would avoid the need to interfere with the electricity transmission line and would avoid impacts on the embankment of the vehicle proving ground test track.

Figure 7.47: Millbrook Connectivity Option 3

Green Lane (TL 014 422)

Site description

7.6.257. Green Lane level crossing is a public highway level crossing located to the southwest of the village of Stewartby. The crossing is of the full-barrier type with CCTV provided so that the signaller can confirm the barriers have correctly lowered and the crossing is clear of obstructions before authorising trains to proceed over the crossing. The crossing has recently been converted from the automatic half-barrier type on account of the crossing's increased use following the construction of the Rookery South energy recovery plant.

7.6.258. At the crossing, Green Lane, a single carriageway public highway, crosses the railway. Green Lane is one of two roads (the other being Broadmead Road) that lead from the village to Bedford Road (the former A421). The speed limit at the crossing for road traffic is 30mph but it increases to 60mph just to the west of the crossing.

7.6.259. Stewartby station straddles the crossing, with one platform situated either side of the road. The crossing provides the only means of access between the two platforms.

7.6.260. The former Stewartby Brickworks site is located on both sides of the railway to the north and northeast of the crossing. Under Policy 25 of the Bedford Borough Local Plan, the site has been identified for mixed-use development. To south and west of the crossing are former claypits associated with the brickworks. The one to the west is now water-filled and forms Stewartby Lake. Stewartby Water Sports Club is located adjacent to the lake and is accessed from Green Lane a short distance to the west of the level crossing. Kimberley Sixth Form College is located around 400m to the northwest of the crossing and is accessed from Green Lane.

7.6.261. A short distance to the east of the crossing is the vehicular access to the energy recovery facility. The closest houses of Stewartby are located around 300m to the east of the crossing.

EWR Co proposals

7.6.262. EWR Co proposes to permanently close Green Lane level crossing.

7.6.263. This means that connectivity options to accommodate displaced road traffic, pedestrians and other crossing users will need to be considered.

7.6.264. EWR Co has developed two connectivity options that provide a bridge close to the site of the current crossing.

Connectivity Option 1

7.6.265. Connectivity Option 1 has been developed on the assumption that the existing Stewartby station is replaced by a station in an alternative location as would be the case with train service concept 2 (see paragraphs 7.3.1 to 7.3.113). This option provides a new bridge a short distance to the north of the current level crossing. Green Lane would be realigned to pass over the new bridge.

7.6.266. Access to the Water Sports Club would be via an access road on the current Green Lane alignment, which would join the realigned Green Lane opposite the (remodelled) access to Kimberley College.

7.6.267. Access to the energy recovery facility would be via a new access road on the north side of the realigned Green Lane that would pass under the new bridge to reach the plant. Further work would be required as part of the next stage of design development to ensure that adequate visibility could be provided of and from the junction of the access road with Green Lane.

7.6.268. Although this option has been developed on the assumption that the existing Stewartby station is relocated, it would be possible to develop a version of this option that incorporates the station, albeit with a revised station layout.

7.6.269. This option is shown in Figure 7.48.

7.6.270. This option would necessitate the permanent acquisition of part of the former brickworks site together with a small area of the grounds of Kimberley College. Additional land would be required temporarily to facilitate construction of the new bridge, realigned road and access roads. Because the bridge would be built to one side of the current road, its construction would be less disruptive and Green Lane could remain open for much of the construction period. This option would also leave undisturbed the mature vegetation adjoining Green Lane to the east of the energy recovery facility.

Figure 7.48: Green Lane Connectivity Option 1

Figure 7.49: Green Lane Connectivity Option 2

Connectivity Option 2

7.6.271. Connectivity Option 2 has been developed on the basis of Stewartby station being retained at its current location. As with Connectivity Option 1, it provides a new public highway bridge over the railway to the north of the current crossing. In this option, the east end of the realigned road is slightly further to the north than Connectivity Option 1 with the result that the realignment continues further towards the village.

7.6.272. As with Connectivity Option 1, access to the Water Sports Club is provided by an access road on the current alignment of Green Lane. This access road could also be used to provide vehicular access to Stewartby station. The access to the energy recovery plant would be via a new access road on the south side of the realigned Green Lane to the east of the crossing. This access road could also be used to provide access to Stewartby station.

7.6.273. The new bridge would be designed to allow active travel routes from the proposed new development on the brickworks site to the station to pass beneath it.

7.6.274. Although this option has been designed on the basis of Stewartby station being retained at its current location, it is compatible with train service concept 2 in which Stewartby station would be relocated.

7.6.275. This option is shown in Figure 7.49.

7.6.276. As with Connectivity Option 1, this option would require the permanent acquisition of part of the former brickworks site and a small area of land at the edge of the grounds of Kimberley College. The area of land required is similar for both options. Further land would need to be used temporarily in connection with the construction of the new bridge and roads. It is likely that this option would require the removal of a small area of the deciduous woodland to the south of Green Lane on the east side of the crossing. This would be confirmed at the next stage of design development.

7.6.277. This option avoids the potential visibility issues at the junction between Green Lane and the access road to the energy recovery facility. The bridge could have a reduced span compared to that in Connectivity Option 1 and therefore is likely to cost less.

Stewartby Brickworks (TL 016 425)

Site description

7.6.278. Stewartby Brickworks level crossing is located within the disused Stewartby Brickworks site. At the crossing, a private access road and public footpath (Stewartby Footpath No. 5) cross the railway. The footpath starts at Broadmead Road (to the east of the railway) and terminates within the brickworks site, to the west of the railway.

7.6.279. The level crossing is of the full-barrier type with CCTV provided so that the signaller can confirm the barriers have correctly lowered and the crossing is clear of obstructions before authorising trains to proceed over the crossing.

7.6.280. In February 2020, consent was in the 2020 Order to close the level crossing and stop up the footpath without the need for any mitigation works.

EWR Co proposals

7.6.281. EWR Co proposes to implement the closure of this crossing and the stopping up of Stewartby Footpath No. 5.

Wootton Broadmead (Broadmead Road) (TL 020 435)

Site description

7.6.282. Wootton Broadmead level crossing is a public highway level crossing located to the northwest of the village of Stewartby. The crossing is of the full-barrier type with CCTV provided so that the signaller can confirm the barriers have correctly lowered and the crossing is clear of obstructions before authorising trains to proceed over the crossing.

7.6.283. At the crossing, Broadmead Road, a single carriageway public highway, crosses the railway. Broadmead Road is one of two roads (the other being Green Lane) that lead from the village to Bedford Road (the former A421). The speed limit at the crossing for road traffic is 60mph.

7.6.284. On the east side of the railway there is agricultural land on both sides of Broadmead Road. On the west side of the railway, the land to the south of Broadmead Road is a former landfill site. On the opposite side of the road, the land is heavily vegetated, and a number of buildings (Randall's Farm) are located within a clearing in the vegetation a short distance along Broadmead Road from the level crossing.

7.6.285. The land to the north of Broadmead Road is subject of a planning application[51] to develop a business park.

[50] Bedford Borough Council reference 18/02940/EIA

EWR Co Proposals

7.6.286. EWR Co proposes to permanently close Wootton Broadmead level crossing.

7.6.287. This means that connectivity options to accommodate displaced road traffic, pedestrians and other crossing users will need to be considered.

7.6.288. EWR Co has developed two connectivity options that provide a bridge close to the site of the current crossing.

Connectivity Option 1

7.6.289. Connectivity Option 1 would provide a new public highway bridge just to the northeast of the existing level crossing. Broadmead Road would be realigned to pass over the new bridge. This option is shown in Figure 7.50.

Figure 7.50: Wootton Broadmead Connectivity Option 1

7.6.290. This option would require the permanent acquisition of an area of agricultural land to the east of the railway and some of the vegetated land to the west of the railway. It would also require the acquisition and demolition of the buildings at Randall's Farm to the west of the railway. Additional land would need to be used temporarily during the construction of the new bridge and realigned road. The new sections of road would require the removal of areas of deciduous woodland.

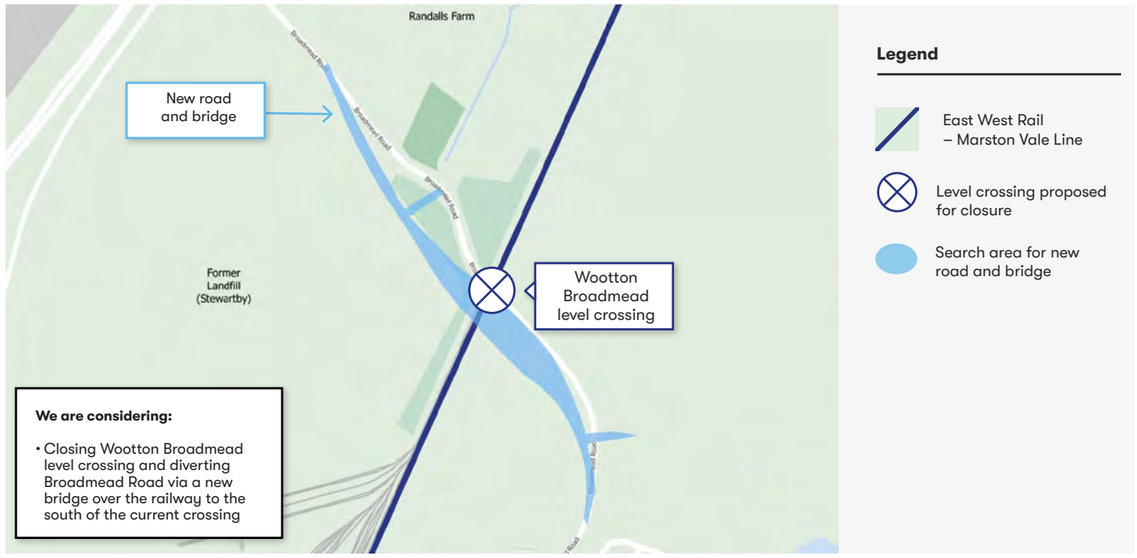
7.6.291. As the bridge is to one side of the existing road alignment, Broadmead Road could remain open for the majority of the period of construction of the new bridge and road.

7.6.292. This option has been developed to be compatible with a new station at this site (relocated Stewartby station), as proposed in train service concept 2 (see paragraphs 7.3.1 to 7.3.113). However, the option is also compatible with train service concept 1 in which the station would not be provided.

Connectivity Option 2

7.6.293. Connectivity Option 2 would provide a new public highway bridge just to the southwest of the existing level crossing. Broadmead Road would be realigned to pass over the new bridge. This option is shown in Figure 7.51.

Figure 7.51: Wootton Broadmead Connectivity Option 2



7.6.294. This option would require the permanent acquisition of an area of agricultural land to the east of the railway and an area within the former landfill site to the west of the railway. Additional land would need to be used temporarily during the construction of the new bridge and realigned road.

7.6.295. This option avoids the need to demolish the buildings at Randall's Farm but it would involve construction within the former landfill site. As the landfill site contains contaminated and potentially hazardous material, the necessary earthworks for the new road could potentially be more hazardous and hence costly to construct. This would need to be investigated further at the next stage of design.

7.6.296. As with Connectivity Option 1, this option would require the removal of areas of deciduous woodland.

7.6.297. As the bridge is to one side of the existing road alignment, Broadmead Road could remain open for the majority of the period of construction of the new bridge and road.

7.6.298. This option has been developed to be compatible with a new station at this site (relocated Stewartby station), as proposed in train service concept 2 (see paragraphs 7.3.1 to 7.3.113). However, the option is also compatible with train service concept 1 in which the station would not be provided.

Wootton Village (TL 024 443)

Site description

7.6.299. Wootton Village crossing is a rural foot crossing to the north of Stewartby. At the crossing, Stewartby Footpath No. 1 crosses the railway. This unsurfaced footpath runs from a point on Bedford Road adjacent to CP Farm on the west side of the railway. On the east side of the railway, it runs to Manor Road in Kempston Hardwick. Broadmead Road (just outside Stewartby) can be reached via Stewartby Footpath No. 2 which joins Stewartby Footpath No. 1 to the east of the railway.

7.6.300. The crossing is surrounded by agricultural land. However, the land to the east side of the railway is subject of a planning application[52] to develop a business park.

EWR Co proposals

7.6.301. EWR Co proposes to permanently close Wootton Village level crossing.

7.6.302. This means that connectivity options to accommodate displaced pedestrians will need to be considered.

7.6.303. EWR Co has developed a connectivity proposal that provides a bridge at the site of the current crossing.

Connectivity proposal

7.6.304. A new footbridge would be provided at the site of the current foot crossing. The footbridge would be accessed via stairs. Although this approach would mean that people whose mobility was impaired could not use the footbridge, EWR Co believes it would not be possible for them to access the bridge using the footpaths leading up to it and so, in practice, mobility impaired people would not use the bridge. However, it may be possible to design the bridge in a way that allows ramps to be included to accommodate groups able to access the location despite restricted mobility. The bridge could also be designed to allow ramps to be added at a later date if changing patterns of development necessitate.

7.6.305. The proposed footbridge is shown in Figure 7.52.

[51] Bedford Borough Council reference 18/02940/EIA

7.6.306. The provision of the proposed footbridge would require the permanent acquisition of a small strip of agricultural land on the east side of the railway. EWR Co does not currently believe any land would be permanently required on the west side of the railway but this will be confirmed at the next stage of design development. Further land would need to be used temporarily to facilitate the construction of the new bridge.

7.6.307. As the bridge would be sited in a relatively flat landscape, it is likely to be visible over a relatively wide area.

Figure 7.52: Wootton Village proposed footbridge

Kempston Hardwick (Manor Road) (TL 026 448)

Site description

7.6.308. Kempston Hardwick level crossing is a public highway level crossing located to the southwest of Bedford. At the crossing, Manor Road crosses the railway. Manor Road is a single carriageway road linking Woburn Road (former A421) to Ampthill Road (B530) via the hamlet of Kempston Hardwick. The speed limit on Manor Road at the site of the crossing is 40mph but it increases to 60mph a short distance to the west of the railway.

7.6.309. The level crossing is an automatic half-barrier level crossing. This type of crossing is protected by road traffic light signals and a lifting barrier on both sides of the railway. When lowered, the barriers only extend across the entrances to the crossing leaving the exits clear. The crossing equipment is activated automatically by an approaching train. The lowering of the barriers is preceded by the display of road traffic light signals.

7.6.310. The land to the south and west of the crossing is agricultural. A private dwelling is located to the north of the level crossing. Beyond this lies an area of open land and a balancing pond beyond which is a distribution facility. The site of a former brickworks is located to the east of the crossing. Around 250m to the southeast of the crossing, a group of dwellings, known as Eastwood Cottages, front on to the north side of Manor Road. The land to the east of the railway is the subject of a planning application[53] for redevelopment as a business park.

7.6.311. Kempston Hardwick station is located immediately to the southwest of the crossing. The level crossing provides the only means of access between the two platforms of the station.

7.6.312. In February 2020, consent was granted in the 2020 Order to close the level crossing and replace it with a bridge over the railway at the site of the crossing. The closure of the crossing and provision of the new bridge has not yet taken place.

[52] Bedford Borough Council reference 18/02940/EIA

EWR Co proposals

7.6.313. EWR Co proposes to implement the consented closure of this crossing.

7.6.314. EWR Co could implement the bridge scheme consented by the 2020 Order. This is described below as Connectivity Option 1. However, EWR Co has also considered two revised connectivity options that would provide a new bridge to the side of the current road alignment. These are described below as Connectivity Option 2 and Connectivity Option 3.

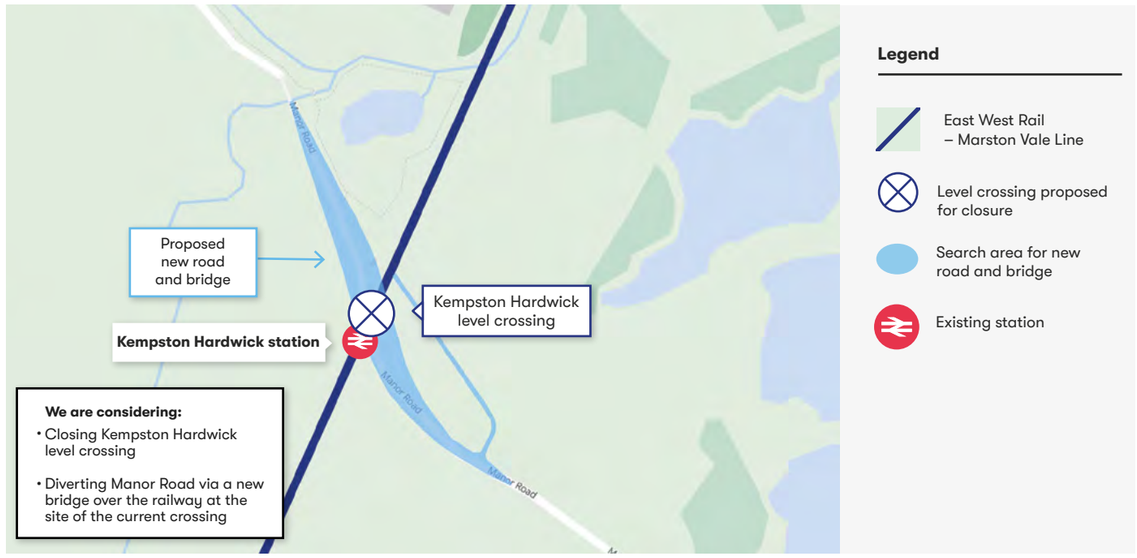
Connectivity Option 1

7.6.315. Connectivity Option 1 would involve implementing the bridge scheme that has already gained consent pursuant to the 2020 Order. This would provide a new bridge over the railway on the same (horizontal) alignment as the current road. Manor Road would be diverted over this new bridge.

7.6.316. Further work would be required to determine a suitable arrangement for access to Kempston Hardwick station if train service concept 1 (see paragraphs 7.3.1 to 7.3.113) is taken forward and a station is retained at this location.

7.6.317. This new bridge is shown in Figure 7.53.

Figure 7.53: Network Rail's proposed new bridge at the site of Kempston Hardwick level crossing (Connectivity Option 1)



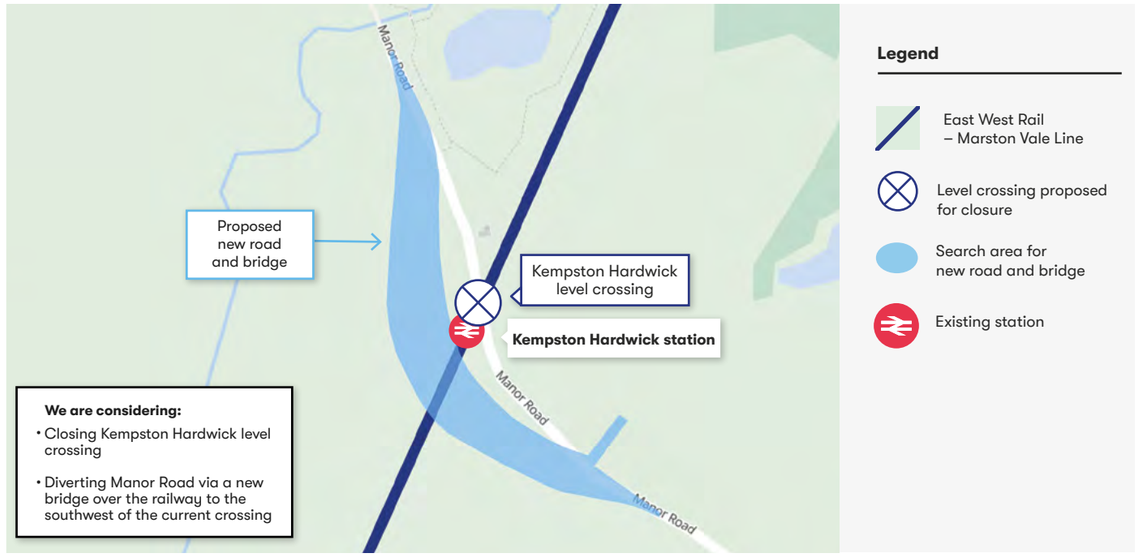
7.6.318. Because the alignment of the new road closely follows the alignment of the existing Manor Road, Manor Road would have to be closed for an extended period to allow the construction of the new bridge and connecting sections of road.

7.6.319. Although some third-party owned land would need to be permanently acquired, this option requires the least third-party land of the three options considered.

Connectivity Option 2

7.6.320. This option would provide a new bridge over the railway to the southwest of the site of the current level crossing and would divert Manor Road over this new bridge. This option is shown in Figure 7.54.

Figure 7.54: Kempston Hardwick Connectivity Option 2



7.6.321. This option would require the permanent acquisition of more third-party land than the Connectivity Option 1. All of the land is currently in agricultural use but that on the east side of the railway is proposed for development. The arrangements for access to Kempston Hardwick station would need to be developed further at the next stage of design if train service concept 1 (see paragraphs 7.3.1 to 7.3.113) is taken forward.

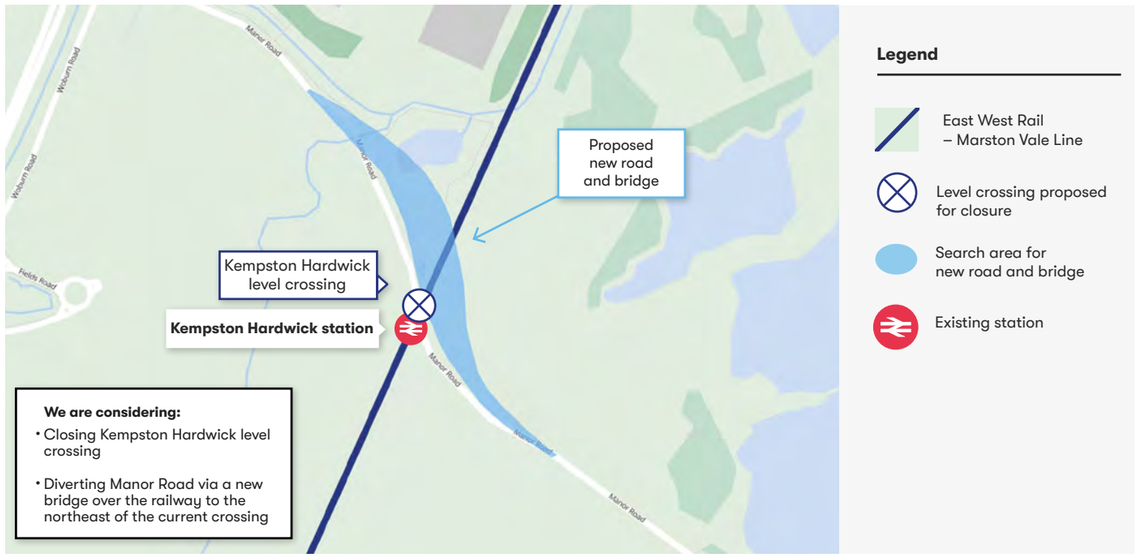
7.6.322. This option would move the road slightly further away from Eastwood Cottages compared to the current road alignment. Because the road would be rising towards the bridge, there could be a minor visual impact from the cottages closer to the railway. This would be reviewed at the next design stage with a view to minimising this impact.

7.6.323. Because the new bridge would be to one side of the existing road, Manor Road could remain open for much of the construction period.

Connectivity Option 3

7.6.324. This option would provide a new bridge to the northeast of the current level crossing and Manor Road would be diverted over the new bridge. This option is shown in Figure 7.55.

Figure 7.55: Kempston Hardwick Connectivity Option 3



7.6.325. This option would require the permanent acquisition of more third-party land than Connectivity Option 1 but a similar amount to Connectivity Option 2. To the north of the crossing, the majority of the land required is open land but the balancing pond on this land would need to be modified. To the east of the crossing, the land required is all within the former brickworks site, which is proposed for redevelopment.

7.6.326. The interface between the realigned road and the residential properties at Eastwood Cottages would need to be developed further at the next stage of development in order to minimise the impact on these properties.

7.6.327. This option has been developed on the basis that Kempston Hardwick station would be retained, as proposed in train service concept 1 (see paragraphs 7.3.1 to 7.3.113). Figure 7.55 shows one way in which road access could be provided to the station. This is an indicative arrangement only and the details of access to the station would be developed further if train service concept 1 is taken forward. This proposal for the new bridge at Kempston Hardwick is not dependent on train service concept 1 and would also be compatible with train service concept 2.

Woburn Road (TL 034 464)

Site description

7.6.328. Woburn Road level crossing is a foot crossing located on the south side of Bedford. At the crossing, Kempston Footpath No. 1 crosses the railway. This footpath commences at the end of Chantry Road on the northwest side of the railway. It runs southwest alongside the railway to reach the site of the crossing. On the southeast side of the railway, it connects (via Footpaths Nos. 1A and 8, which form a continuation of Footpath No. 1) to Ampthill Road to the south of Bedford.

7.6.329. An industrial estate is located adjacent to the crossing on the northwest side of the railway. On the southeast side of the railway the path crosses a bridge over a watercourse (that runs parallel to the railway) and then runs alongside the railway and watercourse through an area of scrub land bordered by the railway, the A421 dual carriageway and the Interchange Retail Park.

7.6.330. In February 2020, consent was granted in the 2020 Order to close the level crossing and replace it with a footbridge over the railway and the watercourse. The closure of the crossing and provision of the new bridge has not yet taken place.

EWR Co proposals

7.6.331. EWR Co proposes to implement the consented closure of this crossing.

7.6.332. EWR Co could implement the bridge scheme consented by the 2020 Order. This is described below as Connectivity Option 1. However, EWR Co has also considered a revised connectivity option that would provide a different arrangement of footbridge that would shorten the length of pedestrian route. This is described below as Connectivity Option 2.

Connectivity Option 1

7.6.333. Connectivity Option 1 would involve implementing the bridge scheme that has already gained consent. The bridge would be located at the end of Chantry Road. This new bridge is shown in Figure 7.56.

Figure 7.56: Network Rail's proposed footbridge to replace Woburn Road crossing (Connectivity Option 1)

Connectivity Option 2

7.6.334. EWR Co has considered a variation to Network Rail's proposals that would shorten the length of diversion required for Kempston Footpath No. 1 by turning the stairs on the southeast side of the railway to face in the opposite direction. This variant is shown in Figure 7.57.

7.6.335. Both solutions for this level crossing require the permanent acquisition of similar amounts of third-party land and would require the temporary use of additional land to facilitate construction of the new bridge.

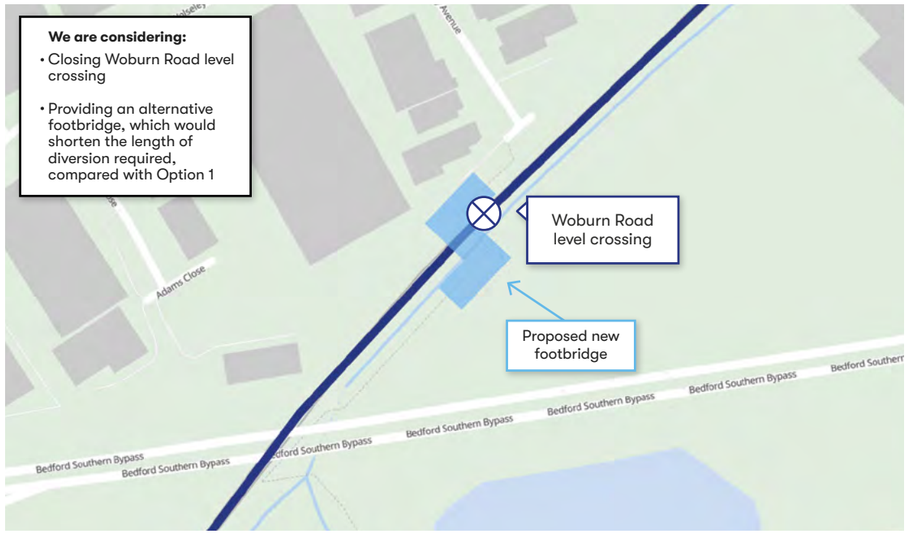


Figure 7.57: EWR Co variant option for Woburn Road (Connectivity Option 2)

Bedford Carriage Sidings (TL 043 494)

Site Description

7.6.336. Bedford Carriage Sidings level crossing is a private crossing at which a private access road crosses the railway. The crossing is situated a short distance (around 220m) to the south of Bedford station and provides vehicular and pedestrian access to the railway sidings located between the Bletchley – Bedford line and the Midland Main Line (MML, the line from London St Pancras to the East Midlands).

Figure 7.58 Bedford Carriage Sidings private crossing

EWR Co proposals

7.6.337. The proposals for this crossing will be dependent on the chosen option for the realignment of the Bletchley – Bedford line south of Bedford. The new alignment would sever the access road leading to the crossing to its north. This proposed realignment is described in Chapter 8.

7.6.338. Further work is required to develop proposals for a revised access route to and from the sidings. These proposals might involve the creation of a new access route leading from the bridge that carries Ford End Road over the railway. EWR Co will develop proposals for the new access route ahead of the Statutory Consultation.

Assessment Factors to be considered

7.6.339. EWR Co has not yet identified preferred options for the mitigation of any of the level crossing closures. Following this consultation, EWR Co will use feedback received from the consultation together with the Assessment Factors to assist in the identification of a preferred option for each crossing (or group of crossings). The following Assessment Factors and Considerations are expected to be of particular relevance when identifying the preferred options:

- Transport user benefits: the impact of different options on road users and pedestrians and the journey times they experience will be of particular relevance in comparing options;
- Contribution to enabling housing and economic growth including best serving areas benefitting from developable land: although not directly relevant to every crossing, at some locations, some options might fit more readily with development plans and might assist in making some potential development sites more accessible;
- Capital costs: some options will cost more than others to deliver. EWR Co needs to ensure that the costs of individual elements of the Project are proportionate and that the Project as a whole remains affordable (see below) and the benefits it provides are delivered in a cost-efficient manner;
- Operating costs: where new infrastructure is provided, there will be on-going costs involved in its maintenance, operation and eventual decommissioning and replacement. EWR Co needs to ensure that on-going costs of operating and maintaining the railway are minimised;
- Overall affordability: EWR Co needs to ensure that the overall cost of the Project remains affordable and that unnecessary costs are avoided;
- Alignment with wider railway strategy / infrastructure: this railway will be part of the national network and it is necessary to ensure that the Project is aligned with national policy and strategy. EWR Co needs to ensure that the new and changed infrastructure it delivers is compatible with adjoining railway schemes;
- Safety risk (construction and operation): EWR Co must ensure that the railway can be constructed and operated as safely as reasonably practicable. Some options may introduce additional safety risks compared to others;
- Environmental impacts and opportunities: EWR Co is aiming to minimise the environmental impacts of the Project and, where possible, take advantage of opportunities to deliver environmental improvements. It therefore needs to consider the environmental impacts of each option, including the impact on current land uses and the extent to which these can be mitigated; and
- Consistency with Local Plans: EWR Co will consider how well each option fits with adopted Local Plans.

7.6.340. Following the identification of preferred options, further design work will take place to develop these options. This design work will take into account any relevant feedback that has been received during this consultation.

7.6.341. The developed designs will be consulted upon as part of the Statutory Consultation.

7.7. Marston Vale Line infrastructure upgrade

Introduction

7.7.1. This section of the Chapter describes the proposed upgrading of the railway infrastructure (track, embankments, signalling, telecommunications equipment etc) and explains the decisions that are still to be made in respect of it.

7.7.2. The current track and signalling infrastructure of the Marston Vale Line reflects the current use of the railway. Regardless of which train service concept is chosen, EWR Co proposes to increase the number of trains using the railway and to operate those trains at higher speeds. The current track and signalling are unsuitable for faster and more frequent trains. Therefore, EWR Co proposes that the Marston Vale Line should be upgraded regardless of the service concept that is ultimately adopted. The upgrade approach – as discussed in this section of this Chapter – is not materially affected by the service concept.

7.7.3. EWR Co therefore proposes to replace the majority of the existing track using more suitable components for future needs. This is a major task that would involve removing the existing tracks and ballast (the stones that support and surround the tracks) over much of, and potentially all of, the full length of the line (around 27km or 16.5 miles).

7.7.4. In light of the increasing frequency and severity of extreme weather events associated with climate change, best industry practice and new standards the condition and capacity of the railway drainage systems are also being reviewed with a view to reducing the future risk of the railway flooding. Where necessary, the track drainage would be overhauled or renewed, after the track has been removed, to ensure the railway is able to continue to operate safely and reliably in future.

7.7.5. In addition, EWR Co is reviewing the condition of the existing earthworks (cuttings and embankments) and would undertake repair and strengthening works where necessary to ensure their long term stability and safety and ensure they are fit for future levels of railway traffic. In the majority of cases, this work would be most easily carried out while the track is removed.

7.7.6. Once the drainage works and earthworks repairs have been completed, the new tracks would be laid. New ballast would be laid and the new tracks would be installed on top of this. Finally, further ballast would be added to provide stability to the tracks.

7.7.7. EWR Co is proposing to replace the existing signalling system with a new signalling system. The choice of signalling system to be used will be based around operational and technical compatibility requirements. The system could be based around the use of conventional lineside signals, a radio-based system that conveys information directly to train drivers using equipment on board trains or a combination of the two. Irrespective of which type of system is used, it would be necessary to lay new cables alongside the tracks and install lineside equipment cabinets at points throughout the line.

7.7.8. The strength and condition of all bridges on the railway (including culverts that carry smaller watercourses beneath the railway) are also being reviewed and EWR Co would undertake refurbishment and strengthening works to ensure they are suitable for the increased levels of traffic that the railway will see in future.

Options to be considered

7.7.9. In designing the upgrading works, EWR Co will consider options appropriate to the future needs of the railway.

7.7.10. In considering options to repair and strengthen earthworks, it may be necessary to consider re-grading (i.e. changing the angle of) certain earthworks slopes. It is possible that this would lead to a requirement for additional land that is not part of the railway, either to accommodate the permanent works or temporarily in connection with construction activities. In such circumstances, the use of retaining walls or similar features could be considered where appropriate to avoid or minimise the amount of land required.

7.7.11. From the work undertaken to date, EWR Co does not expect there to be a need to carry out any significant strengthening or replacement of bridges other than as described in Section 7.5 (in relation to the Fenny Stratford area works) and Chapter 8 (in relation to works in the Bedford St Johns and Bedford areas).

7.7.12. EWR Co will present more detailed proposals in respect of the Marston Vale Line Infrastructure Upgrade works as part of the Statutory Consultation.

Assessment Factors to be considered

7.7.13. Many of the key considerations associated with this aspect of the works will relate to the technical capabilities of the railway. However, when deciding which option to take forward, in addition to the outcomes of this consultation, the following Assessment Factors are expected to be of particular relevance:

- Capital costs;
- Operating costs;
- Overall affordability;
- Satisfying existing and future freight demand;
- Performance;
- Alignment with wider railway strategy / infrastructure;
- Safety risk (construction and operation) – including the safety of staff accessing equipment for the purposes of servicing and repair
- Environmental impacts and opportunities – including any impacts on land and property (primarily in connection with need to repair and improve existing earthworks)

08.
Project Section C: Bedford

8.1 Chapter summary

8.1.1. This Chapter describes the proposals for the section of the Project between Bedford St Johns station and Clapham Green, where the new railway would connect to the existing Midland Main Line (MML).

8.1.2. After introducing the broad scope of the proposals and some of the important challenges in this area, this Chapter explains the proposals in the Bedford St Johns area. Here EWR Co proposes to provide at least two tracks (one in each direction). Two options have been developed, both of which include the relocation of Bedford St Johns station. This Chapter explains those options and how they have been developed. It also provides an initial review of the options based around key Assessment Factors. Both options will be investigated further following consultation feedback.

8.1.3. At Bedford station, new platforms, a new station building and new access works are required to provide the capacity for EWR services in addition to existing services, which may entail reconfiguration of train stabling areas between Bedford St Johns and Bedford stations. This Chapter describes the existing station and its surroundings together with the constraints and opportunities that these present. It explains that EWR Co has considered a number of concepts and describes an emerging preferred option for a station to the north of Ford End Road, which EWR Co considers is deliverable as part of the Project.

8.1.4. The Chapter also describes the options which have been considered in the North Bedford area, north of Bedford station, where EWR Co has explored how the existing railway is likely to need to be modified to provide for EWR services. The Chapter explains that options which retain the existing four tracks, or provide one or two additional tracks, have been considered. It sets out a summary of each option and provides a comparison between options using the Assessment Factors. It concludes that the preferred option in this area is to provide two new tracks to the east of the existing four tracks; EWR services would use these two new tracks.

8.1.5. The alignment of EWR through Bedford is the result of the need (a) to upgrade the Marston

Vale Line as described in the preceding Chapter of this Report and (b) the selection of Route Option E as the preferred route option for further development. You can read about the selection of Route Option E in the Preferred Route Option Report . This Chapter looks at the way the Project would be developed in Bedford, including impacts on properties which EWR Co has identified as a result of the further work undertaken following selection of the Preferred Route Option.

8.1.6. Routing EWR through the centre of Bedford and Bedford station was identified as resulting in greater transport user benefits than Route Options that do not serve Bedford station. However, these routes would require the demolition of a number of residential and commercial properties due to the expansion of the current railway boundary north of Bromham Road (see section 8.4 below). This greater detail has emerged since the decision to select Route Option E as the preferred route option in 2020 - at that time, it was not known that EWR services would require additional tracks north of Bromham Road. Consequently, EWR Co considered whether this indicates that the route option decision remains valid. EWR Co's conclusion is that identifying Preferred Route Option E remains sound because:

i. A route to the South of Bedford would require a combined MML interchange at Wixams on the Route Options passing to the south of Bedford, which would also require the demolition of residential and/or commercial property;
ii. It remains the case that the transport user benefits and connectivity opportunities of a single interchange point between MML, GTR and EWR services at Bedford Midland would not be secured; and
iii. Route Options to the south of Bedford would still encounter a number of significant and complex constraints, such as the former clay and gravel pit workings, floodplains and other sensitive receptors including ecological receptors, whereas Route Options via Bedford Midland do not have these interactions.

8.2. Introduction

8.2.1. The Marston Vale Line approaches Bedford from the southwest, crosses below the MML and passes through Cauldwell before curving north via Bedford St Johns station and connecting into a terminating bay platform on the eastern side of Bedford station.

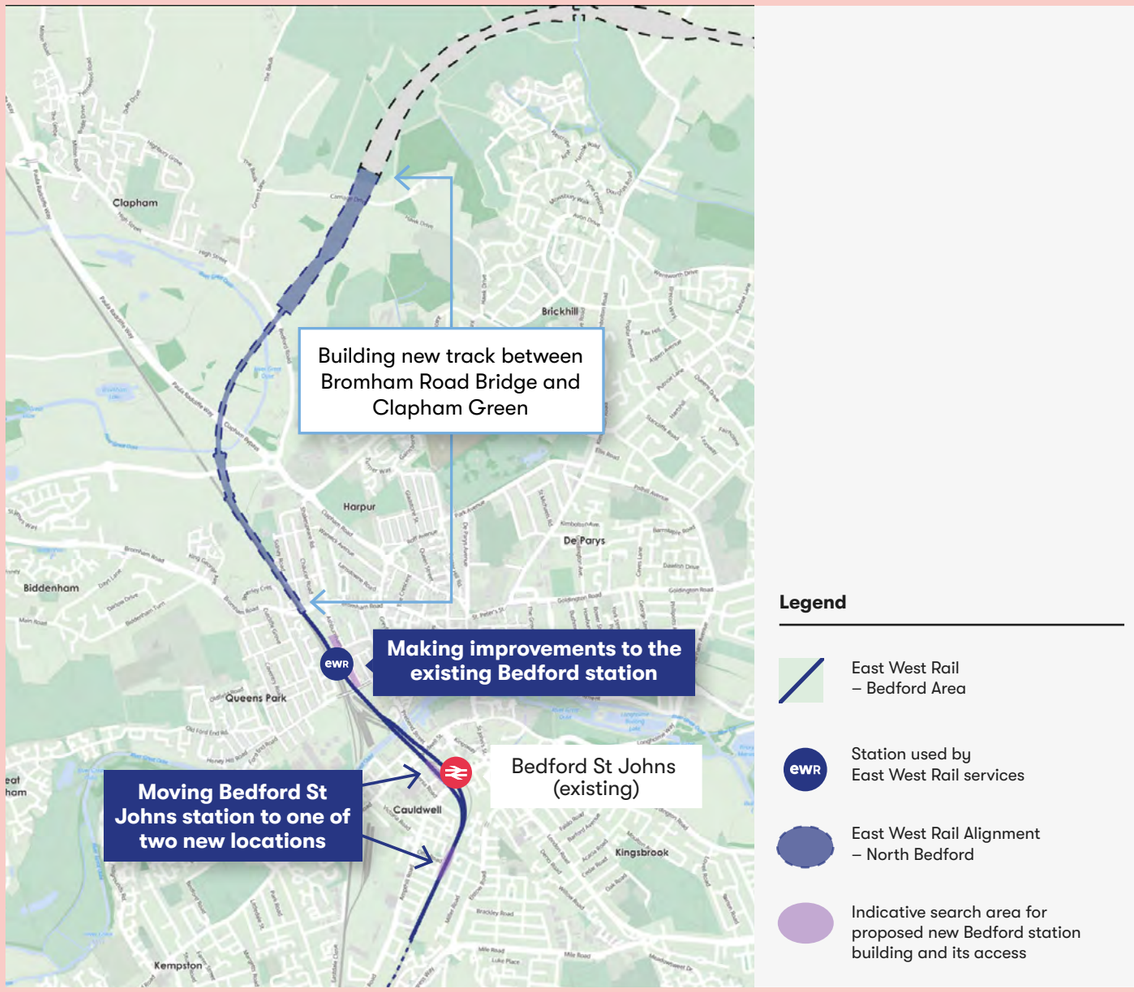


Figure 8.1: Bedford Section

8.2.2. To meet the Project Objectives, improvements need to be made to the section of the Marston Vale route to the south of Bedford station, to Bedford St Johns and Bedford stations and to the MML to the north of Bedford station, which is shown in Figure 8.1.

Benefits

8.2.3. As detailed in Chapter 5, the Secretary of State announced Route Option E as the Preferred Route Option on 30 January 2020. One of the key reasons for this decision was that 'by serving Bedford station it provides easy connectivity into Bedford town centre and supports plans to regenerate Bedford'. Route Option E could provide greater support for growth and regeneration in Bedford in line with Bedford Borough Council's aspirations.

8.2.4. Bedford station would provide an interchange for EWR services with Thameslink and East Midlands Railway (EMR) services.

Challenges

8.2.5. The design of EWR through Bedford is constrained by numerous features including the existing railway, residential and commercial properties, the River Great Ouse, areas of woodland, highways and car parks, utility apparatus and several bridges. Whilst EWR Co is seeking to minimise impacts on communities and the environment, as set out in the Project Objectives, it is likely that there would need to be some impacts to achieve the benefits noted above.

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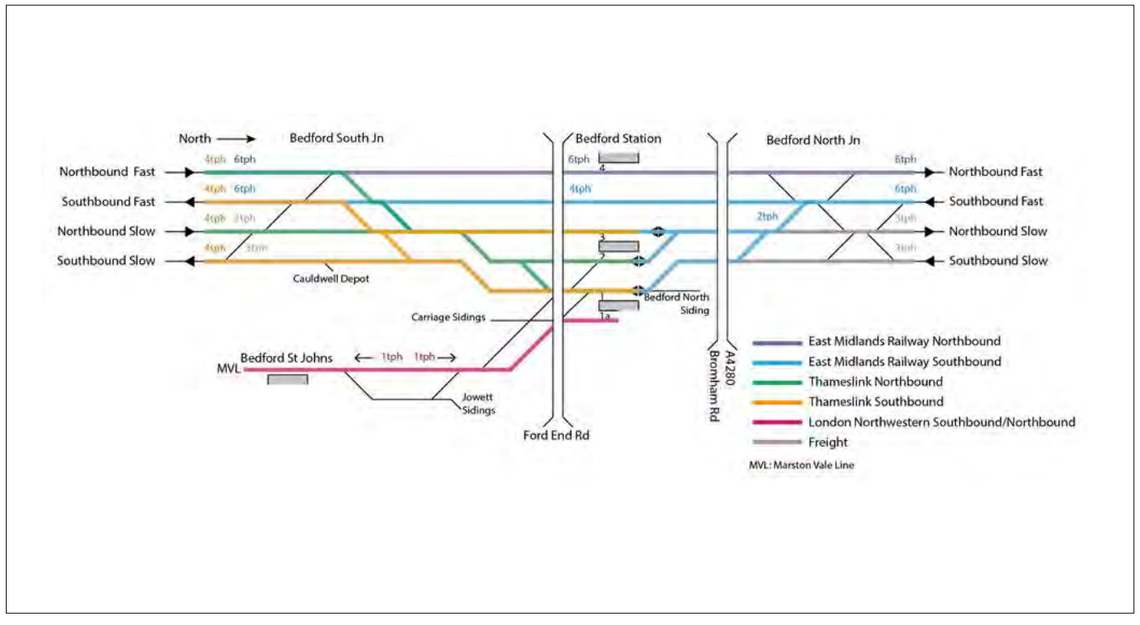
8.2.7. Within the Bedford Urban Area, it may be necessary to acquire and potentially demolish some residential and commercial properties. The proximity of EWR to buildings could cause potential disturbance effects associated with noise and vibration, and air quality. Bedford town centre Air Quality Management Area is an important consideration in the consenting process if the Project would affect the area's ability to be compliant with the Air Quality Directive.

8.2.8. North of the Bedford Urban Area, the Project would need to take particular care to minimise impacts on residents and businesses in Clapham, on the River Great Ouse and its floodplain, including ecology and amenity, and the ancient woodlands of Crabtree Spinney and Helen's Wood.

8.2.9. Network Rail declared the MML through Bedford to be 'Congested Infrastructure' on 24 September 2014, between Cricklewood and Leicester via both Market Harborough and Corby. It is one of only three locations in the UK to have this designation[56]. This is in line with "The Railways (Access Management and Licensing of Railway Undertakings) Regulations 2016" ("2016 Regulations"), because Network Rail was unable to accommodate all requests for access into the timetable.

8.2.10. As part of the declaration under the 2016 Regulations Network Rail completed a "Capacity Analysis"[57] and then a "Capacity Enhancement Plan"[58]. Since these documents were published, Network Rail has enhanced the infrastructure on the MML through the MML Upgrade Project[59]. Nevertheless, despite some improvements delivered on the MML, the Congested Infrastructure declaration remains in place. One of the key reasons for this is that no work has taken place in the Bedford area. The "Capacity Enhancement Plan" identifies potential solutions that have not been implemented.

Figure 8.2: Existing railway at Bedford with pre-EWR passenger service frequency and freight train capability



8.2.11. The MML Upgrade Project has enabled an increase in EMR services through Bedford from five to six trains per hour in each direction from May 2021[60]. Therefore, the existing passenger service on the MML passing through Bedford when the EWR service is introduced is anticipated to comprise six EMR trains every hour in each direction between Yorkshire, the East Midlands and London. Of these, two trains every hour would stop at Bedford Station. The layout of the current platforms and the tracks to the north and south of the station is such that the two southbound trains stopping at Bedford Station every hour can only access an available platform by changing from the Southbound Fast line to the Northbound or Southbound Slow line about a mile north of the station at Bedford North Junction, using up valuable capacity in doing so.

8.2.12. As part of the MML Upgrade Project, Network Rail has installed an additional track north of Bedford between Sharnbrook Junction and Kettering South Junction. This has increased the capability of the Bedford to Kettering section of the MML to an average of three freight trains per hour in each direction[61] over an 18 hour operating day. Currently there are timetabled paths for two freight trains per hour in each direction in the off-peak and one in the peak.

8.2.13. The majority of the freight demand on the MML is currently heavier, slower Class 6 aggregates traffic rather than lighter, faster Class 4 intermodal traffic. Class 6 aggregate freight trains pose a greater challenge to the ability of the railway to fit freight paths within a reliable passenger service.

[56] https://www.networkrail.co.uk/wp-content/uploads/2019/11/Network-Statement-2021.pdf
[57] https://www.networkrail.co.uk/wp-content/uploads/2020/12/Midland-Main-Line-Congested-Infrastructure-Capacity-Analysis-240315.pdf
[58] https://www.networkrail.co.uk/wp-content/uploads/2020/12/Midland-Main-Line-Congested-Infrastructure-Capacity-Enhancement-Plan-240915.pdf
[59] https://www.networkrail.co.uk/running-the-railway/our-routes/east-midlands/midland-main-line-upgrade
[60] https://www.networkrail.co.uk/running-the-railway/our-routes/east-midlands/midland-main-line-upgrade/midland-main-line-upgrade-plan-bedford-to-kettering/
[61] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/941566/London-to-Corby-land-acquisition-and-bridge-works-act-order-inspectors-report-accessible.pdf

8.3. Bedford St Johns

Introduction

8.3.1. The station at Bedford St Johns is a single platform that is served by a single track. This constrains capacity. The tight curvature to the south and through the station limits train speeds to 15mph. The station itself does not currently offer the customer experience to which EWR aspires, lacking modern facilities and adequate access provisions. These characteristics of the track layout result in a significant limitation on capacity and journey time, which is not consistent with the Project Objectives, which require the provision of a minimum of two tracks between Oxford and Cambridge to achieve the EWR business case outcomes.

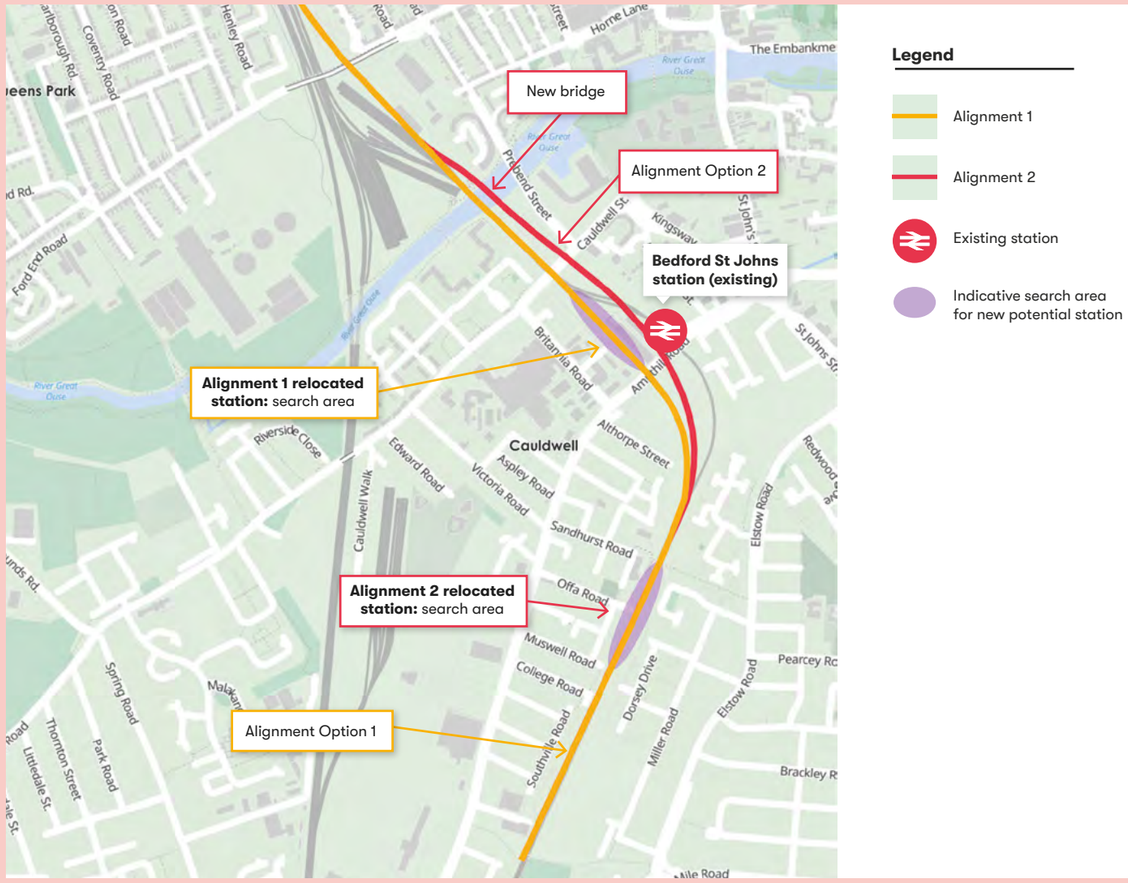


Figure 8.3: Bedford St Johns area

Option development

8.3.2. Design development work has focused on providing a minimum of a twin track railway through the area between the Ampthill Road – Elstow Road pedestrian link and Cauldwell Street bridge with a minimum line speed of 30mph, which is required to achieve the Project's overall journey time, set out in the PWOS. A twin track railway is needed to avoid conflicting train movements and to ensure that the Project is capable of meeting the Project Objectives. Designs for a future station have also sought to ensure appropriate functionality in line with those Objectives.

8.3.3. All options that have been developed require the relocation of Bedford St Johns station and locations close to the existing one have been sought, with a sufficiently long straight section of track required to enable the provision of a new station which meets the Project Objectives. The proposed sites for the relocated station are on straight sections of track to improve boarding and alighting from trains and reduce the risk of accidents when compared to a curved platform.

8.3.4. The Assessment Factors that drive the better performing Route Alignment Options include Transport User Benefits and Environmental Impacts (reflected by line speed potential), capital costs (reflected by the ability to utilise existing structures, for example), and Consistency with Local Plans (manifested by station location/opportunities for development). Positions for station locations vary depending on the Route Alignment option.

8.3.5. Key considerations in developing solutions are set out below followed by an indicative assessment of the emerging options.

Alignment and speed

8.3.6. In developing options, an attempt has been made to keep the proposed alignment within the corridor bounded by the old railway to Hitchin (currently a car park adjacent to the hospital) and the existing Marston Vale Line alignment. This approach enables a maximum speed of 40mph to be achieved. An alignment which achieves greater speed - up to 60mph - requires a move further east under Cauldwell Street. It should also be noted, however, that the higher speeds may not be achievable by trains needing to stop at Bedford St Johns station.

Bridges

8.3.7. At this stage of the design, Cauldwell Street Bridge is assumed to require reconstruction in all cases since the clearance under this structure is very limited. Even without any consideration of electrification, clearances are tight and track lowering to achieve non-electrified clearances is unlikely to be practical because track levels are constrained by the need to achieve the same level as the river bridge. In any reconstruction, to meet modern standards, electrical clearances for potential future electrification would require a substantial raising of the road surface.

8.3.8. Ampthill Road Bridge (over the old Hitchin rail alignment) comprises several spans currently providing means of access to a car park, which could be used to take an improved EWR alignment through. The current bridge is expected to accommodate the required clearances for any overhead electrification. This will be verified with surveys and clearance assessment. Should the alignment require a new span of the bridge to be constructed, then full electrical clearances to modern standards would be required, and the road profile would have to be raised.

8.3.9. Subject to asset condition assessments, the existing bridge over the River Great Ouse could be reused to support the Hitchin Alignment option (40mph). The faster line speed alignment (60mph) would require a new river bridge; such a bridge would need to have a shallow construction depth to maintain a walkway along the north bank of the river and to ensure that the river remains navigable.

Station locations

8.3.10. A number of alignment and station location possibilities were investigated. Some were discounted due to them failing to meet the Project Objectives. These included a station location north of Cauldwell Street on a 55mph alignment, which was concluded to be unaffordable. An option for a fast alignment with no station at Bedford St Johns was also considered but was ultimately felt to be unacceptable because removing the station would degrade public transport services in this part of Bedford. The outline feasibility work resulted in two potentially viable options emerging and the advantages and disadvantages of each are summarised below.

8.3.11. A 40mph alignment that follows the old Hitchin railway alignment is compatible with a relocated St Johns station between Cauldwell Street and Ampthill Road. The station would be close to the hospital (“Hospital Station”). It would also maximise the area available for development and could be integrated into new facilities, creating additional development value. This station could provide the opportunity to consolidate the urban structure by providing a focal point for the area, becoming the catalyst for change and placemaking. It would be critical for the success of the area to overcome the severance produced by integrating the access to the platforms with the adjacent development, resulting in wider benefits to the community.

8.3.12. A faster alignment would not enable sufficient space between Cauldwell Street and Ampthill to allow for platforms that are capable of future extension to accommodate eight-car trains. Relocation to the north under Cauldwell Street and towards the river has been investigated. This location has been concluded to be inappropriate as it is closer to Bedford station (therefore with limited transport benefits), would severely impact Cauldwell Street and a consequent reconstruction of the road junction would be required. The complexity involved in constructing a station in this location would make it very unlikely to be affordable and therefore it could not meet the Project Objectives since it would be unlikely to be constructed. A station at this location would also be less of a catalyst to development, as a larger portion of land would be occupied by the railway and road infrastructure.

8.3.13. Alternatively, a station could be located on the straight section of track immediately south of the realignment works, close to the Elstow Road - Ampthill Road pedestrian link over the railway (‘St Johns South’). This station would serve a larger existing residential area to the south, between Elstow Road and Ampthill Road. There is an existing pedestrian link between these roads which crosses the railway on a footbridge. This footbridge could be replaced and enhanced to provide access to platforms either side of the track within the existing railway corridor. The site is moderately convenient for the hospital and a pedestrian/cycle link could be provided to any new development in the St Johns area.

Options considered

Bedford St Johns option 1: Hitchin alignment (Hospital station)

Summary of option

8.3.14. As shown in Figure 8.4, in this option the alignment would run beneath Ampthill Road and Cauldwell Street, and across the river, all utilising existing bridges (although Cauldwell Street Bridge is likely to need to be reconstructed due to insufficient headroom clearances) and would provide a new station with platforms that can be extended in the future between Ampthill Road and Cauldwell Street.

8.3.15. Key characteristics of this option are that it:

- Achieves a line speed of 40mph, which exceeds the 30mph minimum objective and is a substantial improvement compared to the current maximum speed of 15mph;
- Provides a replacement Bedford St Johns station close to the existing location;
- Enables station access to be accommodated off Britannia Road and/or a new development;
- Offers good land development opportunities north and south of Ampthill Road.

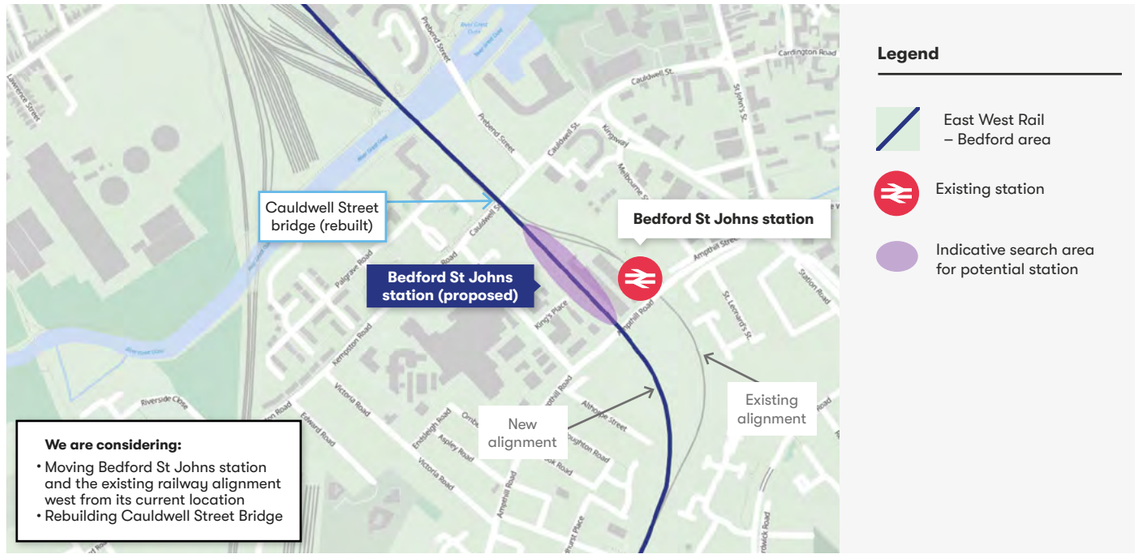
Station opportunity

8.3.16. The area south of the River Great Ouse is identified by the Bedford Town Centre Masterplan (Bedford central town masterplan report, Bedford Borough Council June 2020) for intensification, and the proposed new station location is surrounded by areas subject to grant of planning permission(s) for development to take place. This proposed location would also promote the use of public transport to/from the existing hospital, which is adjacent, and help to reduce car dependency. The construction of the new station would also unlock the development potential of the area and become the catalyst to consolidate the existing nature of the urban structure, providing the opportunity to reduce the surface car parking in the area.

8.3.17. The choice of platform types immediately north of Ampthill Road depends on how the station would connect with the local environment. Side platforms would provide a softer barrier between the railway and the surrounding area. On one side there would be access to Bedford Hospital. Further hospital expansion towards the station with the introduction of a multi-storey car park, potentially, could provide a direct linkage between the station and the hospital. On the other side of the railway, the side platform could be integrated into any development proposals, with station access being either at ground level or via a footbridge.

8.3.18. An alternative of an island platform would give the opportunity to provide direct station access off Ampthill Road, only metres away from the access to the existing Bedford St Johns station.

Figure 8.4: Bedford St Johns Option 1 – Hitchin Alignment



Development opportunity

8.3.19. This alignment opens up the maximum amount of space for development to the east and northeast of the alignment by moving the railway to the western edge of the redevelopment land. However, it should be noted that the northern part of this area is in the flood risk zone for the River Great Ouse.

Construction issues

8.3.20. The alignment would diverge from the existing railway (heading north) into mostly current car parking areas, industrial sites and some wooded areas. The area has been identified in the Local Plan for redevelopment, but some property and existing car parking would be likely to be required to construct the railway.

8.3.21. The alignment makes use of the existing Ampthill Road overbridge, which used to pass over the old Hitchin railway. Initial dimensional checks suggest that it should be possible to retain the bridge without any major structural modifications.

8.3.22. The alignment would then tie back into the existing railway just south of the Cauldwell Street overbridge. Initial dimensional checks here show that there is insufficient headroom to retain the bridge in its present state to accommodate the required electrical clearances as track lowering would not be feasible due to the proximity of the river, meaning that it would need to be rebuilt at a higher elevation. Reconstruction of the bridge may be possible in phases since it currently has four traffic lanes so it may be possible to demolish and rebuild it in sections and keep a lane open in each direction. However, the significant lift required would affect the Prebend Street and Britannia Road junctions which are only 50m and 70m respectively from the bridge, although the detailed impacts will need to be investigated during the next stage of project development.

8.3.23. Site access could be provided by making use of the existing industrial complex access ramp from Ampthill Road, or via Britannia Road, though this latter option may be disruptive to Bedford Hospital. Any car parking lost to the Project could potentially be mitigated by the construction of a multi-storey car park.

8.3.24. The works for the new EWR alignment would be largely offline from the existing railway, with the impact on the existing line limited to the location of tie-ins. The programme for this section of works is likely be driven by the replacement of the Cauldwell Street overbridge, especially if the bridge always needs to have two lanes maintained. There may also be other programme constraints if there are roadworks planned on surrounding roads and the overall traffic management of the area would need to be co-ordinated carefully.

Bedford St Johns option 2 - maximum speed (St Johns South station)

Summary of option

8.3.25. As shown in Figure 8.5 below, in this option the alignment would run beneath Ampthill Road and Cauldwell Street, under new road bridges, before crossing the river on a new bridge, and would provide a new station with four-car side platforms (with eight-car provision for the future) close to the Ampthill Road – Elstow Road Pedestrian Link bridge, to the south-west of the current Bedford St Johns station.

8.3.26. Key characteristics of this option are that it:

- Achieves a maximum line speed of 60mph, well in excess of the 30mph requirement for this element of the Project;
- Requires a new bridge over the River Great Ouse;
- Requires a new overbridge for Cauldwell Street and significant realignment of the road junction at Prebend Street and Cauldwell Street;
- Requires a new overbridge on Ampthill Road;
- Provides a station location to the south of the existing location;
- Offers limited land development opportunities south of Ampthill Road;

8.3.27. This option represents the alignment which can provide the fastest speeds achievable in this area whilst still providing a station close to the existing Bedford St Johns location.

Figure 8.5: Bedford St Johns Option 2 – Maximum Speed

Station opportunity

8.3.28. There is no location on this Route Alignment option between Cauldwell Street and Ampthill Road where a sufficiently long straight section is available to accommodate a platform. A location for the station north of Cauldwell Street would be too complex and challenging to construct. The only place in the area where a station could be located would be on the straight section of railway immediately to the south and west of the realignment, in the more residential area to the south of the existing St Johns station, between Ampthill Road and Elstow Road.

8.3.29. Locating the station in this residential area would provide the opportunity to increase the catchment for the population heading towards Bedford, promoting a more sustainable form of travel. However, it is a less convenient location for access to the hospital and, importantly, the proposed development area between Cauldwell Road and Ampthill Road, where there would be the potential for greater integration. It is also located a further distance from the south side of Bedford Town Centre and the local schools, which are currently an important source of traffic for the Marston Vale Line.

Development opportunity

8.3.30. This alignment cuts through the middle of the development area identified between Ampthill Road and Cauldwell Street, which would be further depleted by the need to realign Cauldwell Street well to the south of its current location to accommodate the realigned railway.

Construction issues

8.3.31. As with Option 1, the Option 2 alignment diverges from the existing railway (heading north) into areas currently used for car parking, industrial sites and some wooded areas. The area has been identified in the Local Plan for redevelopment, but some property and existing car parking is likely to be required to construct the railway, although less of the car parking area is expected to be required than for Option 1.

8.3.32. The alignment would require a new overbridge to carry Ampthill Road over the railway. Even though Ampthill Road is elevated on an embankment at this location, the road level is likely to need to be lifted substantially to provide modern electrical clearances for any future overhead electrification. In addition, Ampthill Road might be able to be diverted locally around the site of the new bridge, partly through the hospital car park extension to the south, whilst the bridge was constructed. The alternative would be to close Ampthill Road during the works.

8.3.33. The alignment also requires a new overbridge to replace Cauldwell Street Bridge. The new alignment is very close to the junction of Cauldwell Street and Prebend Street and the road would not be able to continue on its current alignment. A new alignment would head southeast from the junction – effectively extending Prebend Street – rising until it could cross the new alignment and then drop down to connect back into either Cauldwell Street or Britannia Road. The new alignment would involve additional land take and adds significant complexity to the Project.

8.3.34. This alignment crosses the River Great Ouse on what would need to be a new bridge over the river, east of the existing rail bridge, before tying back into an alignment to reach Bedford station. The Bedford Siding Footbridge would also need to be demolished and rebuilt.

8.3.35. Phasing of works for the new alignment would be centred around the three new bridges. The bridge over the river could proceed independently of the two other bridges, which would need to be synchronised with respect to overall traffic flow. There would be impacts on the existing railway line operation at the tie-ins at each end, and where the new alignment crosses the existing railway. The construction of a new station on the existing alignment south of St Johns station would also create some disruption and would be close to residential properties.

Comparison of options

8.3.36. An initial review of the Route Alignment designs for the Bedford St Johns area resulted in two emerging options, that either maximise the use of existing infrastructure and development opportunities (Option 1) or maximise route speed and transport benefits (Option 2). These two options were developed further to enable a more detailed assessment and can be compared as follows in respect of their performance against the Assessment Factors. There are other variations around these options which will be considered as designs are refined and optimised and a preferred option selected at the next stage of project development.

8.3.37. The following Assessment Factors have been the focus as they are likely to be the principal differentiators between the Bedford St Johns area Options 1 and 2:

- Transport user benefits;
- Capital costs;
- Environmental impacts and opportunities; and
- Consistency with Local Plans.

Transport user benefits

8.3.38. Option 2 offers the potential for higher speeds of 60mph, compared to the maximum 40mph delivered by Option 1 due to the remaining curved track geometry. This would translate into quicker journey times and therefore greater transport benefits, although even the 40mph offered by Option 1 represents a major improvement compared to the existing 15mph speed restriction through the area. Moreover, it is unlikely that the highest speeds would be achievable when trains are required to stop at a station in the area. Therefore, whilst Option 2 performs better in respect of journey times and transport user benefits, both options perform well against this Assessment Factor and need to be considered within the wider context.

Capital costs

8.3.39. Option 2 would be significantly more complex and disruptive to construct than Option 1 and would therefore incur a higher capital cost. Construction would also be more disruptive to the operation of the railway since most of Option 1 can be built off-line, whereas Option 2 is likely to require more extensive railway closures. Construction would also be more disruptive to the operation of the railway since most of Option 1 can be built off-line, whereas Option 2 is likely to require more extensive railway closures.

8.3.40. In Option 2, the Cauldwell Street/ Prebend Street junction remodelling would be very challenging and be likely to require road closures during construction. The Ampthill Road works might not be as disruptive if a temporary local realignment of the road could be achieved. In Option 1, Cauldwell Street reconstruction will still be challenging, but there is a little more room for manoeuvre than with Option 2 and it is currently expected that Ampthill Road would be largely unaffected by the works in Option 1.

8.3.41. The new bridge over the River Great Ouse would be a challenging and costly element of Option 2 and would not be needed in Option 1.

8.3.42. In summary, Option 1 would be a substantially less expensive and more affordable option overall.

Consistency with localplans

8.3.43. By making use of existing bridges, in addition to reducing the capital cost, Option 1 would maximise the size of the development area site to the north east of the alignment that is included in the Local Plan, whilst providing good access from the relocated station to the hospital and offering integration opportunities with future developments. Option 2 performs less well in this regard as the relocation of Cauldwell Street Bridge and realignment of the local roads would reduce the land available for development. Furthermore, a station to the south and in a residential area, would not be as advantageous in supporting development in the Local Plan.

Environmental impacts and opportunities

8.3.44. Both alignments and stations would have limited environmental impacts on the locality in respect of additional noise and visual intrusion. However, Option 1, with a relocated station near the hospital would have the opportunity to be integrated into new developments, which would help to mitigate the impact. Alternatively, a station to the south in Option 2, would require construction within an existing residential area and the construction of a new bridge over the River Great Ouse would be likely to have more of an environmental impact in terms of residential amenity and the river environment respectively.

Summary

8.3.45. Option 1 with a station located between Ampthill Road and Cauldwell Street performs better in respect of capital costs, consistency with local plans and environmental impacts, based on the work undertaken to date. It is a more affordable option. However, Option 2, with a station located close to the Ampthill Road – Elstow Road Pedestrian Link bridge also meets the Project Objectives, remains potentially viable, and offers different benefits to the local area.

8.3.46. Option 1 is EWR's emerging preferred option, but further investigation of both options will be undertaken during the next stage of development following consultation feedback and development of the timetable.

8.4. Bedford station

Introduction

Current situation

8.4.1. After Bedford St Johns station and then crossing the River Great Ouse, the Marston Vale Line presently heads north into Bedford station, weaving as a single track railway between the existing and extensive Thameslink train stabling sidings and a Network Rail Maintenance Delivery Unit (which uses a historic Midland Railway grain store) and then underneath Ford End Road Bridge into a bay terminating platform (Platform 1A) or the southbound MML platform (Platform 1). The railway curvature limits train speeds and the single line constrains capacity, whilst the current railway and platform configuration in the station is limited in flexibility and insufficient to allow an increase in service levels and through service opportunities for EWR.

8.4.2. The station itself is located to the west of Bedford town centre, to the west of a low-rise residential area (see Figure 8.6, which depicts a map of the Bedford station area). The station building footprint is limited by the rail corridor to the west, which crosses Bedford in a north-south direction. The station is surrounded by existing roads and properties and further expansion beyond the railway boundary is constrained. South of Ford End Road bridge, the area is dominated by Thameslink sidings and is limited by the River Great Ouse. Between the rail corridor and Ashburnham Road on the eastern side of the station, most of the area is currently occupied by the station, the small transport interchange and both public and rail staff car parks.

8.4.3. Nevertheless, the total area occupied by the rail infrastructure and its facilities is significant, as it includes Bedford station, station car parking, Thameslink sidings, the Thameslink staff car park, and the Network Rail Maintenance Delivery Unit and its car parking. This area of land provides significant opportunity for the upgrade of the railway and improvements to the station to enable the implementation and operation of EWR, to improve the connection between the station and the town centre and to improve both east-west and north-south active travel connectivity.

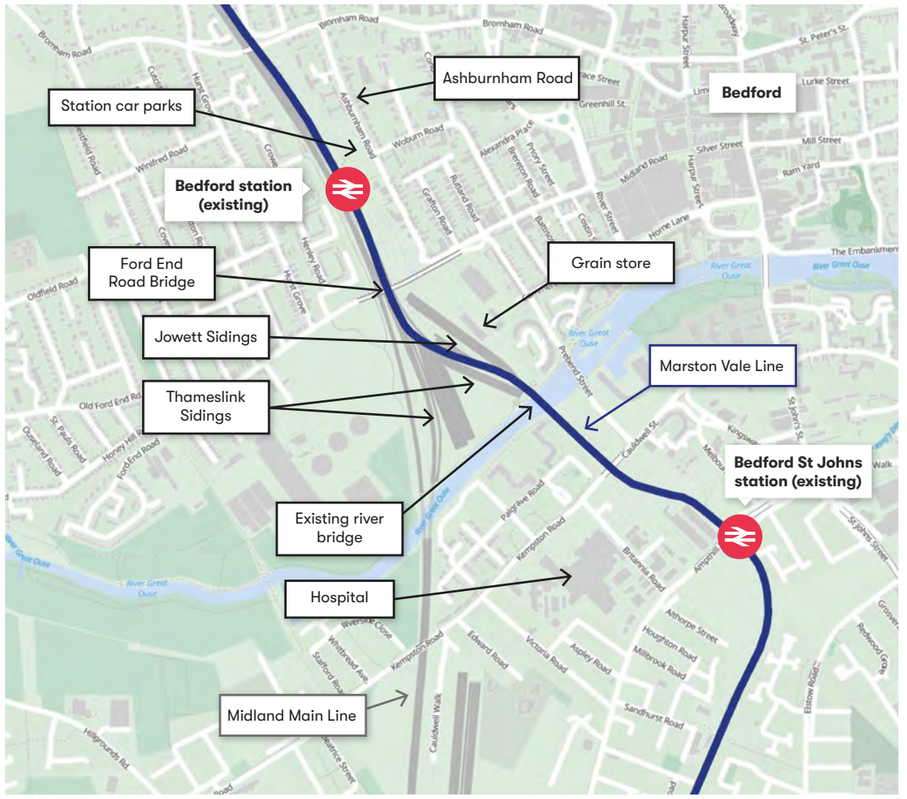


Figure 8.6: Bedford station area

Station context: connectivity, river and town centre relationship

8.4.4. The relationship between the station and the town centre is currently very weak. The station is located off Ashburnham Road, at the back of a low-rise residential area. There is no direct, vibrant and pedestrian-friendly route from the station to the town centre, with the urban fabric acting as a barrier, and most of the public transport network not directly serving the station.

8.4.5. Ford End Road Bridge does provide some east-west connectivity, although the bridge is narrow, and a separate pedestrian bridge is provided to the north since the original bridge is not wide enough to accommodate a footpath. The nature of Ford End Road overbridge – a series of brick arches - and the road network configuration around the station, act as a barrier to north-south connectivity in the area. The area surrounding the station is mostly given over to car parking for both passengers and railway staff. All car parking is at surface level which gives the current station area a suburban and vehicle-dominated landscape and character. Changes to the station design could create opportunities for passenger growth through better multimodal integration, but it will be important to ensure that sufficient convenient car parking is provided to facilitate access to the railway.

8.4.6. Whilst Network Rail land spans from Bromham Road to the north bank of the River Great Ouse, there is no direct connection to the river from the station as the current rail sidings and Maintenance Delivery Unit block any north-south connectivity. There is an existing east-west cycle and pedestrian route along the north bank of the river that crosses the Thameslink tracks via an underpass, and the Marston Vale Line tracks via an overbridge and a new pedestrian bridge that crosses to the south bank of the river to new developments. The active travel route along the river is part of a network and a priority for Bedford Borough Council. The option of linking it directly to the station would be beneficial for active travel in the area and improve long-term sustainability.

8.4.7. Because the existing terminus of services on the Marston Vale Line is at a bay platform, and because the existing station building is located where EWR would pass closest to the MML, it is logical to consider a new station configuration because the existing station configuration would be affected by EWR. In any event, new platforms and a new station building and frontage would be required to provide the capacity for EWR. This creates the opportunity to support the regeneration of the surrounding area and the unlocking of development land that would help to consolidate the expansion of the town centre in its relation to the river front. It would also enable the connectivity of the station area to be improved for public transport, cyclists and pedestrians.

8.4.8. The existing alignment and connection of the Marston Vale Line into Bedford station provides several key constraints and opportunities in developing solutions. These are summarised as follows:

- Marston Vale Line river bridge;
- Thameslink Sidings and Grain Store;
- Ford End Road Bridge; and
- Other operators' platform requirements.

8.4.9. In considering these constraints and opportunities, a number of concepts have been developed for the Bedford station area, comprising variations on railway alignment and station layout.

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8.4.11. The following section explains how the constraints and opportunities have shaped the two concepts. The proposed North Concept as well as the South Concept one is then presented in further detail.

Constraints and opportunities

Marston Vale Line river bridge

8.4.12. The existing bridge spanning the River Great Ouse carries the Marston Vale Line railway and provides access to the Jowett Sidings, located immediately north of the river crossing on the eastern flank of the railway which provides important stabling for five 12-car Thameslink trains. This means that the bridge carried two railway lines although only one is currently used for Marston Vale Line services.

8.4.13. Reusing the bridge for the double-track EWR and retaining the Jowett Sidings would compromise the alignment of the EWR tracks, reducing line speed and would also undermine the independence of operations for both EWR and Thameslink, as Thameslink empty coaching stock would have to use the EWR lines to access the sidings and reverse on the running line. EWR Co's preferred alignment for the EWR tracks currently, therefore, cuts through the Jowett Sidings, meaning they must be relocated. EWR Co recognises the impact that this would have on Thameslink operations and will work closely with the Operating Company and Network Rail to find a solution which is acceptable to them, A number of potential possibilities for relocating the sidings have been identified and further development work is required to determine an appropriate solution, which will form part of the EWR Project.

8.4.14. A new bridge to the east of the existing structure would either force the alignment of EWR through the Grain Store, a building of historic interest, and under Ford End Road Bridge, or east of the Grain Store on an alignment that would necessitate the partial or complete demolition and reconstruction of Ford End Road Bridge. Further, construction of a new bridge here would require reconstruction of the existing cycle bridge over the Marston Vale Lines.

8.4.15. If the Jowett Sidings were not available to Thameslink, the provision of a new bridge west of the existing bridge would be possible to enable Thameslink trains to access a small number of sidings on the

former Hitchin Alignment. However, it is not likely that sufficient 12-car sidings could be provided on this site to replace those lost in the Jowett Sidings. This is therefore unlikely to be an acceptable solution. Additionally, it would force the EWR lines to follow the current alignment south of the river, removing the opportunity of having sufficient straight track for a replacement Bedford St Johns station near its current site.

8.4.16. A fourth option is to construct a new span west of the existing bridge for use by EWR trains. This option also assumes the removal of the Thameslink sidings that are currently located to the west of the Marston Vale Line, and hence the need for their replacement. The new bridge would be a requirement if it was desired to create sufficient space for Bedford station to be relocated with platforms south of Ford End Road, as well as enabling the remainder of the area to be redeveloped.

8.4.17. For a new station with platforms north of Ford End Road, the option to re-use the existing bridge is considered preferable from a railway alignment perspective, although a solution for the replacement of the Jowett Sidings would need to be found. This will entail development of a proposal for this, the identification of a site and its potential inclusion in an application for a DCO. As such, it would be necessary for such a proposal to be included in the forthcoming Statutory Consultation on the Project.

Thameslink sidings

8.4.18. The Bedford station area is an important location for Thameslink. In addition to the five 12-car Jowett Sidings, the Thameslink train operating company currently has 14 eight-car stabling sidings in the triangle of land between the MML, the Marston Vale Line and the River Great Ouse. Additional 12-car stabling is available in Cauldwell Depot which is located off the MML at Bedford South Junction, to the south of the river. Both the Jowett Sidings and Cauldwell Depot require trains to reverse on their journey between the stabling points and the Bedford station platforms (and vice versa), adding undesirable complexity and time to train operations.

8.4.19. As noted above, if the existing bridge over the River Great Ouse is adopted for the EWR route, this would mean that the Jowett sidings could no longer be used for stabling Thameslink trains if the EWR service is to be operated effectively to meet the Project Objectives. If implemented, the effect would be to reduce stabling capacity at Bedford, particularly for 12-car trains, and a replacement facility would need to be constructed as part of the Project, although it would provide the opportunity to improve upon some of the existing operational constraints.

8.4.20. For the purposes of enabling trains to move between the Marston Vale Line and the MML a connection is currently provided to the south of Bedford station. It is proposed to move this connection to the north of the station to enable freight services to operate with a smaller likelihood of disrupting EWR services. This means that in developing a station for EWR north of Ford End Road Bridge, the infrastructure required for the existing junction is no longer required and can be repurposed. This would allow the group of four sidings in the east of the triangle to be removed and replaced with a number of new sidings (as replacements for both these four sidings and the five Jowett sidings), some of which could be 12-car length, although further design work is required to confirm the number and length of such sidings. Potentially this offers a solution to impacts on Jowett Sidings.

8.4.21. If a station option involving relocation of platforms to the south side of Ford End Road bridge was chosen, it would be sited in the area currently occupied by the 14 eight-car sidings, meaning that these too would be lost, in addition to the Jowett sidings. This would require a much more extensive relocation exercise to be undertaken before the main EWR works at Bedford could be constructed, adding time and cost to the Project. At this stage, such an alternative location or solution has not been identified.

8.4.22. Therefore, in determining the best solution for Bedford station the potential impacts on the existing Thameslink sidings, and the potential availability of relocation options, is an important consideration. This is due to the potential impact on existing railway operations and the cost and time involved in providing replacement facilities. There are several potential options for stabling the displaced trains and these require further investigation, development and assessment, but may themselves be affected by options selected for EWR in the Bedford station area. EWR Co will seek to minimise the impact on existing operations and will work with the Train Operating Company and Network Rail to determine the most appropriate solution.

The Grain Store

8.4.23. Although there are no listed buildings in the vicinity of the station, the former Midland Railway Grain Store is of historic interest and EWR Co aims to preserve it if it does not significantly affect the Project in this location. The Grain Store is situated east of the Marston Vale Line between Ford End Road Bridge and the River Great Ouse Bridge. In 2016, it was incorporated into a Network Rail Maintenance Delivery Unit area when this facility was moved to allow construction of the Jowett Sidings.

8.4.24. Retention of the Grain Store forces the alignment of EWR either through the Jowett Sidings, which would need to be relocated elsewhere, or further east, requiring reconstruction of Ford End Road Bridge.

8.4.25. Careful deconstruction of the building and relocation elsewhere is theoretically possible, but it is unlikely that a heritage railway could make economic use of such a large structure. It would also be difficult to justify the costs of relocation. EWR Co therefore does not propose to relocate the building if it cannot be retained without significantly affecting the Project in this location.

Ford End Road

8.4.26. Ford End Road Bridge is a key east-west route providing an important link between the Queens Park and Great Denham suburbs and the town centre. EWR Co's current view is that the existing bridge can be retained, although further design work and surveys may reveal that this is not the case. Notwithstanding this, the bridge is narrow and uninviting, and demolition may provide the opportunity to improve both connectivity and the local environment, although reconstruction to modern standards may present construction challenges that could require a permanent diversion of the road.

Other operators' platforms

8.4.27. Maintaining independence of Thameslink and MML operations, and therefore supporting operational resilience, is an aim of the Project. However, most of the options for Bedford station would impinge on infrastructure used by Thameslink. Therefore, it is necessary for EWR Co to consider the layout and operations of the Thameslink platforms and how a redesign of the station will ensure there is no detrimental impact on existing operations. A redesign of the station may also enable more efficient operation of the station by solving current operational constraints, including a lack of sufficient slow line platforms and the absence of a "fast" platform in the London direction.

Concepts considered

8.4.28. Following consideration of these constraints and opportunities, a number of station options were conceptualised and rationalised into two broad approaches. EWR's proposed solution is a station to the north of Ford End Road. An alternative concept for a station to the south of Ford End Road, based on work undertaken by Bedford Borough Council in 2020, was also developed.

8.4.29. The Proposed Concept for a station north of Ford End Road is at an early stage of development at present and there will be variations considered as the design is developed over the coming months. Feedback is therefore sought during this consultation on how the station design could be further developed and optimised.

Bedford station North Concept – station to the north of Ford End Road

8.4.30. The track layout for EWR Co's North Concept for Bedford station is shown in schematic form in Figure 8.7 and as a plan in Figure 8.8. The concept would take the two tracks for EWR over the existing Marston Vale Line River Great Ouse bridge but instead of swinging west to join the MML Slow Lines at Ford End Road Bridge as at present, the alignment would split into three tracks and continue through the Jowett Sidings site to pass under three separate existing arches of Ford End Road Bridge. This would provide the best opportunity to use the centre of the arches to provide the clearances required for potential electrification. Three new

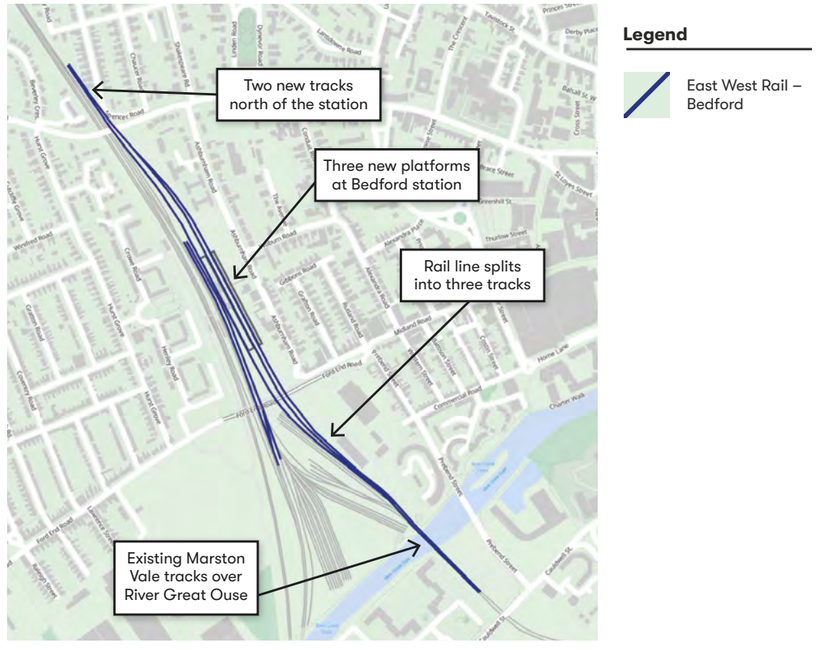
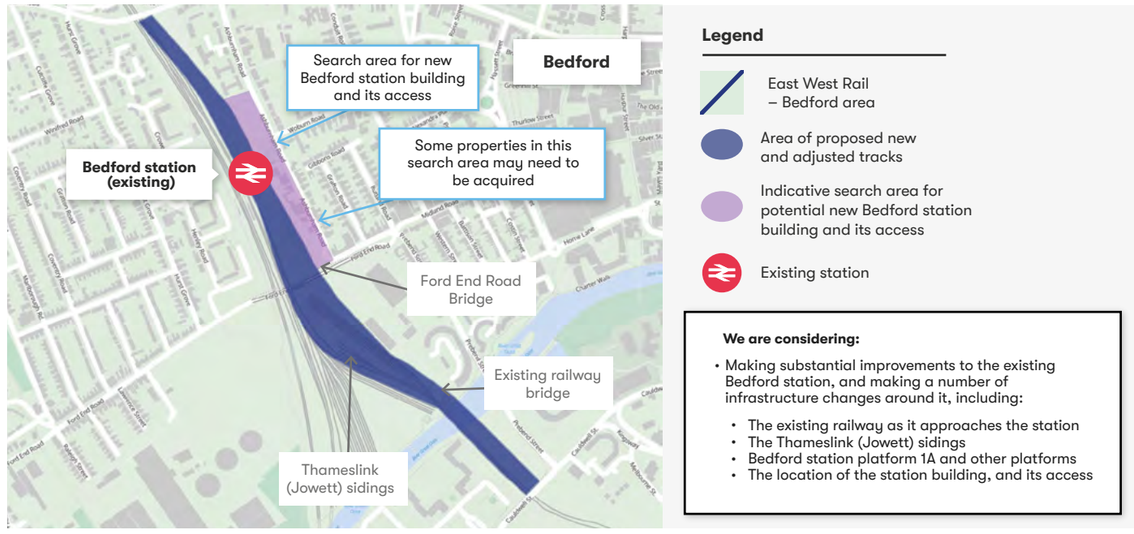


Figure 8.7: Track Schematic: Bedford station North Concept



igure 8.8: Proposed Bedford Station North Concept

platforms would then be created on the east side of the station close to the existing platforms before the tracks return to two independent EWR tracks passing under a new span of Bromham Road Bridge, north of the station.

8.4.31. This arrangement would mean that the Grain Store would be left intact, but the Jowett Sidings would need to be removed and stabling capacity for five 12-car Thameslink trains provided elsewhere. As indicated above, the removal of the existing Marston Vale Line connection at Ford End Road Bridge would create the opportunity to make some additional provision for Thameslink sidings, whilst other potential alternative locations for stabling would need to be explored during the next stage of design development. Platform 1A, the current Bletchley Bay Platform could be extended through the site of the current station building to create a platform capable of accommodating a 12-car Thameslink train, enabling Network Rail to provide an extra Thameslink platform if desired.

8.4.32. The proposed Bedford station location to the north of Ford End Road would minimise the impact on existing facilities. The majority of existing Thameslink sidings (apart from the Jowett Sidings) would be retained, which opens up the possibility of further developing the land to the south of Ford End Road, independently of the station location, as a related but separate regeneration scheme. The proposed station location would allow for future-proofing connectivity to such a development, without risking significant delays to EWR services arriving in Bedford or disruption to existing train services.

8.4.33. With the north of Ford End Road station concept there is the opportunity to create a vibrant station place, with the station acting as a gateway into Bedford and as catalyst for the regeneration of the surrounding area by improving the station presence and accessibility from the town centre, with better public transport and intermodal interchange. Designs are not yet sufficiently developed to be able to identify the precise area of land required at this stage. However, some stakeholders around the existing station may be affected by the proposed location for the station and associated facilities.

8.4.34. The North Concept for Bedford station is the emerging preference of EWR Co, and Figure 8.9 illustrates an indicative area of land that may be affected by such a regeneration concept, with a rebuilt station north of Ford End Road. There are several commercial and residential properties in this area with direct links to Ashburnham Road that may be affected and subject to demolition. Properties potentially affected include a doctors' surgery, Pentecostal Church, tyre centre, Polish community centre and some private residences. However, the design is not yet developed to a position where we are able to say which properties in this area would be subject to compulsory acquisition and demolition.

8.4.35. With a North Concept station in this location, there would be a potential opportunity to create an attractive urban station forecourt and plaza between Ford End Road Bridge, Ashburnham Road and the station and create an additional enhanced pedestrian connection directly to the town centre. The existing station footbridge could be extended to provide access to all platforms. However, there would also be the opportunity to enhance east-west pedestrian connectivity by providing a new footbridge connection that lands directly in the station plaza and connects to Queen's Park, to the west of the station.

8.4.36. One of the challenges of this station location is to be able to provide enough transport interchange, as well as sufficient car parking spaces. A high number of the existing parking spaces would be impacted by the new track alignment and a Multi-Storey Car Park (MSCP) would need to be considered, most likely to the north of the current station area and south of Bromham Road Bridge.

8.4.37. Consideration of the future transport trends should be reflected when re-providing the new car parking spaces. Options exist to provide enhanced car parking as a community hub, integrating some of the facilities needed in the community. The MSCP could be a mixed-use facility. Retail or co-working spaces could be provided at street level, together with health and/or education facilities combined to respond to community needs and to generate economic growth.

8.4.38. EWR Co will undertake further development work on the proposals for the station following this consultation. This will consider stakeholder feedback and will enable us to understand the implications of the design on the surrounding area. EWR Co will discuss the evolving proposals with affected stakeholders and formally consult on the design at a Statutory Consultation before submitting a Development Consent Order application.

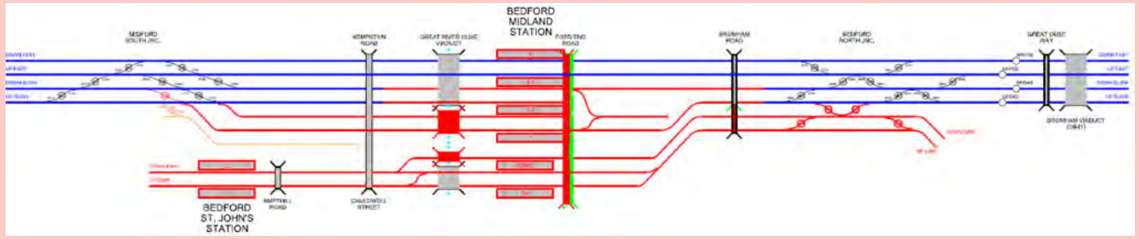
8.4.39. It is envisaged that land to the south of Ford End Road down to the riverside will be redeveloped separately by others and does not form part of the Project.

Bedford station South Concept – platforms south of Ford End Road

8.4.40. EWR Co is aware that Bedford Borough Council has an aspiration for a wider regeneration of the area around the station and has proposed a relocated station south of Ford End Road Bridge, surrounded by a significant amount of new development. The Bedford station South Concept builds on this proposition but is should be noted that third party funding would be required to deliver this alternative, which is beyond the current scope of the Project. However, if it were decided that the ambition was to create a more extensive development of the station, consideration would need to be given to the phasing of this work to enable the Project to be delivered by the end of the decade.

8.4.41. The track layout is shown in schematic form in Figure 8.9 and as a plan in Figure 8.10. In this South Concept, the Marston Vale Line would split into three tracks south of the River Great Ouse Bridge and a new river bridge span would be required for the eastbound EWR track. The three tracks would keep as far west as possible providing three platforms in the relocated Bedford station, before passing under three separate existing arches of Ford End Road bridge, giving the best opportunity to use the centre of the arches to provide the clearances required for potential future electrification. The tracks would then reconverge to two independent EWR tracks before passing under a new span of Bromham Road Bridge.

Figure 8.9: Track Schematic Bedford station South Concept)

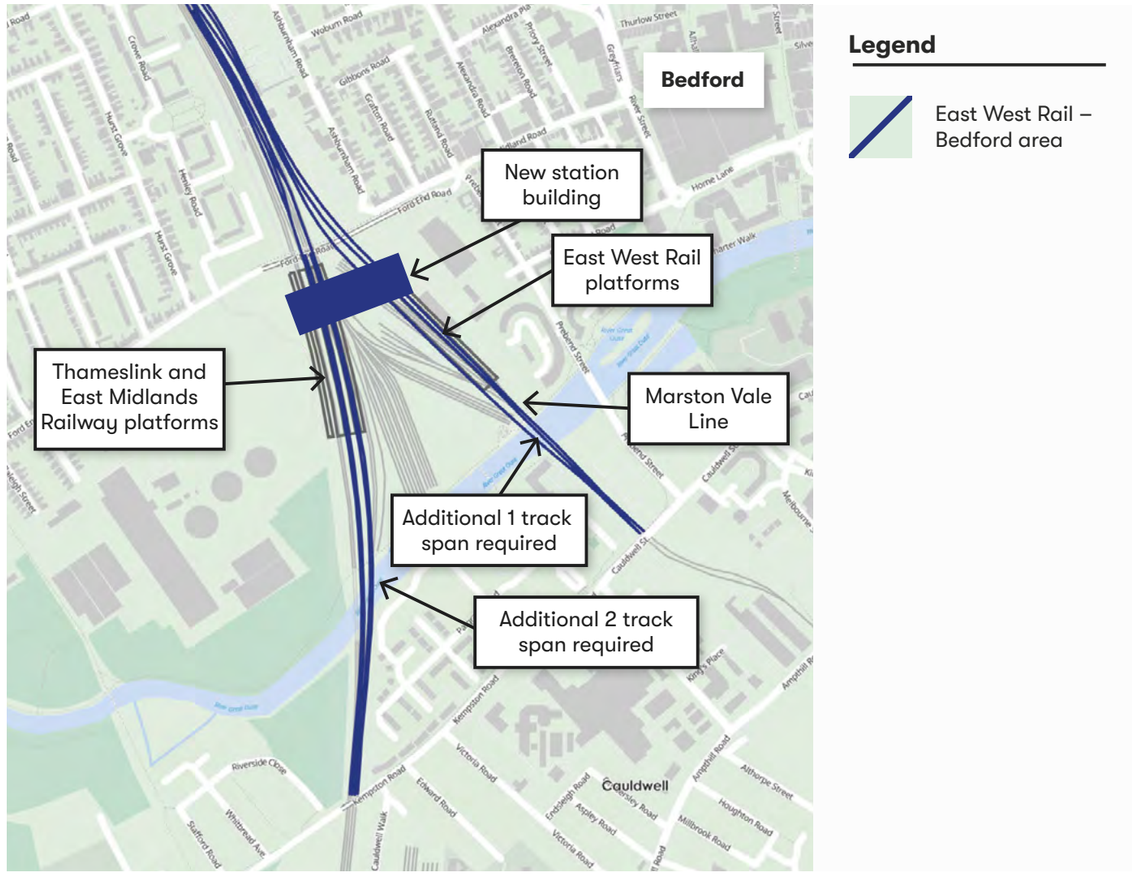


8.4.42. The Grain Store would be left intact, but a solution would need to be identified for the provision of alternatives for the existing Thameslink Sidings. EMR services on the MML would be provided with two Fast Line platforms. Thameslink would be provided with two Slow Line platforms, two 12-car bay platforms and a turnback siding between the Slow Lines north of the platforms. An additional two track span would be required across the River Great Ouse and two additional tracks would need to be provided all the way to Bedford South Junction.

8.4.43. In this South Concept, the track and platform layout would enable two different approaches to be taken with regard to the interaction of the station with its surrounding area. Firstly, a major gateway could be created by building the station with an entrance facing towards Bedford town centre. There is also the potential to repurpose the Grain Store and convert it into part of the new Bedford station building and to build a new overbridge that connects the Thameslink/MML and the EWR platforms.

8.4.44. Alternatively, the requirement to construct a new set of platforms for Thameslink would create the opportunity to provide a new station building above the tracks that would become the connector between the two sides of the railway, and at the same time create a direct access from and to the space in between the two corridors, which could be redeveloped. Figure 8.10 is illustrative of how this could work.

Figure 8.10: Bedford station South Concept



8.4.45. This South Concept would help to improve east-west connectivity in the area, as well as providing a direct connection to the platforms. Further, the more accessible and integrated it is in the area, the more successful the station would become. This approach would need to be carefully considered in conjunction with the necessary intervention to Ford End Road Bridge.

8.4.46. It should be noted that the distance between the Thameslink/MML platforms and EWR platforms is significant, especially compared with the Bedford station North Concept, north of Ford End Road, resulting in long interchange distances and substantial disbenefit to passengers, which could act as a disincentive to use the railway. In addition, the provision of platforms in this area would use a considerable amount of footprint, reducing the amount of space available for commercial and community development.

8.4.47. For the South Concept with a station south of Ford End Road, the investment required upfront to consolidate the development area would be significantly larger than in the North Concept, which can be delivered with a more modest intervention.

8.4.48. The relocation of the sidings and the land available around the site, would provide the opportunity to locate the new station facing a regenerated area with a generous forecourt to facilitate a versatile, flexible and dynamic intermodal space, where different transport modes could be integrated and provide all the necessary facilities for the passenger to choose the most accessible and convenient onward travel. The proximity to the river would further promote the modal shift to active travel, as it would improve the connection to the station from the already existing cycle and pedestrian routes.

8.4.49. As with the emerging preference for a North Concept, a multi-storey car park for this area is assumed to be required and it would be important to carefully consider the structure so that it is able to adapt and change over time as community needs and technology evolve. Designing the car park as a mixed-use space, with an entrance floor allocated to retail and other activities and ensuring that it responds to the needs of the local community, would ensure the success of the facility.

8.4.50. Figure 8.10 illustrates an indicative plan for a layout and regeneration concept, with a new South Concept station south of Ford End Road Bridge and the area around the station redeveloped down to the riverside, with the station acting as a gateway in this case.

Construction issues

Bedford station North Concept – station to the north of Ford End Road

8.4.51. A significant benefit of EWR Co's emerging preference for a North Concept is that, depending on the option chosen north of Bromham Road Bridge as discussed in the North Bedford paragraphs below, the existing platforms at Bedford station and their associated tracks would be relatively unimpacted during the works, with the new EWR platforms and tracks being built largely offline, to the east side of the operational railway.

8.4.52. Platform 1A would be extended by demolishing the existing Bedford station entrance and ticket hall (through which footprint it would pass). New Bedford station buildings would be constructed, to serve all train services passing through, during which temporary alternative ticketing and toilets would be provided for passengers. During the works, bicycle rack facilities and the availability of parking bays and the taxi rank would be likely to diminish (Thameslink and Ashburnham Road Car Parks). The present footbridge over the platforms would probably also be replaced or at least extended, these works needing night-time or weekend possessions. The new Bedford station would be substantially larger than the existing one in order to incorporate the additional three new platforms for EWR as well as a higher footfall arising from the increase in train services.

8.4.53. In addition to the Platform 1A extension, new EWR trackwork would be laid between Bromham Road and the River Great Ouse. The alignment is planned to avoid the Marston Vale Line until close to the river which will prevent conflicts with existing services. Some car parking would be lost temporarily during the works in addition to the spaces lost permanently as a consequence of the scheme.

8.4.54. The ambition and expectation is that no significant works will be required to the Ford End Road bridge, under which the new EWR alignment is planned to pass. There should be no need for contractor occupation of land other than that under railway management or required for the works between Bromham Road and the River Great Ouse.

Bedford station South Concept – platforms south of Ford End Road

8.4.55. Works for the Bedford station South Concept are far more extensive than for the North Concept. The most significant elements would be the construction of three new rail bridges/viaducts over the River Great Ouse and the building of a completely new station with multiple new platforms on the south side of Ford End Road. The two existing fast lines would be relatively untouched on the western side but all other tracks would require significant works, which would need careful planning to mitigate disruption to train services.

8.4.56. Construction access to build the

eastern-most of the two new bridges over the river would be disruptive to residents of Palgrave Road on the south side and west of Prebend Street Car Park. Demolition of some existing properties may also be required in this area depending upon the outcome of further design development. On the north side of the river, for the same bridge, there is a spiral footbridge ramp which would need to be demolished and rebuilt. Once the adjacent rail sidings have been decommissioned, construction access to the north riverbank would be straightforward for the new eastern bridge.

8.4.57. For the new western bridges, to connect onto the MML slow lines, construction access would be challenging on the south bank, close to relatively new residential properties along Champion Way. Some of these properties may be impacted to enable the new rail alignment to be built to Bedford South Junction. Access on the north riverbank would be less of a challenge, being a rail sidings area presently.

8.4.58. Construction of the new platforms and combined station to the south of Ford End Road would be a significant challenge and would need to be phased in a manner that would cause least disruption to existing train services.

8.4.59. The need to relocate the Thameslink sidings before significant works can commence could extend the programme by at least two years, impacting on the date by which EWR can open.

Comparison of concepts

8.4.60. This section of the Chapter explains why a station located north of Ford End Road is EWR's emerging preference for Bedford station. The following Assessment Factors have been the focus of the comparison as they are most likely to provide the principal differentiation between the two Bedford station concepts, including the southern approaches from the River Great Ouse:

- Capital costs;
- Overall affordability;
- Alignment with wider railway strategy / infrastructure;
- Rail passenger connectivity to existing main lines;
- Environmental impacts and opportunities; and
- Consistency with local plans.

Capital costs and overall affordability

8.4.61. The Bedford station South Concept would involve a substantially higher cost than the North Concept, given the scale and complexity of the required interventions. Additional financial contributions would be needed to make the Project affordable, creating a reliance on funds from other sources, which are not presently available to EWR. This presents a material obstacle to the choice of this solution. The timing of the wider development is also unclear and the additional interdependencies that this creates would be a major risk to the Project.

8.4.62. The South Concept works would also take considerably longer and would add significant risk to the overall Project completion date, which would also affect the cost and affordability of the Project. This is in part due to the complexity of the works, and because of the need to relocate all the Thameslink Sidings before any other work could commence.

Alignment with wider railway strategy / infrastructure and rail passenger connectivity to existing main lines

8.4.63. For the area between the A4280 Bromham Road and the River Great Ouse there would be substantially more disruption to current train services with the South Concept than with EWR's North Concept. Construction of the new platforms and combined station to the south of Ford End Road in the alternative South Concept would be a major challenge, with a significant impact on the existing MML and Thameslink operations, as well as the Marston Vale Line, and would need to be phased in a manner that would cause least disruption to existing train services.

8.4.64. EWR Co recognises the importance of maintaining existing levels of stabling provision for Thameslink trains and will provide alternative facilities in the area to replace any sidings that need to be removed to accommodate the Project. Both station concepts would require the closure of the Jowett Sidings to the east of the Marston Vale Line, which would result in the loss of five sidings that can accommodate 12-car trains.

8.4.65. However, the South Concept station to the south of Ford End Road has the significant disadvantage of requiring the removal of all the current stabling facilities, including the further 14 shorter sidings south of the station, which would also need to be removed to accommodate the station platforms. The North Concept would enable EWR to be disconnected from wider decision-making, whilst also having the potential to enhance and extend these sidings to accommodate the longer trains displaced from the Jowett Sidings. Therefore, the loss of the Thameslink sidings with the South Concept is a distinct drawback, since a new, large stabling facility would need to be sourced, designed and constructed before EWR construction could begin at Bedford. Alternatively, in the North Concept, there are a number of opportunities to replace the five sidings that would need to be removed. ings that would need to be removed.

8.4.66. These are important decisions, particularly when considering the wider redevelopment of the area, but are unlikely to be resolved in such a timescale as to enable the earliest possible introduction of EWR services. The North Concept does not preclude the relocation of the Thameslink sidings to enable the redevelopment of the area to the south, but neither does it necessitate it. It could therefore enable timely delivery of EWR services to Bedford as well as preserving the opportunity for the subsequent redevelopment of the railway lands.

Environmental impacts and opportunities and consistency with local plans

8.4.67. Both concepts provide the opportunity to improve the presence of the station in the area, to provide modern new facilities and to improve the relationship with the wider community, including the town centre. However, the South Concept presents the opportunity for a more significant redevelopment of the area with the station acting as a gateway to the town, in line with the ambitions of Bedford Brough Council and the Local Plan. The South Concept though would require additional tracks along the southern approach of the MML to Bedford station, resulting in additional land take and its consequential impacts.

8.4.68. Both options enable connectivity to the south of the station towards the riverside, enabling the provision of green space and a link to existing sustainable transport routes. However, the South Concept would enable a more holistic redevelopment of the space between Ford End Road and the river.

Compatibility with options to the north and south of Bedford station

8.4.69. Both station concepts are capable of being connected to the options for Bedford St Johns and Bedford North areas, although further design work is required during the next stage of development to confirm the details.

8.4.70. For the Bedford St Johns area, the schematics shown in Figure 8.7 and Figure 8.9 tie-in to Bedford St Johns Option 1. For the Bedford St Johns Option 2, where a new bridge is required east of the current bridge, then it would be feasible to connect back into the current proposed alignment. For this arrangement, however, the curved nature of the alignment may make the placing of switches and crossings more difficult as these should be positioned on straight track.

8.4.71. Alternatively, a Bedford St Johns Option 2 alignment could continue east of the Jowett sidings, through the Grain Store, then swinging back under Ford End Road arches. The alignment could also pass east of the Grain Store, but then Ford End Road Bridge would have to be reconstructed as it would not be possible for these alignments to pass through full height arches. The more easterly alignment also reduces the possibility of creating a good north-south connectivity to the river as the alignment would extend close to the railway land boundary particularly close to the river. These options are not currently an emerging preference.

8.4.72. At Bromham Road Bridge, the two alignment options have been drawn to match with the emerging preference of the Six Track Eastern option discussed in the North Bedford paragraphs below, with two additional tracks on the east side of the existing MML tracks. The implications of the other options in the North Bedford area are discussed below.

Summary

8.4.73. A North Concept station to the north of Ford End Road would enable EWR Co to meet the Project Objectives, whilst facilitating the regeneration of the surrounding area and enabling the redevelopment of the railway land to the south in due course, if that were to be viable. It also performs better than the South Concept, with a station south of Ford End Road as the centre of a redevelopment, against the Assessment Factors relating to cost and affordability. It would be more straightforward to construct, have a smaller impact on Network Rail and other users of the railway, make better use of existing infrastructure and would be more likely to be completed to a programme in line with the Project Objectives. It is therefore presented as the EWR Co's emerging preference for a new Bedford station.

8.4.74. The South Concept would provide the opportunity for a wider redevelopment of the area with a new station at its centre, and it is recognised that this is an aspiration of Bedford Borough Council as part of a broader development plan. However, this alternative is not the emerging preference of EWR Co because of the costs, challenges and risks involved. Instead, a station to the north of Ford End Road can be built within current budgets and aspired timescales, independently of a major redevelopment, yet acting as a catalyst for regeneration, whilst maximising the amount of railway land available for subsequent development.

8.4.75. Nevertheless, EWR recognises the aspirations of key stakeholders, including Bedford Borough Council, for the regeneration of the area to the south of Ford End Road with a new station at its heart, and remains open to considering such a solution. EWR will continue to engage with stakeholders on the South Concept. However, to take such a scheme forward, additional funding or new funding mechanisms would need to be provided as well as clarity and Government agreement on delivery timescales. The scheme would also need to perform at least as well as the emerging preference of the North Concept and meet the Project Objectives.

8.4.76. Further design work is required on the emerging preference of the North Concept during the next stage of development, considering feedback from this consultation, to ensure that it meets the operational needs of the railway, delivers a solution that supports the changing needs of the wider community, and enables the regeneration of the surrounding area.

8.5 North Bedford

Introduction

8.5.1. The North Bedford area discussed in this section of the Chapter extends from Bromham Road Bridge on the MML to a location north of Carriage Drive near Clapham Green where the alignment options diverge in Project Section D. It extends over approximately 3.3km of proposed railway. The area is shown in Figure 8.11.

8.5.2. All options in this area follow the MML corridor from Bedford station to approximately 800m north of Bromham Road. North of this point the EWR alignment rises and curves eastwards, passing under The Great Ouse Way and spanning over the River Great Ouse, Paula Radcliffe Way and Clapham Road on a single viaduct before entering a cutting to pass under Carriage Drive.

8.5.3. North of Bedford, consideration has been given to the impact which the EWR scheme might have on Midland Mainline operations and the longer-term resilience and reliability of the EWR service. Sharing the existing four track railway with MML would reduce the resilience of both services and reduce the capacity for freight traffic on the EWR lines. Providing segregated tracks for EWR is therefore beneficial but will require the acquisition of certain residential properties and other land.

8.5.4. The existing infrastructure in this area will be subject to additional demand due to the EWR services. The options generated for appraisal considered using the existing infrastructure (4-track railway) or progressively augmenting it with one or two additional tracks. The additional tracks have been considered either side of the existing ones. Five options, each with variations, have been considered and are described in the following paragraphs:

- Four Track
- Five Track Eastern
- Five Track Western
- Six Track Eastern
- Six Track Western

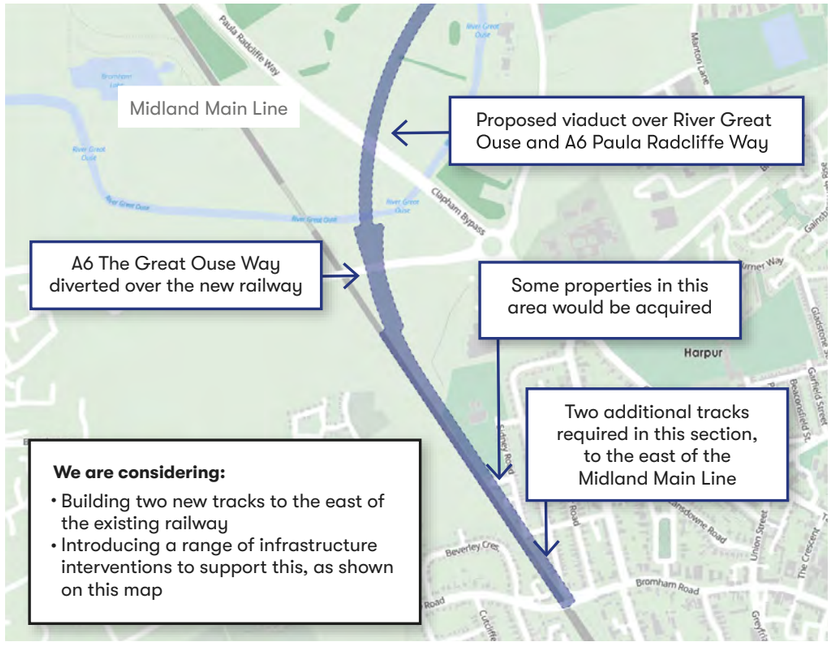


Figure 8.11: North Bedford area

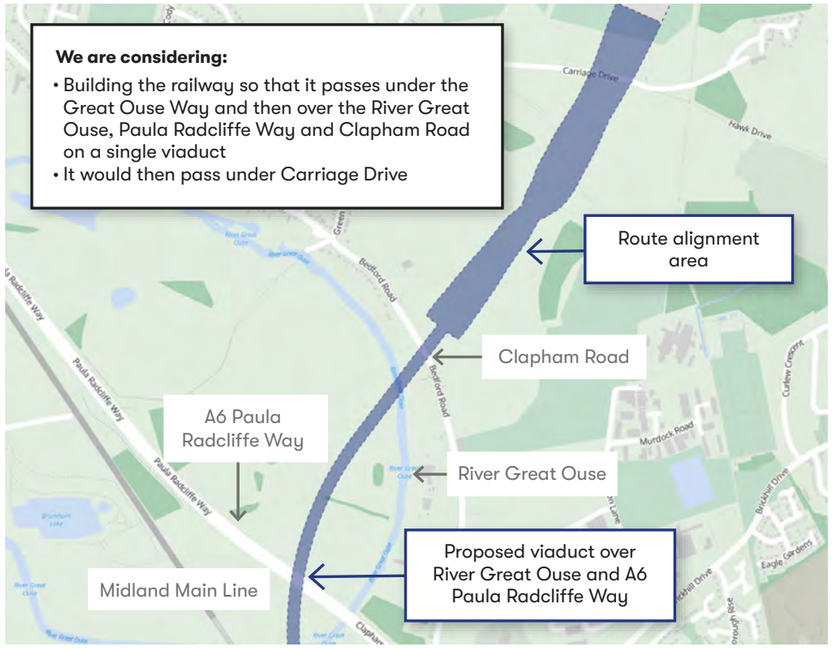


Figure 8.12: Six Track Eastern

8.5.5. The key considerations in this area include:

- The twin track connection between the new platforms on the eastern side of Bedford station (associated with a North Concept design for the station) and the alignment north of Bromham Road;
- The capacity of the MML infrastructure to support current and future passenger train services, plus freight demand;
- The risk of EWR passengers being affected by delays on the MML and vice versa;
- The ability of Network Rail and EWR to keep trains running when needing to do work on the infrastructure and when there is an unplanned incident;
- The potential disruption to MML services during construction of EWR;
- The recently reconstructed Bromham Road Bridge and the potential impact of needing to modify it to accommodate new infrastructure;
- The potential need to acquire domestic properties where land is needed for EWR;
- The potential impact of construction and operation on residents located near to the MML;
- The potential impact on the Bedford town centre Air Quality Management Area during construction and operation;
- The potential impact on the UK Power Networks Substation at Fairhill, which is close to the railway boundary, and overhead electricity lines through this area;
- The potential impact on the Brewpoint facility and on potential future development of other plots in the Fairhill Development Site;
- The potential disruption to users of The Great Ouse Way, Paula Radcliffe Way, Clapham Road and Carriage Drive during construction;
- The potential impact on the River Great Ouse and its floodplain, including ecology and amenity;
- The visual impact of an elevated railway;
- The potential impact on the proposed Anglian Water Solar Farm;
- The potential impact on residents and businesses in Clapham; and
- The ancient woodlands of Crabtree Spinney and Helen's Wood.

8.5.6. The Six Track Eastern option is the emerging preferred option for this area as it is the best performing option using the Assessment Factors. The Six Track options ensure that the Project Objectives can be met, in particular those relating to provision of a reliable, resilient and attractive passenger train service and maintaining current capacity for freight. The Six Track Western option is likely to be substantially more expensive, pose a significant risk of substantial increases in the duration of the overall Project and require frequent and lengthy closures of the MML to construct, when compared with the Six Track Eastern option.

Options considered

Overview

8.5.7. A range of options has been considered which aimed to achieve the Project Objectives whilst minimising impacts. In the Four Track option, no new tracks would be provided alongside the MML so EWR trains would share two of the existing four tracks with other trains using the MML. EWR require use of two tracks, one for each direction, to be able to provide the reliable and attractive passenger service as set out in the Project Objectives. The Five Track options provide one new track dedicated to EWR and the sharing of one or more MML tracks. The Six Track options provide two new tracks dedicated to EWR alongside the MML.

8.5.8. New track(s) could be constructed to the east or west of the MML. The new EWR platforms at Bedford station would need to be on the eastern side as explained above. Therefore, should any new track(s) be constructed to the west it would be necessary for Network Rail operations to move over to these new tracks to avoid conflicts between trains. The MML infrastructure would need to be reconfigured to achieve this.

8.5.9. For the Five Track and Six Track options the following 'reasonable worst-case' railway corridor width has been taken as the starting point for design:

- 5.5m separation (rail to rail) between the tracks used by EWR and the tracks not used by EWR, to ensure a safe space for railway staff to walk without disruption to train services and to ensure that trains are sufficiently clear of any structures, where retained or added, to support the overhead electric lines;
- 2m separation (rail to rail) between each track used by EWR to ensure EWR trains pass each other safely;
- 5m between the permanent boundary and the nearest rail to ensure sufficient space for staff to walk and work safely, for drainage to prevent flooding, for equipment cabinets to be safely positioned and for structures, where required, to support the overhead electric lines; and
- 4m between the permanent boundary and a temporary boundary to ensure sufficient space for construction activities and any works necessary to ensure that adjacent properties are not undermined.

8.5.10. It may be possible to reduce the corridor width once more detailed surveys and design are undertaken. Therefore, the areas and number of properties affected by each option are only indicative at this stage.

8.5.11. All options avoid the Wells & Co. Brewpoint brewery but would reduce the size of some of the other plots in the Fairhill Development Site. The Great Ouse Way would need to be lifted between the Clapham Road roundabout at a point approximately 650m to the east of the roundabout to ensure the tracks are sufficiently high above the River Great Ouse and the Paula

Radcliffe Way. A new bridge would be provided over EWR and a modified or replacement bridge would be needed over the MML to avoid a severe hump and dip in the road between the two bridges. The balancing pond to the north of The Great Ouse Way would need to be relocated.

8.5.12. The Paula Radcliffe Way has been treated as a constraint as it would not be possible to raise or lower it to be clear of the tracks due to the river and the connecting roads. It is not expected that Clapham Road would need to be raised or lowered.

8.5.13. In all options the new railway would enter a cutting as it passes between the ancient woodlands of Crabtree Spinney and Helen's Wood. A bridge would be provided where the railway passes under Carriage Drive and The John Bunyan Trail.

Four Track

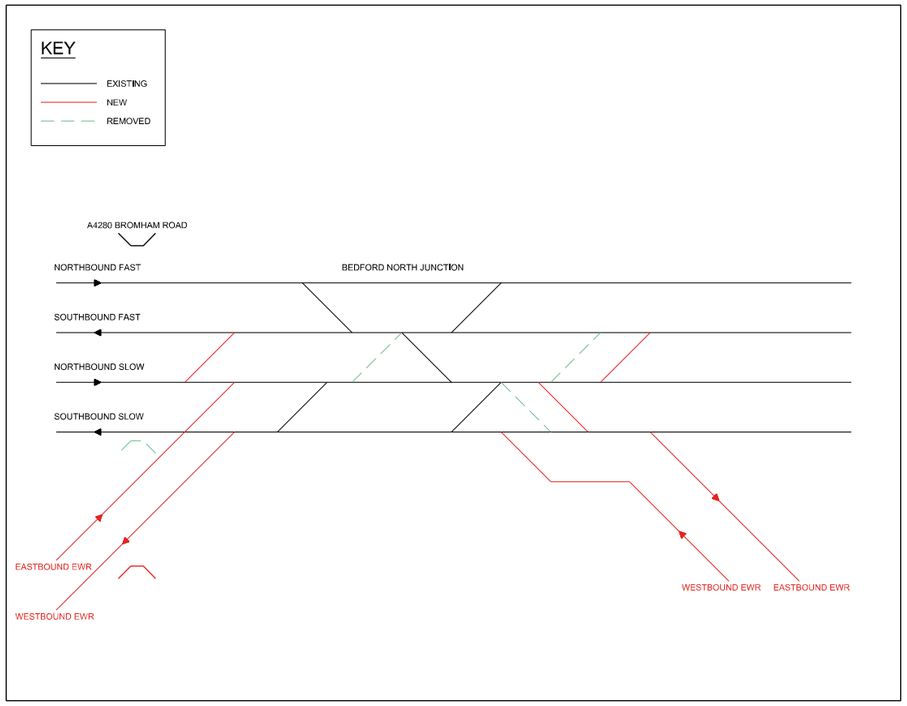


Figure 8.13: Four Track schematic

8.5.14. In this option the new EWR lines connect to the existing Slow Lines. The Slow Lines must remain connected to the rest of the MML as it is not possible to fit all the non-EWR trains which would use the MML on the two Fast Lines. In addition, the capacity provided by the Slow Lines is vital in keeping trains running during maintenance and minimising delay when the unexpected happens.

8.5.15. It would not be possible for eastbound EWR trains to share the Northbound Slow line with freight and southbound EMR stopping trains because there would be too many trains going in the opposite direction to each other along the same track for the railway to operate safely and reliably. To avoid this conflict either Bedford station would need to be reconfigured to provide an additional platform on the Fast Lines for the southbound stopping trains or, if the station remains in its current location as per the Bedford station North Concept, an alternative set of points would be needed closer to the station for these trains to access Platform 3. Providing an alternative set of points south of Bromham Road Bridge would require a reduction in the speed limit of the Southbound Fast line from 125mph to at best 110mph. The track curves through the station and a faster speed requires a more tilted track to reduce the sideways forces on passengers. The higher the tilt the more difficult it is to include points. Providing an alternative set of points north of Bromham Road Bridge where the tracks are straighter would require reconstruction of the bridge to remove the central pier and to move the Slow Lines further east. The implications of these solutions are discussed in paragraphs 8.5.44 to 8.5.98.

8.5.16. The space between the existing station, if retained in its current location as per the Bedford station North Concept, and Bromham Road Bridge is such that to avoid modifying the bridge EWR trains would be limited to 25mph until they have joined the existing four tracks. Moving the points northwards and replacing the bridge, or moving the station south, would enable a higher speed limit of 40mph. The existing Slow Lines have a speed limit of 50mph, but it may be possible to increase this to 75mph.

8.5.17. The current Bedford North Junction would need to be modified to allow EWR trains to diverge eastwards, including relocation of existing points.

8.5.18. Connecting to the existing Slow Lines imposes a constraint on where EWR trains can begin their rise and curve over the River Great Ouse and Paula Radcliffe Way. The further north the points are the steeper the gradient. The further south the points are the greater the area of land that would need to be acquired. The Four Track option starts to diverge from the MML just south of the UK Power Networks Substation, which may need to be modified. It rises at a gradient of 1 in 75 which is steeper than the limit set out in the Project Objectives and may restrict the accessibility of EWR to some freight trains that may otherwise be able to use the railway.

8.5.19. In the Four Track option the viaduct is immediately adjacent to a residential property on Clapham Road. To keep the viaduct as far as possible from this property and Woodlands Lodge, a Grade II listed building, the curve of the railway would have a radius of at best 850m. This means that the speed of trains would be limited to at best 80mph until the northern end of the viaduct, approximately 2.4km from Bromham Road Bridge, before they can accelerate to the full line speed of 100mph.

Five Track Eastern

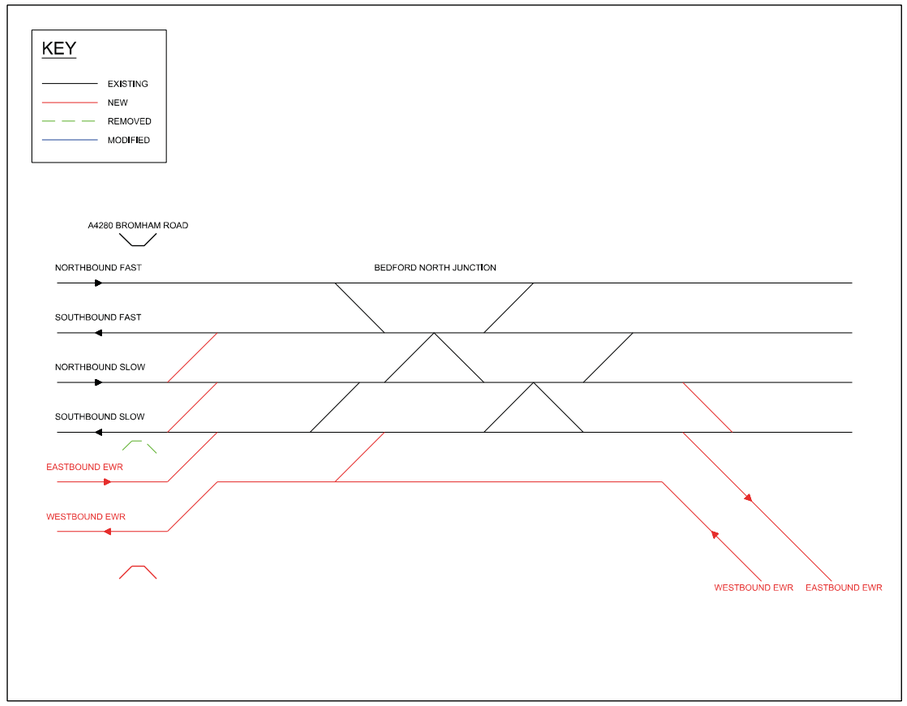


Figure 8.14: Five Track Eastern schematic

8.5.20. In this option a new track is provided to the east of the existing Southbound Slow line for use by westbound EWR trains.

8.5.21. It is likely to be necessary to acquire land alongside the existing railway corridor for this option. This includes residential and business properties on Spenser Road, Milton Road, Sidney Road, Milne Row and Chesterton Mews. The number of properties affected in this option, based on the 'reasonable worst-case' railway corridor width described in paragraph 8.5.8 is as follows:

- 17 properties are likely to require demolition;
- 28 properties may need to be acquired and/or demolished because they are attached to properties which are likely to require demolition;
- 51 properties may lose part of their garden or parking area.

8.5.22. Bromham Road Bridge would need to be extended eastwards to accommodate the new EWR track. The A4280 Bromham Road rises over the railway so it would need to begin its rise further from the railway to accommodate the extension, potentially requiring modification between the junctions with Ashburnham Road and Hurst Grove/Beverley Crescent. The access to properties on Bromham Road may need to be modified accordingly. Retaining walls or similar structures may be necessary in some locations to support its elevated position.

8.5.23. It is likely to be necessary to acquire part of the Alexander Sports Centre playing fields and to modify or relocate the UK Power Networks Substation because land acquisition for EWR would remove parts of the substation compound.

8.5.24. There are multiple variations of how the railway might be configured and trains timetabled in this option; with either two tracks dedicated to EWR services or shared use of one or both Slow lines. As per the Four Track option, the Southbound Slow line would need to remain connected to the north and south of where EWR connects to the MML, which would constrain the speed of EWR trains. In all variations it would be necessary to run passenger and freight trains in the opposite direction to each other along the same tracks, which limits the number of trains that can be accommodated.

8.5.25. The current Bedford North Junction would need to be modified to allow EWR trains to diverge eastwards, including relocation of existing points. If Bedford station remains in its current location as per the North Concept, an alternative connection between the Northbound Slow Line and Platform 1 would be needed to the south of the junction to ensure that freight trains can pass through the station when Thameslink trains occupy Platforms 2 & 3 and eastbound EWR trains occupy the Southbound Slow Line. In addition, it may not be possible for all freight trains to share the Northbound Slow line with southbound EMR trains, necessitating the engineering solutions to this problem as described for the Four Track option in paragraphs 8.5.13 to 8.5.18. Both these constraints mean that a six-track railway may be needed under Bromham Road Bridge, increasing its extension eastwards.

Five Track Western

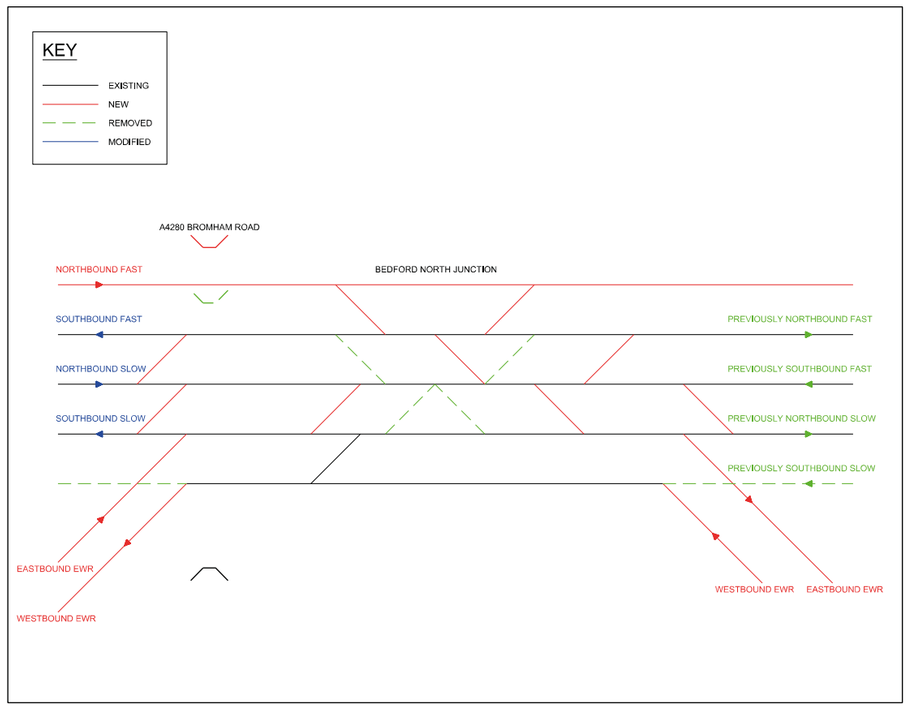


Figure 8.15: Five Track Western schematic

8.5.26. In this option a new Northbound Fast line is provided to the west of the existing four tracks. The existing Slow Lines are repurposed for EWR and stay in their current position between where they diverge into the new platforms at Bedford station and where they diverge eastwards towards Cambridge. Bedford North Junction is moved westwards to maintain the current functionality for MML operations.

8.5.27. It is likely to be necessary to acquire land alongside the existing railway corridor for this option. This includes residential properties on Granet Close and partial loss of gardens or parking areas to residential properties on Beverley Crescent and Queensbury Close. The number of properties affected in this option, based on the 'reasonable worst-case' railway corridor width described in the paragraph 8.5.8, is as follows:

- 11 properties would be likely to require demolition;
- 16 properties may need to be acquired and/or demolished because they are attached to properties which would be likely to require demolition;
- 14 properties may lose part of their garden or parking area.

8.5.28. Bromham Road Bridge would need to be extended westwards to accommodate the new EWR track. The A4280 Bromham Road rises over the railway so it would need to begin its rise further from the railway to accommodate the extension, potentially requiring modification between the junctions with Ashburnham Road and Hurst Grove/Beverley Crescent. Retaining walls or similar structures may be necessary in some locations to support its elevated position.

8.5.29. The track layout south of Bromham Road Bridge would need to be reconfigured including Bedford station. If the station remains in its current location as per the North Concept, Platform 4 would need to be moved westwards and the station footbridge extended, to avoid putting a curve in the Fast Lines and substantially reducing the speed that trains would be able to pass through Bedford.

8.5.30. As for the Four Track option, the Northbound Slow line would need to remain connected to the north and south of where EWR connects to the MML, which would constrain the speed of EWR trains.

Six Track Eastern

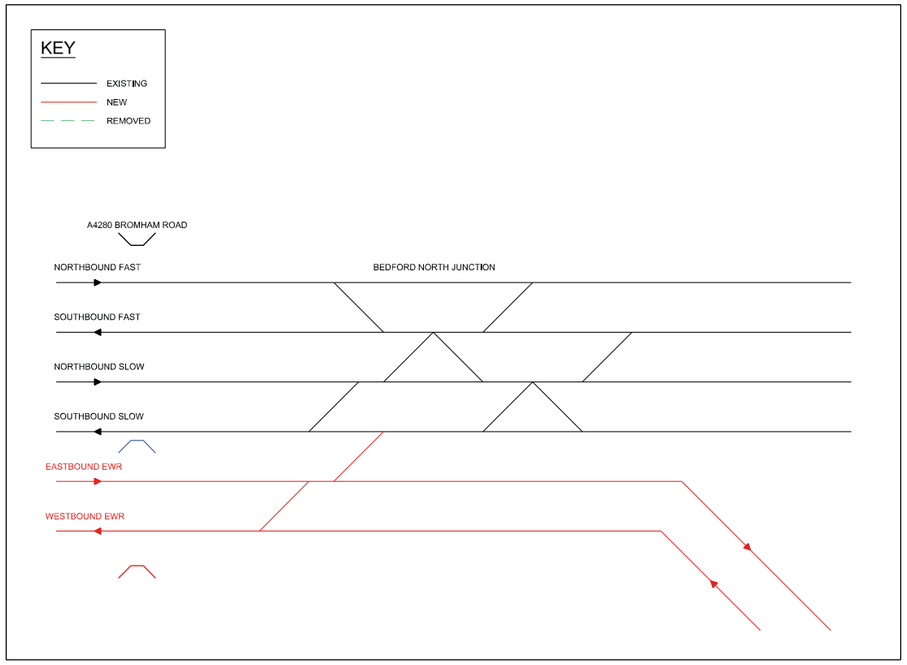


Figure 8.16: Six Track Eastern schematic

8.5.31. In this option two new tracks are provided to the east of the existing Southbound Slow line for EWR. EWR trains would only use the new tracks, maintaining the existing capacity of the MML for other trains.

8.5.32. It would be necessary to acquire land alongside the existing railway corridor for this option. This includes residential and business properties on Spenser Road, Milton Road, Sidney Road, Milne Row and Chesterton Mews. The number of properties affected in this option, based on the 'reasonable worst-case' railway corridor width described in the paragraph 8.5.8, is as follows:

- 28 properties are likely to require demolition;
- 25 properties may need to be acquired and/or demolished because they are attached to properties which are likely to require demolition;
- 44 properties may lose part of their garden or parking area.

8.5.33. Refer to Figure 8.17 for details of which properties might be affected.

Figure 8.17: Six Track Eastern properties affected in reasonable worst-case railway corridor width scenario

8.5.34. Bromham Road Bridge would need to be extended eastwards to accommodate the new EWR tracks. The A4280 Bromham Road rises over the railway so it would need to begin its rise further from the railway to accommodate the extension, potentially requiring modification between the junctions with Ashburnham Road and Hurst Grove/Beverley Crescent. The access to properties on Bromham Road may need to be modified accordingly. Retaining walls or similar structures may be necessary in some locations to support its elevated position.

8.5.35. Permanent closure and demolition of Bromham Road Bridge is not proposed due to the increase in congestion on alternative routes for traffic and the loss of an important pedestrian, bus and cycle route.

8.5.36. It would be necessary to acquire part of the Alexander Sports Centre playing fields and to modify or relocate the UK Power Networks Substation because land acquisition for EWR would remove parts of the substation compound.

8.5.37. As the new tracks would not be as constrained by the existing tracks as they would be in the Four Track and Five Track options, the Six Track Eastern option would enable EWR trains to accelerate to 80mph shortly after leaving the station and 100mph when approximately 1.9km from Bromham Road Bridge. The gradient could be at or shallower than the 1 in 80 limit set out in the Project Objectives and therefore not preclude freight from using EWR. The curve radius would be 900m and the alignment would be approximately 130m from the nearest residential property on Clapham Road.

Six Track Eastern – northern variant

8.5.38. Where the Six Track Eastern alignment curves eastwards there is an alternative to go slightly further to the north on a sharper curve with radius 800m. Paula Radcliffe Way slopes downhill in the northbound direction so the further the alignment is to the north the lower the viaduct can be, potentially reducing its visual impact and capital cost. It may also reduce the extent to which The Great Ouse Way needs to be raised. However, these benefits are negligible whilst the alignment would be approximately 50m closer to the residents of Clapham, increasing the potential for impacts such as noise, and the whole life cost of the railway would be worsened as sharper curves require more maintenance. Therefore, this variation has not been pursued.

Six Track Western

8.5.39. In this option two new tracks are provided to the west of the existing four tracks. They become the new Fast Lines. The existing Slow Lines are repurposed for EWR and stay in their current position between where they diverge into the new platforms at Bedford station and where they diverge eastwards towards Cambridge. Bedford North Junction is moved westwards to maintain the current functionality for MML operations.

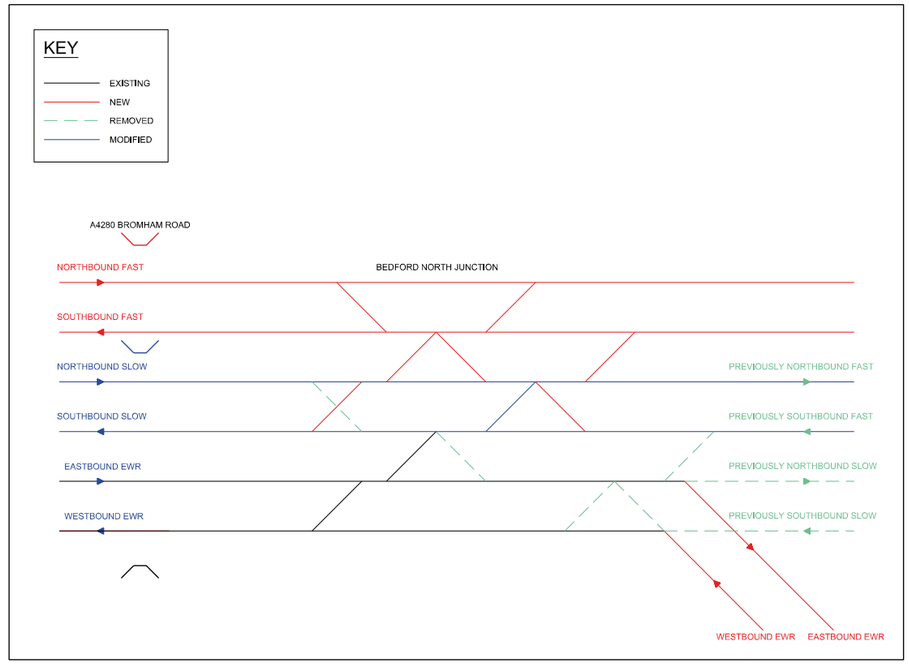


Figure 8.18: Six Track Western schematic

Figure 8.19: Six Track Western indicative track positions in reasonable worst-case railway corridor width

8.5.40. It would be necessary to acquire land alongside the existing railway corridor for this option. This includes residential properties on Granet Close and partial loss of gardens or parking areas to residential properties on Beverley Crescent and Queensbury Close. The number of properties affected in this option, based on the 'reasonable worst-case' railway corridor width described in paragraph 8.5.8, is as follows:

- 21 properties would be likely to require demolition;
- 6 properties may need to be acquired and/or demolished because they are attached to properties which would be likely to require demolition;
- 27 properties may lose part of their garden or parking area.

8.5.41. Bromham Road Bridge would need to be extended westwards to accommodate the new Fast Lines. The A4280 Bromham Road rises over the railway so it would need to begin its rise further from the railway to accommodate the extension, potentially requiring modification between the junctions with Ashburnham Road and Hurst Grove/ Beverley Crescent. Retaining walls or similar structures may be necessary in some locations to support its elevated position.

8.5.42. Bedford station Platform 4 would need to be moved westwards but further than for the Five Track Western option. It is likely that the new tracks would need to extend as far south as Kempston Road with modifications required to Ford End Road bridge and the southern bridge over the River Great Ouse. The northern bridge over the River Great Ouse may also need to be modified or replaced.

8.5.43. The following variations on the Six Track Western option have been considered, in which the existing Slow Line(s) would be moved eastwards to provide 5.5m separation from EWR as described in the 'reasonable worst-case' railway corridor width:

A. A: adding two new tracks to the west but with the existing Fast Lines staying on their current alignment (see Figure 8.20), or

B. B: adding one track to the west and one to the east (see Figure 8.21).

Figure 8.20: Six Track Western Variation A indicative track positions in reasonable worst-case railway corridor width

Figure 8.21: Six Track Western Variation B indicative track positions in reasonable worst-case railway corridor width

8.5.44. These variations result in a greater number of properties being affected as additional land would be required on both sides of the MML (see Table 8.1). Bromham Road Bridge would require a new span on the western side as well as the east with marginal, if any, reduction in the extent of work required to Bromham Road compared to the Six Track Western option. Therefore, these variations have not been pursued.

	Six Track Western	Variation A	Variation B
Residential demolition	21	30	26
Residential at-risk	6	29	36
Residential land loss	27	75	59
Business demolition	0	1	1

Table 8.1: Number of properties affected by the Six Track Western option and its variations

Comparison of options

8.5.45. The following Assessment Factors from the list agreed with the Department for Transport (DfT) are those most likely to differentiate between the North Bedford options and therefore have been the focus of the comparison:

- Transport user benefit;
- Capital costs;
- Overall affordability;
- Short-distance passenger services and connectivity to support commuting travel into key employment hubs (current and future);
- Long distance passenger services;
- Satisfying existing and future freight demand;
- Performance;
- Alignment with wider railway strategy / infrastructure;
- Environmental impacts and opportunities.

8.5.46. The following ‘Network Capability’ Assessment Factors are discussed together:

- Short distance passenger services and connectivity to support commuting travel into key employment hubs (current and future);
- Long distance passenger services;
- Satisfying existing and future freight demand.

Network capability

8.5.47. An essential test for each of the options is whether they provide enough capacity to meet demand, that is whether the number of tracks is enough for the number of trains needed to satisfy all the passengers and freight customers wishing to use the railway. The capability of the railway to accommodate these trains depends on several other considerations including the time at which they need to pass through Bedford and the track they need to use, to avoid conflicts between trains at Bedford station and elsewhere on their journey.

8.5.48. The Six Track options provide enough capacity to meet demand as the existing MML capacity would not be affected. Given that the MML is Congested Infrastructure, as explained in the introduction to this Chapter, a capacity analysis has been undertaken to assess the likelihood of the Four Track and Five Track options being able to provide enough capacity to meet demand. To be certain on the capability of the network to accommodate EWR services a full and definitive timetable including EWR services will be necessary. This will be developed later in the design process, considering the Preferred Route Alignment, station locations and interactions between EWR and Network Rail elsewhere in the Project.

8.5.49. At this stage EWR Co has considered Network Rail's draft timetable for the recently upgraded MML which introduces a sixth EMR train through Bedford to London, as detailed in the introduction to this Chapter. This assumes that service provision returns to its pre-Covid levels, but that there is no further growth, before EWR services commence. Therefore, the anticipated existing passenger service to be accommodated through North Bedford is six EMR trains per hour in each direction. The EWR service to be accommodated is four trains per hour in a 'clock-face' regular interval pattern, as explained in the Project Objectives. The ability of the Four Track and Five Track options to accommodate these passenger services has been tested with either two or three freight trains per hour in each direction, as detailed in the introduction to this Chapter.

8.5.50. EWR Co has also considered two scenarios for southbound EMR stopping trains; the current scenario in which they use the Northbound Slow Line to access Platform 3, limiting the number of trains that can use that track, and the alternative scenario in which they remain on the Southbound Fast Line, providing more capacity on the Slow Lines but necessitating one of the infrastructure solutions described with the Four Track option.

8.5.51. For the Four Track option, EWR Co's analysis has concluded that, even with southbound EMR stopping trains remaining on the Fast Lines and no growth in demand, it is unlikely to be possible to accommodate two freight trains per hour in any hour and it would not be possible to accommodate three freight trains per hour in any hour.

8.5.52. For the Five Track options the analysis has concluded that it may be possible to accommodate two freight trains per hour if they can share tracks with EWR trains or if southbound EMR stopping trains remain on the Fast Lines. If both these conditions are applied, it would be possible to accommodate two freight trains per hour and it may be possible to accommodate three freight trains per hour. However, delays would become more likely on the MML as discussed for the Performance Assessment Factor.

8.5.53. It would only be possible to satisfy future freight demand beyond three freight trains per hour by delivering the Six Track options. Similarly, it would only be possible to accommodate an increase in EWR services beyond four trains per hour, extension of Thameslink services north of Bedford or more frequent EMR services in the Six Track options.

8.5.54. As the Four Track and Five Track options include connections to the existing tracks, the gradient of the new EWR tracks would be constrained which may limit the accessibility of EWR to freight trains. The Five Track options are less constrained than the Four Track option, but the Six Track options provide the most flexibility to allow for freight trains. The objectives for freight are detailed in Chapter 3.

8.5.55. Therefore, the Network Capability Assessment Factors all favour the Six Track options.

Performance

8.5.56. If EWR services are disrupted it is important to ensure they do not cause delay to other users of the railway network because of shared track, junctions or platforms. Even if it were possible to resolve the capacity challenges discussed above the addition of EWR services to the existing network would increase the risk of delay to existing services on the MML and negatively impact network performance. If an unplanned incident requires the closure of one or more of the existing tracks the other tracks are currently used to minimise the impact on customer service. The addition of EWR services would reduce this operational resilience and delay recovery would become longer and more problematic.

8.5.57. Similarly, EWR Co needs to ensure that it can provide a reliable service to its passengers. Other cross-country routes across the UK experience performance issues due to the interaction with arterial routes to and from London. EWR Co aims to avoid this as far as it can. Given that the MML is 'Congested Infrastructure' a passenger holding a door on a Thameslink or EMR train for a few seconds in Brighton or Corby could delay EWR trains by several minutes. This could be significantly more if a freight train must clear the platforms and Bedford North Junction before the EWR train can proceed.

8.5.58. Even if EMR and EWR trains operated on separate tracks, delays can be passed from one to the other through freight unless EWR and freight are also separated. This is not possible in the Four Track option. It is only likely to be possible in the Five Track options if freight is limited to two tph in each direction and a Fast Lines solution is provided.

8.5.59. However, there would still be an increase in risk of delay on the MML in the Five Track options with EWR and freight separated due to the interaction between freight, EMR and Thameslink trains at the station. A contributing factor to this is that there is no capacity south of the station to hold a delayed northbound freight train, which must pass all the way through the Bedford area without stopping to minimise the impact of the delay on other trains.

8.5.60. It is theoretically possible to take an approach that EWR trains wait for freight trains to pass every time there is a delay, but this would have knock-on consequences elsewhere on EWR and is not compatible with the Project Objective of providing a reliable service.

8.5.61. The only way to meet the EWR service as set out in the Project Objectives in the Five Track options whilst maintaining the performance of the MML is to:

- reconfigure Bedford station including more platforms, which would be likely to require the Bedford station South Concept of new platforms south of Ford End Road and relocation of all the existing sidings for Thameslink trains; and
- provide a passing loop to hold northbound freight in or south of the station, which would be likely to require acquisition of additional properties to those required for the Five Track options and the reconfigured station; and
- limit freight to two tph in each direction, which would negate a benefit of Network Rail's MML Upgrade Project; and
- not allow for any further growth in passenger demand beyond that provided for by EMR six tph and Thameslink eight tph terminating at Bedford.

8.5.62. When Network Rail needs to undertake maintenance on or in the vicinity of the shared MML infrastructure in the Four or Five Track options it is likely that this would have a detrimental impact on EWR services. Similarly, maintenance work required to the EWR infrastructure in the vicinity of the shared section is likely to have a detrimental impact on services on the MML.

8.5.63. Therefore, this Assessment Factor favours the Six Track options.

Transport user benefit

8.5.64. As detailed for the Network Capability Assessment Factors, it is likely that for there to be enough capacity in the Five Track options it would be necessary for southbound EMR stopping trains to remain on the Southbound Fast Line rather than crossing over to the Northbound Slow Line as they do today. The importance of ensuring that southbound EMR trains are still able to stop at Bedford station is emphasised by Bedford Borough Council's Rail Strategy[62].

8.5.65. As detailed for the Four Track option, one of the solutions to make this possible would involve reducing the speed limit for southbound non-stopping trains from 125mph to at best 110mph. This would increase journey times and have a disbenefit to users of EMR services and undermine one of the key objectives of Network Rail's MML Upgrade Project which is making line speed improvements at other locations such as Market Harborough. To avoid this disbenefit, the Five Track option would need to include an additional platform on the Fast Lines or a sixth track under Bromham Road Bridge.

8.5.66. The new EWR tracks need to connect to the existing Slow Lines in the Four Track and Five Track options. These place a constraint on the speed of EWR trains north of the station. The difference in speed restriction between the options results in a journey time saving of approximately one minute in the Six Track options compared with the Four Track and Five Track options. EWR Co expects this contribution to shorter journey times between key centres of the Oxford - Cambridge Arc to have a marginal but positive impact on the overall demand for EWR services, resulting in higher transport user benefits including more people changing from other modes of transport to rail.

8.5.67. Therefore, this Assessment Factor favours the Six Track options.

Capital costs

8.5.68. The Four Track option avoids the cost of acquiring and clearing land adjacent to the existing Network Rail corridor between Bromham Road Bridge and the UK Power Networks substation. The Six Track Eastern option avoids the need to replace, relocate or enhance existing MML infrastructure, such as track junctions and the recently installed structures supporting the overhead electric lines over the existing four tracks, with the associated disruption to MML services and risk to cost and programme. The Six Track Eastern option also avoids the need for complex integration of signalling and train control systems in this area with the associated risk to cost and programme.

8.5.69. The direct costs of construction are approximately 8% higher for the Six Track Eastern option compared to the Four Track option. This includes the cost of acquiring property but excludes the cost of obtaining and managing closures of the MML and risk. At the current level of accuracy, EWR Co does not consider this cost difference to be significant. The risk of cost increase and programme delay due to the difficulty of obtaining closures of the MML and the complexity of system integration favour the Six Track Eastern option. In addition, it is likely that the Four Track option would require expansion of the existing infrastructure south of Bromham Road to mitigate some of the impact on Network Capability and Performance, such as a passing loop to hold northbound freight.

8.5.70. The Five Track options are likely to be more expensive than both the Four Track and Six Track options as they would incur the cost of modifying the existing MML infrastructure both north and south of Bromham Road as well as the cost of acquiring and clearing land adjacent to the existing Network Rail corridor.

8.5.71. For the Western Options a complex construction strategy would need to be agreed with Network Rail. The modifications to the existing

[62] https://bbcdevwebfiles.blob.core.windows.net/webfiles/Parking Roads and Travel/Strategies and projects/Bedford Rail Strategy - December 2019.pdf

track and overhead line equipment (OLE), which supports the overhead electric lines, within the North Bedford area would require the MML to be closed to most if not all trains for approximately 32 weekends for the Six Track Western option and approximately 24 weekends for the Five Track Western option. This compares to approximately 12 weekends for the Four Track and Five Track Eastern options, and potentially only one weekend closure for the Six Track Eastern option. Additional closures would be required for works to the bridges, signalling and other railway infrastructure. It is not possible to close the MML at this location every weekend and it is likely that there would need to be additional temporary works to enable existing services to keep running between the periods of work, potentially with restrictions imposed on the number and speed of trains that can run.

8.5.72. The Western Options would require tracks and platforms at Bedford station to be moved westward. As well as land acquisition, the Six Track Western option would necessitate a new bridge over the River Great Ouse south of the station, which would require closure of the MML during construction.

8.5.73. Therefore, the Western options are likely to be substantially more expensive and pose a significant risk of substantial increases in the duration of the overall Project and the associated costs and disbenefits of delay, when compared to the Eastern options. The disruption to MML services would be frequent and lengthy, resulting in customer dissatisfaction and substantial compensation costs to be paid to train operators.

8.5.74. The cost of extending Bromham Road Bridge and modifying the highway are likely to be broadly similar in all options. As detailed above, the Four Track and Five Track options are likely to require an additional track under the bridge to accommodate an alternative crossover to Platform 3 for southbound EMR stopping trains, unless the station were to be reconfigured and moved south at substantially greater cost.

8.5.75. Therefore, this Assessment Factor is likely to favour the Six Track Eastern option.

Overall affordability

8.5.76. The choice of option is not expected to make a difference to revenue or the potential for third party funding contributions.

8.5.77. Wider costs and incomes beyond EWR, such as the revenue of existing Train and Freight Operating Companies, would be affected by the choice of option if the existing number of trains on the MML were to be reduced to make space for EWR in the Four or Five Track Options. This would be contrary to the Project Objectives and would be likely to have a net negative impact on overall transport user benefit.

8.5.78. As detailed for the Capital Cost Assessment Factor, the Four Track option may have a lower up-front cost than the Six Track Eastern option, depending on the compensation costs payable to train operators and the works required south of Bromham Road. The Five Track and Six Track Western options would be more expensive than the Six Track Eastern option.

8.5.79. Considering Whole Life Cost, the Six Track options would have lower maintenance and renewal costs than the alternatives. Curved track, points and crossings cause more wear and tear than straight track without points or crossings. More wear and tear means more frequent maintenance and renewal. The Four Track and Five Track options are constrained by needing to connect to the existing tracks therefore have a sharper curve over the River Great Ouse and more points and crossings due to the connections. The difference in maintenance and renewal costs between the Six Track options is likely to be marginal. However, trains would accelerate and brake on straighter track in the Six Track Eastern option which would result in less wear and tear.

8.5.80. Therefore, this Assessment Factor is likely to favour the Six Track Eastern option.

Environmental impacts and opportunities

8.5.81. The primary benefit of the Four Track option is that it avoids the need to demolish any residential and business properties adjacent to the existing MML. The number of properties which may be affected by each option is detailed in paragraphs 8.5.6 to 8.5.43 and summarised in Table 8.1.

8.5.82. In the Four Track option the increase in train frequency on the existing MML tracks is likely to produce a minor increase in noise levels on both sides of the line. The demolition of properties in the Five or Six Track options would increase noise for the remaining properties in two ways: a) for some residential properties, opening up line-of-sight to the MML and b) introducing a railway noise source closer to the properties than was previously the case. The provision of a noise barrier would mitigate this increase.

8.5.83. The Five and Six Track options bring rail emissions closer to residential properties which has the potential for adverse air quality impacts and the Eastern options bring the railway within the Bedford town centre Air Quality Management Area.

8.5.84. In the Eastern options two trees with preservation orders are likely to need to be removed from Spenser Road as shown in Figure 8.24. In the Western options, at least thirteen trees with preservation orders may need to be removed based on the reasonable worst-case corridor width as detailed in paragraph 8.5.8. The loss of a tree with a Tree Preservation Order (TPO) would be mitigated through the provision of tree planting as part of the wider habitat compensation of the Project.

Figure 8.22: TPOs impacted by North Bedford Eastern options

8.5.85. In all options the railway would cross the River Great Ouse, which is a County Wildlife Site at this location, on a viaduct. The viaduct would be supported on piers located in the floodplain grassland habitat. The further north the alignment is, the less the impact on the river and its floodplain, albeit a marginal difference. This favours the Four Track option over the Six Track Eastern option with other options in between.

8.5.86. Two areas of lowland deciduous woodland habitat would be affected: one on the Fairhill Development Site and adjacent to the River Great Ouse, and one adjacent to Carriage Drive. There is no difference between the options in the area of woodland habitat affected, noting that much of this habitat has already been cleared as part of the Fairhill Development Site.

8.5.87. The viaduct would have a potential visual impact on residents in Clapham and users of the public right of way which crosses the river at The Ford. All options are similar in terms of alignment and elevation. The further north the alignment is the lower the viaduct is likely to need to be, due to the downhill gradient of the northbound Paula Radcliffe Way, but the difference is marginal. The further north the alignment is the closer it would be to Clapham.

8.5.88. The railway is closest to Clapham in the Four Track option and furthest away in the Six Track Eastern option, due to the constraints imposed by connecting to the existing railway. As the Four Track option is further to the north, it may have a lower impact on the potential Anglian Water solar farm when compared to the Six Track Eastern option. In the Four Track option the viaduct is immediately adjacent to a residential property on Clapham Road. The distance from the Grade II listed Woodlands Lodge is approximately 100m in the Six Track Eastern option and approximately 30m in the Four Track option. The Five Track and Six Track Western options are likely to be between these two extents.

8.5.89. In all options the railway would pass between but more than 50m from two areas of potential ancient woodland: Crabtree Spinney and Helen's Wood.

8.5.90. Overall this Assessment Factor favours the Four Track option.

Option	Western			Eastern	
Number of Tracks	**Six**	**Five**	**Four**	**Five**	**Six**
Residential demolition*	21	11	0	17	28
Residential at-risk*	6	16	1	28	25
Residential land loss*	27	14	0	51	44
Business demolition*	0	0	0	1	1
Bromham Road raised between junctions	Required		Likely	Required	
Air Quality Management Area	Increase in adjacent train frequency			Railway within Area	
Tree Preservation Orders impacted*	14	13	0	2	2
River Great Ouse impact			Lowest		Highest
Proximity to Clapham (Woodlands Lodge)			30m		100m

Table 8.2: Differentiating Environmental Impacts of North Bedford Options

*Indicative numbers based on reasonable worst-case corridor width as detailed in the paragraphs 8.5.6 to 8.5.12.

Alignment with wider railway strategy / infrastructure

8.5.91. Operating on separate tracks means that strategies and new technologies could be deployed independently between the new and existing services as may be required to meet separate operational and customer expectations. The opportunity to do this may be limited where tracks are shared.

8.5.92. The provision of two additional tracks provides flexibility to adapt to future changes in passenger and freight demand if these are different to the projections used during the design of the railway.

8.5.93. Therefore, this Assessment Factor favours the Six Track options.

Summary

8.5.94. The Four Track option almost avoids the need to acquire any residential property. Therefore, even with consideration of other environmental pros and cons, it is likely to represent a major improvement on the other options in terms of environmental impacts and opportunities. However, it would not meet the Project Objectives and poses major challenges in terms of railway capacity, operational performance and delivery.

8.5.95. Whilst the Five Track options give the potential for a lower number of property acquisitions, this is outweighed by the potential impacts on the capacity and performance of the railway.

8.5.96. The National Policy Statement for National Networks states that 'In the short to medium term, the Government's policy is to improve the capacity, capability, reliability and resilience of the rail network at key locations for both passenger and freight movements to reflect growth in demand, reduce crowding, improve journey times, maintain or improve operational performance and facilitate modal shift from road to rail'. The Four Track and Five Track Options would not accord with this policy.

8.5.97. Whilst the Western options give the potential for a lower toll in terms of property acquisition, this is outweighed by the potential impacts on delivery of the Project as a whole and on MML operations during construction.

8.5.98. Whilst the Six Track Eastern option results in the loss of property and changes to access to property, with consequent effects upon residents in the area, it is the preferred option as it:

- Ensures that EWR Co can provide a frequent and regular service to meet initial forecast passenger demand;
- Ensures that EWR services do not constrain existing freight demand on the MML;
- Provides confidence in being able to accommodate longer-term increases in passenger demand for services on EWR or MML;
- Provides potential to meet future freight demand on EWR or MML;
- Ensures that EWR trains are not slowed down or delayed by sharing the same track as passenger and freight trains on the busy main line north from Bedford station, thus helping to provide a reliable service to EWR customers;
- Ensures no detrimental effect on the performance of existing services using the MML;
- Maintains and enhances the ability of the railway network as a whole to respond to unplanned events;
- Ensures that each party would be able to undertake routine maintenance and inspections of their infrastructure safely without affecting the other, for example a closure of the MML would not mean that EWR would also need to close and vice versa;

- Avoids the need to replace, relocate or enhance existing MML infrastructure (such as track junctions and the recently installed structures supporting the OLE over the existing four tracks) with the associated disruption to MML services and risk to cost and programme;
- Avoids the need for complex integration of signalling and train control systems in this area with the associated risk to cost and programme; and
- Avoids a constraint on EWR and Network Rail being able to independently deploy strategies and new technologies as required to meet EWR Co's operations and customer expectations.

Conclusion

8.6.1. EWR Co is investigating options to reconfigure the Bedford railway infrastructure to meet the EWR Project Objectives. This involves proposals being developed for the three broad areas of Bedford St Johns, Bedford station and North Bedford.

8.6.2. In the **Bedford St Johns** area EWR Co proposes to provide at least two tracks (one in each direction). Two options have been developed, which include the relocation of Bedford St Johns station.

8.6.3. Option 1 has an alignment running beneath Ampthill Road and Cauldwell Street, and across the river, utilising existing bridges (although Cauldwell Street Bridge is likely to need to be reconstructed due to insufficient headroom clearances). It would provide a new station between Ampthill Road and Cauldwell Street with platforms that can be extended in the future. The alignment achieves a line speed of 40mph.

8.6.4. Option 2 would have a faster, 60mph alignment, running beneath Ampthill Road and Cauldwell Street, under new road bridges, before crossing the river on a new bridge, and would provide a new station with side platforms to accommodate four-car trains (with provision for eight-car trains in the future) close to the Ampthill Road – Elstow Road Pedestrian Link bridge, to the south-west of the current Bedford St Johns station.

8.6.5. EWR Co carried out an initial review of the options based around differentiating Assessment Factors. Option 1 with a station located between Ampthill Road and Cauldwell Street performs better in respect of capital costs, consistency with local plans and environmental impacts, based on the work undertaken to date. It is a more affordable option. However, Option 2, with a station located close to the Ampthill Road – Elstow Road Pedestrian Link bridge also meets the Project Objectives, remains potentially viable, and offers different benefits to the local area.

8.6.6. Option 1 is EWR's emerging preferred option, but further investigation of both options will be undertaken during the next stage of development following consultation feedback and development of the timetable. We will also assess the environmental impacts of the preferred option and report on its impacts at the next stage of consultation.

8.6.7. At **Bedford station**, new platforms and significant modifications to the existing station are required to provide the capacity for EWR services in addition to existing services. EWR Co has considered a number of concepts for the approach to the station from the River Great Ouse through to the existing station.

8.6.8. The North Concept, with a station to the north of Ford End Road would provide an option that would meet the Project Objectives. It also performs better than the South Concept (a station south of Ford End Road) when considered against the Assessment Factors relating to cost and affordability. It would be more straightforward to construct, have a smaller impact on Network Rail, Thameslink (and its stabling) and other users of the railway, make better use of existing infrastructure and would be more likely to be completed to a programme in line with the Project Objectives. It is therefore presented as the emerging preference for a new Bedford station
.

8.6.9. The South Concept would provide the opportunity for a wider redevelopment of the area and it is recognised that this has been recommended in previous work undertaken by Bedford Borough Council as part of a broader development plan. However, this alternative has been discounted as an option for EWR to promote because of the costs, challenges and risks involved.

8.6.10. Nevertheless, EWR recognises the aspirations of key stakeholders, including Bedford Borough Council, for the regeneration of the area to the south of Ford End Road with a new station at its heart, and remains open to considering such a solution. EWR will continue to engage with stakeholders on the South Concept. However, to take such a scheme forward, additional funding would need to be provided as well as clarity and Government agreement on delivery timescales. The scheme would also need to perform at least as well as the North Concept and meet the Project Objectives.

8.6.11. Further design work is required on the North Concept during the next stage of development, considering feedback from this consultation, to ensure that it meets the operational needs of the railway and delivers a solution that supports the changing needs of the wider community. In developing the design, EWR will seek opportunities to facilitate the regeneration of the area surrounding the station and to integrate with the wider development aspirations of Bedford Borough Council. We will also assess the environmental impacts and report on them at the next stage of consultation.

8.6.12. In the **North Bedford** area, north of Bedford station, EWR Co has explored how the existing railway might need to be modified to provide for EWR services. Options which retain the existing four tracks, or provide one or two additional tracks, have been considered.

8.6.13. The Four Track option minimises the need to acquire any residential property. Therefore, even with consideration of other environmental benefits and disbenefits, it is likely to represent a major improvement on the other options in terms of environmental impacts and opportunities. However, it would not meet the Project Objectives and poses major challenges in terms of railway capacity, operational performance and delivery.

8.6.14. Whilst the Five Track options give the potential for a lower number of property acquisitions compared to the Six Track options, this is outweighed by the potential impacts on the capacity and performance of the railway. The National Policy Statement for National Networks states that "In the short to medium term, the Government's policy is to improve the capacity, capability, reliability and resilience of the rail network at key locations for both passenger and freight movements to reflect growth in demand, reduce crowding, improve journey times, maintain or improve operational performance and facilitate modal shift from road to rail". The Four Track and Five Track options would not accord with this policy.

8.6.15. The options with additional tracks to the west potentially require less land to be acquired, but this is outweighed by the potential impacts on delivery of the Project as a whole and on MML operations during construction.

8.6.16. The Six Track Eastern Option results in the loss of property and changes to access to property, with consequent effects upon residents in the area, but it is the emerging preferred option as it ensures that EWR Co can provide a frequent, regular and reliable service to meet initial forecast passenger demand and it does not constrain existing freight demand on the MML. The option also provides confidence in being able to accommodate longer-term increases in passenger demand for services on EWR or MML as well as potential to meet future freight demand on EWR or MML. As it allows separation of EWR and MML operations, it ensures that each party would be able to undertake routine maintenance and inspections of their infrastructure safely without affecting the other; and it avoids the need to replace, relocate or enhance existing MML infrastructure (such as track junctions and the recently installed structures supporting the OLE over the existing four tracks) with the associated disruption to MML services and risk to cost and programme. Finally, it avoids the need for complex integration of signalling and train control systems in this area with the associated risk to cost and programme and avoids a constraint on EWR and Network Rail being able to independently deploy strategies and new technologies as required to meet EWR Co's operations and customer expectations. The Six Track Eastern option is therefore proposed to be taken forward as the emerging preferred option.

09.
Project Section D: Clapham Green to The Eversdens

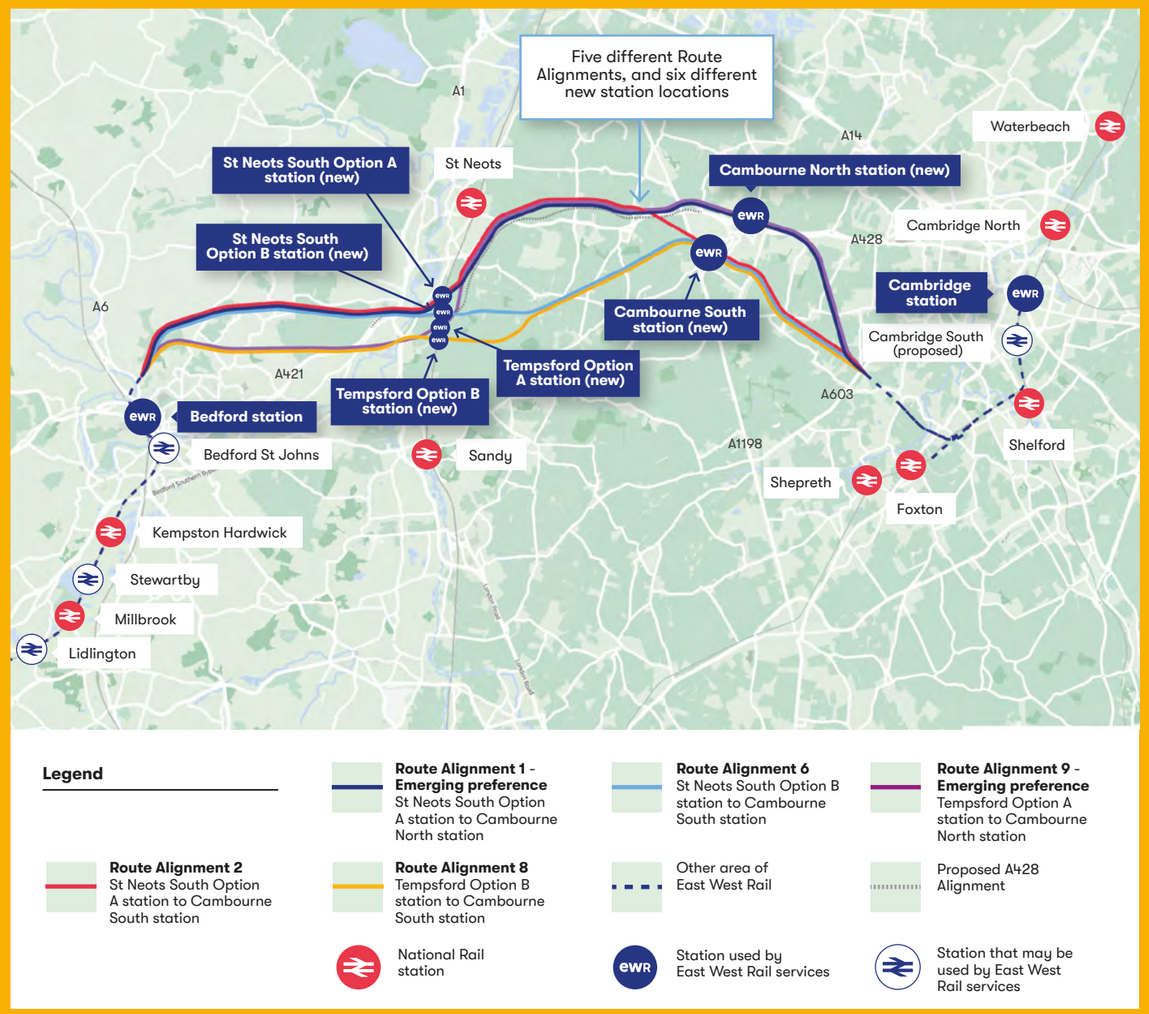


Figure 9.1: Project Section D

9.1. Chapter summary

9.1.1. This Chapter describes the proposals for the section of the Project between Clapham Green (north of Bedford) and The Eversdens (northwest of Harlton). This section of the Project will be a new railway.

9.1.2. The Chapter explains the process of option development for this section of the Project. This generated a number of possible Route Alignments for the new railway, within the area identified for Preferred Route Option E (the route announced by the Secretary of State in 2020). EWR Co also considered possible Route Alignments located partially outside that area, recognising the potential to serve a station north of Cambourne and/or to follow the route of the A428 Improvement Scheme being promoted by Highways England.

9.1.3. The Chapter describes the options considered for station locations on the new railway. There would be two new stations between Bedford and Cambridge. One would be in the Tempsford / St Neots area, to the south of St Neots, where four potential locations have been considered. This new EWR station would be distinct from the existing St Neots station on the East Coast Main Line (EMCL, the line between London, York and Edinburgh). The other new EWR station would be either to the north or to the south of Cambourne.

9.1.4. The Chapter goes on to explain that nine options were considered for the alignment of the new railway. It describes each of these options briefly. All Route Alignment Options included one of the station locations at Tempsford / St Neots and one of the station locations at Cambourne.

9.1.5. The Chapter explains the assessment and comparison of the nine Route Alignment Options and the performance of each option against the Assessment Factors, particularly focussing on those Factors where differences between options were most likely to arise. These include consideration of transport user benefits; enabling housing and growth; capital expenditure; performance; safety risk; and environmental impacts and opportunities.

9.1.6. Five of the nine Route Alignment Options, across the four possible station combinations, were identified as performing particularly well. These are the best performing options for each station combination (and two for St Neots North to Cambourne South which were close). They therefore form the **alignment shortlist for consultation**. The remaining four Route Alignment Options were not taken forward. The five shortlisted Route Alignment Options were:

- Alignment 1: St Neots South Option A to Cambourne North via the A428 Improvement Scheme corridor;
- Alignment 2: St Neots South Option A to Cambourne South via the A428 Improvement Scheme corridor;
- Alignment 6: St Neots South Option B to Cambourne South;
- Alignment 8: Tempsford to Cambourne South; and
- Alignment 9: Tempsford to Cambourne North via the A428 Improvement Scheme corridor.

9.1.7. Of the five shortlisted Route Alignment Options, two are considered to be the **emerging preferred options**, which are:

- Alignment 1 from St Neots South Option A to Cambourne North via the A428 Improvement Scheme; and
- Alignment 9 from Tempsford to Cambourne North via the A428 Improvement Scheme.

9.2. Introduction

9.2.1. Project Section D, also referred to as the Core Section, extends from Clapham Green, north of Carriage Drive, to The Eversdens, west of the location where the EWR alignment crosses the Cambridge Road (A603). Project Section C (Bedford) is located to the west and Project Section E (Harlton to Hauxton) is located to the east.

9.2.2. In the Core Section, the new railway would cross the River Great Ouse and the ECML in the vicinity of Tempsford/ St Neots.

9.2.3. There are several major highway routes in this area which interface with the Route Alignment Options presented in this Chapter. The A1 runs approximately north to south between Sandy and St Neots. The A421 joins the A1 at Black Cat roundabout South of St Neots and the existing A428 runs approximately east to west connecting Wyboston with Cambridge.

9.2.4. Highways England, the Government's arms-length body responsible for managing the Strategic Road network in England, is proposing to upgrade the A428 between Black Cat roundabout on the A1 and the existing A428 at Caxton Gibbet to the west of Cambourne and include new junctions. The preferred alignment for the A428 was confirmed by Highways England in February 2019, part way through EWR Co's 2019 consultation on the Route Options, and it is located just north of the Preferred Route Corridor. A Development Consent Order application for the proposed A428 Black Cat to Caxton Gibbett Improvement Scheme (A428 Improvement Scheme) was submitted to the Planning Inspectorate in February 2021. The proposed alignment for this scheme is shown in Figure 9.2. In light of the new information from Highways England and following comments received from respondents during the 2019 consultation regarding the A428 Scheme, EWR Co has considered how potential alignments in this area might perform compared to alignments wholly within the Preferred Route Option area.

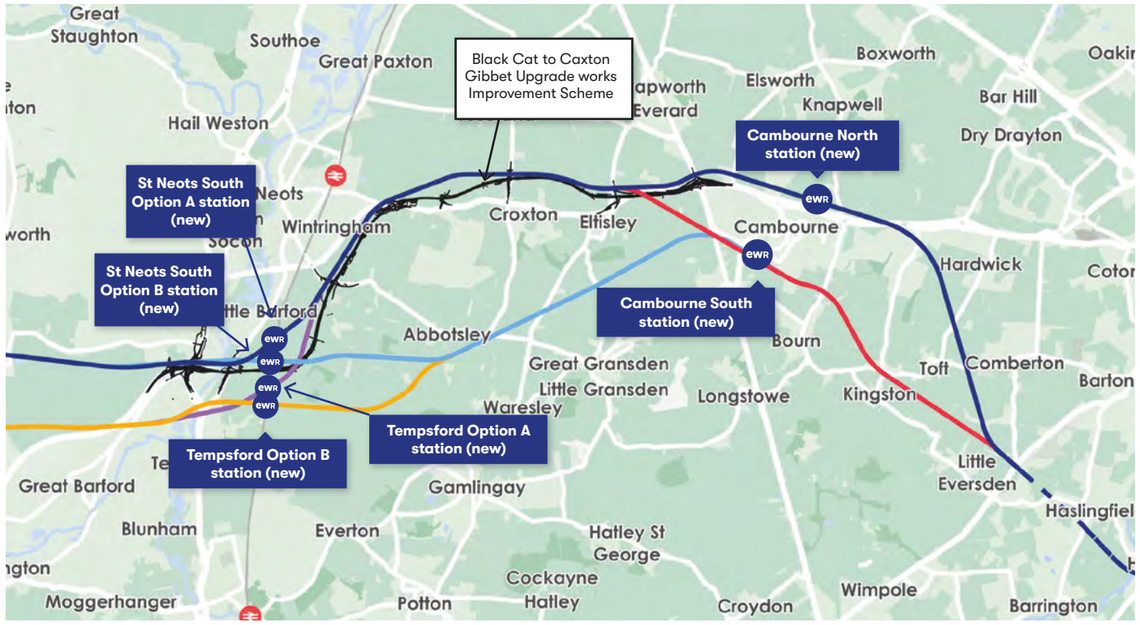


Figure 9.2: Highways England Black Cat to Caxton Gibbet Upgrade works Improvement Scheme: Highways England Black Cat to Caxton Gibbet Upgrade works Improvement Scheme

9.2.5. Two EWR stations would be located within the Core Section. Indicative locations within Preferred Route Option E were identified, and presented, in EWR Co's initial non-Statutory Consultation between January and March 2019 and the Preferred Route Option Announcement in January 2020. Broad locations for these stations on the current Route Alignment Options are shown in Figure 9.1.

9.2.6. A new station would be located where the EWR alignment crosses the ECML. Two potential areas have been identified for this station:

- The St Neots area, south of St Neots and north of the A428 Improvement Scheme. The Route Alignment Options present two possible station locations within this area. This station would be in addition to the existing St Neots station on the ECML.
- The Tempsford area, north of Tempsford and south of the A428 Improvement Scheme. The Route Alignment Options present two possible station locations within this area.

9.2.7. The EWR alignment would cross the ECML on a viaduct. A high-level station would be located on the EWR alignment with a potential corresponding low-level station on the ECML. A potential station on the ECML would allow passenger interchange between the two lines.

9.2.8. A second new station would be located in the vicinity of Cambourne. This could be located:

- South of Cambourne, near Caxton;
- North of Cambourne, north of the A428.

9.2.9. Passing loops (additional tracks to allow faster trains to overtake slower trains) may be provided at two locations within Project Section D for operations and maintenance of the railway. The number and precise location of loops, within the areas described below, will be determined at the next stage of design and may also depend on the capacity and anticipated demand for freight, as discussed in Chapter 3. The reasonable worst-case scenario is:

- Two passing loops located to the east of the village of Ravensden, between Bedford and the St Neots/ Tempsford station. One would be located either side of the main route. Crossovers would enable resilience in the network allowing bi-directional operations.
- Two passing loops located to the north or west of Cambourne, between the St Neots/ Tempsford stations and Cambourne stations. One would be located either side of the main route. Crossovers would enable resilience in the network allowing bi-directional operations.

9.2.10. At the eastern end of Section D, the Mullard Radio Astronomy Observatory (MRAO) is located on the A603, east of the Eversdens. Conversations between EWR Co and the University of Cambridge and the MRAO are ongoing to identify any impacts the railway might have on the observatory. Following this, EWR Co expects to secure and mitigation required and include it in the proposed DCO application.

9.3. Option development

9.3.1. Chapter 5 of this Technical Report describes the identification of the Route Option E Indicative Alignment and its refinement.

9.3.2. Following the refinement of the Route Option E Indicative Alignment, additional potential alignments were identified where they might provide better performance against the Assessment Factors than the Indicative Alignment. Initially these were limited to the Preferred Route Option E area.

9.3.3. The possibility of developing alignments outside the Preferred Route Option E, but within the same general area, was considered as a result of stakeholder feedback and of the preferred alignment for the A428 confirmed by Highways England in February 2019. Consequently, alignments were identified and developed to the same level of detail as alignment options within Preferred Route Option E where there was a prospect that they might offer better performance against the Assessment Factors. The alignments outside Preferred Route Option E can be characterised as follows:

- **Alignments with a station at Cambourne North**. Although an alignment via this location does tend to be longer with extended journey times than alignments with a station to the south of Cambourne, preliminary investigation suggested several opportunities. These included an increased opportunity to enable economic and housing development, fewer demolitions of private property, less drainage infrastructure, and shorter lengths in floodplain. Consequently, alignment options to the north of Cambourne were included in the identification of options.

- **Alignments following the route of the proposed A428 Improvement Scheme**. The preferred alignment for the A428 Improvement Scheme had not been published when the Preferred Route Corridor was selected. It is not within Route Corridor C or Route Option E. When the proposed A428 alignment became clear, preliminary investigation suggested an alignment in this area could have benefits including avoiding an area of weaker geology and fewer additional setting impacts to listed buildings and scheduled monuments. Alignments which follow the route of the proposed A428 Improvement Scheme are also more compatible with a station located to the north of Cambourne because route lengths are comparable to other alignments, already under consideration, that serve Cambourne North station.

9.3.4. Given these opportunities - associated with alignments serving a station north of Cambourne and alignments following the A428 Improvement Scheme - EWR Co has taken forward those options in the analysis of Assessment Factors, even though they include areas outside Preferred Route Option E. Consequently, these alignments are described in this Technical Report and compared with alignments wholly within Route Option E.

9.3.5. Bearing in mind that alignments outside Preferred Route Option E affect land that had not been identified in the Preferred Route Option, EWR Co considered whether it should revisit the Route Options considered. However, EWR Co is only considering Route Alignment Options outside the Preferred Route Option E area where there is a strong possibility these would deliver better outcomes against the Assessment Factors than alignments within Preferred Route Option E. The alignments within the Preferred Route Option can be assumed to out-perform alignments in the other Route Options not preferred in 2020, because Route Option E out-performed the other Route Options. Therefore, there is no need to consider the discarded Route Options afresh since an alignment in another route option would neither be likely to out-perform an alignment in the Preferred Route Option or the prospective alignments outside but adjacent to Route Option E. As such, the additional Route Alignment Options under consideration, that are outside the Preferred Route Option, do not affect the selection of Route Option E as the Preferred Route Option.

9.3.6. In the consultation in relation to Route Options, an emerging preference was expressed for an option that would access the centre of Cambridge from the south. Nevertheless, EWR Co and the Secretary of State were open-minded as to whether there would be advantage in accessing Cambridge from the north. This was explained in the consultation. Having considered this alternative, and taking account of the responses to that consultation, it was decided that a northern access would not be preferred.

9.3.7. Given the potential for a station at Cambourne North there remain potential alternative alignment options for accessing Cambridge from the North. For completeness, further information about the relative performance of a northern access to Cambridge has been compiled and can be found in Appendix F (See also Chapter 5).

9.3.8. The Route Alignment Options and the Preferred Route Option E area are shown in Figure 9.3 below (blue shows the Preferred Route Option E area).

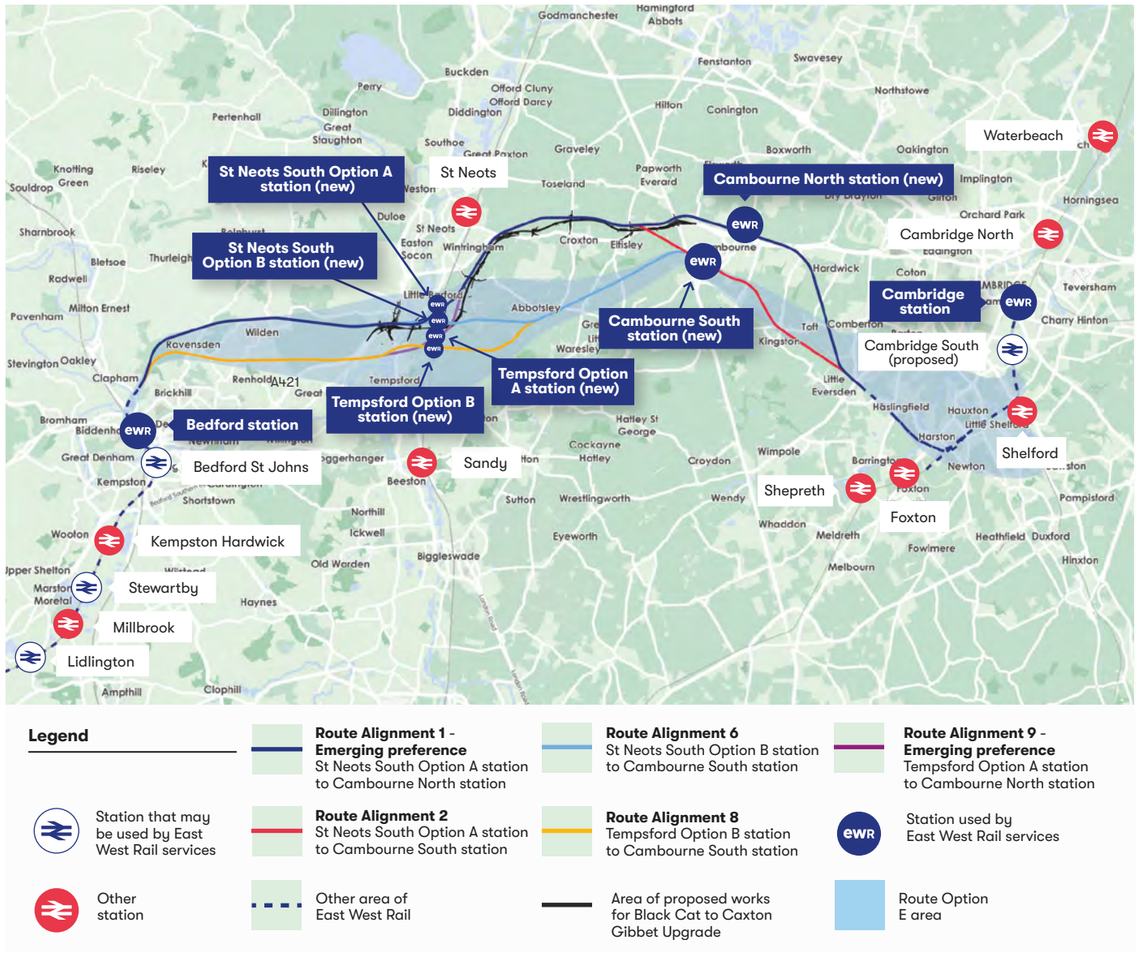


Figure 9.3: Route Option E and the Route Alignment Options Being Considered

9.3.9. Alignments were developed and considered both within Preferred Route Option E (including a connection to Cambourne North) and the A428 Improvement Scheme. Nine Route Alignment Options were developed that served the different combinations of station locations for assessment. Following the application of the Assessment Factors, described in this report, four alignments were discounted and a shortlist of five alignments was identified for consultation.

9.3.10. The full list of Route Alignment Options identified for assessment is included below. The shortlisted alignments are in bold:

- Core Section Alignment 1 - St Neots South Option A to Cambourne North station via A428 Improvement Scheme corridor
- Core Section Alignment 2 - St Neots South Option A to Cambourne South station via A428 Improvement Scheme corridor
- Core Section Alignment 3 –St Neots South Option A to Cambourne North station
- Core Section Alignment 4 - St Neots South Option A to Cambourne South station
- Core Section Alignment 5 - St Neots South Option B to Cambourne North station
- Core Section Alignment 6 - St Neots South Option B to Cambourne South station
- Core Section Alignment 7 - Tempsford Option B to Cambourne North station
- Core Section Alignment 8 - Tempsford Option B to Cambourne South station
- Core Section Alignment 9 - Tempsford Option A to Cambourne North station via A428 Improvement Scheme corridor

9.3.11. The following paragraphs discuss the comparison and analysis of the nine Route Alignment Options that informed the alignment shortlist. Two alignments are also identified as emerging preferred options in the conclusion.

9.3.12. Alignment 8 is the value engineered Route Option E Indicative Alignment and provides the Reference Alignment against which the performance of other alignments is assessed.

Table 9.1: Route Alignment Options and designated colour

Route Alignment Option	Colour
Core Section Alignment 1 - St Neots South Option A to Cambourne North station via A428 Improvement Scheme corridor	Dark blue
Core Section Alignment 2 - St Neots South Option A to Cambourne South station via A428 Improvement Scheme corridor	Red
Core Section Alignment 3 –St Neots South Option A to Cambourne North station	Emerald
Core Section Alignment 4 - St Neots South Option A to Cambourne South station	Pink
Core Section Alignment 5 - St Neots South Option B to Cambourne North station	Bright yellow

Route Alignment Option	Colour
Core Section Alignment 6 - St Neots South Option B to Cambourne South station	Light blue
Core Section Alignment 7 - Tempsford Option B to Cambourne North station	Brown
Core Section Alignment 8 - Tempsford Option B to Cambourne South station	Yellow
Core Section Alignment 9 - Tempsford Option A to Cambourne North station via A428 Improvement Scheme corridor	Purple

9.4. Options considered – station locations

9.4.1. Each of the nine Route Alignment Options that have been assessed would have two new stations. One would be in the Tempsford / St Neots area where there are four possible locations, two at Tempsford and two to the south of St Neots. The other would be in the Cambourne area where there are two possible locations, one to the south and one to the north of Cambourne. This section of the Chapter discusses each of the locations before Route Alignment Options are presented in the next section. EWR Co will consider options for connecting the stations to the existing transport network and sustainable transport modes as part of our preparation for Statutory Consultation.

9.4.2. Route Alignment Options which serve all station combinations were included in the alignment shortlist for consultation. The selection of the alignment shortlist is discussed in greater detail in the conclusions, from paragraph 9.7.1 onwards.

9.4.3. Analysis so far has identified potential housing delivery estimates for each location, as well as a qualitative summary of potential housing deliverability challenges. This is discussed in the evaluation of the Assessment Factor 'Contribution to enabling housing and economic growth' including best serving areas benefitting from developable land in paragraphs 9.6.17 to 9.6.20.

Tempsford station

9.4.4. A new Tempsford station would be located to the north east of Tempsford and east of Roxton. It would be south of the proposed A428 Improvement Scheme. The station would have a platform on each side of the alignment. Depending on the alignment, there are two possible station locations:

- Tempsford Option A (Alignment 9)
- Tempsford Option B (Alignment 7 and 8)

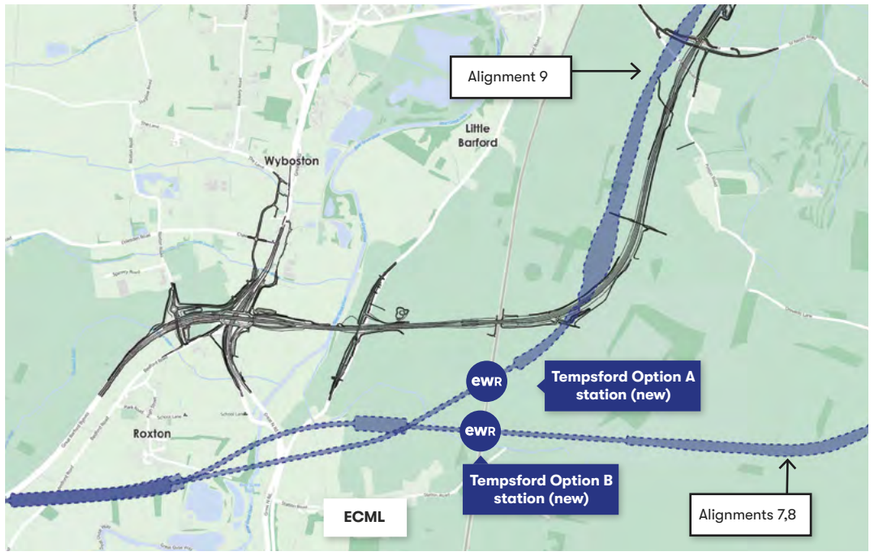


Figure 9.4: Tempsford Station area

9.4.5. Both station options would be located to the north east of Tempsford. Tempsford Option B would be closer to the existing community than Tempsford Option A station, but it is located within a flood zone requiring flood compensation at this location and flood protection measures. Flood compensation may require additional land take to manage displaced flood waters and ensure adverse flooding impacts to third party stakeholders are mitigated. Protecting critical station infrastructure might include locating plant equipment at higher elevations above the flood level or installation of flood defences. Tempsford Option A station would be located outside the flood zone. The Environment Agency is considering the modelled flood zone extents in the area of Tempsford in order to ensure they are accurate and up to date, and plans to undertake flood modelling in this area, which may affect the area of land available for housing.

9.4.6. For both options the structure over the ECML would be complex, with the station platforms located above the ECML at a high level. The structural complexity for the Tempsford Option A station would be greater than Tempsford Option B because the EWR alignment for the Tempsford Option A Station crosses the ECML at a greater skew angle.

St Neots station

9.4.7. A new station would be located to the south of St Neots town and north east of Roxton. It would be north of the proposed A428 Improvement Scheme. This would be in addition to the existing St Neots station further north on the ECML. The station would have a platform on each side of the alignment. There are two possible station locations:

- St Neots South Option A (Alignment 1, 2, 3 and 4)
- St Neots South Option B (Alignment 5 and 6)

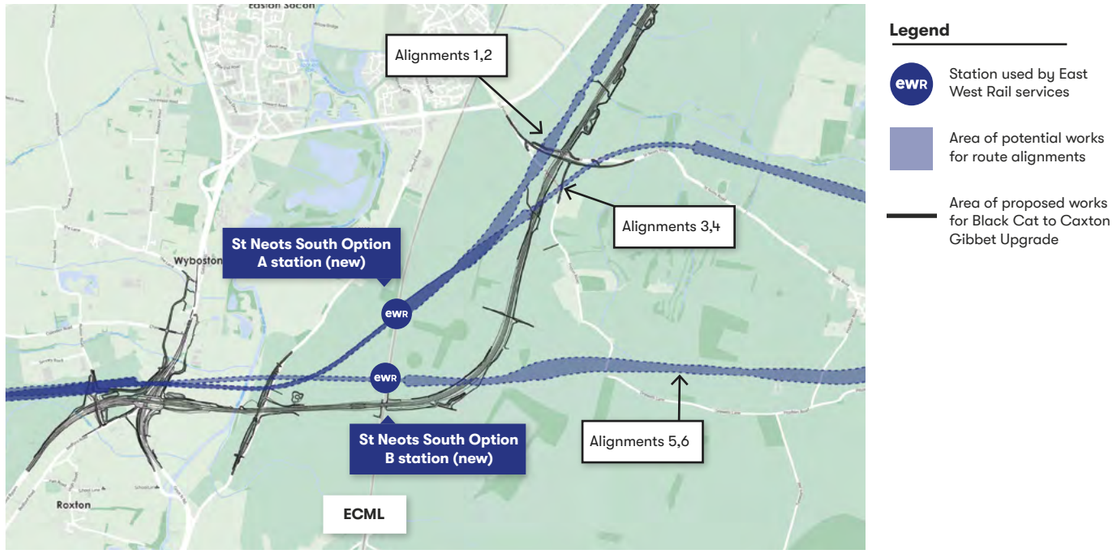


Figure 9.5: St Neots Station area

9.4.8. Both St Neots station options would be located outside the River Great Ouse floodplain. St Neots and Tempsford stations are located close to their respective communities but St Neots stations are closer to a larger number of existing properties overall. St. Neots stations also have slightly better connectivity to the proposed A428 Improvement Scheme as there would be a shorter access by road.

9.4.9. For both St Neots station options, the structure over the ECML would be complex, with the station platforms located above the ECML at a high level. The complexity of the St Neots South Option A station would be greater than the St Neots South Option B station because the northern option crosses the ECML at a greater skew angle.

EWR passenger interchange to ECML station

9.4.10. Provision has been assumed for a prospective station on the ECML with a passenger interchange with EWR. This would be at the same location as the EWR station, where the alignment crosses the ECML. A high-level station would be located on the EWR alignment (at Tempsford or St Neots) and a potential corresponding low-level station located on the existing ECML.

9.4.11. The potential ECML station, and passenger interchange with EWR, is at an early development stage. Further work is required to establish whether the level of usage and consequential effects upon the ECML would justify an interchange station and following that, to develop the design. The differentiators identified between ECML station locations at this stage are not sufficiently large to influence the assessment of the final alignment.

Cambourne station

9.4.12. There are two possible Cambourne station locations, both of which would have platforms either side of the new railway:

- Cambourne North (Alignment 1, 3, 5, 7 and 9)
- Cambourne South (Alignment 2, 4, 6 and 8)

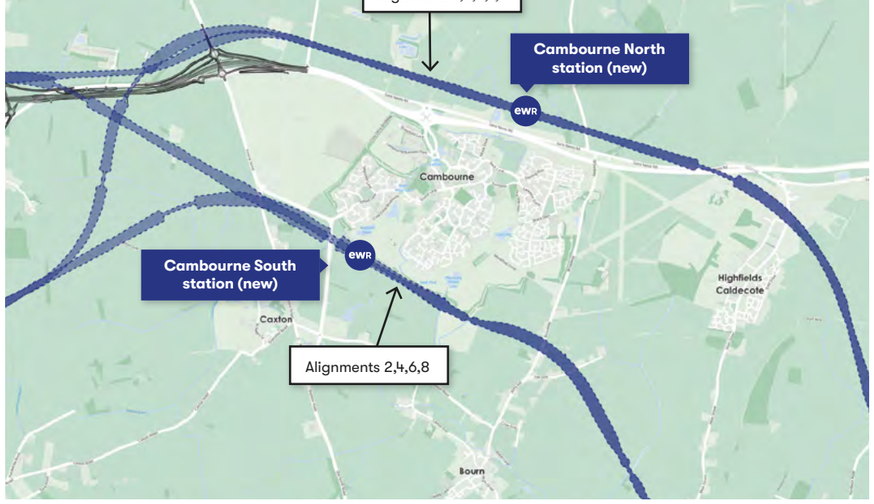


Figure 9.6: Cambourne Station options

9.4.13. All proposed station options in Cambourne would be located close to existing communities. Cambourne North station is separated from Cambourne by the A428 which may slightly reduce connectivity to the existing settlement, compared to Cambourne South, particularly for active travel options such as walking and cycling. It also positions the station further from Caxton.

9.5. Options considered – nine alignment options

9.5.1. This section of the Chapter describes each of the nine Route Alignment Options that have been assessed in turn. Afterwards, the potential benefit of synergies with the A428 improvement is discussed.

9.5.2. Four of the nine alignments were discounted following the assessment, which is described from paragraph 9.7.1 onwards. The remaining five shortlisted alignments which are included in this consultation are:

- Core Section Alignment 1 - St Neots South Option A to Cambourne North station via A428 Improvement Scheme corridor
- Core Section Alignment 2 - St Neots South Option A to Cambourne South station via A428 Improvement Scheme corridor
- Core Section Alignment 6 - St Neots South Option B to Cambourne South station
- Core Section Alignment 8 - Tempsford Option B to Cambourne South station
- Core Section Alignment 9 - Tempsford Option A to Cambourne North station via A428 Improvement Scheme corridor

Core Section Alignment 1 - St Neots South Option A to Cambourne North via A428 Improvement Scheme corridor

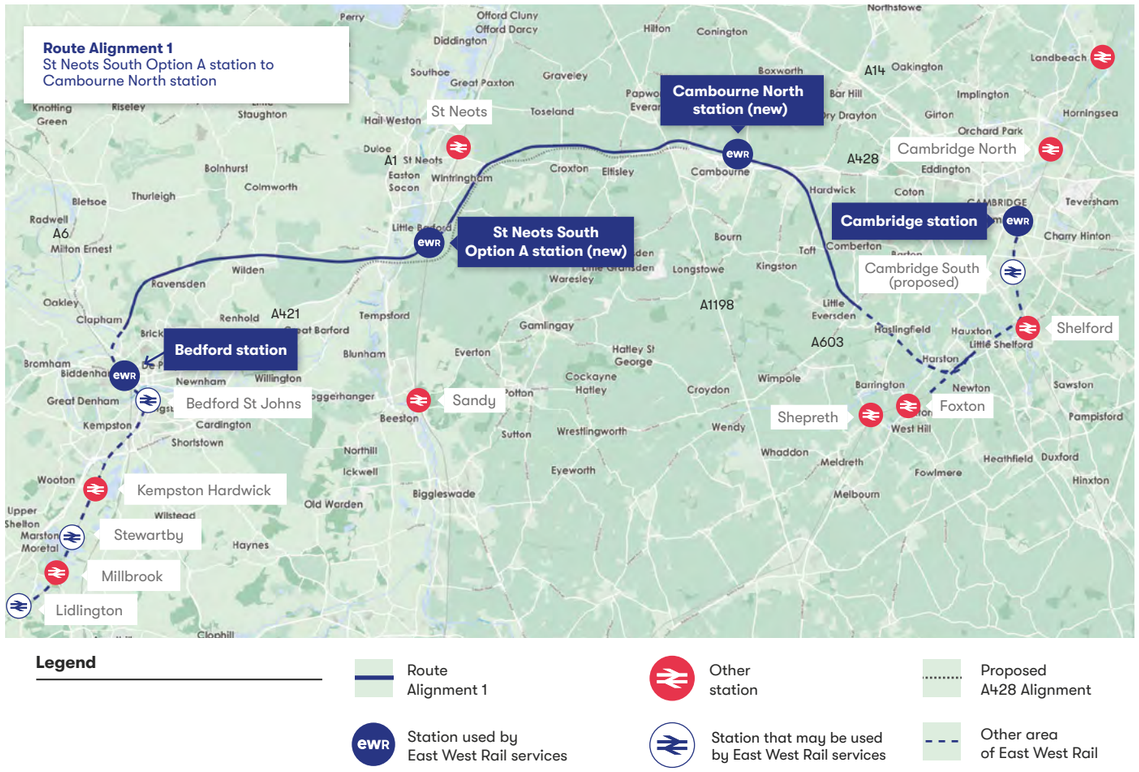


Figure 9.7:
Core Section Alignment 1

9.5.3. From Clapham Green, north of Carriage Drive, the alignment curves east and passes north of Ravensden and Roxton. A viaduct is currently proposed to the south of St Neots between the A1 Black Cat Junction and the ECML. This includes viaduct crossings of the A1 and the River Great Ouse. A new St Neots South station would be provided where the alignment crosses the ECML.

9.5.4. The alignment follows the same corridor as the proposed A428 Improvement Scheme, running to the north of the new dual carriageway and continuing to the north of Cambourne. The alignment impacts the Papworth Inn to the north west of Cambourne. The alignment does not cross the proposed A428 between the ECML and Cambourne, but it does cross the side roads which intersect the proposed A428. There is an opportunity to simplify some of these crossings through coordination with the A428 Improvement Scheme, thereby reducing capital expenditure and the extent of disruption during construction if the two schemes are built with each taking due cognisance of the other scheme.

9.5.5. A station would be provided to the north of Cambourne. The alignment curves south, to the east of Cambourne, crossing the existing A428 on a viaduct. It passes east of Caldecote and west of Hardwick and then east of Toft and west of Comberton, crossing part of Cambridge Meridian Golf Club, before converging with the other alignment options at the A603 (to the north east of The Eversdens).

Core Section Alignment 2 - St Neots South Option A to Cambourne South via A428 Improvement Scheme corridor

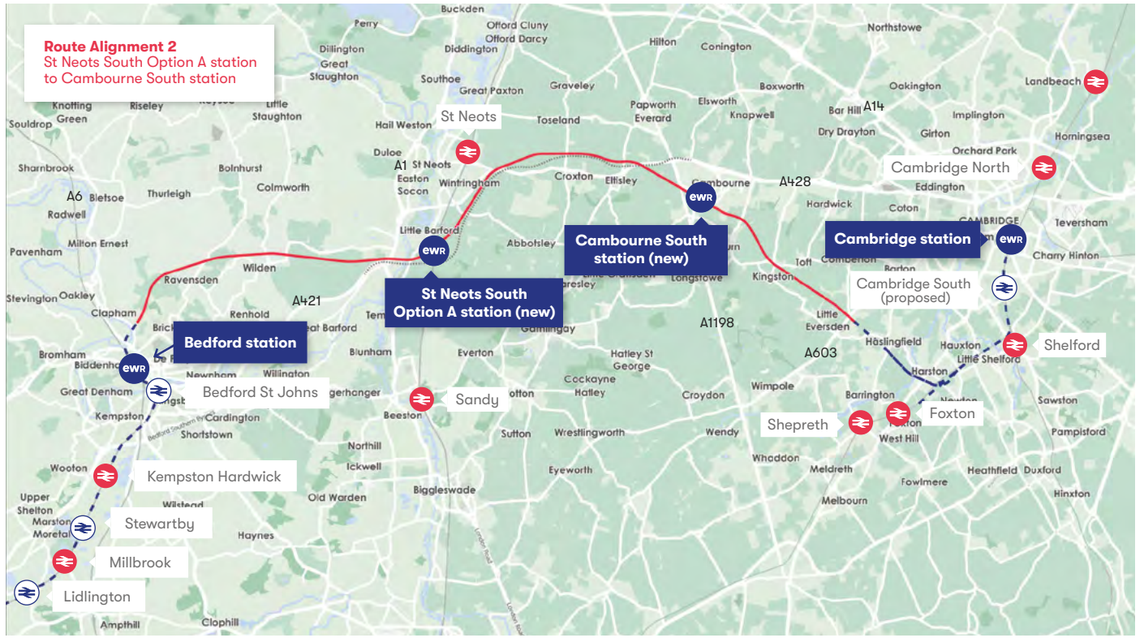


Figure 9.8: Core Section Alignment 2

9.5.6. From Clapham Green, north of Carriage Drive, the alignment curves east and passes north of Ravensden and Roxton. A viaduct is currently proposed to the south of St Neots between the A1 Black Cat Junction and the ECML. This includes viaduct crossings of the A1 and the River Great Ouse. A new St Neots South Option A station would be provided where the alignment crosses the ECML.

9.5.7. The alignment follows the same corridor as the proposed A428 Improvement Scheme, running to the north of the new dual carriageway, before turning south to cross the A428 Improvement Scheme on a viaduct to the west of Cambourne. The alignment also crosses the side roads which intersect the proposed A428. There is an opportunity to simplify some of these crossings through coordination with the A428 Improvement Scheme, thereby reducing capital expenditure and the extent of disruption during construction.

9.5.8. The alignment passes between Caxton and Cambourne and a station would be located south of Cambourne. To the south of Cambourne the alignment runs between a solar farm and Cambourne nature reserve. The alignment crosses land on the edges of both sites whilst seeking to minimise the land take.

9.5.9. The alignment passes east of Bourn and west of Caldecote and then east of Kingston and west of Toft before converging with the other alignments at the A603 (to the north east of The Eversdens).

Core Section Alignment 3 – St Neots South Option A to Cambourne North

Figure 9.9: Core Section Alignment 3

9.5.10. From Clapham Green, north of Carriage Drive, the alignment curves east and passes north of Ravensden and Roxton. A viaduct is currently proposed to the south of St Neots between the A1 Black Cat Junction and the ECML. This includes viaduct crossings of the A1 and the River Great Ouse. A new St Neots South Option A station would be provided where the alignment crosses the ECML.

9.5.11. The alignment then proceeds in a north-easterly direction, crossing the A428 Improvement Scheme on a viaduct to the north of Abbotsley Golf course, where the alignment curves to the east. It passes to the north of Abbotsley before curving northwards to the east of Caxton. The alignment passes east of Eltisley, crosses the A428 Improvement Scheme on a viaduct structure and curves to the east to follow the A428, providing a station to the north of Cambourne.

9.5.12. The alignment then curves south, to the east of Cambourne, crossing the existing A428 on a viaduct. It passes east of Caldecote and west of Hardwick and then east of Toft and west of Comberton, crossing part of Cambridge Meridian Golf Club, before converging with the other alignment options at the A603 (to the north east of The Eversdens).

Core Section Alignment 4 - St Neots South Option A to Cambourne South

Figure 9.10: Core Section Alignment 4

9.5.13. From Clapham Green, north of Carriage Drive, the alignment curves east and passes north of Ravensden and Roxton. A viaduct is currently proposed to the south of St Neots between the A1 Black Cat Junction and the ECML. This includes viaduct crossings of the A1 and the River Great Ouse. A new St Neots South Option A station would be provided where the alignment crosses the ECML.

9.5.14. The alignment then proceeds in a north-easterly direction, crossing the A428 Improvement Scheme on a viaduct to the north of Abbotsley Golf course, where the alignment curves to the east. It passes to the north of Abbotsley, between Great Gransden and Eltisley and curves to the south to pass between Caxton and Cambourne. A station would be located south of Cambourne. To the south of Cambourne the alignment runs between a solar farm and Cambourne nature reserve. The alignment crosses land on the edges of both sites whilst seeking to minimise the land take.

9.5.15. The alignment passes east of Bourn and west of Caldecote and then east of Kingston and west of Toft before converging with the other alignments at the A603 (to the north east of The Eversdens).

Core Section Alignment 5 - St Neots South Option B to Cambourne North

Figure 9.11: Core Section Alignment 5

9.5.16. From Clapham Green, north of Carriage Drive, the alignment curves east and passes north of Ravensden and Roxton. A viaduct is currently proposed to the south of St Neots between the A1 Black Cat Junction and the ECML. This includes viaduct crossings of the A1 and the River Great Ouse. A new St Neots South Option B station would be provided where the alignment crosses the ECML.

9.5.17. The alignment crosses under the A428 Improvement Scheme and passes to the south of Abbotsley. Alignment options with a crossing under the proposed A428 Improvement Scheme could be more disruptive than alignments with viaduct crossings over the proposed A428 from the perspective of impacts on traffic, assuming there will be no integration between the A428 Improvement Scheme and EWR. There is an opportunity to reduce the impact of this crossing through integration with the proposed A428 Improvement Scheme and EWR Co is collaborating with Highways England.

9.5.18. East of Caxton the alignment curves to the north. The alignment passes east of Eltisley, crosses the proposed A428 Improvement Scheme on a viaduct structure and curves to the east to follow the existing A428 with a station being provided to the north of Cambourne.

9.5.19. The alignment curves south to the east of Cambourne crossing the existing A428 on a viaduct. It passes east of Caldecote and west of Hardwick and then east of Toft and west of Comberton, crossing part of Cambridge Meridian Golf Club, before converging with the other alignments near The Eversdens.

Core Section Alignment 6 - St Neots South Option B to Cambourne South

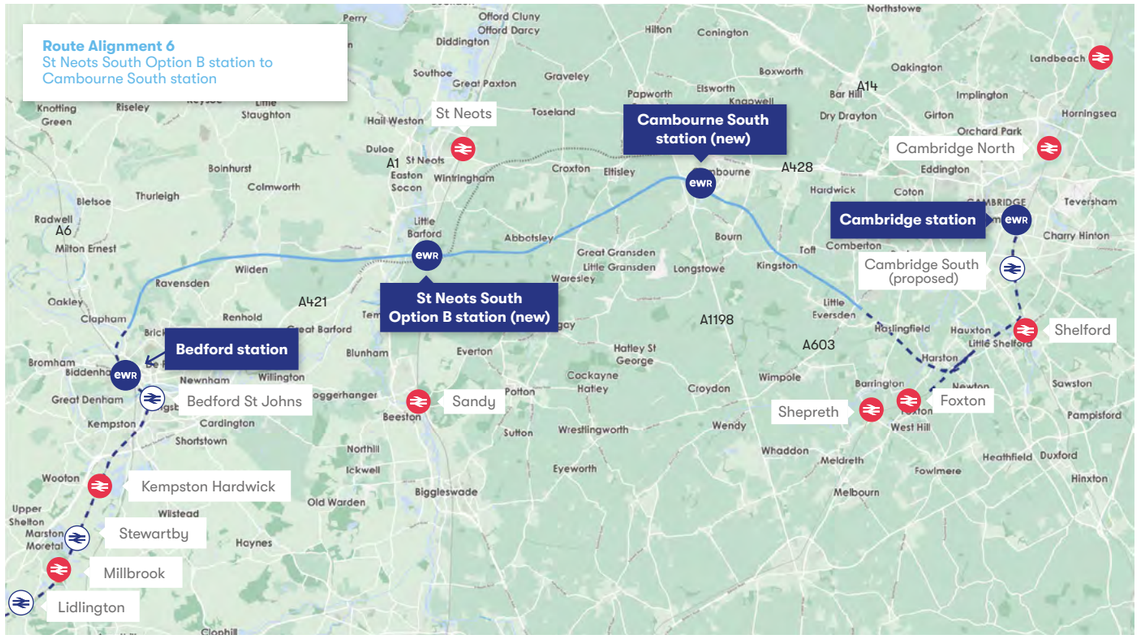


Figure 9.12: Core Section Alignment 6

9.5.20. From Clapham Green, north of Carriage Drive, the alignment curves east and passes north of Ravensden and Roxton. A viaduct is currently proposed to the south of St Neots between the A1 Black Cat Junction and the ECML. This includes viaduct crossings of the A1 and the River Great Ouse. A new St Neots South Option B station would be provided where the alignment crosses the ECML.

9.5.21. The alignment crosses under the A428 Improvement Scheme and passes to the south of Abbotsley. Alignment options with a crossing under the proposed A428 Improvement Scheme could be more disruptive than alignments with viaduct crossings over the proposed A428 from the perspective of impacts on traffic, assuming there will be no integration between the A428 Improvement Scheme and EWR. There is an opportunity to reduce the impact of this crossing through integration with the proposed A428 Improvement Scheme and EWR Co is collaborating with Highways England.

9.5.22. The alignment passes between Great Gransden and Eltisley and curves to the south to pass between Caxton and Cambourne. A station would be located south of Cambourne. To the south of Cambourne the alignment runs between a solar farm and Cambourne nature reserve. The alignment crosses land on the edges of both sites whilst seeking to minimise the land take.

9.5.23. The alignment passes east of Bourn and west of Caldecote and then east of Kingston and west of Toft before converging with the other alignments near The Eversdens.

Core Section Alignment 7 - Tempsford Option B to Cambourne North

Figure 9.13: Core Section Alignment 7

9.5.24. From Clapham Green, north of Carriage Drive, the alignment curves east and passes south of Ravensden and Roxton with viaducts over the A421 and A1 roads and the River Great Ouse. The alignment passes Brickhill Country park and affects Willow Cottage Cattery. North of Tempsford the alignment passes near to a sewage treatment works before crossing the ECML on a viaduct, where a new station would be provided. The alignment curves to pass south of Abbotsley and north of Great Gransden.

9.5.25. East of Caxton the alignment curves to the north. The alignment passes east of Eltisley, crosses the A428 Improvement Scheme on a viaduct structure and curves to the east to follow the existing A428 with a station being provided to the north of Cambourne.

9.5.26. The alignment curves south to the east of Cambourne crossing the existing A428 on a viaduct. It passes east of Caldecote and west of Hardwick and then east of Toft and west of Comberton, crossing part of Cambridge Meridian Golf Club, before converging with the other alignments near The Eversdens.

Core Section Alignment 8 - Tempsford Option B to Cambourne South

Figure 9.14: Core Section Alignment 8

9.5.27. From Clapham Green, north of Carriage Drive, the alignment curves east and passes south of Ravensden and Roxton with viaducts over the A421 and A1 roads and the River Great Ouse. The alignment passes Brickhill Country park and affects Willow Cottage Cattery. North of Tempsford the alignment passes near to a sewage treatment works before crossing the ECML on a viaduct where a new station would be provided. The alignment curves to pass south of Abbotsley and passes between Great Gransden and Eltisley.

9.5.28. The alignment curves to the south to pass between Caxton and Cambourne. A station would be located south of Cambourne. To the south of Cambourne the alignment runs between a solar farm and Cambourne nature reserve. The alignment crosses land on the edges of both sites whilst seeking to minimise the land take.

9.5.29. The alignment passes east of Bourn and west of Caldecote and then east of Kingston and west of Toft before converging with the other alignments near The Eversdens.

Core Section Alignment 9 - Tempsford Option A to Cambourne North via A428 Improvement Scheme corridor

Figure 9.15: Core Section Alignment 9

9.5.30. From Clapham Green, north of Carriage Drive, the alignment curves east and passes south of Ravensden and Roxton with viaducts over the A421 and A1 roads and the River Great Ouse. The alignment passes Brickhill Country park and affects Willow Cottage Cattery. North of Tempsford the alignment curves to the north and crosses the ECML on a viaduct, where a new station would be provided.

9.5.31. The alignment crosses under the proposed A428 Improvement Scheme and under the B1046. The B1046 is a side road which intersects with the A428 and is part of the A428 Improvement Scheme. Alignment options with crossings under roads could be more disruptive than alignments with viaduct crossings over roads from the perspective of impacts on traffic. There is an opportunity to reduce the impact of these crossings through integration with the A428 Improvement Scheme and EWR Co is collaborating with Highways England.

9.5.32. Pumped drainage may be required at the structure under the proposed A428 due to a low point in the proposed rail alignment. Further design development is needed to confirm whether this can be removed through design refinement or through combining design elements with the A428 Improvement Scheme and EWR Co is collaborating with Highways England. At this stage pumped drainage is included in the assessment.

9.5.33. The alignment follows the same corridor as the A428 Improvement Scheme, running to the north of the new dual carriageway and continuing to the north of Cambourne. The alignment impacts the Papworth Inn to the north west of Cambourne. A station would be provided to the north of Cambourne. The alignment curves south to the east of Cambourne crossing the existing A428 on a viaduct. It passes east of Caldecote and west of Hardwick and then east of Toft and west of Comberton, crossing part of Cambridge Meridian Golf Club, before converging with the other alignment options near The Eversdens.

A428 Improvement Scheme synergies

9.5.34. In parallel to the development of the EWR Project by EWR Co, Highways England (HE) is developing the A428 Black Cat to Caxton Gibbet Improvement Scheme, which provides 16km (ten miles) of new dual carriageway between A1 (Black Cat Roundabout) and Cambourne (Caxton Gibbet).

9.5.35. All of the Route Alignment Options being considered by EWR Co, with the exception of Alignment 8 (Tempsford to Cambourne South), which is entirely to the south of the new road, have some degree of interaction with the A428 Improvement Scheme:

- Alignments 1, 2, 3, 4, 5 and 6 would pass in close proximity to the A428 works at Black Cat roundabout
- Alignments 2, 3, 4, 5, 6, 7 and 9 would require a bridge under or over the A428 Improvement Scheme.
- Alignments 1, 2 and 9 run parallel and in close proximity to the A428 Improvement Scheme for approximately 12km.

9.5.36. The EWR Project is at an earlier stage of development than the A428 Improvement Scheme. So, to facilitate the application of the Assessment Factors, for option selection, a consistent approach to how the EWR Project would affect the A428 Improvement Scheme was adopted. This assumed that no integration would be possible due to the more advanced stage of the A428 Improvement Scheme. This provided a worst-case scenario for the delivery of EWR.

9.5.37. However, in coordination with Highways England and the Department for Transport (DfT), EWR has completed some initial reviews to consider the extent to which construction, operational and environmental synergies can be created by working together. This process has identified a number of potential benefits, and disbenefits, that could be achieved through integrating the two transport schemes to varying degrees. The possible impacts of A428 Improvement Scheme synergies have been considered, outside the Assessment Factors, when shortlisting Route Alignment Options as described in paragraphs 9.7.1 to 9.7.24.

9.5.38. There is an opportunity, by working with Highways England, to modify the design of the A428 Improvement Scheme to better accommodate the new railway. This opportunity could:

- Allow the railway to run closer to ground level, particularly in the areas around the proposed A428 Improvement Scheme junctions and reduce the volume of earthworks and number / length of structures required for EWR.
- Allow EWR to consider moving the railway closer (horizontally) to the road alignment where possible which may have benefits for construction and reduce overall impacts of the Project.
- Allow integration of the construction programme for both schemes, to be more efficient and minimise the overall period of time for which residents are affected by construction.
- Create efficiencies arising from joint arrangements to divert underground and overhead utility services.

9.5.39. While some impacts, such as those listed above, could be reduced, others may be increased as a result of the two schemes being located closer together. These will be evaluated as part of the design process and both benefits and disbenefits will be considered together to determine the most appropriate solution.

9.5.40. The work to quantify and assess the engineering changes required, possible impacts, and benefits and disbenefits of this integration is ongoing. The potential areas of change, and possible impacts are described in Appendix D.

Value Management opportunities

9.5.41. A Value Management exercise will be completed at the next design stage. During this, the design of the preferred alignments will be assessed, developed and refined to improve their design. Refinements could have several benefits including reducing cost, reducing environmental impacts and improving constructability. A number of potential opportunities have been identified which will be investigated at the next design stage. These have been logged for all the alignments under consideration.

9.5.42. An initial list of Value Management opportunities has been identified which are described in Appendix D. This list is not definitive, as further opportunities may be identified through the consultation process and ongoing design development. At this stage, Value Management opportunities are not expected to differentiate between options, except in relation to the potential synergies with the A428 Improvement Scheme.

9.6. Comparison of nine Route Alignment Options

Approach

9.6.1. The nine Route Alignment Options were assessed using the Assessment Factors with the aim of identifying a short list of options for consultation and an emerging preferred option or options. This section of the Chapter describes that assessment. The shortlisted alignments identified by that process for this consultation are:

- Core Section Alignment 1 - St Neots South Option A to Cambourne North station via A428 Improvement Scheme corridor
- Core Section Alignment 2 - St Neots South Option A to Cambourne South station via A428 Improvement Scheme corridor
- Core Section Alignment 6 - St Neots South Option B to Cambourne South station
- Core Section Alignment 8 - Tempsford Option B to Cambourne South station
- Core Section Alignment 9 - Tempsford Option A to Cambourne North station via A428 Improvement Scheme corridor.

9.6.2. Each Route Alignment option is compared against the Reference Alignment, provided by Alignment 8, for each Assessment Factor (and Considerations supporting the Assessment Factors). This shows if the alignment option is an improvement on, the same as, or a worsening from, the Reference Alignment. This then gives an indication of the relative performance of each option compared to the Reference Alignment.

9.6.3. Alignment 8 has been chosen as the Reference Alignment because it is a version of the Route Option E Indicative Alignment which has undergone design development as described in Chapter 5. It serves the same stations as the Route Option E Indicative Alignment and is within the Preferred Route Option E boundary.

9.6.4. The designs have been assessed on the basis of EWR and the A428 Improvement Scheme being two separate independent projects. This assumed that no integration would be possible due to the more advanced stage of the A428 Improvement Scheme. However, opportunities presented by synergy with the A428 Improvement Scheme have been considered in the shortlisting of alignments in terms of whether they would be likely to favour one alignment over another.

9.6.5. With the exception of the A428 Improvement Scheme synergy, the Value Management opportunities have not been included in the selection of the alignment short list. No Value Management opportunities were included in the application of Assessment Factors. Opportunities have been identified on all alignments and subsequently Value Management activities are not expected to disproportionately benefit one alignment over another. At this stage the Value Management opportunities have not been investigated to determine their feasibility or quantify their benefits.

9.6.6. Train stabling and depot facilities may be required in Project Section D to facilitate the maintenance and storage of infrastructure and rolling stock. Further description of the function of such facilities are provided in Chapter 3. Work to identify the preferred location(s) for train stabling and depot facilities is ongoing and details will be shared at the Statutory Consultation. It is possible to provide facilities on all Route Alignment Options and it is not expected to be a determinant when short listing alignments. Consequently, depot and stabling locations have not been included in the assessment of alignments.

Summary of assessment

9.6.7. As set out in Chapter 5, a series of factors has been agreed with DfT that reflect the Project Objectives and are used to assess options and arrive at a short list and/or preferred option. All Assessment Factors have been considered in the assessment but those that differentiate between Core Section options at this stage are presented as the focus here. These are the factors that differentiate between Route Alignment Options in the Core Section and therefore have helped to identify the short list:

- Transport User Benefits (journey time and modal shift) together with short distance passenger services;
- Contribution to enabling housing and economic growth including best serving areas benefiting from developable land;
- Capital Cost (including programme risk);
- Overall affordability (maintenance and renewal);
- Performance (infrastructure reliability, and resilience);
- Safety risk (operations and maintenance); and
- Environmental impacts and opportunities.

9.6.8. Table 9.2 presents the outcomes of assessments against the **differentiating** Assessment Factors (and Considerations that support the Assessment Factors). Differentiating Considerations for each Assessment Factor are shown directly underneath the relevant Assessment Factor in the table. The assessment for the capital cost factor has been combined with the overall affordability factor as the dominant factor in both these assessments is the cost to implement the Project. This is described in greater detail in the following sections of this Chapter below.

Table 9.2: Project Section D Options Assessment Outcomes

Assessment Factors		Tempsford to Cambourne South	Tempsford to Cambourne North		St Neots to Cambourne North			St Neots to Cambourne South		
		Alignment 8 (Benchmark)	Alignment 9 (A428)	Alignment 7	Alignment 1 (A428)	Alignment 3	Alignment 5	Alignment 2 (A428)	Alignment 4	Alignment 6
Assessment Factor	**Transport user benefits**	**Neutral**	**Minor Worsening**	**Minor Worsening**	**Minor Worsening**	**Minor Worsening**	**Minor Worsening**	**Neutral**	**Neutral**	**Neutral**
Consideration	*Journey time*	*Neutral*	*East +01:52 West +01:52*	*East +01:53 West +01:36*	*East +01:38 West +01:36*	*East +01:50 West +02:09*	*East +01:51 West +01:40*	*East +00:25 West +00:43*	*East -00:01 West +00:07*	*East +00:01 West -00:02*
Consideration	*Modal shift*	*Neutral*	*Minor Worsening*	*Minor Worsening*	*Neutral*	*Neutral*	*Neutral*	*Minor Improve*	*Minor Improve*	*Minor Improve*
Assessment Factor	**Housing and Growth**	**Neutral**	**Minor Improve**	**Minor Improve**	**Minor Improve**	**Minor Improve**	**Minor Improve**	**Neutral**	**Neutral**	**Neutral**
Assessment Factor	**Capex (coresection)**	**Neutral**	**Neutral**	**Neutral**	**Minor Improve**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Minor Improve**
Consideration	*Up front cost £bn (2019 prices)*	*£2.3bn - £2.5bn*	*£120m to £130m less -5%*	*Circa £50m more +2%*	£310m to £340m less -14%	*£160m to £170m less -7%*	*£200m to £230m less -9%*	*£210m to £230m less -9*	*£190m to £200m less -8%*	£270m to £300m less -12%
Consideration	*Programme risk*	*Neutral*	*Minor Worsening*	*Minor Worsening*	*Neutral*	*Neutral*	*Neutral*	*Minor Improve*	*Minor Improve*	*Minor Improve*
Consideration	*Maintenance cost*	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*
Consideration	*Renewal cost*	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*
Assessment Factor	**Performance**	**Neutral**	**Neutral**	**Neutral**	**Minor Improve**	**Neutral**	**Neutral**	**Minor Improve**	**Neutral**	**Neutral**
Consideration	*Inf reliability*	*Neutral*	*Minor Improve*	*Neutral*	*Minor Improve*	*Neutral*	*Neutral*	*Minor Improve*	*Neutral*	*Neutral*
Consideration	*Resilience*	*Neutral*	*Minor Worsening*	*Neutral*	*Minor Improve*	*Minor Improve*	*Minor Improve*	*Minor Improve*	*Minor Improve*	*Minor Improve*
Assessment Factor	**Safety Risk**	**Neutral**	**Neutral**	**Neutral**	**Minor Improve**	**Neutral**	**Minor Improve**	**Minor Improve**	**Minor Improve**	**Minor Improve**
Consideration	*Construction*	*Neutral*	*Neutral*	*Neutral*	*Minor Improve*	*Neutral*	*Minor Improve*	*Minor Improve*	*Minor Improve*	*Minor Improve*
Consideration	*O&M*	*Neutral*	*Minor Improve*	*Neutral*	*Minor Improve*	*Minor Improve*	*Minor Improve*	*Minor Improve*	*Minor Improve*	*Minor Improve*
Assessment Factor	**Environmental**	**Neutral**	**Minor Improve**	**Minor Improve**	**Major Improve**	**Major Improve**	**Major Improve**	**Major Improve**	**Major Improve**	**Major Improve**

Improve = Improvement; Italics = a Consideration that feeds into the assessment of an Assessment Factor. The estimated cost ranges represent the capital cost order of magnitude costs for the core section. This is based upon the engineering design for non-statutory consultation. Excluded from these figures are operation & maintenance costs, land and property, and any inflation beyond 2019.

Commentary

9.6.9. The following sections of this Chapter discuss the performance of the nine Route Alignment Options against each of the differentiating Assessment Factors and Considerations in turn.

Transport user benefits

9.6.10. Journey time (one of the considerations within the transport user benefits Assessment Factor) was the most helpful Consideration in the assessment of the overall transport user benefits when differentiating between alignments. EWR Co expects journey times to influence demand take-up and deliver benefits in the form of journey time savings, revenues and modal shift to rail away from less sustainable modes of transport, such as private vehicles. The assessment also reflects the differences in short distance connectivity to support commuting travel, and short distance passenger services, for each alignment.

9.6.11. The alignments which serve a Cambourne North station (Alignments 1, 3, 7 and 9) are longer than those which serve a Cambourne South station and consequently have longer journey times, compared to the Reference Alignment (Alignment 8 – Tempsford to Cambourne South). Overall, Alignment 3 has the longest journey time out of the options that serve a Cambourne North station. Longer journey times result in lower modelled transport user benefits.

9.6.12. Alignments which serve a station at Cambourne South (Alignments 2, 4 and 6) have lengths, and subsequently journey times, that are more closely comparable to the Reference Alignment (Alignment 8 – Tempsford to Cambourne South). Alignment 2 has the longest journey time out of the options that serve a Cambourne South station.

9.6.13. Modal shift benefits (the other differentiating Consideration contributing to the transport user benefits Assessment Factor) were considered for existing residents of the corridor (which excludes benefits from future demand generated from new developments, which are captured in the housing and economic growth Assessment Factor) were based on a high-level qualitative assessment of the proximity to existing users to capture the ability of the station to attract new local patronage.

9.6.14. Performance of the different station locations for modal shift benefits is as follows:

- Cambourne South (Alignment 8, 2, 4 and 6) stations perform slightly better than Cambourne North (Alignment 9, 7, 1, 3 and 5) stations. Cambourne North station is separated from Cambourne by the A428 which may slightly reduce connectivity, especially for active travel options. This could be mitigated in part through the provision of new foot and cycle crossings over the A428. Cambourne North also positions the station much further from Caxton, discouraging this existing community from active travel to the station.
- St Neots station (Alignments 1-6) options perform better than Tempsford station (Alignment 7-9) options. Both are close to their respective existing community, but St Neots stations are closer to a larger number of existing properties overall.
- St Neots South Option A station alignments (Alignments 1-4) perform slightly better than St Neots South Option B alignments (Alignments 5 and 6) as they are closer to the existing community, and a slightly larger number of properties overall.

9.6.15. Overall, alignments which serve the combination of St Neots and Cambourne South stations (Alignments 2, 4 and 6) are a minor improvement to the Reference Alignment (which serves Tempsford and Cambourne South). Alignments which serve both Tempsford and Cambourne North (Alignment 7 and 9) are a minor worsening.

9.6.16. In the overall assessment of transport user benefits, alignments connecting a St Neots station to Cambourne South (Alignments 2, 4 and 6) perform slightly better than the Reference Alignment (Alignment 8 – Tempsford to Cambourne South) when combining journey time and modal shift Considerations. Those connecting St Neots to Cambourne North (Alignments 1, 3 and 5) and Tempsford to Cambourne North (Alignments 7 and 9) were considered to perform slightly worse than the Reference Alignment. The overall time saving Consideration was determined to be the most important Consideration in the assessment of the transport user benefits at this design stage.

Contribution to enabling housing and economic growth including best serving areas benefitting from developable land

9.6.17. Stimulating economic growth, housing and employment across the Oxford-Cambridge Arc is a key Project Objective. Therefore, understanding how station location options might influence the development potential of their surrounding areas is vital when comparing the Route Alignment Options.

9.6.18. On this section of EWR, the locations for the new stations are yet to be decided. These are: a station close to the ECML, where options are at Tempsford and St Neots; and the Cambourne station, where the options are Cambourne North (north of the A428) and Cambourne South (to the south of the existing built-up area). The relative performance of each station location option will affect its performance in relation to this Assessment Factor.

9.6.19. To understand the potential of each station location for housing development and economic growth, EWR Co has undertaken a high-level assessment of the following:

- The availability and suitability for development of land within close proximity to potential station locations and any constraints (for instance environmental considerations such as flooding or heritage assets);
- Placemaking opportunities and constraints;
- Relevant information from local plans and related local planning documents; and
- Socio-economic factors.

9.6.20. The high-level findings for each location decision point are set out below.

Cambourne

Land availability and suitability

9.6.21. There are several environmental and local heritage areas that have been identified in the vicinity of Cambourne South that would require appropriate mitigation to protect them. These are:

- Scheduled monuments and listed buildings;
- Areas of woodland, priority habitat, and county wildlife sites; and
- Cambourne Local Nature Reserve.

9.6.22. From a planning perspective, EWR Co expects that this would place greater constraints upon development at Cambourne South, which is likely to result in a reduction in the amount of development that could be delivered. Impacts at Cambourne North are expected to be limited to significantly fewer environmental and heritage assets and therefore would not result in as many constraints as at Cambourne South.

9.6.23. There is the potential for development at Cambourne North to have a visual impact on historic buildings such as Childerly Hall, due to the relatively elevated location of developable land within the existing rural landscape, but EWR Co does not expect that to be a major constraint to development.

9.6.24. Hydrological mitigation, such as areas for water run-off, will need to be integrated into both Cambourne North and Cambourne South, helping to support sensitive hydrological management. This is not expected to have a significant impact on the delivery of development at either location.

9.6.25. Development at Cambourne North would need to provide mitigation for the local electricity lines that run across the site, which would be likely to reduce the area of land available for development. Such mitigation is not expected to be necessary at the Cambourne South location.

Placemaking

9.6.26. Cambourne North development would lie north of the A428, which would result in severance between the existing village of Cambourne and Cambourne North development, but would not constrain development north of the A428.

9.6.27. For Cambourne South, the A1198 would cause severance between the east and west of the area that could be developed, which would require mitigation. As this is a single carriageway, the mitigation is not expected to impact greatly on the scale of development that might be realised.

9.6.28. Housing development at Cambourne North is expected to be able to retain separation from and between existing settlements such as Papworth Everard, Knapwell and Elsworth. However, the amount of new hosing provided at Cambourne South is expected to be less than at Cambourne North in order to overcome the concerns regarding the coalescence of smaller villages including Caxton, Caxton End and Crow End.

Planning

9.6.29. A site in the vicinity of the Cambourne North location has already been identified for development as part of a consultation upon the emerging Greater Cambridge Local Plan, although the local planning authority has yet to publish an updated development plan that would either accept or reject this site. No such site has been identified in the vicinity of the Cambourne South location

9.6.30. At either location, the existing highway network would need to be upgraded to support development of significant scale.

9.6.31. Land at the Cambourne South site is in multiple ownerships, which would present challenges to delivering large scale development at speed. In contrast, land ownership around Cambourne North is generally consolidated, which would provide better opportunity to deliver the proposed development. However, in March 2020 the Government committed to developing the case for a development corporation at Cambourne to "accelerate new housing and infrastructure development"[63]. Should a development corporation come forward, land consolidation in the vicinity of each site would not impact on deliverability of the proposed development, therefore should not be a distinguishing factor between the two locations.

Socio-economic factors

9.6.32. Socio-economic factors are finely balanced between Cambourne North and South.

[63] www.gov.uk/government/publications/budget-2020-documents/budget-2020

9.6.33. For Cambourne North new employment uses could be expected to be located close to the existing employment centre of Cambourne Business Park. In contrast, at Cambourne South any new employment cluster would be in a location where no such use currently exists and could potentially be incompatible with the adjacent residential uses. Cambourne Business Park and its planned expansion as part of Cambourne South would help to mitigate this risk.

9.6.34. There are limited employment opportunities within Cambourne and the surrounding area. Proposed development at either Cambourne North or Cambourne South is therefore likely to result in increased out-commuting, but the railway would provide the connectivity needed to do this.

9.6.35. Existing and planned social infrastructure provision around the Cambourne area will not be sufficient to support the proposed developments at either Cambourne North or South. Wider government investment will therefore be needed in the area to support any future development.

Summary

9.6.36. Although EWR Co is still developing its analysis of each station option's potential for housing development, the evidence reviewed so far suggests that, on balance, development around the Cambourne North station would require fewer, or less significant, mitigation measures than around Cambourne South.

9.6.37. Alignments serving Cambourne North are therefore currently assessed as being likely to perform better in relation to housing and economic growth than those serving Cambourne South. Further analysis will be developed to support this ahead of selecting a Preferred Route Alignment.

9.6.38. Combining these Considerations, alignments with a station at Cambourne North (Alignments 1, 3, 5, 7 and 9) are likely to offer greater potential for growth.

Tempsford / St Neots

Land availability and suitability

9.6.39. Development in the vicinity of Tempsford would need to avoid the surface water flood zone located in the area identified in current modelling by the Environment Agency. This could potentially reduce the size of developable area at this location. There would also need to be mitigation in the St Neots area to avoid these surface flood risk zones, but this would be somewhat less significant than at Tempsford, based on outputs from current models.

9.6.40. There are several environmental and local heritage areas that have been identified in the vicinity of both the Tempsford site and the St Neots site that would require appropriate mitigations to protect. These are:

- Scheduled monuments and listed buildings, particularly around the Tempsford Church End Conservation Area; and
- Areas of ancient woodland, priority habitat, and county wildlife sites.

9.6.41. The area in the vicinity of the St Neots station option is on lower ground, rising to a ridge line. This will require appropriate integration with any development on the site but is not expected to affect the size of a potential development.

9.6.42. Both Tempsford and St Neots station sites could be negatively affected by noise and pollution issues due to their geographic relationship with the A428 Improvement Scheme, and those effects would require mitigation. The A428 Improvement Scheme would be situated closer to the proposed station at St Neots than to Tempsford, therefore negatively affecting potential development at St Neots more than it would at Tempsford, where the proposed station would be situated further away from the road.

9.6.43. Hydrological mitigations, such as areas for water run-off, would need to be integrated into both Tempsford and St Neots development proposals, helping to support sensitive hydrological management. This is not expected to have a significant impact on the delivery of either option.

9.6.44. High voltage overhead electricity lines would affect both options and there would be a choice of whether to avoid developing around those lines, which would constrain the developable areas of land at each location, or to funding an alternative solution such as re-routing or 'undergrounding' of the lines, which would be costly.

Placemaking

9.6.45. There would be a risk of new development coalescing with existing villages at both St Neots and Tempsford. Around the site of the St Neots station options, new development would risk coalescence with the existing St Neots built up area. Furthermore, there is outline planning permission for south-easterly expansion of existing St Neots and the existing industrial estate south of the A428, which would reduce the ability to integrate development with existing settlements at a St Neots station location. At Tempsford, there would be a risk of coalescence with existing settlements including Tempsford, Everton, Little Barford and potentially Sandy.

9.6.46. The proposed sites both interact with the A428 Improvement Scheme, which would create severance between settlements within the proposed sites. The A428 Improvement Scheme would run closer to the proposed St Neots station than the proposed Tempsford station, and through a larger area of the proposed St Neots site than the proposed Tempsford site. This would potentially cause a greater severance impact in the St Neots station options than in those for Tempsford. This would reduce the attractiveness of development at St Neots compared with Tempsford.

Planning

9.6.47. Much development potential around Tempsford has already been identified as part of an opportunity area within Central Bedfordshire's draft local development plan (albeit with no allocation). In contrast, most potential development around a St Neots station has not yet been identified within local development plans.

9.6.48. Land ownership in the area around the St Neots station options is disjointed, which would present challenges to delivering large scale development. In contrast, land ownership around the Tempsford station options is generally consolidated, which would provide better opportunity to deliver development. Nevertheless, as with the Cambourne location, in March 2020 the Government committed to developing the case for a development corporation at St Neots / Sandy to "accelerate new housing and infrastructure development"[64]. Should a development corporation come forward, land consolidation in the vicinity of each site would not impact on deliverability of the proposed development therefore should not be a distinguishing feature between the two locations.

Socio-economic factors

9.6.49. Socio-economic factors are finely balanced between Tempsford and St Neots.

9.6.50. There are limited employment opportunities within St Neots and the surrounding area. Proposed development at either St Neots or Tempsford is therefore likely to result in increased out-commuting initially at least, but the railway provides the connectivity needed to do this.

9.6.51. Existing and planned social infrastructure provision around the St Neots area will not be enough to support the proposed developments at either St Neots or Tempsford. Wider government investment may be needed in the area to support any future development.

[64] www.gov.uk/government/publications/budget-2020-documents/budget-2020

Summary

9.6.52. Evaluating the Tempsford and St Neots station location options using the high-level approach set out indicates that potential housing growth opportunities for Tempsford and St Neots could be more finely balanced than at the Cambourne locations. The constraints associated with the St Neots options, particularly those related to coalescence with the existing St Neots area, and severance problems caused by the A428 Improvement Scheme, appear to be more severe than those around Tempsford, since they relate to placemaking and the attractiveness of future development around the station, but it is difficult to conclude this with certainty at this stage. This means that while it would not be appropriate at this stage to show a clear preference for either St Neots or Tempsford as a station location, it may be possible to do so in the future with additional evidence and feedback from this consultation.

9.6.53. Further analysis will be undertaken to draw firmer conclusions on the potential for housing and growth across both these locations, which will allow us to select a preferred station location in time for the Statutory Consultation.

Capital costs

9.6.54. Cost differences, whilst significant in absolute terms, are small when considered relative to the overall capital cost of the Project. The key drivers of the capital cost at this stage of scheme development are the length of the alignment, the total length of structures, the total quantity of earthworks and the amount of imported fill material required. The potential cost savings compared to the Reference Alignment are included in Table 9.2. The estimated cost ranges represent the capital cost order of magnitude costs for the Core Section only. This is based upon the engineering designs presented at the non-Statutory Consultation and described in this technical report. Excluded from these figures are costs attributable to operation and maintenance of the railway, land and property and any inflation beyond 2019. This is an estimate of the Project's cost to complete to inform comparison of the alignments.

9.6.55. Alignments that serve a Tempsford station location (Alignment 8 and Alignments 7 and 9) are expected to have greater capital costs than alignments with a station at St Neots. Tempsford alignments have the longest lengths of structures and require a larger quantity of imported earthworks fill material. The Reference Alignment (Alignment 8 – Tempsford to Cambourne South) and Alignment 7 have comparable costs and are expected to have the largest capital cost. Alignment 9 is expected to be slightly less expensive than the Reference Alignment, despite it being a longer alignment, because it has a shorter length of structures and a smaller requirement for imported fill.

9.6.56. Alignments 1 (St Neots South Option A to Cambourne North via A428 Improvement Scheme) and 6 (St Neots South Option B to Cambourne South) are expected to provide the greatest capital cost saving compared to the Reference Alignment (Alignment 8 – Tempsford to Cambourne South). Alignment 1 (St Neots South Option A to Cambourne North via A428 Improvement Scheme) is expected to provide one of the greatest capital cost savings compared to the Reference Alignment, despite being one of the longer routes, because it requires a smaller quantity of imported fill than the Reference Alignment, has a smaller total volume of earthworks and has one of the shortest total lengths of structures. Alignment 6 is also expected to offer cost savings because a shorter total length of structures is required and lower quantities of imported fill material compared to the Reference Alignment.

9.6.57. Alignments 2 (St Neots South Option A to Cambourne South via A428 Improvement Scheme), 3 (St Neots South Option A to Cambourne North), 4 (St Neots South Option A to Cambourne South) and 5 (St Neots South Option B to Cambourne North) are also expected to offer capital cost savings compared to the Reference Alignment. The cost of these four options is expected to be comparable.

9.6.58. Programme risk (level of confidence in estimate of delivery time and scale of potential impact on entry into service date) is a smaller but still important Consideration within the capital cost Assessment Factor. Alignments serving Tempsford (Alignment 8, Alignment 7 and Alignment 9) and those serving Cambourne North (Alignments 1, 3 and 5) have large differences between earthworks cut and fill volumes which creates programme risk related to the sourcing and transport of fill material to site.

9.6.59. The amount of structural work is also a factor in the programme risk. The Reference Alignment (Alignment 8 – Tempsford to Cambourne South) has the longest length of structures overall. Alignment 9 (Tempsford to Cambourne North via A428 Improvement Scheme) and alignments serving St Neots South Option B (Alignments 5 and 6) have a structure under the proposed A428 which requires traffic management to avoid closure of the proposed A428. If this can be built at the same time as the A428 Improvement Scheme it would reduce the programme and cost risk for these alignments. EWR Co is collaborating with Highways England to establish the level of integration possible between the two schemes, but in this appraisal this is acknowledged as a particular worst reasonable case risk.

9.6.60. Combining these Considerations, capital cost was considered the most helpful differentiating factor in the overall judgement. Programme risk will be further understood as the construction programme is developed. Although there are instances of worsening in programme risk, this is not deemed significant enough to change the relative performance of the alignments in this factor. Alignments 1 (St Neots South Option A to Cambourne North via A428 Improvement Scheme) and 6 (St Neots South Option B to Cambourne South) perform better than the other options.

9.6.61. If the opportunity for synergy with the A428 Improvement Scheme is realised it could potentially reduce the capital costs for Alignments 1 (St Neots South Option A to Cambourne North via A428 Improvement Scheme), 2 (St Neots South Option A to Cambourne South via A428 Improvement Scheme) and 9 (Tempsford to Cambourne North via A428 Improvement Scheme). This would increase the differentiation between Alignment 1 and the other alignments for capital cost and could make the capital cost for Alignment 2 comparable to Alignment 6. The cost of Alignment 9 could decrease making it more comparable to the cost of the alignments serving St Neots stations. However, this opportunity for synergy is considered separately below.

Overall affordability

9.6.62. The differentiating Considerations within the overall affordability Assessment Factor are capital cost, maintenance cost and renewal cost.

9.6.63. Capital cost has been discussed in the previous paragraphs. Alignments 1 (St Neots South Option A to Cambourne North via A428 Improvement Scheme) and 6 (St Neots South Option B to Cambourne South) are expected to provide the greatest capital cost saving compared to the Reference Alignment (Alignment 8 – Tempsford to Cambourne South). A428 Improvement Scheme synergy could potentially make the capital cost for Alignment 2 (St Neots South Option A to Cambourne South via A428 Improvement Scheme) comparable to Alignment 6.

9.6.64. At this stage of design, a full Whole Life Cost (WLC) model has not been produced, and there is no absolute WLC estimate for each of the options considered. Whole life cost is the total cost over the lifetime of an asset which includes capital, renewal, maintenance and operating costs. In order to contribute to the maintenance and renewal Considerations in the assessment of options, a qualitative judgement was made on the basis of quantitative indicators.

9.6.65. Track length and track geometry were identified as the biggest differentiators between alignments in relation to maintenance cost. A longer total length of track or an alignment with greater curvature would have a higher maintenance requirement. All alignments have the same number of switches / points and the track geometry is within desirable values. Although there is some differentiation at this stage differences in maintenance cost are not expected to be a significant differentiator. Costs differences are expected to be less than £100m based on an assumed split between capital cost, operating cost, and maintenance and renewal cost of 70%, 15% and 15% respectively. At the current level of accuracy, EWR Co does not believe this to be a differentiating Consideration.

9.6.66. The length of structure was identified as the biggest differentiator between alignments for renewal costs. As for maintenance costs, renewal costs are not expected to be a significant differentiator at this stage.

9.6.67. Operating costs is its own factor. The total length of the rail alignment is expected to be the biggest differentiator at this stage and, as for maintenance and renewal costs, operating costs are not expected to be a significant differentiator at this time.

9.6.68. The overall affordability Assessment Factor combines these Considerations. In this case the dominant Consideration is capital cost. The best performing alignments for capital cost are discussed under the capital cost factor above.

Performance

9.6.69. The performance Assessment Factor considers infrastructure reliability (likelihood of a failure occurring, not including unplanned events), maintainability and resilience (ability of the railway to avoid or withstand unplanned events and its ability to respond and recover) as the main differentiating Considerations for the assessment of options in the Core Section.

9.6.70. The ability to maintain infrastructure was considered comparable for all alignments. Although maintenance access plans have not been completed at this stage, no major obstacles to accessing the railway have been identified. Siphons, pumps and balancing ponds have been identified as assets requiring access and a higher frequency of maintenance. Some of these features may be designed out at the next stage.

9.6.71. At this stage of design, the key differentiator in infrastructure reliability was considered to be geology. Alignments that follow the A428 Improvement Scheme (Alignment 1, 2 and 9) avoid an area of weaker geology, where there is exposed Ampthill clay. Measures could be taken to mitigate some of the risks of crossing the weaker geology, e.g. shallower earthwork side slopes, but in the weaker geology, small ground movements would still be more likely. More significant mitigation at design stage would need to be undertaken and more frequent inspection and maintenance of the track and track geometry would be required.

9.6.72. Other considerations on infrastructure reliability were:

- Siphons - as these require more maintenance and have a higher likelihood of failure than other cross drainage structures. Alignments following the A428 Improvement Scheme corridor (Alignments 1, 2 and 9) and Alignment 6 (St Neots South Option B to Cambourne South) require more siphons than other alignments.
- Pumping - if pumped drainage fails the water would be trapped on the alignment. Alignment 9 (Tempsford to Cambourne North via A428 Improvement Scheme) may require pumped drainage at one location.
- Track characteristics, such as curvature, could increase the likelihood of failure. This is considered neutral at this stage.

9.6.73. At this stage of design, the key differentiators in resilience were the length of floodplain crossed, pumped drainage and geology. The length in floodplain was considered in resilience and not reliability as resilience considers unplanned events. This may prevent access to some assets in a flood event and an unplanned event could stop railway services. Alignments serving Tempsford, which do not follow the A428 Improvement Scheme corridor (Alignment 7 and Alignment 8), cross the longest length of floodplain of all the alignments. Alignment 9 (Tempsford to Cambourne North via A428 Improvement Scheme) was considered a minor worsening for resilience, despite it having a shorter length in floodplain than the Reference Alignment, because it may require pumped drainage at one location.

9.6.74. Overall, within the performance Assessment Factor, alignments serving St Neots which follow the A428 Improvement Scheme corridor (Alignments 1 and 2) perform better than the other options for both resilience and reliability Considerations. All St Neots alignments (Alignments 1 to 6) also perform better than the Reference Alignment in the resilience Consideration.

Safety risk (construction and operation)

9.6.75. No significant safety risks have been identified that would prevent any of the Route Alignment Options from progressing. The construction activities identified are not unsafe and risks can be mitigated. However, some activities associated with construction and operation have safety risks associated with them (for example, working at height) and the extent to which such activities are required can provide differentiation between alignment options.

9.6.76. Three main elements were identified to have the biggest influence on construction risk. These were:

- The volume of imported earthwork fill material and the total volume of earthworks. A greater fill import would require more vehicle movements, some of which could be on the public road network. The total volume of earthworks is a significant indicator in the amount of construction work required.
- The total number and length of structures and their complexity. Working at height is inherently riskier than working at ground level. Structures also require lifting movements and components must be brought to site on the public road network. Structural complexity increases construction safety risk as it requires construction activities that are done less frequently.
- The overall length of the route. The total route length is a significant indicator in the amount of construction work required.

9.6.77. Under the elements discussed above the difference in risk is related to the amount of construction work required. The more times an activity is done the higher the likelihood of a hazard associated with that activity being realised, and subsequently the higher the risk.

9.6.78. Alignments serving Tempsford (Alignments 7 and 9) and Alignment 3 (St Neots South Option A to Cambourne North) were identified to have a safety risk during construction comparable to that for the Reference Alignment (Alignment 8 – Tempsford to Cambourne South). The other alignments performed better than the Reference Alignment in relation to construction risk.

9.6.79. The main elements identified to have the biggest impact on the risk to operation in the Core Section, at this stage, were the length in a flood zone and the geology. Risks within a flood zone include the undermining of track by flood water, maintenance access across flood zones and evacuation into flood areas. In the weaker geology small ground movements are more likely. More significant mitigation at design stage would need to be undertaken and more frequent inspection and maintenance of the track and track geometry would be required.

9.6.80. Alignment 7 (Tempsford to Cambourne North) is expected to have a comparable level of operational safety risk to that for the Reference Alignment (Alignment 8 – Tempsford to Cambourne South) as both alignments have the longest lengths in floodplain and follow the same alignment over the Ampthill Clay, identified as high-risk low strength geology. Operational safety risk for all other alignments is expected to be lower than for the Reference Alignment because they have shorter lengths in floodplain. In addition, alignments following the A428 Improvement Scheme (Alignment 1, 2 and 9) avoid an area of weaker geology.

9.6.81. Overall, for this Assessment Factor, all alignments, other than Alignment 7 (Tempsford to Cambourne North), Alignment 3 (St Neots South Option A to Cambourne North) and Alignment 9 (Tempsford to Cambourne North via A428 Improvement Scheme) are expected to perform slightly better than the Reference Alignment (Alignment 8 – Tempsford to Cambourne South). Alignment 3 (St Neots South Option A to Cambourne North) and Alignment 9 (Tempsford to Cambourne North via A428 Improvement Scheme) do perform better than the Reference Alignment in the operational risk Consideration but are comparable in construction risk.

Environmental impacts and opportunities

9.6.82. The following section of this Chapter sets out the review of the alignments in relation to potential environmental impacts. A high-level environmental appraisal has been undertaken at this stage to give an indication of potential environmental impacts. This is in advance of full survey data and environmental assessment (which would be undertaken as part of the process to produce the Environmental Impact Assessment which will support the Development Consent Order application). Potential environmental impacts of the Reference Alignment are presented first, followed by the environmental impacts of each of the alternative alignment options.

9.6.83. In each case, consideration is given to whether the alternative alignments would have a greater or lesser environmental impact than the Reference Alignment and would therefore perform better or worse. In considering potential environmental impacts, all environmental topics outlined in Table 9.3 have been taken into account. However, only those topics where there is a potential differentiation between the alternative alignment considered and the Reference Alignment are reported (i.e. a worsening or improvement). Whilst there may be impacts on receptors relevant to other topics including socio-economics, health and waste, at this stage these have not been assessed in detail as this is not considered to differentiate materially between alignments. Table 9.3 provides a summarised outcome of the ratings concluded from the environmental appraisal of the alignments.

9.6.84. Potential environmental impacts identified from the appraisal and reported in the below include:

- Air quality – adverse air quality impacts could be caused by dust arising from construction works and from construction vehicles and plant. During operation, emissions from trains and an increase in traffic around stations would cause adverse air quality impacts.
- Noise and vibration - adverse noise impacts would be caused by construction vehicles and plant. During operation, train movement (wheel noise etc) and an increase in traffic around stations would cause adverse noise impacts.
- Community – adverse community impacts during construction would be caused by the requirement for residential, commercial and/or community facilities demolitions and the loss of open space and private land. Adverse amenity impacts would also be caused by a combination of adverse noise, air quality and visual impacts as a result of construction works, including presence of construction vehicles, and operation of the railway.
- Agriculture - adverse impacts on farm holdings would result from the loss or severance of land and disruption to farming practices as a result of construction or operation of the railway.
- Cultural heritage – adverse impacts on heritage assets would be caused by the loss of buried archaeological features, where there is a need to disturb land during construction, and where construction works and/or the operation of the railway is in close proximity to listed buildings, scheduled monuments or Conservation Areas resulting in an impact on the setting of these assets.
- Ecology – adverse impacts on ecology and biodiversity during construction would be caused by the loss of habitat and/or severance and fragmentation of habitat. Loss, severance or fragmentation of habitats could impact on the species they support. There could also be indirect impacts on Ancient Woodland and ecological designated sites, including the Impact Risk Zone (IPZ)[62] of a Site of Special Scientific Interest (SSSI)[63]. Adverse impacts on the movement of species, particularly those species which would cross the alignment (such as bats and birds), could occur as a result of the operation of the railway.

[62] A SSSI IRZ is a defined area around a SSSI which reflects the sensitivities for which the SSSI has been designated for.

[63] Site of Special Scientific Interest (SSSI) is the land notified as an SSSI under the Wildlife and Countryside Act (1981), as amended. SSSI are the finest sites for wildlife and natural features in England, supporting many characteristic, rare and endangered species, habitats and natural features.

[64] Source Protection Zones (SPZs) are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction.

- Landscape and visual – adverse impacts on views, including those from residential properties and Public Rights of Ways, would be caused by presence of construction activity and movement of construction vehicles. During operation, the adverse landscape impacts result from the presence of infrastructure (such as viaducts and stations), movement of trains and the increase in traffic around stations.
- Water resources - adverse impacts on water resources would be caused by the degradation of the floodplain and the potential for contamination of the Source Protect Zone (SPZ)[64] as a result of construction of the railway.

9.6.85. International and/or European sites have been considered as part of the assessment and no such sites are to be directly impacted by any of the alignment options. The closest site to the options is the Wimpole and Eversden Woods Special Area of Conservation (SAC), which is designated for the population of barbastelle bats that it supports. Surveys are ongoing to determine the potential for indirect impacts to the bat populations present, such as the possible severance of flight paths, which would then be mitigated through design, if required. As design progresses, EWR Co will also have regard to Fenland SAC, Portholme SAC and the Ouse Washes SAC, SPA and Ramsar Site, which are remote from route alignments, but on watercourses that they cross. At this stage, there are no clear differentiators between the alignment options with respect to potential indirect impacts that may result. Furthermore, we are confident that in the detailed design of the railway, impacts on the Wimpole and Eversden Woods SAC will be capable of mitigation.

9.6.86. The ratings in Table 9.3 represent an appraisal based on an unmitigated proposal relative to the Reference Alignment and impacts presented are prior to mitigation measures being applied to avoid or reduce the impact. Measures could be applied to improve the performance of the alignments, in full or in part. However, it is not possible to mitigate some impacts, such as impacts on Ancient Woodland. The following represents an example of control measures that could be applied to the impacts identified from the appraisal. These will be considered as part of future design development:

- Air quality – construction activities that result in an increase in dust can be mitigated through the use of wheel washing and water suppression. Other measures include the use of clean vehicles and electric plant.
- Noise and vibration – the use of insulated plant for construction activities and siting of plant away from sensitive noise receptors would minimise noise impacts as would temporary screening. Further design development could also mitigate adverse operational noise impacts through measures such as noise barriers.
- Community – compensation for loss of residential and commercial property could be provided and amenity impacts could be mitigated through the measures applied to control air quality and noise and screening views of construction activities and operation of the railway.
- Agriculture - compensation for the temporary or permanent loss of agricultural land could be provided.
- Cultural heritage – in some cases (for example milestones), non-designated assets could be removed in advance of construction, to allow for conservation and storage and, where feasible, relocation as close to their original position as possible. Further design development could also mitigate adverse operational setting impacts through the use of planting to screen the movement of trains and noise barriers.
- Ecology – the provision of habitat replacement within the Project would compensate for the loss of habitat. Sensitive design within the SSSI IRZ, protection of areas around Ancient Woodland and the provision of habitat to enhance connectivity could all be developed.
- Landscape and visual - further design development could mitigate adverse construction and operational landscape and visual impacts through the use of planting for screening.
- Water resources - further design development could mitigate adverse impacts on water resources through flood compensation and the protection of groundwater and surface water features. The impacts on the SPZ could be mitigated by lining the cutting.

Consideration	Reference Alignment	Judgement							
	Tempsford to Cambourne South	Tempsford to Cambourne North		St Neots to Cambourne North			St Neots to Cambourne South		
	Alignment 8 (Benchmark)	Alignment 9 (A428)	Alignment 7	Alignment 1 (A428)	Alignment 3	Alignment 5	Alignment 2 (A428)	Alignment 4 SNN-SC	Alignment 6 SNS-SC
Overall Score	Neutral	Minor improvement	Minor improvement	Major improvement	Major improvement	Major improvement	Major improvement	Major improvement	Major improvement
Agriculture, Forestry and Soils	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Minor improvement	Minor improvement	Minor improvement
Air Quality	Neutral	Neutral	Minor improvement	Major improvement	Major improvement	Minor improvement	Minor improvement	Major improvement	Minor improvement
Climate	Neutral	Minor improvement	Minor improvement	Major improvement	Major improvement	Major improvement	Major improvement	Major improvement	Major improvement
Community	Neutral	Minor improvement	Minor improvement	Minor improvement	Minor improvement	Minor improvement	Neutral	Neutral	Neutral
Ecology and Biodiversity	Neutral	Minor worsening	Minor worsening	Minor improvement	Minor improvement	Neutral	Major improvement	Major improvement	Major improvement
Historic Environment	Neutral	Major improvement	Minor improvement	Major improvement	Minor improvement	Major improvement	Minor improvement	Minor improvement	Minor improvement
Land Quality	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Landscape and Visual	Neutral	Neutral	Neutral	Minor improvement	Major improvement	Major improvement	Neutral	Minor improvement	Minor improvement
Noise and Vibration	Neutral	Neutral	Neutral	Minor improvement	Minor improvement	Minor improvement	Minor improvement	Minor improvement	Minor improvement
Planning	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Water Resources and Flooding	Neutral	Minor improvement	Minor improvement	Major improvement	Minor improvement	Major improvement	Minor improvement	Minor improvement	Minor improvement

Table 9.3 Project Section D – Summary of environmental impacts by topic for each alignment (unmitigated)

Reference Alignment - Tempsford to Cambourne South – Alignment 8

9.6.87. The Reference Alignment would be likely to result in the need to demolish eight residential properties; seven properties are located around Broadway, Bourn and one property is located near Sandy. This alignment would also be likely to result in amenity or isolation impacts on the Disabilities Trust care home on Graze Hill. This care home is particularly sensitive to amenity impacts as it provides care for adults with autism and learning disabilities. Amenity impacts occur as a combination of adverse air quality and noise from construction and views of construction sites and traffic. Isolation would be likely to occur where routes are diverted leaving communities or individual properties severed from services. This alignment would be likely to result in adverse construction and/or operation air quality impacts for residential properties in Roxton, Tempsford, Abbotsley, Caxton, Great Cambourne and Crow End and residual noise impacts for residential properties in Ravensden Church End, Woodend Lane, Bedford Road and Crow End.

9.6.88 Based on available information the Reference Alignment would be likely to adversely impact approximately 50 farm holdings, of which two would be likely to experience a major impact from the construction of the Project.

9.6.89. The Reference Alignment is located in close proximity to the greatest number of designated assets in comparison to all other alignments. It passes within 250m of three scheduled monuments and earthworks would be located in an archaeologically sensitive area at Tempsford. The alignment comes within 500 m of ten conservation areas. This includes Bourn – Village & Hall, Caldecote, Harlton, Kingston, Toft, Bedford, Roxton, Great Barford, Tempsford and Abbotsley. Concentrations of listed buildings are focused in these areas. This alignment would pass through the complex heritage resource area of the Bourn Valley, which includes buried archaeology, built heritage and the Conservation Areas of Bourn, Caldecote and Kingston.

9.6.90. The Reference Alignment would be likely to have relatively high adverse impacts upon landscape character, due to impacts on woodland and changes to the character of Brickhill Country Park, the River Great Ouse valley and Roxton Park. This alignment would also be likely to result in very high visual impacts on residential properties in Renhold, Roxton and Crow End and high/moderate visual impacts on residential properties including those in Caxton, Caldecote, Great Cambourne, Lower Cambourne and Kingston. In the construction phase these are likely to relate to view of construction activities, movement of construction vehicles and temporary features (e.g., compounds and stockpiles). During operation these are likely to relate to views of the operation of the railway.

[65] Designated heritage assets are World Heritage Sites, Scheduled Monuments, Listed Buildings, Protected Wreck Sites, Registered Parks and Gardens, Registered Battlefields or Conservation Areas designated under the relevant legislation. In this area, there are no World Heritage Sites or Protected Wreck Sites.

9.6.91. The Reference Alignment would pass through the Impact Risk Zone (IRZ) of the Weaveley and Sand Woods Site of Special Scientific Interest (SSSI), resulting in the potential for indirect impacts to the features of the SSSI. The alignment is also likely to result in indirect impacts to eight confirmed or potential Ancient Woodland sites (where these woodlands are within 50m of the alignment)[69] . In comparison with other alignments, this alignment results in a relatively low loss of mapped priority habitat areas[70] , both in terms of extent of impact and number of sites.

9.6.92. The Reference Alignment would be likely to result in several adverse impacts on water resources. This alignment has a relatively long crossing of the River Great Ouse floodplain, crosses an area of flood risk at Tempsford and crosses a groundwater Source Protection Zone (SPZ) south of Cambourne.

Tempsford to Cambourne North - A428 Improvement Scheme – Alignment 9

9.6.93. Alignment 9 would be likely to result in the need to demolish three properties; two properties at Two Potts Farm and one property near Eynesbury Hardwick. This alignment would also be likely to result in amenity or isolation impacts on the very sensitive Disabilities Trust care home on Graze Hill.

9.6.94. Alignment 9 is in close proximity to significantly fewer listed buildings and scheduled monuments than the Reference Alignment and would avoid the complex heritage resource area of the Bourn Valley. As this alignment is north of, and in parallel to, the A428 Improvement Scheme there would be fewer additional setting impacts to listed buildings and scheduled monuments in the vicinity. The alignment passes within 500m of six conservation areas. This includes Harlton, Toft, Bedford, Roxton, Great Barford, Tempsford. The earthworks associated with this alignment would also avoid the archaeologically sensitive area north of Tempsford.

9.6.95. Alignment 9 would not encroach into the Weaveley and Sand Woods SSSI IRZ and would result in lower indirect impacts to confirmed and potential Ancient Woodland, five sites (where these woodlands are within 50m of the alignment). This alignment would, however, result in a greater loss of mapped priority habitat areas, including impacts to the highest number of priority areas of all alignments.

9.6.96. Alignment 9 has a similar alignment to the Reference Alignment at the River Great Ouse crossing and Tempsford but by routing via the A428 Improvement Scheme and Cambourne North it avoids the groundwater SPZ south of Cambourne.

9.6.97. This alignment would be likely to result in a lower carbon footprint than the Reference Alignment, predominantly due to a decrease in the number of viaducts and bridges required.

[68] Designated heritage assets are World Heritage Sites, scheduled monuments, listed buildings, Protected Wreck Sites, Registered Parks and Gardens, Registered Battlefields or Conservation Areas designated under the relevant legislation. In this area, there are no World Heritage Sites or Protected Wreck Sites.

Summary

9.6.98. Compared to the Reference Alignment, Alignment 9 would be closer to fewer residential properties. Alignment 9 would also result in fewer residential property demolitions and a smaller impact on heritage assets. There would be a smaller indirect impact on confirmed and potential Ancient Woodland, however there would be a greater loss of priority habitats. There is a decrease in number of structures associated with Alignment 9 and therefore a lower carbon footprint. On balance it is considered that Alignment 9 represents a minor improvement compared to the Reference Alignment.

Tempsford to Cambourne North – Alignment 7

9.6.99. Alignment 7 would be likely to result in the need to demolish three residential properties: two properties at Two Potts Farm and one property near Sandy. This alignment would also be likely to result in amenity or isolation impacts on the very sensitive Disabilities Trust care home on Graze Hill. This alignment would be closer to residential properties in Highfields, but overall fewer properties would experience adverse air quality impacts from this alignment than with the Reference Alignment.

9.6.100. Alignment 7 would be in close proximity to fewer listed buildings and scheduled monuments than the Reference Alignment and would avoid the complex heritage resource area of the Bourn Valley, however earthworks would be located in an archaeologically sensitive area at Tempsford. The alignment passes within 500 m of seven conservation areas. This includes Harlton, Toft, Bedford, Roxton, Great Barford, Tempsford, and Abbotsley.

9.6.101. Alignment 7 encroaches into the Weaveley and Sand Woods SSSI IRZ to the same extent as the Reference Alignment and has the potential to result in indirect impacts to eight confirmed and potential Ancient Woodland sites (where these woodlands are within 50m of the alignment). There would also be a greater loss of mapped priority habitat with this alignment compared to the Reference Alignment.

9.6.102. Alignment 7 would avoid the groundwater SPZ south of Cambourne. This alignment would be likely to result in a lower carbon footprint than the Reference Alignment, predominantly due to a decrease in the number of viaducts and bridges required.

Summary

9.6.103. Compared to the Reference Alignment, Alignment 7 would be closer to fewer residential properties and therefore there would be lower air quality impacts. Alignment 7 would also result in a reduced number of residential property demolitions and reduces impacts on known heritage assets. Alignment 7 is likely to result in a smaller indirect impact on confirmed and potential Ancient Woodland. However, it would result in a greater loss of priority habitats. There is a decrease in number of structures associated with Alignment 7 and therefore a lower carbon footprint. On balance it is considered that Alignment 7 represents a minor improvement compared to the Reference Alignment.

St Neots South Option A to Cambourne North – A428 Improvement Scheme – Alignment 1

9.6.104. Alignment 1 would be likely to result in the need to demolish four properties: two properties at Two Potts Farm, one property to the south of Little Barford and one property near Eynesbury Hardwick. This alignment would also be likely to result in amenity or isolation impacts on the very sensitive Disabilities Trust care home on Graze Hill. This alignment would be closer to residential properties in Highfields and Chawston, but overall fewer properties would experience adverse air quality impacts from this alignment than with the Reference Alignment. Residual noise impacts would be limited to residential properties in Graze Hill, Lower Grange / Sunderland Hill, Colesden, Spinney Road, Chawston, Wintringham Hall, Highfields and Highfields Court.

9.6.105. Alignment 1 is in close proximity to significantly fewer listed buildings and Schedule Monuments than the Reference Alignment and would avoid the complex heritage resource area of the Bourn Valley. The alignment passes within 500m of three conservation areas. These conservation areas are Harlton, Toft and Bedford. In addition, as this alignment is north of, and parallel to, the A428 Improvement Scheme there would be fewer additional setting impacts to listed buildings and scheduled monuments in the vicinity. .

9.6.106 Alignment 1 also has fewer landscape impacts compared to the Reference Alignment. This alignment would avoid impacts on the character of Brickhill Country Park, the River Great Ouse valley and Roxton Park. However, this alignment results in greater areas of woodland loss than the Reference Alignment. This would adversely impact on the landscape character of the area. This alignment would be likely to result in very high visual impacts on residential properties in Chawston.

9.6.107. Alignment 1 would not encroach into the Weaveley and Sand Woods SSSI IRZ and would not result in impacts to confirmed and potential Ancient Woodland sites (where these woodlands are within 50m of the alignment). This alignment would, however, result in a greater loss of mapped priority habitat areas compared to the Reference Alignment.

9.6.108 Alignment 1 comprises a shorter crossing of the River Great Ouse floodplain and routes via St Neots South Option B and then via the A428 Improvement Scheme lowering flood risk by being located nearer the sub catchment divide. There is a lower risk of flooding when crossing watercourses in the upper

part of a river catchment near the catchment or sub-catchment divide where the watercourses are smaller and the severity for flooding is generally less. This alignment would avoid the groundwater SPZ south of Cambourne. This alignment would be likely to result in a lower carbon footprint than the Reference Alignment, predominantly due to a decrease in the number of viaducts and bridges required.

Summary

9.6.109. Compared to the Reference Alignment, Alignment 1 would be closer to fewer residential properties and therefore there would be fewer adverse air quality and noise impacts. Alignment 1 would also result in fewer residential property demolitions and a smaller impact on known heritage assets. Alignment 1 avoids the Bourn Valley and the majority of Conservation Areas and as the alignment avoids designated landscape assets there are fewer impacts on landscape character. However as with the Reference Alignment there would be high visual impacts and, in addition, a greater loss of priority habitats. There is a decrease in number of structures associated with Alignment 1 and therefore a lower carbon footprint. On balance it is considered that Alignment 1 represents a major improvement compared to the Reference Alignment.

St Neots South Option A to Cambourne North – Alignment 3

9.6.110. Alignment 3 would be likely to result in the need to demolish three residential properties: two properties at Two Potts Farm and one property in Wilden. This alignment would also be likely to result in amenity or isolation impacts on the very sensitive Disabilities Trust care home on Graze Hill. This alignment would be closer to residential properties in Highfields and Chawston, but overall there would be fewer properties experiencing adverse air quality impacts from this alignment than with the Reference Alignment. Residual noise impacts would be limited to residential properties in Graze Hill, Lower Grange / Sunderland Hill, Colesden, Spinney Road, Chawston, Highfields and Highfields Court.

9.6.111. Alignment 3 is in close proximity to significantly fewer listed buildings and scheduled monuments than the Reference Alignment and would avoid the complex heritage resource area of the Bourn Valley. The alignment passes within 500m of three conservation areas. This includes Harlton, Toft and Bedford. However, this alignment could also result in some setting impacts to Abbotsley Conservation Area.

9.6.112. Alignment 3 also has fewer landscape impacts compared to the Reference Alignment. This alignment would avoid impacts on the character of Brickhill Country Park, the River Great Ouse valley and Roxton Park. However, this alignment results in a greater area of woodland loss than the Reference Alignment. This would adversely impact on the landscape character of the area. This alignment is likely to result in very high visual impacts on residential properties in Chawston and Highfields Caldecote.

9.6.113. Alignment 3 would not encroach into the Weaveley and Sand Woods SSSI IRZ and would result in potential indirect impacts to only one confirmed and potential Ancient Woodland site (where these woodlands are within 50m of the alignment). This alignment would, however, result in a greater loss of mapped priority habitat areas.

9.6.114. Alignment 3 includes a shorter crossing of the River Great Ouse floodplain. However, it also includes a 4km section adjacent to flood zone 2 and 3 of Abbotsley Brook, including multiple crossings of tributaries. The proximity to the flood zone and the number of tributary crossings is negative as these are likely to require mitigation. This alignment would avoid the groundwater SPZ south of Cambourne. This alignment would be likely to result in a lower carbon footprint than the Reference Alignment, predominantly due to a decrease in the number of viaducts and bridges required.

Summary

9.6.115. Compared to the Reference Alignment, Alignment 3 would be closer to fewer residential properties and therefore there would be likely to be fewer air quality and noise impacts. Alignment 3 would also result in fewer residential property demolitions and a smaller impact on heritage assets. Alignment 3 also avoids the Bourn Valley and the majority of Conservation Areas and as the alignment avoids designated landscape assets there are fewer impacts on landscape character, however as with the Reference Alignment there would be high visual impacts. There is a decrease in number of structures associated with Alignment 3 and therefore a lower carbon footprint. On balance it is considered that Alignment 3 represents a major improvement compared to the Reference Alignment.

St Neots South Option B to Cambourne North – Alignment 5

9.6.116. Alignment 5 would be likely to result in the need to demolish four residential properties: two properties at Two Potts Farm, one property in Wilden and one property to the south of Little Barford. This alignment would also be likely to result in amenity or isolation impacts on the very sensitive Disabilities Trust care home on Graze Hill. This alignment would be closer to residential properties in Highfields and Chawston, but overall there would be fewer properties experiencing air quality impacts from this alignment than with the Reference Alignment. Residual noise impacts would be limited to residential properties in Graze Hill, Lower Grange / Sunderland Hill, Colesden, Spinney Road, Chawston, Highfields and Highfields Court

9.6.117 Alignment 5 is in close proximity to significantly fewer listed buildings and scheduled monuments than the Reference Alignment and would avoid the complex heritage resource area of the Bourn Valley. The alignment passes within 500m of four conservation areas. This includes: Harlton, Toft, Abbotsley and Bedford but avoids Roxton and Tempsford Conservation Areas which the Reference Alignment passes through.

9.6.118. Alignment 5 also has fewer landscape impacts compared to the Reference Alignment. This alignment would avoid impacts on the character of Brickhill Country Park, the River Great Ouse valley and Roxton Park. However, this alignment results in greater areas of woodland loss than the Reference Alignment. This would adversely impact on the landscape character of the area. This alignment is likely to result in very high visual impacts on residential properties in Chawston and Highfields Caldecote.

9.6.119. Alignment 5 comprises of a shorter crossing of the River Great Ouse floodplain and routes via St Neots South Option B lowering flood risk by being located nearer the sub catchment divide. This alignment would avoid the groundwater SPZ south of Cambourne. This alignment would be likely to result in a lower carbon footprint than the Reference Alignment, predominantly due to a decrease in the number of viaducts and bridges required.

Summary

9.6.120. Compared to the Reference Alignment, Alignment 5 would be closer to fewer residential properties and therefore there would be likely to be fewer air quality and noise impacts. Alignment 5 would also result in fewer residential property demolitions and a smaller impact on heritage assets. Alignment 5 also avoids the Bourn Valley and the majority of Conservation Areas and as the alignment avoids designated landscape assets there are fewer impacts on landscape character, however as with the Reference Alignment there would be high visual impacts. There is a decrease in the number of structures associated with Alignment 5 and therefore a lower carbon footprint. On balance it is considered that Alignment 5 represents a major improvement compared to the Reference Alignment.

St Neots South Option A to Cambourne South – A428 Improvement Scheme – Alignment 2

9.6.121. Alignment 2 would be likely to result in the need to demolish nine residential properties: seven properties are located around Broadway, Bourn, one property in Wilden and one property is located near Eynesbury Hardwick. This alignment would also be likely to result in amenity or isolation impacts on the very sensitive Disabilities Trust care home on Graze Hill. This alignment would be closer to residential properties in Chawston, but overall fewer properties would experience adverse air quality impacts from this alignment than with the Reference Alignment. Residual noise impacts would be limited to residential properties in Graze Hill, Lower Grange / Sunderland Hill, Colesden, Spinney Road, Chawston, Wintringham Hall and Crow End.

9.6.122. Alignment 2 would be likely to impact approximately 40 farm holdings (based on available information), of which two would be likely to experience a major impact from the construction of the Project.

9.6.123. Alignment 2 is in close proximity to fewer listed buildings and schedule monument than the Reference Alignment. This alignment avoids the heritage sensitive areas at Tempsford and Roxton. However, to the south of Cambourne, the alignment would pass through the complex heritage resource area of the Bourn Valley and, east of Eltisley, comes in close proximity to a scheduled monument and associated listed building ("Pastures Farm – Moated site at Pastures Farm" and "Dovecote to the North East of Caxton Pastures Farmhouse") which is likely to result in adverse setting impacts to the designated assets. The alignment passes within 500m of six conservation areas. This includes Bourn – Village & Hall, Caldecote, Harlton, Kingston, Toft and Bedford.

9.6.124. Alignment 2 would not encroach into the Weaveley and Sand Woods SSSI IRZ and would not result in impacts to confirmed and potential Ancient Woodland sites (where these woodlands are within 50m of the alignment). This alignment would also result in fewer losses of mapped priority habitat areas. This alignment would, however, be likely to result in minor adverse impacts to the boundary of the Cambourne Nature Reserve. 9.6.125 Alignment 2 comprises a shorter crossing of the River Great Ouse floodplain and routes via St Neots South Option B and then via the A428 Improvement Scheme lowering flood risk by being located nearer the sub catchment divide. This alignment routes south of Cambourne and crosses a groundwater SPZ. This alignment would be likely to result in a lower carbon footprint than the Reference Alignment, predominantly due to a decrease in the number of viaducts and bridges required.

Summary

9.6.126. Compared to the Reference Alignment, Alignment 2 would be closer to fewer residential properties and therefore there would be lower air quality and noise impacts. Alignment 2 would also result in fewer residential property demolitions and a smaller impact on heritage assets. However, at Eltisley there is the potential for an indirect impact on a scheduled monument. There would be a lower impact on farm holdings and fewer losses of priority habitats. There is a decrease in number of structures associated with Alignment 2 and therefore likely to result in a lower carbon footprint. As with the Reference Alignment, Alignment 2 would cross the Bourn Valley, cross a groundwater SPZ and result in high visual impacts. On balance it is considered that Alignment 2 represents a major improvement compared to the Reference Alignment.

St Neots South Option A to Cambourne South – Alignment 4

9.6.127. Alignment 4 would be likely to result in the need to demolish eight residential properties: 7 properties located around Broadway, Bourn and one property in Wilden. This alignment would also be likely to result in amenity or isolation impacts on the very sensitive Disabilities Trust care home on Graze Hill. This alignment would be closer to residential properties in Chawston, but overall there would be fewer properties experiencing adverse air quality impacts from this alignment than with the Reference Alignment. Residual noise impacts would be limited to residential properties in Graze Hill, Lower Grange / Sunderland Hill, Colesden, Spinney Road, Chawston and Crow End.

9.6.128. Alignment 4 would be likely to impact approximately 39 farm holdings (based on available information), of which two would be likely to experience a major impact from the construction of the Project.

9.6.129. Alignment 4 is in close proximity to fewer listed buildings and schedule monument than the Reference Alignment, however it would pass through the complex heritage resource area of the Bourn Valley. The alignment passes within 500m of six conservation areas. This includes Bourn – Village & Hall, Caldecote, Harlton, Kingston, Toft and Bedford. This alignment also has fewer landscape impacts compared to the Reference Alignment. Alignment 4 would avoid impacts on the character of Brickhill Country Park, the River Great Ouse valley and Roxton Park. However, this alignment would be likely to result in very high visual impacts on residential properties in Chawston and Crows End.

9.6.130. Alignment 4 would not encroach into the Weaveley and Sand Woods SSSI IRZ and would result in potential indirect impacts to only one confirmed and potential Ancient Woodland site (where these woodlands are within 50m of the alignment) and lower loss of mapped priority habitat areas. This alignment would, however, be likely to result in minor adverse impacts to the boundary of the Cambourne Nature Reserve.

9.6.131. Alignment 4 comprises a shorter crossing of the River Great Ouse floodplain. This alignment routes via St Neots North, avoiding the flood risk of the alignments that go via Tempsford. It then continues on the northern side of Abbotsley where it runs adjacent to Abbotsley Brook, crossing multiple tributaries. This alignment routes south of Cambourne and crosses a groundwater SPZ. This alignment would be likely to result in a lower carbon footprint than the Reference Alignment, predominantly due to a decrease in the number of viaducts and bridges required.

Summary

9.6.132. Compared to the Reference Alignment, Alignment 4 would be closer to fewer residential properties and therefore there would be reduced air quality and noise impacts. Alignment 4 would also result in fewer residential property demolitions and a smaller impact on heritage assets. There would be likely to be a lower impact on farm holdings, a smaller indirect impact on confirmed and potential Ancient Woodland sites and fewer losses of priority habitats. There is a decrease in number of structures associated with Alignment 4 and therefore a lower carbon footprint. As with the Reference Alignment, Alignment 4 would cross the Bourn Valley, cross a groundwater SPZ and result in high visual impacts. On balance it is considered that Alignment 4 represents a major improvement compared to the Reference Alignment.

St Neots South Option B to Cambourne South – Alignment 6

9.6.133. Alignment 6 would be likely to result in the need to demolish nine residential properties: seven properties located around Broadway, Bourn, one property in Wilden and one property to the south of Little Barford. This alignment would also be likely to result in amenity or isolation impacts on the very sensitive Disabilities Trust care home on Graze Hill. This alignment would be closer to residential properties in Chawston, but overall there would be fewer properties experiencing adverse air quality impacts from this alignment than with the Reference Alignment. Residual noise impacts would be limited to residential properties in Graze Hill, Lower Grange / Sunderland Hill, Colesden, Spinney Road, Chawston and Crow End.

9.6.134. Based on available information Alignment 6 would be likely to impact approximately 40 farm holdings (based on available information), of which two would be likely to experience a major impact from the construction of the Project.

9.6.135. Alignment 6 is in close proximity to fewer listed buildings and scheduled monuments than the Reference Alignment, however it would pass through the complex heritage resource area of the Bourn Valley. The alignment passes within 500m of seven conservation areas. This includes Bourn – Village & Hall, Caldecote, Harlton, Kingston, Toft, Abbotsley and Bedford. This alignment also has fewer landscape impacts compared to the Reference Alignment. Alignment 6 would avoid impacts on the character of Brickhill Country Park, the River Great Ouse valley and Roxton Park. However, this alignment would be likely to result in very high visual impacts on residential properties in Chawston and Crows End.

9.6.136. Alignment 6 encroaches less into the Weaveley and Sand Woods SSSI IRZ, reducing the potential for indirect impacts to the features of the SSSI compared to the Reference Alignment. This alignment would result in potential indirect impacts to two confirmed and potential Ancient Woodland

sites (where these woodlands are within 50m of the alignment) and a lower loss of mapped priority habitat areas. This alignment would, however, be likely to result in minor adverse impacts to the boundary of the Cambourne Nature Reserve.

9.6.137. Alignment 6 comprises a shorter bridge span of the River Great Ouse and routes via St Neots South Option B reducing flood risk by being located nearer the sub catchment divide. The alignment also crosses water courses which are significantly smaller than those associated with the Reference Alignment. This alignment routes south of Cambourne and crosses a groundwater SPZ. This alignment would be likely to result in a lower carbon footprint than the Reference Alignment, predominantly due to a decrease in the number of viaducts and bridges required.

Summary

9.6.138. Compared to the Reference Alignment, Alignment 6 would be closer to fewer residential properties and therefore there would be lower air quality and noise impacts. Alignment 6 would also result in fewer residential property demolitions and reduces impacts on heritage assets. There would be a lower impact on farm holdings, a smaller indirect impact on confirmed and potential Ancient Woodland and the SSSI IRZ, and fewer losses of priority habitat. There is a decrease in number of structures associated with Alignment 6 and therefore a lower carbon footprint. As with the Reference Alignment, Alignment 6 would cross the Bourn Valley, cross a groundwater SPZ and result in high visual impacts. On balance it is considered that Alignment 6 represents a major improvement compared to the Reference Alignment.

9.7. Conclusions - alignment short-list for Consultation

9.7.1. The performance of options against Assessment Factors and Considerations discussed in the previous section of this Chapter has been used to prepare a shortlist of Route Alignment Options for this consultation.

9.7.2. The differentiating Assessment Factors identified for the Core Section of EWR are:

- Transport User Benefits;
- Contribution to enabling housing and economic growth;
- Capital Cost;
- Overall affordability;
- Performance;
- Safety risk; and
- Environmental impacts and opportunities.

9.7.3. The amount of differentiation within each factor differs, and some overlap, so the relative importance of each Factor needs to be considered in deciding on options to be taken forward.

9.7.4. The nine shortlisted alignment options provided EWR Co with multiple solutions to connect each combination of station locations (i.e. connecting St Neots / Tempsford with Cambourne North / Cambourne South). Each of these alignments was evaluated using the Assessment Factors mentioned above and was compared with a Reference Alignment. The shortlisting process considered the best performing option for each station combination from the nine alignments assessed.

9.7.5. Within each station combination comparison (i.e. each alignment serving the same station locations) there was similar overall performance shown by the environmental appraisal overall (judged using comparison to the Reference Alignment) and all options are at least as good as the Reference Alignment in the round. At this stage of environmental appraisal (in advance of surveys and environmental assessment) further comparisons would not differentiate between options. Housing and economic growth is the same within the station pair comparisons as the same stations are served, and therefore it is not relevant in deciding which alignment is best for a given station pair. The other Assessment Factors (and Considerations and the drivers of them) were considered in order to identify the best performing option for each station pair.

Comparison of station combinations

St Neots to Cambourne North

9.7.6. Three alignment options serve the St Neots to Cambourne North station combination:

- Alignment 1 (St Neots South Option A to Cambourne North via A428 Improvement Scheme corridor);
- Alignment 3 (St Neots South Option A to Cambourne North); and
- Alignment 5 (St Neots South Option B to Cambourne North).

9.7.7. Alignment 1 was selected as the preferred alignment for the St Neots to Cambourne North station combination. Alignment 1 is expected to perform better than Alignment 3 in terms of cost, journey time, performance and safety risk Assessment Factors as it has a shorter total length of structures, fewer complex structures, a smaller fill import requirement and a shorter length on weaker geology.

9.7.8. Alignment 1 has similar performance to Alignment 5, but it performs better in terms of the performance Assessment Factor as it has a shorter length on weaker geology. In addition, Alignment 1 could provide increased benefits if the opportunity for synergy with the A428 Improvement Scheme is realised.

St Neots to Cambourne South

9.7.9. Three alignment options serve the St Neots to Cambourne South station combination:

- Alignment 2 (St Neots South Option A to Cambourne South via A428 Improvement Scheme corridor);
- Alignment 4 (St Neots South Option A to Cambourne South); and
- Alignment 6 (St Neots South Option B to Cambourne South).

9.7.10. Alignments 2 and 6 were selected as preferred alignments for the St Neots to Cambourne North station combination. Alignment 6 is expected to perform better than Alignment 4 and Alignment 2 in terms of cost and safety Assessment Factors as it has a shorter total length of structures and smaller imported fill requirements. Potential synergy with the A428 Improvement Scheme might reduce the expected cost for Alignment 2.

9.7.11. Alignment 2 performs better than Alignment 4 and Alignment 6 in the performance Assessment Factor as it has a shorter length on weaker geology. Alignment 2 is expected to have a longer journey time than alignments 4 and 6, however the difference is relatively small.

9.7.12. When opportunities associated with the A428 Improvement Scheme synergy were considered, the performance of Alignments 2 and 6 was comparable and both were therefore included in the shortlist.

Tempsford to Cambourne North

9.7.13. Two alignment options serve the St Neots to Cambourne South station combination:

- Alignment 7 (Tempsford to Cambourne North); and
- Alignment 9 (Tempsford to Cambourne North via A428 Improvement Scheme corridor).

9.7.14. Alignment 9 was selected as the preferred alignment for the Tempsford to Cambourne North station combination. Alignment 9 is expected to perform better than Alignment 7 in terms of cost. Alignment 9 has a shorter total length of structure, a shorter length in floodplain, a shorter length on weaker geology and a smaller imported fill requirement than Alignment 7. It also could offer further potential benefits, beyond those reported, through synergy with the A428 Improvement Scheme.

9.7.15. Alignment 9 is slightly worse in relation to programme risk and resilience due to pumped drainage and the requirement to provide crossing structures under the A428 Improvement Scheme and B1040, though this could potentially be improved by working with the Highways England design team for the A428 Improvement Scheme.

Tempsford to Cambourne South

9.7.16. There is one alignment option that serves the Tempsford to Cambourne South station combination, Alignment 8 (Tempsford to Cambourne South). Other alignments were not developed because it was expected that any other variations around this would perform less well.

Alignment shortlist for Consultation

9.7.17. Five of the nine Route Alignment Options, across the four possible station combinations, have been identified as the best performing options for each station combination, as described above. These are being consulted upon as a short list. The following Route Alignment Options are short-listed.

- Alignment 1 (St Neots South Option A to Cambourne North via A428 Improvement Scheme corridor);
- Alignment 2 (St Neots South Option A to Cambourne South via A428 Improvement Scheme corridor);
- Alignment 6 (St Neots South Option B to Cambourne South);
- Alignment 8 (Tempsford to Cambourne South); and
- Alignment 9 (Tempsford to Cambourne North via A428 Improvement Scheme corridor).

Summary of assessment of shortlisted options

9.7.18. **Alignment 1 (St Neots South Option A to Cambourne North via A428 Improvement Scheme corridor)** serves the St Neots and Cambourne North station combination. It performs strongly in relation to enabling housing and economic growth, with a greater certainty of development potential around Cambourne North. It has one of the shortest total lengths of structures and one of the shortest lengths of floodplain crossed of any of the alignments and it also has a smaller requirement for imported fill material than some of the shortlisted options. These aspects mean that it is expected to have one of the lowest capital costs of any of the alignments and better overall affordability than the Reference Alignment (Alignment 8 – Tempsford to Cambourne South). If the opportunity for synergy with the A428 Improvement Scheme is realised the capital cost might reduce further. It also shows better overall performance in relation to reliability and resilience, overall environmental considerations and a slightly better safety risk than the Reference Alignment. It is a longer alignment than the Reference Alignment, Alignment 2 and Alignment 6, because it serves Cambourne North, which would lead to additional journey time although this is expected to be less than two minutes.

9.7.19. **Alignment 2 (St Neots South Option A to Cambourne South via A428 Improvement Scheme corridor)** is one of the shortlisted alignments which serve the St Neots and Cambourne South station combination. There would only be a small increase in journey times compared to the Reference Alignment and in this respect Alignment 2 performs better

than Alignment 1 and Alignment 9. Alignment 2 is expected to show cost savings compared to the Reference Alignment with improved programme risk resulting from a shorter length of structures and reduced requirement for imported fill material. These cost savings could be comparable to Alignment 6 and Alignment 1 if the opportunity for synergy with the A428 Improvement Scheme is realised. It also shows better performance than the Reference Alignment in relation to reliability, resilience, environmental considerations and safety risk. Alignment 2 does not perform as strongly in relation to enabling housing and growth as Alignment 1 and Alignment 9 because potential at Cambourne South is expected to be more limited than at Cambourne North. The potential for housing and economic growth is comparable to the Reference Alignment and Alignment 6.

9.7.20. **Alignment 6 (St Neots South Option B to Cambourne South)** is one of the shortlisted alignments which serve the St Neots and Cambourne South station combination. It shows very similar performance to that for Alignment 2. The only notable difference from the Assessment Factor outcomes is in relation to the performance Assessment Factor. Alignment 2 performs better than Alignment 6 for performance because the latter crosses an area of weaker geology. However, Alignment 6 performs better than Alignment 2 for journey times and capital cost due to the track length, imported fill requirement and total length of structures. Nevertheless, both Alignment 2 and Alignment 6 perform well in relation to the Reference Alignment (Alignment 8 – Tempsford to Cambourne South).

9.7.21. **Alignment 9 (Tempsford to Cambourne North via A428 Improvement Scheme corridor)** is the best performing Tempsford to Cambourne North station option. It shows better potential than the Reference Alignment, Alignment 2 and Alignment 6 in terms of enabling housing and economic growth, resulting from larger expected potential around Cambourne North. It also performs better than the Reference Alignment (Alignment 8 – Tempsford to Cambourne South) in the overall environmental Assessment Factor. However, Alignments 2, 4 and 6 perform better in the overall environmental Assessment Factor than Alignment 9. As one of the longer alignments an increase in journey times is anticipated although this is expected to be less than two minutes compared to the Reference Alignment. Alignment 9 is expected to show a cost saving compared to the Reference Alignment but it is expected to cost more than Alignments 2, 4 and 6. However, the cost saving could increase if the opportunity for synergy with the A428 Improvement Scheme is realised. Alignment 9 shows a slight worsening in programme risk and resilience compared to the Reference Alignment due to pumped drainage and the requirement to provide crossing structures under the A428 Improvement Scheme and B1040, though this could potentially be improved by working with the Highways England design team for the A428 Improvement Scheme. Despite having more complex structures, Alignment 9 has a shorter total length of structure, a shorter length in floodplain, a shorter length on weaker geology and a smaller imported fill requirement than the Reference Alignment. Alignment 9 is expected to perform worse than Alignments 1 and 2 for the performance Assessment Factor and Alignments 1, 2 and 6 for the safety Assessment Factor. This is due to pumped drainage, a longer overall length of structures and a larger overall imported fill requirement.

9.7.22. The Reference Alignment - **Alignment 8 (Tempsford to Cambourne South)** serves the Tempsford and Cambourne South stations. It has the shortest journey time of all the alignments (comparable to Alignment 6) and the fewest complex structures. It is the only alignment that does not interact with the A428 Improvement Scheme. The Reference Alignment is expected to have the highest cost, the longest length of structures, the longest length in floodplain and the greatest fill import requirement of the shortlisted options. It also performs worse than the other shortlisted options in the environmental assessment.

9.7.23. Table 9.4 shows the relative performance of the five shortlisted Route Alignment Options in relation to the Assessment Factors.

Assessment Factors		Reference Alignment	Tempsford to Cambourne North	St Neots to Cambourne North	St Neots to Cambourne South	
Assessment Factors		Alignment 8 (Benchmark)	Alignment 9 (A428)	Alignment 1 (A428)	Alignment 2 (A428)	Alignment 6
Assessment Factors	**Transport User Benefits**	**Neutral**	**Minor Worsening**	**Minor Worsening**	**Neutral**	**Neutral**
Consideration	*Journey time*	*Neutral*	*East +01:52* *West +01:52*	*East +01:38* *West +01:36*	*East +00:25* *West +00:43*	*East +00:01* *West -00:02*
Consideration	*Modal shift*	*Neutral*	*Minor Worsening*	*Neutral*	*Minor Improve*	*Minor Improve*
Assessment Factor	**Housing and growth**	**Neutral**	**Minor Improve**	**Minor Improve**	**Neutral**	**Neutral**
Assessment Factor	**Capex (core section)**	**Neutral**	**Neutral**	**Minor Improve**	**Neutral**	**Minor Improve**
Consideration	Up front cost £bn (2019 prices)	*£2.3bn - £2.5bn*	*£120m to £130m less -5%*	£310m to £340m less -14%	£210m to £230m less -9%	£270m to £300m less -12%
Consideration	Programme risk	*Neutral*	*Minor Worsening*	*Neutral*	*Minor Improve*	*Minor Improve*
Consideration	Maintenance cost	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*
Consideration	Renewal cost	*Neutral*	*Neutral*	*Neutral*	*Neutral*	*Neutral*
Assessment Factor	**Performance**	**Neutral**	**Neutral**	**Minor Improve**	**Minor Improve**	**Neutral**
Consideration	Inf reliability	*Neutral*	*Minor Improve*	*Minor Improve*	*Minor Improve*	*Neutral*
Consideration	Resilience	*Neutral*	*Minor Worsening*	*Minor Improve*	*Minor Improve*	*Minor Improve*
Assessment Factor	**Safety Risk**	**Neutral**	**Neutral**	**Minor Improve**	**Minor Improve**	**Minor Improve**
Consideration	Construction	*Neutral*	*Neutral*	*Minor Improve*	*Minor Improve*	*Minor Improve*
Consideration	O&M	*Neutral*	*Minor Improve*	*Minor Improve*	*Minor Improve*	*Minor Improve*
Assessment Factor	**Environmental**	**Neutral**	**Minor Improve**	**Major Improve**	**Minor Improve**	**Major Improve**

Table 9.4: Shortlisted Route Alignment Options – Assessment Outcomes

Improve = Improvement; Italics = a Consideration that feeds into the assessment of a Factor. The estimated cost ranges represent the capital cost order of magnitude costs for the core section. This is based upon the engineering design for non-statutory consultation. Excluded from these figures are operation & maintenance costs, land and property and any inflation beyond 2019.

9.7.24. Figure 9.16 shows the Route Alignment Options which have been shortlisted.

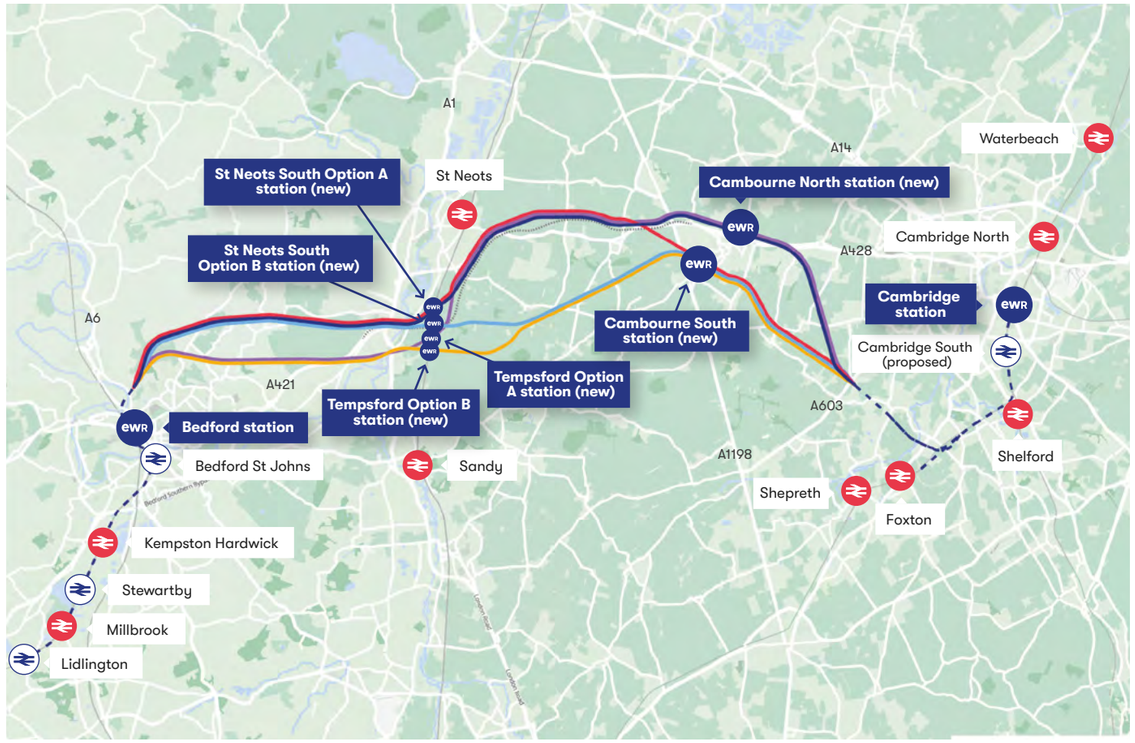


Figure 9.16: Core Section Shortlisted Five Route Alignment Options

9.8. Conclusions - Emerging Preferred Options

Summary

9.8.1. Having considered the performance of the nine identified Route Alignment Options and the appraisals of their performance against the various Assessment Factors, particularly those most likely to assist in differentiating between them, EWR Co has considered whether it is possible to identify an emerging preference or preferences from among the short list. It should be noted that these emerging preferred alignment options are subject to change, for example should further evidence come to light.

9.8.2. Since the Route Alignment Options perform very similarly in many respects, but not consistently across all Assessment Factors, it is necessary to decide which Assessment Factors are the most important. This means favouring Route Alignment Options which perform well in some Assessment Factors more than in others – those Assessment Factors to which the greatest weight should be given at this point in the decision-making process.

9.8.3. As stimulating economic growth, housing and employment across the Oxford – Cambridge Arc is a key Project Objective, EWR Co believes that the potential for supporting housing and economic growth is a key driver for option selection and should attract particular weight. This is supported by the fact that some differences between the performance of Route Alignment Options, as outlined in the previous section of this Chapter, could be strongly influenced by the potential housing development and economic growth benefits that a particular station location might bring. Therefore, although the following Assessment Factors are important, they are not the principal driver of the choice of an emerging preferred option from the shortlisted five if potential for housing and economic growth would be stronger for another alignment. The rationale for this is that:

9.8.4. **Transport User Benefits** - EWR is a new railway which is already significantly improving transport opportunities and journey times. Given the Project Objectives for EWR, it is important to prioritise serving locations that could support growth and new homes over faster end-to-end journey times. Furthermore, unlocking housing development would drive up Transport User Benefits, as there would be additional residents to utilise the railway, which has the potential to offset any differences between options currently.

9.8.5. **Capital cost** – the differences between the option cost ranges, according to EWR Co's current estimates, are small when considered relative to the overall capital cost of the Project and the level of accuracy of cost estimates which can be achieved at this stage in project development. EWR Co believes that the differences between options, when it comes to the potential benefits from housing and economic growth, could be substantial enough to offset the expected capital cost differences.

9.8.6. Therefore, the most important differentiating factors that remain when comparing the five shortlisted options are:

- **Safety and Performance** – this is an important Assessment Factor, but the differentiation between options is very small and therefore it does not assist in choosing a Preferred Route Alignment Option. No significant safety risks have been identified that would prevent any of the Route Alignment Options from progressing.
- **Environment** – there is differentiation between the relative performance of Route Alignment Options. However, all options perform better from an environmental perspective than the baseline Reference Alignment - Alignment 8. Alignments 1, 2 and 6 perform slightly better than Alignments 8 and 9 in terms of this Assessment Factor, but it is also important to consider this performance in the context of housing as explained in paragraphs 9.6.17 to 9.6.20.
- Ability to unlock **housing and wider economic growth**. Stimulating economic growth, housing and employment across the Oxford-Cambridge Arc is a key Project Objective for the scheme and EWR Co believes that the high level differences identified in the housing potential associated with station options enables us able to identify one or more emerging preferences at this stage. Further more detailed analysis will be undertaken to draw firmer conclusions around each location's potential for housing and growth before selecting a final Preferred route alignment.

9.8.7. The evidence EWR Co has used in relation to the comparison of Route Alignment Options above so far suggests that options serving Cambourne North are likely to deliver housing and economic growth advantages that would outweigh factors in favour of other Route Alignment Options. The reasons for this are explained below. Therefore, **given the importance of housing and wider economic growth to the Project, EWR Co has identified Alignment 1 and Alignment 9 as potential emerging preferences from the shortlisted Route Alignment Options.**

Emerging preferred options

9.8.8. Taking the housing considerations into account in particular, when assessing the five shortlisted Route Alignment Options, EWR Co has come to the following emerging conclusions:

- Alignment 1. St Neots South Option B to Cambourne North (via A428 Improvement Scheme corridor). This option includes Cambourne North which has been identified as the emerging preferred Cambourne option. The alignment performs well across the Assessment Factors, apart from journey time, but as locations that could support growth and new homes should be prioritised over faster end-to-end journey times, this has been identified as an emerging preferred option.
- Alignment 2. St Neots South Option A to Cambourne South (via A428 Improvement Scheme corridor). Performs similarly to Alignment 1, with better journey time but includes Cambourne South, which has less favourable housing potential. Given the high importance of housing, this option is not preferred.
- Alignment 6: St Neots South Option B to Cambourne South. Performs well across Assessment Factors, but includes Cambourne South, which has less favourable housing potential. Given the high importance of housing, this option is not preferred.
- Alignment 8: Tempsford - Cambourne South. Several options perform better than this option (the Reference Alignment), and it also includes Cambourne South, therefore this alignment is not preferred.
- Alignment 9: Tempsford - Cambourne North (via A428 Improvement Scheme corridor). This option includes Cambourne North which has been identified as the emerging preferred Cambourne option. Although this alignment does not perform as well as others across Considerations such as capital costs, environment and journey time, there is the potential that Tempsford could better support growth and new homes by a substantial margin and therefore this has been identified as an emerging preferred option.

9.8.9. In light of this approach, the emerging preferences are **Route Alignment 1 and Route Alignment 9.**

9.8.10. It should be noted that these are emerging preferred options, which are subject to change should further evidence come to light that concludes that Cambourne South would be a better location for delivering against housing delivery objectives. None of the five shortlisted options are being discounted at this stage.

9.8.11. Identifying two options, Alignment 1 and Alignment 9, means that both St Neots and Tempsford options can be left open for the purposes of this consultation. Further work is underway to identify an emerging preferred ECML option.

10.
Project Section E: Harlton to Hauxton

10.1. Chapter summary

10.1.1. This Chapter describes the proposals for the section of the Project between Harlton, near the A603 Cambridge Road, and Hauxton, to the west of the M11. It includes the connection between the new railway and the Shepreth Branch Royston (SBR) line (the line between Cambridge and Hitchin via Shepreth).

10.1.2. This Chapter explains the development of the options to connect the new railway to the existing railway network. EWR Co has concluded that this should be by a connection to the (SBR) line, rather than a direct connection to the West Anglian Main Line (WAML, the line between London Liverpool Street and Cambridge).

10.1.3. Four options for the new junction have been considered. This Chapter describes and compares those options together with their assessment using the Assessment Factors. It concludes that the emerging preferred option for the connection is a grade-separated junction (where one line passes over or under another) which would be constructed offline (which means it would involve works outside the existing railway corridor).

10.2. Introduction

10.2.1. This section discusses the proposed East West Rail (EWR) connection to the existing railway within Project Section E, Harlton to Hauxton, as shown in Figure 10.1 below.

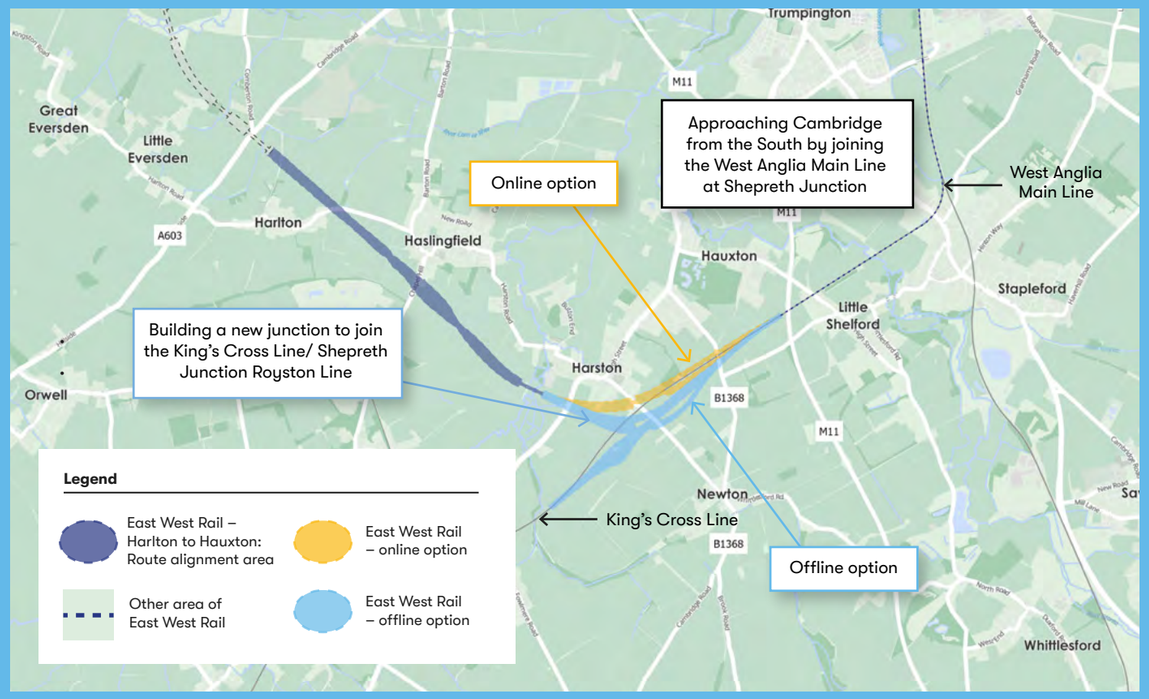


Figure 10.1: Project Section E: Harlton to Hauxton

10.2.2. Project Section E covers approximately 8km of proposed railway between:

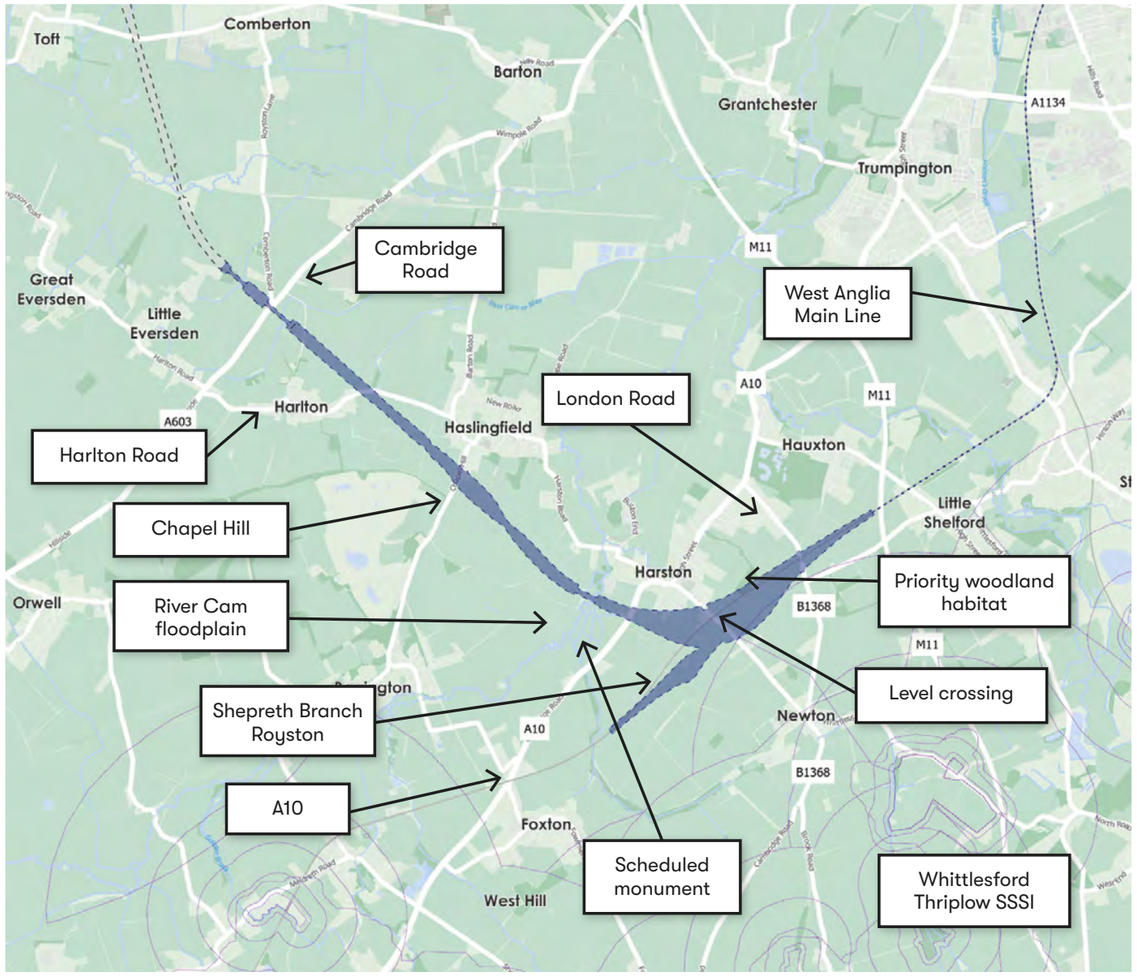
- The eastern end of Project Section D, where the alignment options in that Project Section converge to the west of Cambridge Road (A603), and
- The connection to the existing SBR Line, located south of the M11.

10.2.3. The SBR, also known as the Cambridge Line, is the section of railway that runs from Cambridge Junction on the East Coast Main Line (ECML) to the Shepreth Branch Junction on the WAML. It forms part of the London King's Cross and East Anglia route between Hitchin and Cambridge.

10.2.4. A six trains per hour (6tph) Govia Thameslink Railway (GTR) service operates on the SBR all day. The GTR service then joins the WAML at Shepreth Branch Junction, located to the northeast of Project Section E. EWR must develop its timetable around the WAML route to and from Cambridge due to the constraints resulting from the need to coexist with GTR services.

10.2.5. The Route Option E Indicative Alignment was developed as described in Chapter 5. This proposed joining the WAML indirectly by connecting EWR to the SBR south of the M11. However, the Route Option E area is sufficiently broad to allow the possibility of a connection to the WAML directly, in which case the connection would be provided either north or south of Shepreth Junction. As such, EWR Co conducted an initial assessment to ascertain the viability of the options to connect to the WAML directly, alongside the Route E Indicative Alignment. EWR Co determined that connecting to the SBR is preferred because it is likely to meet the Project Objectives and provide a sustainable and value for money transport solution, when compared to options for connecting to the WAML directly. The section on option development below (paragraph 10.3.1) discusses this in more detail.

10.2.6. Based on these initial assessment recommendations, EWR Co considered options that connect EWR to the SBR for further development. Four alignment options were developed taking into consideration the key constraints in the area, as shown in Figure 10.2 and listed below. The section on options considered below (paragraph 10.4.1) discusses this in more detail.



Legend

East West Rail – Harlton to Hauxton

Other area of East West Rail

Figure 10.2: Project Section E: key constraints

10.2.7. The key constraints in the area that EWR Co has considered include:

- The need to cross the River Cam and its floodplain, Cambridge Road, Harlton Road, Chapel Hill, and the A10;
- The location of Station Road, which is one of two key connections between Harston and Newton and is located almost directly at the point where the new railway would cross the SBR;
- The location of London Road, which is the second key connection between Harston and Newton and is located almost directly at the point where the new railway would join the SBR;
- The need to avoid affecting the M11, such as requiring any alterations to the existing bridge abutments or foundations, which would negatively impact the construction programme and increase the cost risk and disruption to road users during construction;
- The current limitations on the capacity of the SBR and the need to avoid constraining the introduction of new services in the future;
- The potential for disruption to existing train services on the SBR during construction;
- Visual impacts as a result of the new railway for the residents of Harston, Newton, and Little Shelford;
- The potential impact from severing or diverting existing connections between Harston and Newton, in particular Station Road and London Road;
- Setting impacts for the historic environment, in particular the settlement site at Manor Farm, which is a scheduled monument;
- The direct impacts to the unnamed rectangular woodland located southeast of Harston. (EWR Co is treating this as potential ancient woodland, and has assumed that as a minimum, it is a priority woodland habitat); and
- The potential impacts to known and unknown buried archaeology and the chalk aquifer.

10.3. WAML / SBR connection

10.3.1. The area identified in preferred Route Option E included the possibility of connecting to the WAML directly, either north or south of Shepreth Junction, or joining the WAML indirectly via a connection to the SBR, southwest of the M11.

10.3.2. EWR Co assessed the direct WAML connection options at a high-level to test whether they could meet the Project Objectives, as outlined in Chapter 3.

10.3.3. EWR Co found the option to join the WAML north of Shepreth Junction, between Addenbrooke's Road Bridge and Shepreth Junction, to have the following key impacts identified:

- Joining the WAML at this location would require the purchase and demolition of several properties, including potentially Shelford Rugby Club, several houses on Cambridge Road, and the Scotsdales garden centre and cafe;
- This option would significantly disrupt the scheduled monument located in the field to the west of the existing WAML opposite Nine Wells; and
- Grade separation (where one track passes over or under another to avoid train movement conflicts) would be required, either now or in the future, to locate the EWR lines on the east side of the WAML in this option. With grade separation, the EWR lines would need to be located on the east side to ensure that the potential future extension of services east of Cambridge is feasible. However, the distance available in this area to achieve grade separation is insufficient. The railway constraints for maintaining track gradients suitable for freight services mean that tracks would not return to ground level before Addenbrooke's Road bridge and, more crucially, Cambridge South station.

10.3.4. Therefore, the option to join the WAML north of Shepreth Junction is highly unlikely to meet the Project Objectives, particularly when considering and planning future passenger demand and making provision for that where it is affordable. This option would create obstacles in the future. Consequently, EWR Co has discounted this option and will not take this option forward.

10.3.5. The option of a connection to the WAML south of Shepreth Junction would entail a railway passing west of Harston and Newton, passing over the SBR and beneath the M11 motorway and then crossing the floodplain of the River Cam to join the WAML south of Great Shelford. Crossing the M11 motorway would require construction of a new underbridge, potentially affecting the M11. From the point at which EWR joined the WAML it is likely that four-tracking of the WAML would be required in order to provide separation for EWR services and sufficient capacity for existing WAML services. Four-tracking would need to extend from this point northwards through Great Shelford, resulting in the acquisition of land – including residential property - to construct the new lines and the reconstruction of the existing Great Shelford Railway Station in the Great Shelford conservation area.

10.3.6. The option to join the WAML south of Shepreth Junction and south of Great Shelford has particular environmental problems, with the following key impacts identified:

- Joining the WAML at this location would require providing a junction within a Flood zone area, resulting in additional infrastructure to mitigate against the risk of flooding and potentially flood zone compensation;
- The EWR alignment would clash with several environmental assets, including Priority Habitats and Site of Special Scientific Interest (SSSI) Impact Risk Zones (IRZ), which can be avoided altogether by a SBR connection;
- EWR Co may require four tracking of the WAML in this location to add the EWR services. Providing a four-track railway would mean a widening of the existing railway corridor resulting in land and potential property take in Great Shelford and expansion to the current station; and
- When compared to the SBR option, this option would represent an increase of approximately 1.8km in journey length to Shepreth Junction, resulting in additional tracks needing to be constructed, maintained, and operated.

10.3.7. The option of a connection to the SBR would entail a railway crossing the floodplain of the River Cam before passing to the south of Harston and the west of Newton before merging with the SBR before the M11 motorway crossing. Any construction work would not impact the M11 and it is not envisaged that the existing two track SBR line requires widening. The alignment avoids impacting the scheduled monument to the south of Harston and would seek to avoid impacting the SSSI and unknown buried archaeology located to the east of Harston.

10.3.8. The option to join the SBR, when compared to the option to join the WAML south of Shepreth Junction, has the following key advantages identified:

- Reduced whole life costs and increased journey time as a result of approximately 1.8km shorter route alignment;
- The alignment can pass to the south of Harston village reducing impact on residential properties and therefore requiring less land and property take;
- While the alignment passes on the periphery of a SSSI Impact Risk Zone, careful design is expected to be able to ensure impacting this zone is avoided;
- The alignment uses the existing M11 crossing on the SBR, by providing a junction to the south, thus avoiding any additional structures required or impacting the M11;
- This option should not require widening of the existing two track corridor beyond the junction resulting in a smaller footprint and acquisition of fewer properties;
- Opportunity to remove existing level crossings in the area and provide alternative connectivity thus reducing the risks to road users.

10.3.9. The option to join the WAML, south of Shepreth Junction, is likely to be capable of meeting the Project Objectives, provided that the additional infrastructure described above is put in place. However, compared to the SBR option, as a result of environmental impacts; additional works in sensitive areas; the likely need for acquisition of domestic property in Great Shelford that could be avoided with the SBR option; the increased journey time; and increased capital and whole life costs, this option does not provide a sustainable and value for money transport solution. Therefore, EWR Co has discounted this option and will not take this option forward.

10.3.10. The option to join the SBR is likely to meet the Project Objectives and provide a sustainable and value for money transport solution. Therefore, EWR Co has determined that connecting to the SBR is preferred to connecting to the WAML directly.

10.4. Options development

Overview

10.4.1. By addressing the key constraints outlined in the previous paragraphs, EWR Co has developed the options for connecting to the SBR by considering two key aspects, the type of junction and the construction approach.

10.4.2. By addressing the key constraints outlined in the previous paragraphs, EWR Co has developed the options for connecting to the SBR by considering two key aspects, the type of junction and the construction approach.

10.4.3. Two types of junctions have been considered: grade-separated, where individual tracks rise to pass over other tracks, and at-grade, which is a railway junction where tracks cross at the same level. These options differ in terms of impacts during the works, impacts of the permanent infrastructure, and level of service that can be achieved with the new infrastructure.

10.4.4. Two types of construction have been considered: online construction, in which works are carried out on or adjacent to the existing railway, and offline construction, in which works are carried out ensuring separation of the operating railway services and construction work. These options differ in terms of impacts during the works and impacts of the permanent infrastructure, although they will provide the same level of service at completion of the works.

Types of junction

10.4.5. For the development of options for Project Section E, EWR Co has considered two types of junction to connect to the SBR which are illustrated in Figure 10.3 and Figure 10.4:

- A grade-separated junction, also known as a flying junction or flyover, which is a railway junction where individual tracks rise to pass over other tracks to avoid conflict with other train movements; and
- An at-grade junction, also known as a level or flat junction, which is a railway junction where tracks cross at the same level, introducing conflict with other train movements.

Figure 10.3: Typical grade-separated junction arrangement

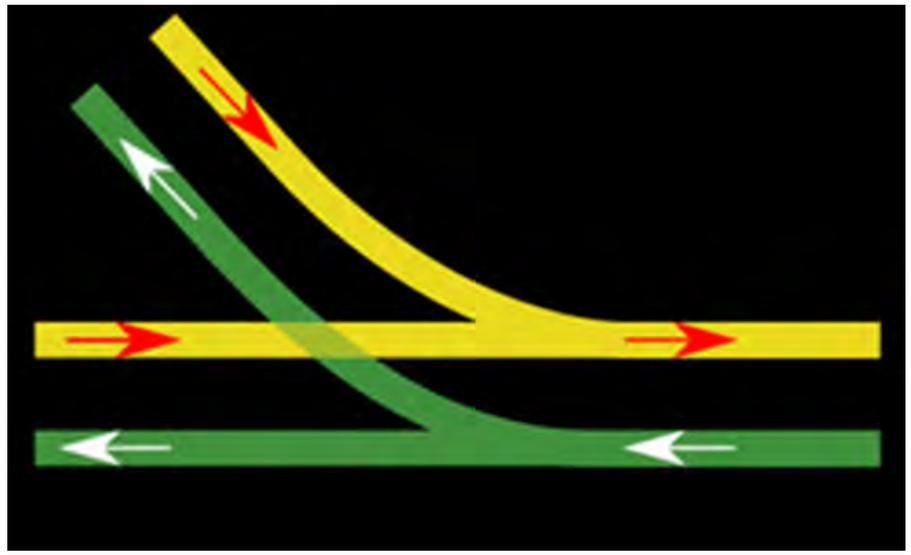


Figure 10.4: Typical at-grade junction arrangement

10.4.6. Grade separation of railway tracks allows for the railway's capacity to be increased. Grade-separated junctions generally enable trains to be less restricted within the timetable, with fewer interruptions and shorter journey times than can be achieved with at-grade junctions. However, grade-separated junctions are typically space-intensive and more costly than at-grade junctions due to the need for large structures such as ramps and bridges.

10.4.7. The type of connection to the SBR must ensure that it can satisfy proposed passenger service demands as described in Chapter 3, initially a 4tph service in each direction, while not prejudicing existing operations on the SBR or precluding the introduction of future services.

10.4.8. Analysis indicates that while it would be feasible to run the 4tph service using an at-grade junction, this would restrict future new services from operating on the SBR line, particularly any planned increase in the number of GTR trains. Therefore, since an at-grade junction would fail to meet the Project Objectives requiring appropriate provision for anticipated growth, the preferred option is for a grade-separated junction.

Types of construction

10.4.9. Preventing interruptions to passenger and freight services during construction works near the track is essential to maintaining a safe and efficient railway. During the design phase of a project, it is necessary to carefully consider any potential impact on the supporting ground conditions around rail infrastructure. Therefore, appropriate construction techniques need to be selected to minimise any impact.

10.4.10. For the development of options for Project Section E, EWR Co has considered two types of approaches to construction:

- Offline construction, in which works are carried out where the proximity of the existing railway has the least impact, ensuring separation of the operating railway services and construction work; and
- Online construction, in which works are carried out on or adjacent to the existing railway.

10.4.11. Therefore, four options were developed and assessed for connecting to the SBR:

- Offline construction of a grade-separated junction (Figure 10.5).
- Offline construction of an at-grade junction (Figure 10.6).
- Online construction of a grade-separated junction (Figure 10.7).
- Online construction of an at-grade junction (Figure 10.8).

Figure 10.5: Offline construction: grade-separated junction option

Figure 10.6: Offline construction: at-grade junction option

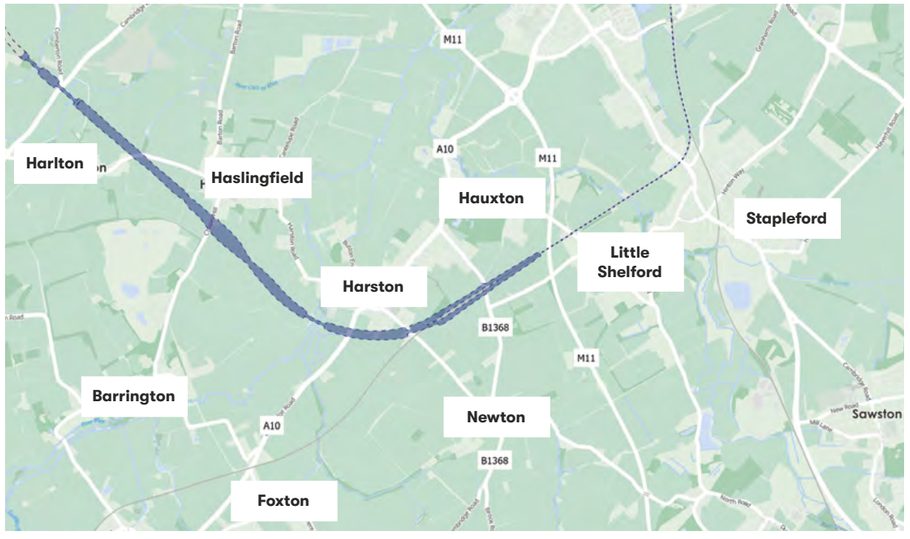


Figure 10.7: Online construction: grade-separated junction option

Figure 10.8: Online construction: at-grade junction option

10.4.12. All four options follow the same alignment from the western end of Project Section E, where the alignment options of Project Section D converge to the west of Cambridge Road (A603), to where the alignment options cross the A10.

10.4.13. The alignment runs southeast on an embankment, crossing over Cambridge Road and Harlton Road before entering into open cutting and crossing under Chapel Hill. The alignment then returns to an embankment on its approach to Harston. The alignment crosses over the River Cam and floodplain on a viaduct of approximately 240m in length. The alignment continues on an embankment, crossing over the A10 and requiring the demolition of New Farm, before curving to the northeast, passing between the scheduled monument settlement site at Manor Farm and south of Harston, and crossing Station Road at the old station yard, affecting buildings and operations there.

10.4.14. From the A10 to the connection to the SBR, the design considers the four options under two key aspects: junction type and construction approach. The following sections expand on the impacts and benefits of each of these aspects of the options below. The following paragraphs describe each of the options in more detail.

Analysis of junction types

10.4.15. This part of the Technical Report analyses whether the at-grade or grade-separated junction options are capable of meeting the Project Objectives. This is because, in order to be considered, an option must achieve sufficient functionality, whilst providing an element of future-proofing.

At-grade junction

10.4.16. EWR Co has identified that it is feasible to plan an EWR 4tph service onto the SBR, amongst the existing GTR timetable, with an at-grade junction. However, this is based on providing no more than four EWR services per hour in each direction. Effectively, the capacity of the SBR would be capped as a result of an at-grade junction and there would be no flexibility to absorb any future increase in demand.

10.4.17. The route between Shepreth Branch Junction and Cambridge would then require widening of the railway corridor to four tracks (it is currently a two-track railway), with an at-grade junction at Shepreth Branch Junction, allowing EWR and GTR services to run generally conflict-free alongside WAML services.

10.4.18. Scheduling of trains into the Working Timetable is enabled by regulating the standard timings between stations and junctions, together with other allowances, as outlined by the Timetable Planning Rules (TPR). EWR Co has used the TPR to assess the utilisation impacts to provide a high-level indication of an at-grade junction's capability.

10.4.19. The at-grade junction introduces conflicting train movements between GTR services towards Cambridge and westbound EWR services. The analysis has indicated that an at-grade junction would vary between 54 and 63% utilisation, meaning that in an hour a minimum of 37%, or 21 minutes, of headway (the time between trains) would be available. Extrapolating the timings suggests that westbound EWR services would have four windows available between GTR services towards Cambridge to cross the track for the conflicting move within the new at-grade junction. These windows would consist of three, four, five and nine--minute headways (based on a three-minute junction margin each way). Therefore, any potential delays to either the GTR services towards Cambridge or the westbound EWR services, of three minutes or more, would be likely to impact the opposing service's performance.

10.4.20. Performance allowances would support the recovery of lateness for the westbound EWR service. However, the potential performance impact in linking GTR services to and from Cambridge would reduce any benefit these services may have in the turnaround allowance (time allowed within the timetable for trains to be prepared after completing one service before commencing another service) at Cambridge. GTR services, particularly towards Hitchin, are on critical paths into the Thameslink core (the Thameslink route through central London), requiring robust train paths. An at-grade junction puts the robustness of these paths at greater risk.

Grade-separated junction

10.4.21. A grade-separated junction would increase flexibility by removing some conflicts between train movements, leading to a greater chance of a feasible combined EWR and GTR timetable to and from Cambridge. Analysis has indicated that a grade-separated junction would vary between 40 and 50% utilisation, meaning that in an hour a minimum of 50%, or 30 minutes, of headway would be available. The additional available headway and removal of the westbound EWR service's conflicting move across the GTR services towards Cambridge would offer both performance and capacity mitigations.

10.4.22. When considering and planning future passenger demand and making provision where it is affordable, providing an at-grade junction would create obstacles in the future. EWR services would require a grade-separated junction for any increase in the number of trains per hour due to the reduced service interval for EWR and GTR services on the SBR. The same applies when considering future passenger demand on the SBR. The reduced interval for GTR services would conflict with the 4tph EWR service.

10.4.23. Therefore, EWR Co considers that providing a connection to the SBR with a grade-separated junction should be the emerging preferred option. So far as the Project Objectives include consideration, where value for money and affordable, for future growth, it would not be possible to meet that objective by providing an at-grade junction, since any future increase in demand could only be met by provision of a grade-separated junction. Accordingly, an at-grade junction is not considered further in this Chapter.

Construction approach options considered

10.4.24. Working on, or adjacent to, an existing railway can be a safety and performance risk to EWR Co's works and Network Rail's (NR) infrastructure. Any such works are subject to an extensive set of rules designed to ensure workers' safety, protect the general public and safeguard railway operators and equipment.

10.4.25. Working with any lines open to traffic should only be undertaken as a last resort, based on the prevention principles included in the Health and Safety at Work Act 1974 (HSWA) and the Management of Health and Safety at Work Regulations 1999 (MHSWR). EWR Co would carry out any works on or adjacent to the railway under planned possessions (when the railway is closed to fit construction work around existing train services) in consultation with NR. For the development of options for Project Section E, EWR Co has considered both offline and online construction approaches.

Offline construction option

10.4.26. Taking an offline construction approach would reduce the risks associated with working on or adjacent to the existing railway. Construction worksites would be in the contractor's control, which would reduce the number of consents required from NR and the number of planned possessions.

10.4.27. Reducing the need to carry out works under planned possessions would also reduce the need for planning contingencies. Undertaking commissioning and hand-back testing would not be time constraints. Possession planning would no longer drive the construction programme. Therefore, the works would be delivered more quickly, allowing the transfer of services to the new infrastructure earlier.

10.4.28. Carrying out the works where the proximity of the existing railway has the least effect would reduce the risk to NR's infrastructure due to vibration during construction. Using offline construction eliminates the hazards associated with working over and adjacent to a railway that would need to be mitigated in an online option. Overall, this would minimise the impact on the operational railway.

10.4.29. Using an offline construction approach is more likely to deliver the Project quickly and safely, allowing the transfer of services to the new infrastructure earlier, in addition to environmental benefits. These are important considerations and therefore EWR Co has determined that this approach is the emerging preferred option.

Online construction option

10.4.30. A key benefit of carrying out the works using online construction is that this minimises the junction's overall footprint.

10.4.31. Achieving the time frames set out in a construction programme is significantly more complicated when taking an online construction approach as works must be carried out during planned possessions.

10.4.32. Enabling a planned possession is dependent on the booked time a train service passes the site of works. As a result, the complexities of coordination between EWR, NR and the train operators, for both the planning of possessions and planning for contingencies, results in a risk of delaying the construction programme.

10.4.33. The longer the construction programme takes, the more significant the impact on the operational railway and the general public. A more extended construction programme would delay the transfer of services to the new infrastructure.

10.4.34. Working on, or adjacent to, an existing railway would represent a greater risk to NR's infrastructure due to the effects of vibration during construction. Monitoring can mitigate these risks; however, this adds another level of complexity to planning the works. Time-constrained arrangements associated with possessions also make commissioning and hand-back testing more difficult. There is a significant increase in safety risk to the construction workers working on, or adjacent to, an existing railway under possession arrangements when compared with offline construction.

Environmental considerations

10.4.35. This section discusses the grade-separated junction option only as the at-grade junction option has been identified as not being able to achieve the Project Objectives. Providing a grade-separated junction in either the offline or the online construction approach results in some environmental considerations that would be common to both options, whilst some impacts favour one option or the other.

10.4.36. The area within and surrounding the offline option is highly sensitive in terms of the potential for buried archaeology. Moving the railway further away from Harston increases the risk of potential impacts on known and unknown buried archaeology within this area. Whilst both options would take the alignment further to the southwest, the offline option affects more of this area.

10.4.37. The grade-separated junction would be likely to result in a very high visual impact (forming a visual hotspot) upon Harston residents due to the height and extent of structures and road realignments required in proximity to the settlement.

10.4.38. There are some scheduled monuments in the area, which would be likely to suffer setting impacts in relation to a grade-separated junction. Any impact would be the same with both construction options. The two assets of concern are:

- The Settlement Site at Manor Farm (NLHE: 1006809), which abuts the footprint of both routes southwest of Harston and would be likely to suffer direct impacts; and
- The Moated complex, which is located 260m northwest of Fryers Cottage (NHLE: 1019179).

10.4.39. There are some listed buildings in the area, primarily in the village of Harston, the closest being approximately 300m from both options. While both options could cause some setting impacts, the grade-separated junction could result in a slight increase in potential setting impacts, most notably at Baggot Hall (NLHE: 1331081), which is a Grade II listed building.

10.4.40. Both options are likely to require the demolition of two properties at New Farm off the A10 Royston Road as a result of the alignment and associated earthworks.

10.4.41. Both options would cross two Public Rights of Way (PRoW), which are assumed to be diverted. These are Barrington Footpath 4 and Harston Footpath 4. However, it has no direct impact on community and recreational facilities, or known public open spaces.

10.4.42. Both options intersect a localised historical landfill (0.5ha) at Chapel Hill, Haslingfield, likely to be a clay or chalk pit. Backfill is unknown. Remediation of contaminated land (if required) would be a benefit with both options.

10.4.43. Both options would result in impacts to woodland to the north of Little Eversden and the River Rhee County Wildlife Site (including priority floodplain grazing marsh and woodland habitats) to the southwest of Harston. Through further design development, impacts should be avoided or minimised (and restoration and enhancement opportunities sought).

10.4.44. The shallow cutting between Newton Road and London Road is in a lower-lying area likely to have a near-surface groundwater table. Groundwater inflow would be likely for both options.

10.4.45. The valley of the River Cam provides local recreation and an ecological corridor whilst also including the watercourse of the River Cam itself. Both options would cross the valley on a viaduct at the same point and would therefore have similar impacts in relation to their footprint in Flood Risk Zone 2.

10.4.46. Both options are located within the green belt and would impact openness and the separation of settlements. Station Road is designated as an 'Important Countryside Frontage' in the Local Plan, which may be more sensitive in planning terms than other edges of the settlement facing the alignments. The grade-separated junction would have a high elevation, with the online construction being closer to the settlement.

10.4.47. The considerations relevant to the individual options are discussed below.

Offline construction option

10.4.48. Carrying out works using offline construction would avoid directly impacting an unnamed rectangular woodland located southeast of Harston. EWR Co is treating this as potential ancient woodland and has assumed that, as a minimum, it is a priority woodland habitat.

10.4.49. The offline construction option would take the alignment further away from residential properties in Harston. This would result in minor improvements to community, air quality and noise compared to the online construction option. Conversely, the offline construction option would be closer to Newton, but the distance between the railway and Newton would still be greater than the distance between the railway and Harston.

10.4.50. As a result of moving the alignment, the offline construction option is likely to have less potential direct impact on residential properties, with no more than two residential properties identified to require demolition at paragraph 10.4.37 above, compared to the online construction option which would require the demolition of eight additional properties.

10.4.51. The offline alignment would result in cutting into the peak of Rowley's Hill due to the existing railway's realignment. The hill is a local landform providing the setting to the south of Harston and this would impact upon local landscape character.

10.4.52. The offline construction approach would encroach slightly into the IRZ for the Whittlesford Thriplow SSSI. Any development within the IRZ would need to consider the potential for indirect impacts to the SSSI through, for example, altering groundwater flows to that area. Data is not available at this stage to support any further understanding of expected impacts. However, EWR Co currently expects that by providing a small realignment of the railway, at the next design stage, it would be possible for impact to this risk zone to be avoided by moving the alignment clear.

10.4.53. The offline option would have deep cuttings in chalk north of the River Cam at Chapel Hill and a shallow cutting south of the River Cam between Newton Road and London Road. Based on preliminary data from the Environmental Appraisal (EA), the deep cutting below Chapel Hill appears to be above the groundwater table and, as such, is not anticipated to require dewatering or groundwater management.

Online construction option

10.4.54. The online construction option requires a smaller additional footprint than the offline construction option. This would decrease the risk of potential impacts on known and unknown buried archaeology.

10.4.55. Carrying out works using offline construction would directly impact the priority woodland habitat located southeast of Harston.

10.4.56. The online construction option would take the alignment closer to residential properties in Harston. It would, therefore, have the potential for minor worsening to community, air quality and noise compared to the offline construction option.

10.4.57. The proposed railway would cross the SBR at its highest point adjacent to the residential properties at The Paddock and Lawrance Lea, along Station Road. As Station Road is designated as an 'Important Countryside Frontage' in the Local Plan, which is more sensitive in planning terms than other edges of the settlement facing the alignments, the online option would have a greater impact when compared to the offline option which is approximately 360m further away. In addition the alignment of the route through this area results in an additional eight properties that would likely require demolition when compared to the offline option.

10.4.58. The online construction option would require a greater length of bridge and retaining structures which would result in a slight increase to greenhouse gas emissions compared to the offline option.

10.4.59. In addition to crossing two PRoW, which may require diversion, the online option would additionally sever Harston Byway 6 which links to the London Road at Harston.

Offline construction options

10.4.60. Having identified that an at-grade junction will not achieve the Project Objectives, the two options which are taken forward for consideration are an offline grade-separated junction and an online grade-separated junction. An offline grade-separated option would be more straightforward and safer to construct, as well as affording greater certainty as to delivery timing. It would perform better overall in environmental terms and have fewer direct impacts on residential properties. However, an online option would have a smaller footprint, would not impact on the existing Harston to Newton connection, and would perform better than the offline option in relation to the water environment and landscape setting.

Offline construction of a grade-separated junction

10.4.61. A connection to the SBR with a grade-separated junction, using an offline construction approach that ties into the existing SBR southwest of the M11, is shown in Figure 10.5..

10.4.62. During construction, EWR Co would build a new section of alignment for the SBR using an offline construction approach in cutting to the southeast and parallel to the current alignment, moving both the existing and proposed railway further away from the residential properties at Harston. This would perform better in terms of air quality, noise and vibration and community benefit. The existing SBR alignment would continue to function as normal during construction. Once construction is complete, EWR Co would then connect each end of the new alignment to the existing SBR. In realigning the SBR, the railway corridor would be relocated further away from the residential properties in Harston but would be slightly closer to Newton.

10.4.63. The westbound EWR line would cross over the new SBR line on a new viaduct, with the eastbound EWR line running parallel to, and to the north of, the SBR line, at-grade. Due to different levels when crossing Station Road, the alignment would be likely to impact upon the existing connection between Harston and Newton in its current arrangement. This would be the result of moving the alignment further away from the residential properties in Harston, in particular those located along Station Road, where the highest point of the crossing would be located approximately 360m further away when compared with the online option. Key constraints, shown in Figure 10.9 below, were considered.

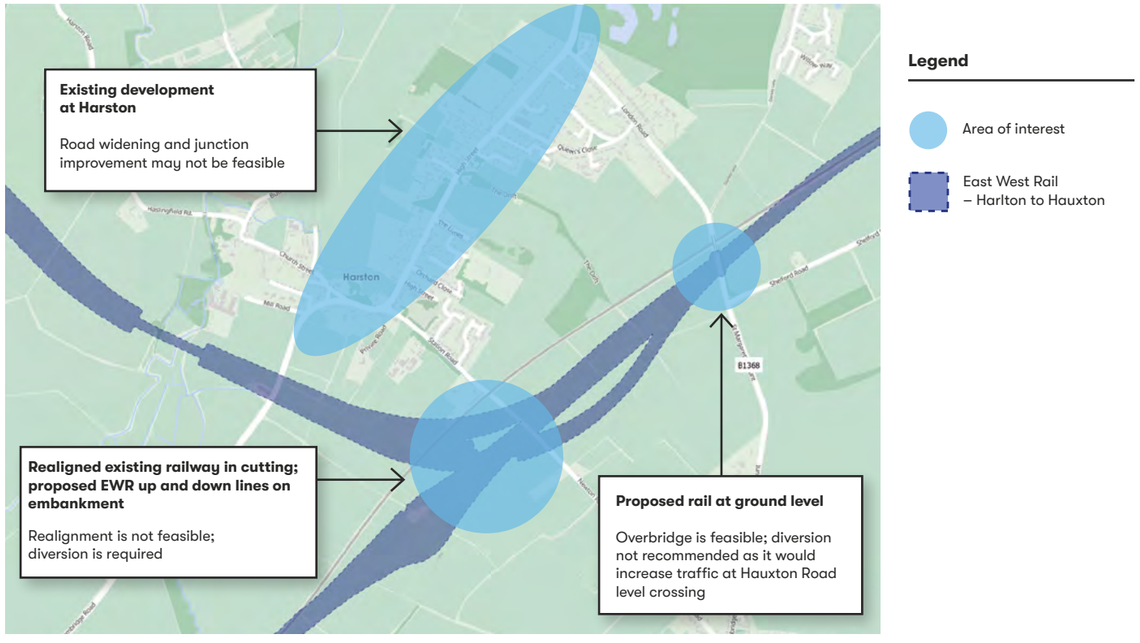


Figure 10.9: Highway constraints map

10.4.64. EWR Co is currently exploring different connectivity options, shown in Figure 10.10, which include:

- Maintaining the existing Harston to Newton connection for use by pedestrians and cyclists only, with provision of a new grade-separated crossing of the SBR and removal of the existing level crossing offering significant safety benefit to the road users;
- Re-purposing the old section of the SBR, which would be decommissioned from service, as a greenway for cyclists and pedestrians;
- Permanent road traffic diversions along the B1368 to the A10;
- Re-purposing the existing SBR railway corridor as a new road and pedestrian/ cycleway connecting the B1368 with Station Road, offering a permanent road traffic diversion that does not increase traffic flow along the A10; and
- Providing a new road connecting Newton Road to the A10 at a new junction along Royston Road as a permanent road traffic diversionary route.

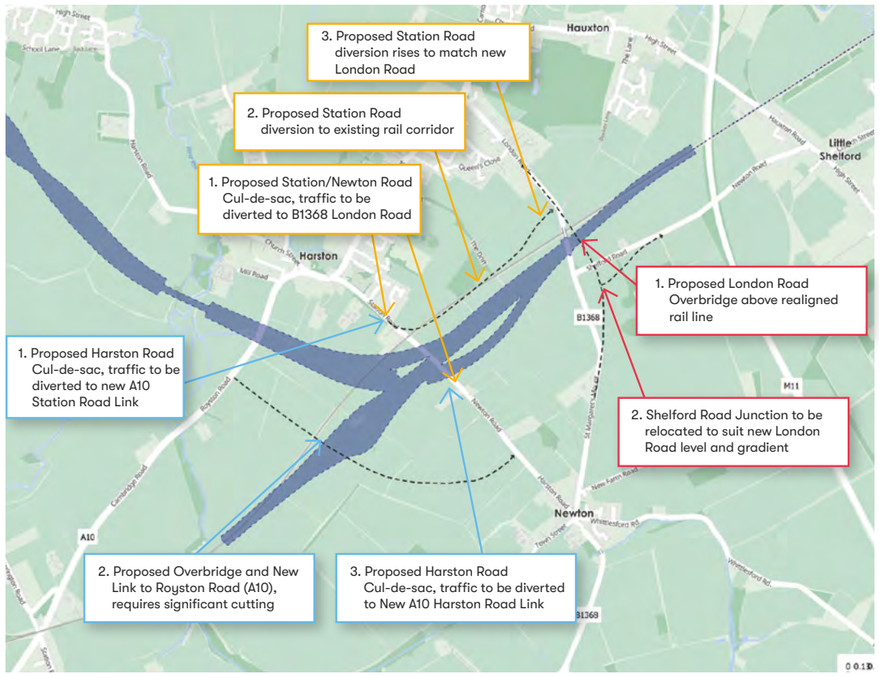


Figure 10.10: Alternative highway diversion options

10.4.65. EWR Co will consult on further details of the solution selected as the preferred option following this consultation at the forthcoming Statutory Consultation and will need to consider:

- Cost;
- Engineering feasibility;
- The impact of increased traffic on the diversionary routes;
- The impact of diversions on bus routes;
- Increased journey times; and
- Community considerations collated through consultation and engagement feedback.

10.4.66. As a result of providing a permanent road traffic diversion for Station Road, EWR Co would propose to close the existing level crossing and replace it with a grade-separated crossing for use by pedestrians and cyclists. This would improve the current pedestrian and cycle route, which is currently closed by the level crossing when trains pass.

10.4.67. The alignment would keep the existing connection along London Road. However, it would require a small realignment to accommodate the new track alignment. A new bridge over the railway would be provided on London Road.

Potential option refinement: partial offline construction

10.4.68. Although the offline grade-separated junction would offer significant benefit in avoiding sensitive receptors in Harston, it does present a broad footprint in terms of land required. EWR Co has explored alternative ways to reduce this requirement while still providing a grade-separated junction at Hauxton.

10.4.69. Figure 10.11 shows a Partial Offline Construction Alignment Option 1. A new section of the Up Cambridge Line (towards Hitchin) would use an offline construction approach to provide a grade-separated junction. The Down Cambridge Line (towards Cambridge) would use an online construction approach to construct the EWR connection, keeping the existing Down Cambridge Line in its current location. EWR would connect to the outside SBR Lines.

Figure 10.11: Partial Offline Construction Alignment Option 1

10.4.70. The existing connection between Harston and Newton along Station Road is likely to remain in the current arrangement, with the new Up Cambridge Line and EWR Lines crossing over on a new bridge. The level crossing on Station Road would remain in place for the Down Cambridge Line. The impact on London Road would also be likely to be reduced. However, a new bridge and some realignment of the road would be required.

10.4.71. Figure 10.12 shows a Partial Offline Construction Alignment Option 2. A new section of the Up Cambridge Line (towards Hitchin) would use an offline construction approach to provide a grade-separated junction. The Down Cambridge Line (towards Cambridge) would use an online construction approach to construct the EWR connection, keeping the existing Down Cambridge Line in its current location. EWR would connect to both the Up and Down Cambridge Lines between the SBR Lines.

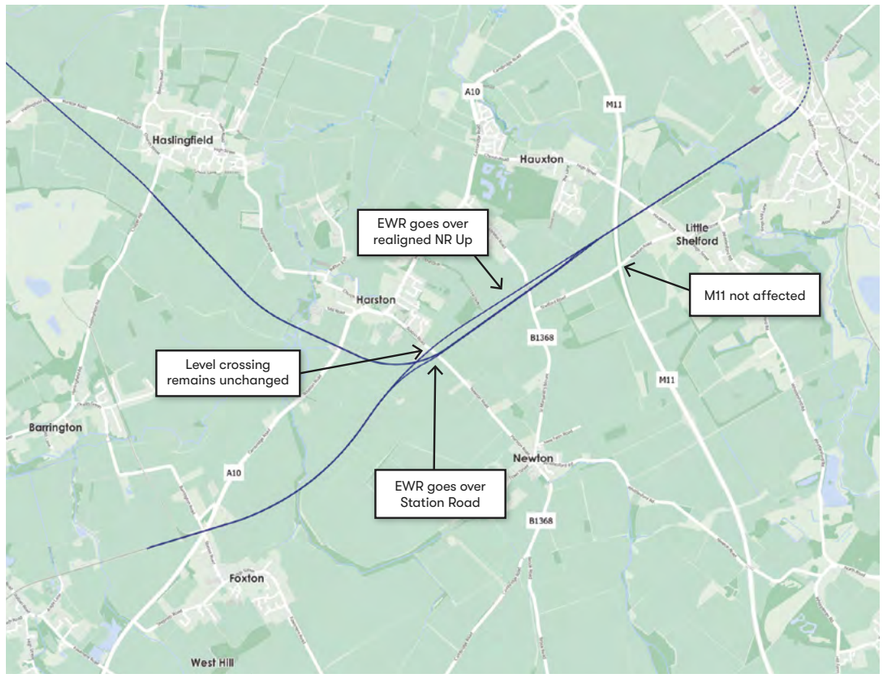


Figure 10.12: Partial Offline Construction Alignment Option 2

10.4.72. The existing connection between Harston and Newton along Station Road is likely to remain in the current arrangement, with the EWR Lines crossing over on a new bridge. The level crossing on Station Road would remain in place. The impact on London Road would be likely to be increased. A new bridge and more significant realignment of the road would be required.

10.4.73. Based on the emerging information at this stage of design, the partial offline construction would reduce the junction's overall footprint compared with full offline construction. However, it would increase visual impact in Harston compared to the offline grade-separated junction.

10.4.74. EWR Co will need to develop these option refinements further to determine the feasibility of the design, particularly the vertical clearances between the road and the railway, and the gradients of the track.

Online construction of a grade-separated junction

10.4.75. This option proposes a connection to the SBR with a grade-separated junction using an online construction approach and would tie into the existing SBR southwest of the M11, as shown in Figure 10.7 above.

10.4.76. During construction, EWR Co would require possessions on the SBR line to carry out the works over the existing railway. Line blockades would result in service disruption to transport users on the SBR. The SBR would remain in its existing alignment, resulting in the proposed railway being located closer to the residential properties in Harston, but further from those in Newton.

10.4.77. Also, by providing the online construction of the SBR, the priority woodland habitat located to the southwest of Harston, adjacent to the existing railway corridor, would be likely to be directly affected.

10.4.78. As part of this option, EWR Co would propose to keep the existing level crossing on Station Road, which would maintain the existing connection between Newton and Harston. The proposed railway would be crossing over the road, and the SBR would remain on its current alignment.

10.4.79. The alignment would keep the existing connection along London Road. However, it would require a small realignment to accommodate the new track alignment. London Road would need a new bridge over the railway.

Comparison of Options

10.4.80. EWR Co has agreed Assessment Factors with the DfT (as set out in Chapter 5) that reflect the Project Objectives. These are used to assess options and arrive at a shortlist and preferred option.

10.4.81. EWR Co assessed the options based on the construction approach, either offline or online. EWR Co has considered the application of all Assessment Factors. However, this section only discusses those that assist in differentiating between the options at this stage.

10.4.82. The following Assessment Factors from the list agreed with DfT differentiate between the online and offline options considered in Project Section E, and therefore were the focus of the comparison:

- Environmental impacts and opportunities;
- Safety risk (construction and operation)
- Capital costs; and
- Overall affordability.

10.4.83. The following Assessment Factors were considered to be neutral and would not assist in differentiating between alignments in this Project Section:

- Transport User Benefits: this Assessment Factor does not particularly influence online or offline construction options as there is little operational difference between the two options;
- Contribution to enabling housing and economic growth, including best serving areas benefitting from developable land: this is not a differentiating factor for these options;
- Operating costs: this is not a differentiating factor for these options;
- Network Capability (covering short distance passenger services and connectivity to support commuting travel into key employment hubs (current and future); long distance passenger services; and satisfying existing and future freight demand). Once it had been determined that a grade-separated option is to be preferred, this Assessment Factor does not assist in differentiating further between online and offline;
- Rail passenger connectivity to existing mainlines: is not a differentiating factor for these options;
- Performance: An increase in the bridge deck length/area would be required with an online construction approach to providing a grade-separated junction. An increased length of retaining structure would also be required, which would be more challenging to maintain than an offline construction approach. A grade-separated junction option, constructed offline, would provide a more maintainable solution, and offer better performance and capacity mitigations than when constructed online. Therefore, this Assessment Factor favours a grade-separated junction option using an offline construction approach. However, in comparison to other Assessment Factors, the differences are marginal and other factors will be of greater assistance in differentiating between options;
- Alignment with wider Railway Strategy / Infrastructure (this Assessment Factor does not assist in differentiating between online or offline options); and
- Consistency with Local Plans is not a differentiator for either the type of junction or the online or offline construction.

Environmental impacts and opportunities

10.4.84. The Environmental Impacts and Opportunities Assessment Factor does provide value in differentiating between options for grade-separated junctions.

10.4.85. An online construction option would involve direct impacts to an unnamed rectangular woodland located southeast of Harston. This woodland contains indicator species that suggest it could be ancient woodland and, as such, in this assessment it is treated as potential ancient woodland. The offline construction option would move the alignment away from this potential impact area and is therefore a major improvement compared to the online construction option.

10.4.86. The offline construction option would take the alignment further away from residential properties in Harston. It would, therefore, have the potential to perform slightly better than the online option in respect of community, air quality and noise. Conversely, the offline construction option would be closer to Newton, but the distance from the settlement would still be further than for Harston. This favours the offline option.

10.4.87. The online option would cross at its highest point adjacent to the residential properties at The Paddock and Lawrance Lea along Station Road. As Station Road is designated as an 'Important Countryside Frontage' in the Local Plan, which may be more sensitive in planning terms than other edges of the settlement facing the alignments, the online option would have a greater impact when compared to the offline option which is approximately 360m further away. However, the offline construction option would result in cutting into the peak of Rowley's Hill due to the existing railway's realignment. The hill is a local landform providing the setting to the south of Harston and would impact upon local landscape character. This favours the offline option.

10.4.88. Noise mitigation would be needed to protect communities. With this in place, the number of houses affected in either of the options would be very low. The online construction option would be located closer to Harston than the offline construction option and represents a minor worsening in performance compared with the offline option. This marginally favours the offline option.

10.4.89. The online grade-separated junction has the highest potential for indirect impact on amenity at residential properties, with nearly double the number of properties (around 740) within 500m of the route than the offline option. This favours the offline option.

10.4.90. The online construction option is likely to have a greater potential direct impact on residential properties, with ten residential properties identified to require demolition, compared to the offline construction option which would require the demolition of two properties. This favours the offline option.

10.4.91. The area within and surrounding both options is highly sensitive in terms of buried archaeology (some cropmark enclosures date from as far back as the Iron Age in the immediate vicinity of both options). The online construction option would require a smaller additional footprint than the offline construction option, decreasing the risk of potential impacts on known and unknown buried archaeology. This favours the online option.

10.4.92. All options would have a chalk cutting at the western end. However, the offline construction option would also have a chalk cutting at the eastern end, compared to the online construction option, which would be at ground level in this location. This favours the online option.

10.4.93. Due to different levels when crossing Station Road, the offline option would be likely to impact upon the existing connection between Harston and Newton in its current arrangement. As a result of providing a permanent road traffic diversion for Station Road, EWR Co would propose to close the existing level crossing and replace it with a grade-separated crossing for use by pedestrians and cyclists. This option favours the online option.

10.4.94. The offline option would encroach slightly into the IRZ for the Whittlesford Thriplow SSSI. However, EWR Co currently expects that by providing a small realignment of the railway, at the next design stage, it would be possible for impact to this risk zone to be avoided by moving the alignment clear. This marginally favours the online option.

10.4.95. Overall, this Assessment Factor favours an offline construction because:

- It avoids impact on the priority woodland habitat;
- It reduces the impact on Station Road which is designated as an 'Important Countryside Frontage' in the Local Plan, which may be more sensitive in planning terms than other edges of the settlement facing the alignments;
- It requires the demolition of eight fewer properties;
- It provides improvements to community, air quality and noise by moving the railway further away from the residential properties in Harston; and
- It would close the existing level crossing and providing a grade-separated crossing for pedestrian and cyclists for the Harston-Newton connection.

10.4.96. However, it is noted that consideration must be given to selecting the correct connectivity option for the permanent road traffic diversion.

Safety risk (construction and operation)

10.4.97. Neither online nor offline construction options are inherently unsafe. Nevertheless, working over a railway is significantly more complex and introduces a set of additional hazards that need to be mitigated and controlled.

10.4.98. Close coordination between EWR Co, NR, and the train operators, for both the planning of possessions and planning for contingencies, would be required for either construction approach to avoid resulting in a risk of delaying the construction programme.

10.4.99. However, the complexities of managing NR interfaces mean that there are greater challenges in relation to an online option. The longer the construction programme takes, the more significant the impact on the operational railway and its customers. Also, the more extended construction programme would delay the transfer of services to the new infrastructure.

10.4.100. Working on or adjacent to an existing railway represents a greater risk to NR's infrastructure due to the effects of vibration during construction. Monitoring can mitigate these risks; however, this adds another level of complexity to planning the works.

10.4.101. Time-constrained arrangements associated with possessions also make commissioning and hand-back testing more difficult.

10.4.102. Taking an offline construction approach would reduce the risks identified with online construction. Construction worksites would be in the contractor's control, which would reduce the number of consents required from NR and the number of planned possessions.

10.4.103. Reducing the need to carry out works under planned possessions would also reduce the need for planning contingencies. Undertaking commissioning and hand-back testing would not be time-constraints. Possession planning would no longer drive the construction programme. Therefore, the works would be delivered quicker, allowing the transfer of services to the new infrastructure earlier.

10.4.104. Mitigation of the principal hazards is more straightforward to apply when not having to consider works on, or adjacent to, the existing railway. Carrying out the works where the proximity of the existing railway would have the least effect would reduce the risk to NR's infrastructure due to vibration during construction. Overall, this would minimise the impact on the operational railway.

10.4.105. Using an offline construction approach would be more likely to deliver the Project quicker and more safely, allowing the transfer of services to the new infrastructure earlier. Providing a grade-separated junction would offer more robust operational resilience when compared to an at-grade junction. Therefore, this Assessment Factor favours a grade-separated junction option using an offline construction approach.

Capital costs

10.4.106. Upfront costs used in this assessment are high-level and indicative, incorporating around 80% of the key cost drivers of upfront capital cost and not including the full delivery costs. The key drivers of the capital cost at this stage of project development are:

- The length of the alignment;
- The total length of structures;
- The total quantity of earthworks; and
- The amount of imported fill required.

10.4.107. Using an online construction approach to the grade-separated junction would result in a 5% increase in upfront costs compared to an offline construction option (for base construction works excluding contractors and possession costs in this Project Section).

10.4.108. The offline construction options would reduce the need to carry out works under planned possessions and also reduces the need for planning contingencies. Possession planning would no longer drive the construction programme. Therefore, the works could be delivered more quickly, allowing the transfer of services to the new infrastructure earlier, resulting in minor improvements in programme risk when compared against the online construction options.

10.4.109. Therefore, this Assessment Factor is likely to favour the offline construction of a grade-separated junction over online construction.

Overall affordability

10.4.110. The overall affordability Assessment Factor considers capital cost, maintenance cost, and renewal cost. In this case, the dominant consideration is the capital cost. However, in this section, the anticipated difference in maintenance and renewal costs is discussed; the capital cost element of affordability is addressed in the previous paragraphs.

10.4.111. At this stage of design, EWR Co has not produced a full Whole Life Cost (WLC) model, and there is no absolute WLC estimate for each of the options considered. To contribute to the WLC Factor in assessing options, EWR Co has made a qualitative judgement based on quantitative indicators that drive Whole Life Cost.

10.4.112. Track length and track geometry drive the biggest differentiators in maintenance costs between alignments. A longer total length of the track or an alignment with greater curvature would have a higher maintenance requirement. However, when a grade-separated solution is proposed, there is little to differentiate between options.

10.4.113. Structure length drives the biggest differentiators in renewal costs between alignments. Due to the increased length of bridge and retaining structure required for an online construction option, an offline construction approach is favoured.

Summary

10.4.114. An offline grade-separated option would be more straightforward and safer to construct, as well as affording greater certainty as to delivery timing, thus reducing the cost and programme risks to the Project.

10.4.115. The offline grade-separated option would result in lower upfront costs and better overall affordability due to less length of structures required.

10.4.116. The offline grade-separated option would perform better overall in environmental terms and has fewer direct impacts on residential properties and significantly less visual impact along Station Road.

10.4.117. The offline option would remove the existing level crossing on Station Road and provide a new grade-separated crossing for pedestrian and cyclists on the Harston-Newton Connection. A permanent diversion would be required for road traffic.

10.4.118. However, an online option would have a smaller footprint, would not impact on the existing Harston to Newton connection, and would perform slightly better in relation to the water environment and landscape setting.

10.4.119. EWR Co has concluded from applying the Assessment Factors that, overall, a grade-separated junction using offline construction methods performs most favourably

10.5. Conclusions

10.5.1. The Route Option E Indicative Alignment proposed joining the WAML indirectly by connecting EWR to the SBR south of the M11. However, the Route Option E area included the possibility of testing whether a connection to the WAML directly would be feasible by providing the connection either north or south of Shepreth Junction. As such, EWR Co conducted an initial assessment to ascertain the viability of the options to connect to the WAML directly, alongside the Route E Indicative Alignment.

10.5.2. EWR Co determined that connecting to the SBR is preferred to connecting to the WAML directly for the reasons listed below:

- The option to join the WAML, north of Shepreth Junction, is highly unlikely to meet the Project Objectives, particularly when considering and planning future passenger demand and making provision where it is affordable;
- The option to join the WAML, south of Shepreth Junction, is likely to be capable of meeting the Project Objectives. However, compared to the SBR option, as a result of environmental impacts; additional works in sensitive areas; the need to acquire property in Great Shelford that could be avoided with the SBR option; the increased journey time; and increased capital and whole life costs, this option does not provide a sustainable and value for money transport solution. The solution would also involve additional engineering interventions; and
- The option to join the SBR is likely to meet the Project Objectives and provide a sustainable and value for money transport solution.

10.5.3. Therefore, EWR Co determined that options to join the WAML directly, either north or south of Shepreth Junction, should be discounted; and that connecting to the SBR is preferred to connecting to the WAML directly.

10.5.4. EWR Co initially considered both at-grade and grade-separated junctions for the connection to the SBR. However, at-grade junction alternatives were discounted for the following reasons:

- Analysis has indicated that it is feasible to plan an EWR 4tph service onto the SBR, amongst the current GTR timetable, with an at-grade junction. However, this is based on providing no more than four EWR services per hour in each direction and does not include any future increases in demand on either EWR or the SBR; and
- When considering and planning future passenger demand and making provision that it is affordable, providing an at-grade junction would create obstacles in the future. EWR services would require a grade-separated junction for any increase in the number of trains per hour due to the reduced service interval for EWR and GTR services on the SBR. The same applies to considering future demand on the SBR. The reduced interval for GTR services would conflict with the 4tph EWR service.

10.5.5. EWR Co considers that providing a connection to the SBR with a grade-separated junction using an offline construction approach should be the emerging preferred option. The reasons for discounting options that consider an online construction approach are listed below:

- The direct impacts to the priority woodland habitat, which EWR Co has treated as potential ancient woodland, should be avoided. The offline construction options would move the alignment away from this potential impact area and are therefore performs better in this respect compared to the online construction options.
- By taking the alignment further away from the residential properties in Harston, the offline construction option would have the potential to perform better in relation to community, air quality and noise compared to the online construction options. The offline construction option would be closer to Newton, but the distance from the settlement would still be further than for Harston.
- The grade-separated online junction would be likely to have a slightly greater potential direct impact on residential properties, with nine residential properties within 100m of the route, compared to the offline construction option junction within 100m of two properties. The grade-separated online junction would also have the highest potential for indirect impact on amenity at residential properties, with nearly double the number of properties within 500m of the route than the offline option. The online option would additionally sever Harston byway 6 which links to the London Road at Harston.
- The online option would cross the SBR at the highest point of the alignment adjacent to the residential properties at The Paddock and Lawrance Lea along Station Road. As Station Road is designated as an 'Important Countryside Frontage' in the Local Plan, which may be more sensitive in planning terms than other edges of the settlement facing the alignments, the online option would have a greater impact when compared to the offline option which is approximately 360m further away.
- In relation to construction and safety impacts, mitigation of the principal hazards listed above is more straightforward to apply using an offline construction approach. Carrying out the works where the proximity of the existing railway has the least effect reduces the risk to NR's infrastructure due to vibration during construction. Overall, this minimises the impact on the operational railway.
- The offline construction options could be delivered more quickly, allowing the transfer of services to the new infrastructure earlier, resulting in better performance in relation to programme risk when compared to the online construction options. The offline construction options would reduce the need to carry out works under planned possessions also reduces the need for planning contingencies. Possession planning would no longer drive the construction programme.

10.5.6. In the offline grade-separated junction option, due to different levels when crossing Station Road, the alignment would be likely to impact upon the existing connection between Harston and Newton in its current arrangement. This is a result of moving the alignment further away from the residential properties in Harston, in particular those located along Station Road. EWR Co is currently exploring different connectivity options which include:

- Maintaining the existing Harston to Newton connection for use by pedestrians and cyclists only, with provision of a new grade-separated crossing of the SBR and removal of the existing level crossing offering significant safety benefit to the road users;
- Re-purposing the old section of the SBR as a greenway for cyclists and pedestrians;
- Permanent road traffic diversions along the B1368 to the A10;
- Re-purposing the existing SBR railway corridor as a new road and pedestrian/cycleway connecting the B1368 with Station Road, offering a permanent road traffic diversion that does not increase traffic flow along the A10; and
- Providing a new road connecting Newton Road to the A10 at a new junction along Royston Road as a permanent road traffic diversionary route.

10.5.7. EWR Co will consult on further details of the proposed solution at Statutory Consultation and will need to consider:

- Cost;
- Engineering feasibility;
- The impact of increased traffic on the diversionary routes;
- The impact of diversions on bus routes;
- Increased journey times; and
- Community considerations collated through consultation and engagement feedback.

10.5.8. The impact of an offline option on the existing connection between Harston and Newton is unfavourable and therefore mitigation must be considered. However, EWR Co considers that the assessment of construction options favours the emerging preferred option of a grade-separated junction, using offline construction option due to:

- The network capability of the junction to meet the Project Objectives;
- Safety in construction;
- Greater certainty as to delivery timing, thus reducing the cost and programme risks to the Project;
- Allowing transfer of services earlier;
- Avoidance of impacts to the priority woodland habitat;
- Better overall performance in environmental terms and has fewer direct impacts on residential properties and significantly less visual impact along Station Road; and
- Removal of the existing level crossing on Station Road and provision of a new grade-separated crossing for pedestrian and cyclists on the Harston-Newton Connection which improves on current provision.

11.
Project Section F: The Shelfords to Cambridge Station

11.1. Chapter summary

11.1.1. This Chapter describes the proposals for the section of the Project between the M11 motorway and Cambridge station. This section comprises existing railway. Proposals are still at a very early stage of design.

11.1.2. Between Hauxton and the junction with the West Anglia Main Line (WAML, the line between London Liverpool Street and Cambridge), EWR Co currently considers that there is no need to provide additional tracks, but this needs further investigation in the coming design phases.

11.1.3. At Hauxton Road level crossing, the increase in train service created by EWR means that the crossing needs to undergo further risk assessment to determine whether it needs to be closed. The Chapter explains the types of option and contributing factors that EWR Co will consider, should closure be needed.

11.1.4. The Chapter also explains that additional tracks would be needed between Shepreth Branch Junction (where the line connecting Cambridge and Hitchin joins the WAML) and Cambridge station, increasing provision from two to four tracks. Modifications to Shepreth Branch Junction would also be needed as a result. The Chapter sets out the factors and considerations that will be taken into account in the next phase of design development.

11.1.5. Two new platforms would be required at Cambridge station and the Chapter describes the principles of what is needed, which will be developed further in the next stage of design.

11.2. Introduction

11.2.1. This Chapter covers the area of existing Network Rail infrastructure that EWR would be using to reach Cambridge station. Key considerations for this Project Section are what the current infrastructure layouts would be at the start of EWR construction, what the timetable requirements are for the various services that call at Cambridge and what the performance requirements of those services are so that the infrastructure modifications needed to meet the new levels of service are identified and scoped.

11.2.2. For the existing railway between the new Hauxton Junction on the SBR and Cambridge station the proposals are at a very early stage of design. In order to identify the areas where a solution needs to be developed, EWR Co has examined the capabilities of the existing railway and its surrounding infrastructure to meet the Project Objectives. The aim of this work is to ensure that:

- The existing railway has adequate capacity for the additional services;
- The new services can operate reliably and minimise interference with other services already operating (or proposed to operate) at key points;
- The new railway will be of benefit to the communities that EWR will serve between Oxford and Cambridge;
- The new services offer attractive journey times consistent with the wider aims of the Project; and
- Stations provide the correct level of facilities for the numbers of people that are expected to use them and the types of journeys those people are expected to make.

11.2.3. The work that EWR Co has undertaken to achieve the above aims has included:

- Modelling of how the existing railway operates;
- Developing a plan for how the railway will operate once the new works are complete;
- Reviewing the condition of the existing infrastructure;
- Understanding and integrating with other schemes;
- Undertaking safety risk assessments;
- Reviewing how the railway is currently used and how it could be used in the future; and
- Considering planned housing and other developments in the area served by the existing railway.

11.2.4. The responses to this consultation will provide more information that will inform the next stage of design for the works.

11.3. Proposed work in the Cambridge area

Figure 11.1: Map of proposed work in the Cambridge area

11.4. Hauxton Junction to Shepreth Branch Junction

11.4.1. The current SBR arrangement is a twin track railway from new Hauxton Junction to Shepreth Branch Junction. This line is currently used by GTR services from King's Cross with six trains per hour. Analysis undertaken by EWR Co has shown that it is most likely that the SBR can remain as a twin track railway as there is sufficient existing capacity to be able to add the EWR services required to achieve the Project Objectives and leave spare capacity for an increase in services in the future. This also means that it would not be necessary to make significant alterations to the existing bridges where the SBR crosses under the M11 and under the A1301 at Shelford.

11.4.2. The working assumption for the operational timetable will be assessed further in the next design phase to confirm that it is correct. The focus will be on timetable and performance modelling of the SBR to ensure that both the EWR and GTR services can run as required with suitable resilience to allow for delay, disruption, and updates to service patterns.

11.5. Hauxton Road level crossing

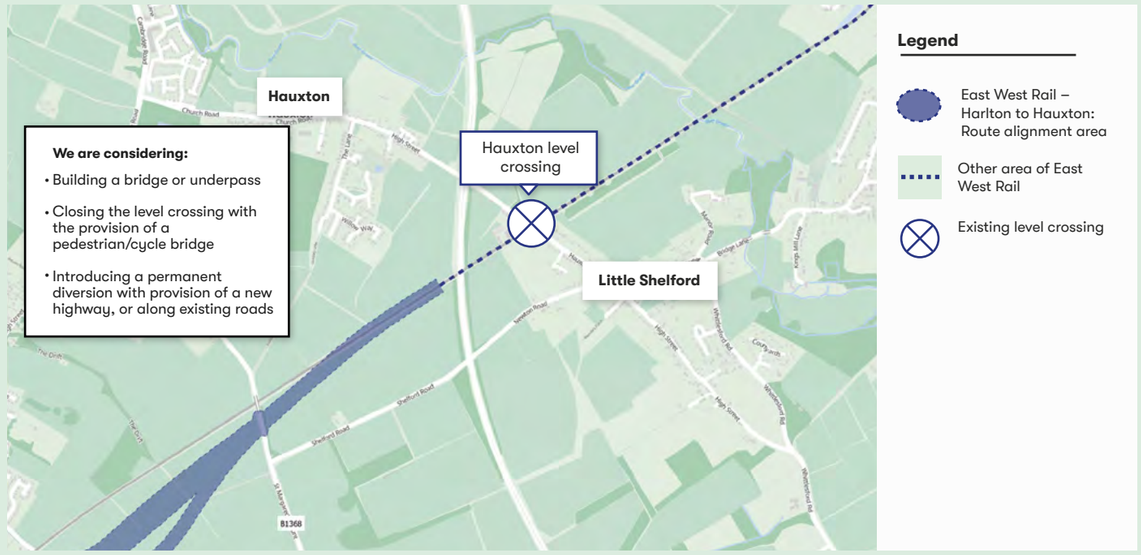


Figure 11.2: Map of proposed changes to Hauxton Road level crossing

11.5.1. Within the Hauxton Junction to Shepreth Branch Junction section of the railway, there is an existing Level Crossing at Hauxton Road.

11.5.2. Hauxton Road provides a link between the villages of Hauxton and Little Shelford, with two bus routes (Route 31 & 32) currently operating, suggesting that this is an important link for public transport, active travel users and pedestrians.

11.5.3. The level crossing is passed by 166 trains per day consisting of passenger and freight. This equates to approximately 11 trains per hour (five minutes per train). EWR would introduce an additional four trains per hour in each direction, five trains every 15 minutes (three minutes per train), resulting in an increase in barrier down time.

11.5.4. EWR Co has identified a need for Hauxton Road level crossing to be further risk assessed as a result of increased train services being introduced by EWR, which needs to be done for all options considered. It has also been identified by NR for assessment in its current arrangement in any event, due to be carried out in April 2021.

11.5.5. Closure of the level crossing could result in extended journey times and reduce the opportunities for active travel between Hauxton and The Shelfords. In addition, there are residential properties which would be affected by closure of the level crossing. If the crossing is identified for closure, there are a number of options that EWR Co will consider:

- grade separation;
- closure with provision of a pedestrian/cycle bridge;
- permanent diversion either with provision of a new highway or along other existing local roads.

11.5.6. For any of these solutions, EWR Co will consider:

- impact of increased traffic on the diversionary routes;
- impact of diversions on bus routes;
- increased journey times;
- cost, engineering feasibility;
- community considerations collated through consultation.

11.5.7. Further details of the proposed solution, along with impacts on other Private User Worked Crossings in the area, will be provided and consulted on at the Statutory Consultation.

11.6. New Shepreth Branch Junction

Figure 11.3: Map of proposed changes to Shepreth Branch Junction

11.6.1. Currently, Shepreth Branch Junction is the meeting point of the twin track SBR and the twin track WAML, resulting in four tracks becoming two as they head into Cambridge.

11.6.2. Analysis has shown that the existing twin track WAML into Cambridge from Shepreth Branch Junction is insufficient to allow all the current and planned operations required in the area. As such, the line from Shepreth Branch Junction into Cambridge would need to be four tracked. This results in the need to modify Shepreth Branch Junction.

11.6.3. Two options for revisions to the Junction have been identified from the operations work: either 'at-grade' or 'grade-separated'. There are two key points that will drive the decision on whether an at-grade solution or grade-separated solution is required.

11.6.4. The first point is regarding the positioning of the tracks so that segregated EWR services, with GTR, would be able to get to the correct platforms at Cambridge station: an at-grade solution would lead to EWR services using platforms on the west side of the station and grade separation would mean using platforms on the east side. The second point is regarding capacity of the lines.

11.6.5. The at-grade solution would remove the junction and segregate the EWR and GTR services entering the junction from the SBR on the two western-most lines with WAML services using the eastern-most pair of tracks.

11.6.6. The grade-separated solution would require a flyover to get allow EWR services from the SBR to reach the east side of the WAML lines. EWR services would then use eastern-most pair of tracks.

11.6.7. Further design is required to understand the design of the grade-separating structure that would be needed, identify the relevant land boundaries, and confirm the most appropriate solution. In both options Shepreth Junction would remain in its current location, however land may need to be acquired for the construction and permanent operation of either option. We do not currently envisage that this would require the acquisition of residential properties. This will be done during the next design phase.

11.7. Four tracking from Shepreth Branch Junction to Addenbrooke's Road bridge

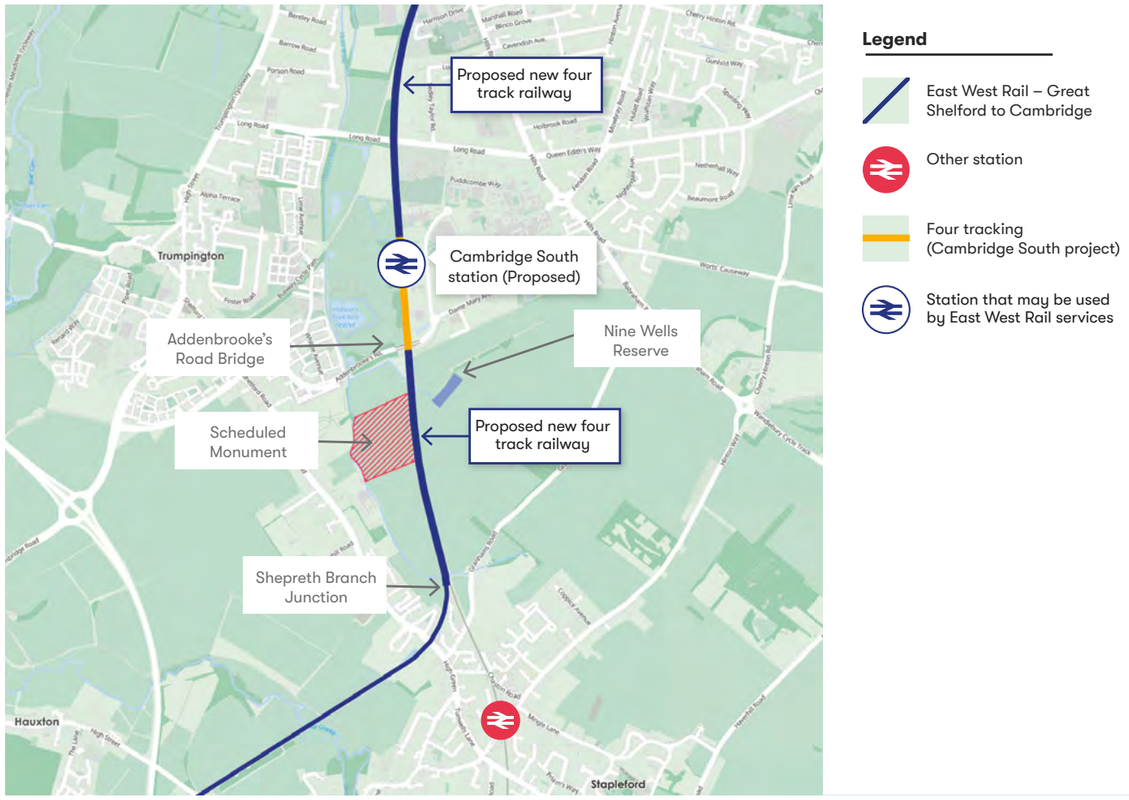


Figure 11.4: Map of proposed four tracking from Shepreth Branch Junction to Addenbrooke's Road Bridge

11.7.1. The new four tracking continues from the segregated Shepreth Branch Junction to Addenbrooke's Road bridge.

11.7.2. The length of this section requiring four tracking is approximately 1.3km.

11.7.3. Addenbrooke's Road bridge is the point where the two new lines would join the new four tracking that the Cambridge South Station scheme would have already built, as shown on their latest consultation designs. In preparing the designs for EWR, EWR Co has made a working assumption that the Cambridge South four tracking would be implemented. This means that NR would have already provided the four tracking between Addenbrooke's Road bridge and around Long Road Sixth Form College area. Cambridge South station would also be built ready for EWR services so no modifications would be required.

11.7.4. Further design is required in the next phase to determine the location of the two new tracks and how they tie in with the Cambridge South four tracking. This design will be developed closely with Network Rail.

11.7.5. Two key environment and heritage sites have been identified in the area: first, Nine Wells Reserve, and the water source to it (Hobson's Brook), on the east side and secondly, a scheduled monument on the west side. The designs will take these into account and avoid impacts wherever possible and minimize impacts where total avoidance is not possible.

11.7.6. The Addenbrookes-Great Shelford Cycleway, known as "The DNA Path", currently runs on the east side of the WAML. This may have to be moved from its current location, but the link would be maintained.

11.7.7. EWR Co and NR have been working closely together so far and will continue to do so in the next design phase in order to maximise the ability to get things right first time, minimize disruption and maximise value for money for the taxpayer.

11.7.8. The Cambridge South East Transport (CSET) scheme is also planning to build a section of the new Cambridge Autonomous Metro in the same area, with a part of that route proposed to run close to the existing WAML. Coordination meetings have been taking place and will continue going forward so that integration risks can be minimised and opportunities maximised, including the possible ability to be able to transfer between EWR and CSET services at Cambridge South station.

11.8. Four tracking from Long Road Sixth Form College area to Cambridge station and Cambridge station alterations

Figure 11.5 Map of four tracking from Long Road Sixth Form College area

11.8.1. The Cambridge South scheme four tracking ends in the area next to Long Road Sixth Form College. This four tracking would need to be extended through to Cambridge Station to allow for EWR services, and the other services calling into Cambridge.

11.8.2. The A1134 overbridge is currently only built to cross a twin track railway. This bridge would, therefore, have to be replaced and temporary traffic diversions put in place during the construction works. The designs for this solution will be produced in the next design phase.

11.8.3. Just north of the A1134, the WAML becomes a three-track railway. This third track may need renewing. As such, only one additional new track is needed from this point on into Cambridge Station. It is highly likely that this new fourth track would be able to be built entirely within existing NR land boundaries; this will be confirmed in the next design phase.

11.8.4. The length of the new four tracking in this section is approximately 1.5km.

11.8.5. Hills Road overbridge currently accommodates four electrified tracks and EWR Co's current assessment is that no alterations would be required. This will be confirmed when the design is produced in the next phase of developing the Project.

11.8.6. The southern throat of Cambridge station would need remodelling. This would change the position and number of switches and crossings that would allow all services that call at or pass through Cambridge station to be on the correct line and platform and deliver the timetable. This work would require possessions to deliver. The design for this, which would include an outline construction plan, will be produced in the next phase of project development and will confirm the possessions required to carry out this work.

11.9. Cambridge station

Figure 11.6 Map of proposed station works at Cambridge station

11.9.1. Cambridge is an important national station. It is estimated that in 2018/19 a total of 10.95 million journeys started or finished at Cambridge Station. In addition, a further 0.56 million journeys involved a change of trains at Cambridge Station.

11.9.2. Cambridge station currently features four terminating (or bay) platforms (two approached from the north – numbered 5 and 6 – and two approached from the south – numbered 2 and 3) and four through platforms (two of which – numbered 1 and 4 – are joined together end-to-end as part of a single long platform face next to the main station building). The additional EWR services would mean that there would be insufficient platform space in the current arrangement. As such, two new through platforms would be required.

11.9.3. The two new through platforms are most likely to be located on the east side, where the current sidings are located. The facilities that these sidings provide would need to be provided in another location on the network. This is to be designed in the next phase of developing the Project.

11.9.4. EWR services would call into different platforms depending upon whether the EWR and GTR tracks are on the west side of the four tracking (if the new Shepreth Branch Junction is at-grade) or on the east side (if Shepreth Branch Junction is grade-separated). A possible third new platform may be required if EWR services call into the east side of Cambridge station. This is due to the need for EWR services terminating at Cambridge not to block the through platforms. This will be confirmed in the next stage of design.

11.9.5. As well as additional platforms, facilities need to be provided for the additional passengers that would use these services.

11.9.6. This work would be in addition to other enhancements that Network Rail is considering at Cambridge station. The next stage of design will develop the items already identified and EWR Co will continue to work closely with Network Rail to find the optimum solution. All works in the Cambridge area have been and will be coordinated with NR and will seek to align with their future plans as set out in the Cambridgeshire Corridor Study 2019.

11.9.7. This consultation will help to establish whether there are any other issues EWR Co should consider when designing the additions to Cambridge station and the upgrade to the railway to the south of it.

11.9.8. Preliminary designs and solutions for this section of the Project are being developed and will be introduced as part of a further, Statutory Consultation exercise in due course.

Cambrdige street

12. Next steps and ongoing work

12.1. Chapter summary

12.1.1. All of the feedback received through this consultation will be carefully considered and taken into account as EWR Co continues to progress designs.

12.1.2. The next stage is to confirm a Preferred Route Alignment option in relation to:

- **Project Section C – North Bedford**
- **Project Section D – Clapham Green to The Eversdens**
- **Project Section E – Harlton to Hauxton**

12.1.3. For some Project elements presented here that are at an earlier stage of development, further progression of designs and assessment is needed before options can be ruled out. In relation to these, EWR Co expects to take account of feedback received during consultation when it produces designs, and to consult in respect of options when it undertakes the Statutory Consultation. This relates in particular to:

- **Project Section A – Oxford to Bicester**
- **Project Section B – Bletchley and the Marston Vale Line**
- **Project Section C – Bedford St Johns and Bedford station**
- **Project Section F – The Shelfords to Cambridge Station**

12.1.4. Designs, including environmental mitigation, and approaches to land and construction for the preferred options continue to be progressed alongside the use of survey data and modelling as it becomes available, to enhance the robustness and detail of the designs.

12.1.5. Outputs from this consultation together with business case assessment will then be used to determine and to enable EWR Co to recommend a Preferred Route Alignment option, which will include identification of preferred engineering solutions for all of the Project sections.

12.1.6. The outcome of the optioneering process and business case analysis will be presented in the Outline Business Case to be put forward to the Government to gain funding approval, and the Secretary of State will – subject to funding approval – select a Preferred Route Alignment and other options in the various Project Sections having considered EWR Co's recommendation.

12.1.7. A more detailed design of the EWR Preferred Route Alignment and a Preliminary Environmental Information Report (PEIR) will be presented at the Statutory Consultation. The PEIR will provide information about the expected impacts of the Project on the environment based on information that EWR Co has available to it at the time it is preparing the PEIR.

12.1.8. EWR Co and the Secretary of State will consider feedback provided during the Statutory Consultation in deciding whether to proceed to apply for a DCO to authorise the Project within the Preferred Route Alignment, which will be subject to funding considerations amongst other matters.

12.1.9. EWR Co will carry out an environmental impact assessment of the likely significant effects of the Project on the environment and will present the results in an Environmental Statement which will be submitted as one of the documents to support the DCO application.

12.1.10. The feedback received from all rounds of consultation will be summarised in a Consultation Report which will also be submitted as part of the DCO application.

Couple out walking with their dog

V1.0