Public Document Pack

OXFORDSHIRE COUNTY COUNCIL

Cabinet
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9. LTP4 and Oxford Transport Strategy Annexes

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Connecting Oxfordshire: Local Transport Plan 2015-2031

Volume 1: Policy Document

DRAFT

CONTENTS

Other documents forming part of *Connecting Oxfordshire*

Document	Status
Area Transport strategies	Published for consultation alongside this document
Science Transit Strategy	Published for consultation alongside this document
Bus Strategy	Published for consultation alongside this document.
Rail Strategy	In development – publication for consultation expected 2015
Cycling Strategy	Published for consultation alongside this document.
Freight Strategy	Published for consultation alongside this document.
Network Capacity Management Strategy	In development – publication for consultation expected 2015
A40 Strategy	In development – publication for consultation expected 2015
A420 Strategy	Published for consultation alongside this document
Highways Asset Management Plan	Agreed by Cabinet September 2014
Green Infrastructure Strategy	In development – publication for consultation expected 2015
Oxfordshire Rights of Way Management Plan	In development – publication for consultation expected 2015

1. Foreword

Oxfordshire is a prosperous and vibrant county, combining a successful, thriving economy with a high quality environment. It is the most rural county in southeast England, and yet is a world leader in areas including scientific and energy research, international publishing, bio-technology, car manufacture and motor sport industries.

Current forecasts are for over 85,000 new jobs and 100,000 new homes in the county by 2031. Major development areas identified across the county include Science Vale, Oxford and Bicester, which has recently been awarded 'garden city' status. This will have a significant impact on our transport network, with an ever increasing number of people and goods needing to use it. Given the existing pressures on the network and the scale of growth we are anticipating, we cannot rely on small, short-term solutions – more radical solutions are required to transform transport in Oxfordshire for its people and growing economy over the next twenty years and beyond.

Connecting Oxfordshire is our new Local Transport Plan (LTP) setting out our proposed transport solutions for the county up to 2031, with ambitions beyond that in some cases. It has been informed by public feedback received in response to a series of public meetings and a public consultation in summer 2014, as well as detailed discussions with a wide range of stakeholders.

You will notice that during this LTP period, we have a huge challenge to enable people to make the journeys they need to as the population grows, and avoid damage to the economy caused by severe congestion, as well as to protect the environment. So there needs to be a significant shift away from dependence on private cars, towards more people using forms of transport that use less road capacity and damage the environment less – where possible walking, cycling, or using public transport. Our aim is to make this happen by transforming travel by these means, supported by innovation. Our strategy seeks to make this more possible and more attractive, for more people, particularly on our busiest routes.

We need to make these other forms of transport equally if not more attractive than using the car, for the majority of people. This is not going to be easy: it requires us to consider some radical solutions as well as smaller-scale improvements, which I believe will make a huge positive impact on people's lives and provide a firm, future-proofed foundation for economic growth and prosperity for Oxfordshire's residents.

Councillor Ian Hudspeth,
Leader, Oxfordshire County Council

2. Executive Summary

Connecting Oxfordshire sets out Oxfordshire County Council's policy and strategy for developing the transport system in Oxfordshire to 2031. We have developed it with input from Oxfordshire's district councils, its businesses, MPs, stakeholder groups and through public consultation. It fits our highest level strategic aims, as set out in *Oxfordshire 2030*, our Sustainable Community Strategy. It takes into account the plans and ambitions of the Oxfordshire Local Enterprise Partnership in its Strategic Economic Plan (SEP) for Oxfordshire and so identifies transport schemes that will support the Knowledge Spine growth area. *Connecting Oxfordshire* is nonetheless a plan for the whole county; it also sets out our policy priorities for parts of the county less affected by the Knowledge Spine, thereby providing a basis for securing transport improvements to support development countywide.

Connecting Oxfordshire has been developed with a set of over-arching transport goals:

- To support jobs and housing growth and economic vitality
- To support the transition to a low carbon future
- To protect, and where possible enhance Oxfordshire's environment and improve quality of life
- To improve public health, safety and individual wellbeing

To achieve these, we have developed ten objectives for transport, set out in Table 1. These are set within three themes, upon which we have based the structure of the policy section of this document. The objectives guide the area and route strategies and the bus, cycle and freight strategies that follow the policy section. This executive summary is not a substitute for, nor does it derogate from, the policies, strategies and text set out in the main document.

Context

Oxfordshire is experiencing economic growth. Its economy is recognised as one of the best performing in the UK and its contribution to the UK economy is well above average. For example, Workplace Gross Value Added per head averaged £28,767 in Oxfordshire in 2013, compared to the UK average of £23,755. Meanwhile, its population is rising: it is home to around 635,000 people, a figure that has grown by over 10% in the past decade. Economic and population growth is due to continue: the SEP programmes a growth in Oxfordshire of 100,000 homes and over 85,000 jobs.

Goal	Theme and section in *Connecting Oxfordshire*	Objective
To support jobs and housing growth and economic vitality	Supporting growth and economic vitality	Maintain and improve transport connections to support economic growth and vitality across the county
		Make most effective use of all available transport capacity through innovative management of the network
		Increase journey time reliability and minimise end-to-end public transport journey times on main routes
		Develop a high-quality, resilient integrated transport system that is attractive to customers and generates inward investment
To support the transition to a low carbon future	Cutting carbon	Minimise the need to travel
		Reduce the proportion of journeys made by private car by making the use of public transport, walking and cycling more attractive
		Influence the location and layout of development to maximise the use and value of existing and planned sustainable transport investment
		Reduce per capita carbon emissions from transport in Oxfordshire in line with UK government targets
To support social inclusion and equality of opportunity To protect and where possible enhance Oxfordshire's environment and improve quality of health To improve public health, safety and individual wellbeing	Improving quality of life	Mitigate and wherever possible enhance the impacts of transport on the local built, historic and natural environment
		Improve public health and wellbeing by increasing levels of walking and cycling, reducing transport emissions, reducing casualties and enabling inclusive access to jobs, education, training and services

Table 1: Connecting Oxfordshire's *goals and objectives*

Although Oxfordshire's transport system has undergone and is undergoing a number of improvements, it will face a major challenge to cope with the number of new homes and jobs expected in the county over the coming years by the SEP. Public transport is currently crowded in many areas and roads are congested, especially in areas around the Knowledge Spine and in the peak hours. Many of our urban areas have poor air quality and climate change is an issue that we need to address. We need to undertake this in a climate of uncertain central government funding and therefore a need to identify new, innovative ways of solving transport problems and of resourcing projects, working with businesses, researchers and the public in Oxfordshire through our Science Transit Strategy.

Supporting growth and economic vitality

Connecting Oxfordshire supports the SEP, the economic growth strategy for the county. Peak time travel to work is prioritised for attention, because it presents the greatest challenge to transport networks and is vital for the economy. We need to provide transport improvements to tackle congestion and provide new connections between homes and jobs. We will work to ensure that the transport network supports sustainable economic and housing growth in the county, whilst protecting our environmental and heritage assets, and supporting the health and wellbeing of residents.

We will work with partners in the Highways Agency and district councils to introduce enhancements to road capacity on strategic roads suffering from congestion and delays. A longer term solution is needed to alleviate congestion on the A34, to accommodate planned development and trip growth. We are developing a series of improvements to the A40, for Local Growth Fund and City Deal funding, and are developing a strategy options report that will identify further investment in longer-term solutions. The A420 is another important principal route running through our county, linking Oxford with Swindon, which operates over capacity at peak time, and we have developed a strategy to address this. Congestion is not limited to the strategic road network; it is a problem throughout much of the county and in growth areas. The area strategies for Oxford, Science Vale, Bicester, Banbury, Witney and Carterton in *Connecting Oxfordshire* volume 2 outline local transport improvements that may be required to accommodate the development identified for those areas.

Through our involvement in strategic planning, we will seek to ensure that the need for additional road infrastructure is minimised. By locating housing close to jobs where people can walk or cycle to work, by providing high quality public transport links to development sites and using 'nudge' measures such as providing residential parking away from houses in new developments, the car will not be perceived as the default means of transport. If we continue to see the same proportion of journeys made by sole-occupancy private car in the future, we will simply not be able to accommodate the trips that people want to make. We will support measures that

make more efficient use of transport network capacity and encouraging a greater proportion of journeys to be made on foot, by bicycle, or by public transport.

It is also vital that freight journeys are made using suitable routes and with minimal environmental impact and that we support initiatives to increase the proportion of freight carried by rail; we have developed a freight strategy with measures to improve the transport of freight within and through Oxfordshire, while reducing the impact of Heavy Goods Vehicles on communities. All roads function as a link, but some also function as a place. Where roads pass through urban centres as a 'high street', they are part of a place as well as being a link. In the latter situation pedestrians would be given a much higher priority, with plenty of opportunity to cross the road even if this means interrupting traffic flow.

Our transport strategy relies on public transport being sufficient and attractive enough to replace the private car on journeys across Oxford outside of the city centre, for travel within other towns and on inter-urban journeys. To achieve this it will need to be very high-quality, easy to use and offer seamless integration on journeys involving different types of transport.

- Our Science Transit Strategy defines both our high-level vision and outline roadmap for the development of better-integrated, high-quality mobility systems that both serve the Oxfordshire Knowledge Spine and connect it with the rest of the county, while promoting projects promoting innovation in mobility and integrated transport delivery, including the Oxfordshire Journey Planner.
- Our Bus Strategy sets out how we will work to improve the county-wide bus network, developing bus rapid transit services along the busiest routes, upgrading Premium services in the county and developing the wider bus network.
- We are also developing a rail strategy setting out our ambition and priorities for rail investment, in partnership with Network Rail and train operators. This was informed by a rail demand forecasting exercise by the Council in 2013, which forecast an increase in passenger demand by 68% to 2026, most of the growth being generated by new rail investment. Better integration of rail and strategic bus networks and enhancing access to local rail stations by the provision of cycle parking are also improvements we will seek.
- We will also support the development of air travel services and facilities to support economic growth across the county, including supporting growth at London Oxford Airport.

In some cases, making public transport more attractive will not be enough to deter car use and the introduction of a Workplace Parking Levy or other constraint may be necessary. The Oxford Transport Strategy sets out proposals for this, as well as for restrictions on more routes in the city. We will manage the parking under our control

and work with district councils to ensure that overall parking provision and controls support the objectives of local communities and this plan.

Public transport may not be available to all those without a private car but who need access to job opportunities, education, retail, leisure and culture, and health services, and taxis may not always be affordable. When developing walking and cycling networks for towns, they must include connections to areas less well served by public transport. For when walking and cycling is not an option, we will work with local research and development partners to scope, design, test, and implement a family of vehicle hire and ride sharing technologies focused on bike hire, car share, car clubs and other on-demand vehicle services.

Keeping Oxfordshire's road and transport infrastructure in good condition is important for the county's economy. While potholes can cause damage to cars, they often make bus journeys extremely uncomfortable and are a hazard to road users on two wheels. Poorly maintained footways can discourage people from walking, or even cause injuries. We will target new investment and maintain transport infrastructure to minimise long-term costs, publishing our policy on prioritisation of maintenance activity in the Highways Asset Management Plan.

Cutting carbon

We will seek to ensure that the location, layout and design of new developments minimise the need for travel. Approximately 12% of people in Oxfordshire work mainly from home and there is clearly potential for this to increase. We are working in partnership with the government and BT to bring high-speed broadband to 90% of homes and businesses by the end of 2015 and we will continue to make this a priority for new developments.

Walking is a healthy, free, low carbon and on-demand form of transport. It can be built into every journey, whether from origin to destination or to travel to bus stops and rail stations. In area strategies we will review walking networks and focus capital improvements on routes with the greatest potential for increasing the numbers of people walking, particularly where improving the pedestrian environment would improve accessibility, support economic growth and reduce car use. We will focus on improvements that make routes safe for all users, such as pedestrian crossings and improved surfaces, but will also improve the pedestrian environment and make other design improvements to improve people's enjoyment of the public space.

Cycling as a means of transport emits zero carbon in use. Where trips by bike replace private car or public transport trips, this helps to reduce carbon emissions overall. Cycling also has huge health benefits, so increasing the proportion of people who cycle regularly will help to address the problems of obesity and ill health related to inactivity. We aim to triple the percentage share of people who cycle to

work in the county. This is outlined in our cycling strategy and the individual area cycling strategies developed or under development.

We will ensure that new development adheres to the principles and philosophy set out in the DfT's *Manual for Streets*. In residential areas this will include restrictions on parking, 20 mph speed limits where appropriate and more through routes for pedestrians and cyclists than for motor vehicles. We will ensure that travel plans for new developments include measures to increase walking and cycling, and that these travel plans are implemented and enforced. We will carry out targeted safety improvements on walking and cycling routes to school, to encourage active travel and reduce pressure on school bus transport.

We will promote the use of low carbon forms of transport, including electric vehicles and associated infrastructure where appropriate. We will work through our Science Transit Strategy to develop and introduce low carbon technology. We are supporting trials of electric buses in our county and will support further pilots where appropriate, working with business and research institutions. We will also work to reduce the carbon footprint of our transport assets and operation where economically viable, taking into account energy consumption and the use of recycled materials.

Improving quality of life

To ensure that the environmental and heritage impacts of this plan are considered fully, a Strategic Environmental Assessment has been carried out, the findings of which are contained in the *Connecting Oxfordshire's* Environmental Report. We will work to reduce negative environmental impacts of the development of new infrastructure and the impact on biodiversity of environmentally damaging forms of transport. We will manage our highway assets to reduce their impact on the environment; details of how we will do this can be found in our Highways Asset Management Plan and our Tree Management Policy. We will work with district councils to develop and implement transport interventions to support Air Quality Action Plans by reducing harmful emissions from vehicles where feasible, giving priority to measures which also contribute to other transport objectives.

We will improve urban public open spaces that are part of highway land where it is part of a wider highway improvement scheme, and we will de-clutter the street environment. We will work with partners to develop Oxfordshire's 'green infrastructure', which includes our public rights of way network. Details of our plans will be set out in the forthcoming Oxfordshire Green Infrastructure Strategy and Rights of Way Improvement Plan.

The county's population is relatively healthy compared to the average for England, but this overall prosperity masks the health inequalities in the areas of deprivation, especially in some urban areas: life expectancy varies by 6.2 years for men and 2.8 years for women between the most and least deprived wards. For many people, the

easiest way to build exercise into their daily routine is through walking or cycling for local journeys and using public transport for other journeys. Improving walking, cycling and public transport together offer the best solution for bringing accessibility to deprived areas, both rural and urban. Better transport links will provide connections with more job opportunities, shops and local centres, giving the opportunity both to improve health and to counter deprivation.

Improving accessibility to deprived areas is an important outcome of this plan. Improving accessibility to those less able to use our existing infrastructure is also important. The population has aged, with the number of people aged 65 and over increasing by 18% from 2001 to 2011, although Oxford itself has a smaller population of older people and a much larger population in the 20-30 age group. Public transport needs to be available to disabled people and, as the population ages, our public transport must be accessible to elderly people and the mobility impaired. We will consult from an early stage in the development of schemes and initiatives so that the needs of individuals, communities and all groups sharing a protected characteristic under the Equalities Act 2010 are considered and, where appropriate, acted upon.

Road safety is an important objective for any transport authority, because of the harm done to individuals by road traffic accidents and also because of the impact on the economy from congestion caused by such accidents. We will respond positively, so that road users in Oxfordshire have the opportunity to take advantage of new technologies, for example through the use of new, safer materials and infrastructure in highway schemes, and road safety adaptations that may become permissible under new legislation – many of these are likely to relate to in-vehicle technology that will alert drivers to risks and potentially manage, for example, the headways between vehicles. We will provide information to support the development of road safety technologies. Monitoring casualty history allows us to target our behaviour-change programmes, and also identify sites that would benefit from maintenance or improvement schemes. We will work with partners to support road safety campaigns and will keep speed limits under review, including giving consideration to the introduction of 20 mph speed limits and zones. We will propose engineering solutions where they would be effective in helping reduce accidents on parts of the highway network where a significant number of accidents occur.

We will use this plan to influence the development of Neighbourhood Plans and seek to influence them with a view to consistency with *Connecting Oxfordshire*. We will work in partnership with the Local Enterprise Partnership, district councils, the Highways Agency and developers to meet the objectives of the plan and seek external funding to support the delivery of transport infrastructure priorities as set out in the SEP, City Deal and Local Investment Plan.

3. Introduction

Transport and economic growth

1. Oxfordshire is expecting, and planning for, strong economic growth. It is already recognised nationally for its universities and the strength of its science-based knowledge industries, with many high-technology firms that now form an Oxfordshire technology cluster with outstanding strengths in four overlapping industries.[1] , The ambition of the Oxfordshire Local Enterprise Partnership (LEP) is for it to be a global leader in 'Big Science'.

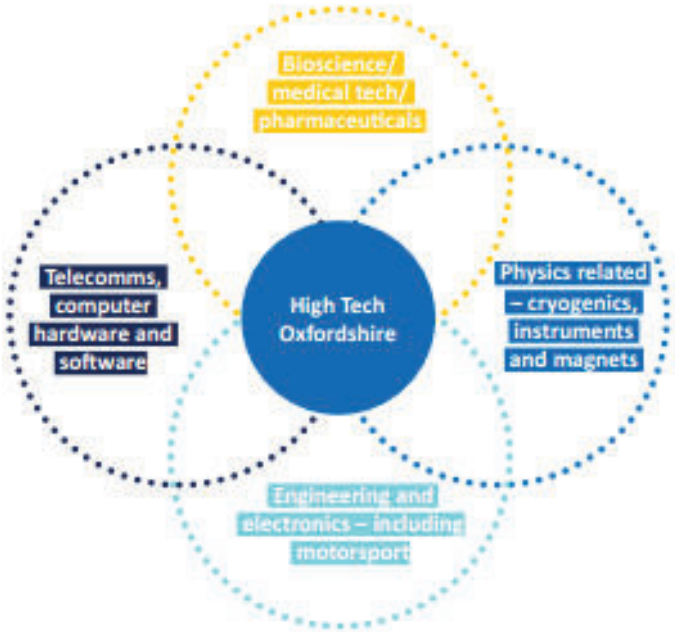


Figure 1: High Tech Oxfordshire (Source: Oxfordshire Strategic Economic Plan, 2013)

2. The growth of these sectors has been supported by a unique grouping of research facilities in Oxfordshire, including the UK Atomic Energy Authority Culham Centre for Fusion Energy; the Science and Technology Facilities Council; Rutherford Appleton Laboratory; Diamond Light Source, the national synchrotron facility; the Medical Research Council's facilities at Harwell; Begbroke Science Park; and the Satellite Applications Catapult Centre. Proximity to these facilities, combined with Oxford's global academic reputation and its strategic position at one apex of the UK's 'Golden Triangle' with Cambridge and London, provides huge potential for inward investment and for businesses to spin out and grow in high quality business locations across the region: Oxford's science parks, Bicester, Science Vale2, the Enterprise Zone, and beyond.

[1] The Oxfordshire Innovation Engine, Realising the Growth Potential, SQW, October 2013

[2] 'Science Vale' is the term applied to an area encompassing the county's key high tech business parks: Milton Park, Culham and Harwell Campus, and their nearby towns of Wantage, Grove and Didcot.

[3] 2011 Census data

3. The high-tech sectors are expected to create the majority of the 85,000 plus new jobs anticipated in the county up to 2031. To do this they will need to retain and attract a large, skilled workforce. To achieve the agglomeration benefits of location in Oxfordshire, there will need to be excellent links between businesses and research establishments in the county, as well as to research establishments, suppliers and customers elsewhere in the UK and globally.

4. The Oxfordshire LEP's Strategic Economic Plan (SEP) sets out the investment that will be required to realise this growth. It focuses on providing homes, developing skills and improving connectivity and is now the basis upon which the majority of central government funding for transport improvements is awarded locally, via the Local Growth Fund (LGF). The SEP'S focus on high tech economic activity means that government funding for transport schemes will be largely focused on links within the area encompassing Bicester, Oxford and Science Vale, known as the Knowledge Spine, as well as improving access to it from important centres elsewhere in Oxfordshire, the UK and overseas.

5. In addition to funding which is available locally via the LGF, the government is investing heavily in strategic transport infrastructure that will support Oxfordshire's economic development. These include important schemes such as railway electrification, East-West Rail, which will link Oxford to Milton Keynes and Cambridge by rail for the first time since 1967, and direct rail access from the west into Heathrow. Additionally, the Highways Agency is developing a route based strategy linking Southampton and the East Midlands, which will include improvements to the A34.

Figure 2: Oxfordshire's Knowledge Spine [Note – this diagram is under review!!]

6. Not all of the workers employed in the Knowledge Spine will live there – Witney and Banbury in particular are already home to a large number of commuters. Transport links between these towns and the Knowledge Spine will become even more important for bringing workers in to the expanding high tech industries. Elsewhere, where a business case cannot be linked to the SEP, it will be more challenging to obtain central government funding for transport schemes, and there will be more reliance on developer funding.

7. *Connecting Oxfordshire* sets out our policy and strategy for the whole county, supporting the SEP but also setting out our priorities for parts of the county less affected by growth in the Knowledge Spine, thereby providing a basis for securing transport improvements to support development countywide.

Goals for transport

8. While this Local Transport Plan focuses on supporting growth in Oxfordshire, it also sets out how we will protect public health and the environment, which could be threatened by development unless action is taken. The growing economy and the transport improvements it brings have the potential to improve quality of life for all of Oxfordshire's residents: *Connecting Oxfordshire* aims to reduce inequality and promote equality of opportunity. This balanced approach fits with our highest level strategic aims, as set out in the Sustainable Community Strategy, *Oxfordshire 2030*, which sets out the long-term partnership vision and strategy for Oxfordshire. It guides the Council's policy making across all services, and is the long-term plan on which the Council's annually updated Corporate Plan is based. Its aims are to:

- Create a world class economy for Oxfordshire.
- Have healthy and thriving communities.
- Look after our environment and respond to the threat of climate change.
- Reduce inequalities and break the cycle of deprivation.

9. The balanced approach of *Connecting Oxfordshire* also aligns with the Government's vision for local transport, as expressed in the 2011 White Paper *Creating Growth, Cutting Carbon: Making Sustainable Local Transport Happen*:

> 'Our vision is for a transport system that is an engine for economic growth, but one that is also greener and safer and improves quality of life in our communities.'

10. With this vision and aims in mind, following consultation with the public and a wide range of stakeholders, we have developed a set of high level goals for transport for *Connecting Oxfordshire*:

Through transport improvement and innovation across Oxfordshire, our goals are:

- **To support jobs and housing growth and economic vitality;**
- **To support the transition to a low carbon future;**
- **To support social inclusion and equality of opportunity;**
- **To protect, and where possible enhance Oxfordshire's environment and improve quality of life; and**
- **To improve public health, safety and individual wellbeing.**

11. To achieve these goals we have developed ten objectives for transport. In this document they are grouped under three themes:

Theme 1: Supporting growth and economic vitality (Goal 1)

- **Maintain and improve transport connections to support economic growth and vitality across the county.**
- **Make most effective use of all available transport capacity through innovative management of the network.**
- **Increase journey time reliability and minimise end-to-end public transport journey times on main routes.**
- **Develop a high quality, resilient integrated transport system that is attractive to customers and generates inward investment.**

Theme 2: Cutting carbon (Goal 2)

- **Minimise the need to travel.**
- **Reduce the proportion of journeys made by private car by making the use of public transport, walking and cycling more attractive.**

- **Influence the location and layout of development to maximise the use and value of existing and planned sustainable transport investment,**
- **Reduce per capita carbon emissions from transport in Oxfordshire in line with UK government targets.**

Theme 3: Improving quality of life (Goals 3, 4 and 5)

- **Mitigate and wherever possible enhance the impacts of transport on the local built, historic and natural environment.**
- **Improve public health and wellbeing by increasing levels of walking and cycling, reducing transport emissions, reducing casualties, and enabling inclusive access to jobs, education, training and services.**

The scope of *Connecting Oxfordshire*

12. *Connecting Oxfordshire* builds on an existing programme of highway and transport schemes focused on unlocking economic growth up to 2021. *Connecting Oxfordshire* sets out a new transport strategy for the whole of Oxfordshire, covering the period 2015-2031. The end date of 2031 has been chosen to tie in with the period of most of the Local Plans being put in place by Oxfordshire's district councils. *Connecting Oxfordshire* considers the needs of residents and the county's employers, as well as people travelling to and through Oxfordshire, including tourists.

13. It has been developed with Oxfordshire's district councils in conjunction with the development plan process, to take account of the future location of housing and employment within the county. It also takes account of the transport challenges created by future development outside but close to the county boundary, for example on the east side of Swindon.

14. However, the situation with regard to local plans is still evolving, largely as a result of the 2014 Oxfordshire Strategic Housing Market Assessment. *Connecting Oxfordshire* is based on the pattern of development currently envisaged through emerging local plans, but these are likely to change. In particular, there will be a requirement to allocate additional housing that cannot be accommodated within Oxford's boundaries in order to meet the city's housing needs. A comprehensive approach is needed to ensure the planning of new housing and employment growth across the County is integrated with the planned investment in strategic transport infrastructure. This work is likely to require a further update of *Connecting Oxfordshire* when options are fully considered and decisions made.

15. *Connecting Oxfordshire* closely links land-use and transport planning, and aligns with the National Planning Policy Framework (NPPF). The NPPF states (paragraph 30):

> 'Encouragement should be given to solutions which support reductions in greenhouse gas emissions and reduce congestion. In preparing Local Plans,

local planning authorities should therefore support a pattern of development which, where reasonable to do so, facilitates the use of sustainable modes of transport.'

It takes into account national and local transport and enterprise policies. This input is outlined in Figure 2:

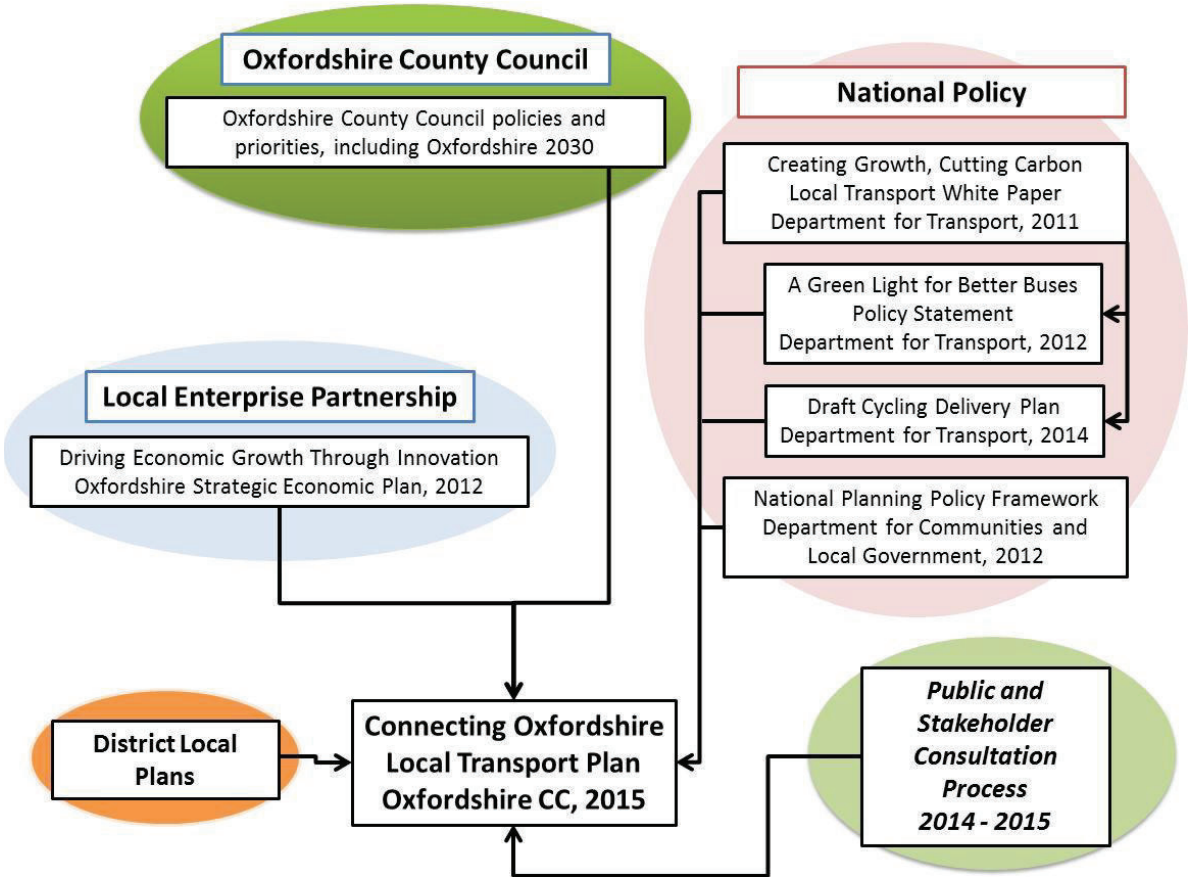


Figure 3: Connecting Oxfordshire*'s relationship with national and local transport and planning policies and with the Oxfordshire Strategic Economic Plan*

Strategic approach

16. Our strategy for the period to 2031 acknowledges that predicting and providing fully for increased demand for road travel by car and freight vehicles, in the form of highway capacity improvements, is neither affordable, nor desirable from an environmental perspective. It is vital that a smaller proportion of journeys, or of the length of journeys, are made by sole-occupancy private vehicle, and that more journeys are made by methods that take up less road capacity or do not use roads at all. This is necessary simply to accommodate all the journeys that people and goods need to make. This plan does include road schemes to connect new developments, but we will be seeking to make best use of existing capacity, mindful that any additional capacity has the potential to generate additional car traffic.

17. Fully loaded buses travelling along an urban road can accommodate roughly eight times the number of people than could be travelling along the same road in fully loaded cars and the bus network in Oxford city centre is subject to a low emission zone. A bicycle takes up only one fifth of the road space of a car. Using rail or walking uses no road space at all. Wherever feasible we will be seeking to make the best use of road space by giving priority to non-car transport.

18. Spreading travel demand onto non-car methods of transport will as far as possible be achieved through making them more attractive to car drivers than the car. In some cases, restrictions on car use will increase as congestion impacts on journey times and premium space for parking becomes ever more expensive. A number of employers, such as the University of Oxford, already charge for staff parking to reduce demand for car travel. There will be increasing pressure on bus and rail capacity, so an important part of our strategy is to reduce the need to travel at all, through the use of technology enabling people to work and access services from home or in their communities, and, most importantly, through a strategic approach to land-use planning, which involves reducing the number and/or distance of journeys that people need to make.

19. The level of HGVs on roads in our county can be managed or even reduced by increasing the proportion of freight journeys made by rail. Oxfordshire's rail network already carries significant volumes of freight, particularly between the port of Southampton and the Midlands and North of England. In summer 2015 there will be a substantial increase in capacity for freight trains on this major rail freight route, which acts as part of the European TEN-T North Sea – Mediterranean transport corridor. This increase in capacity will be due to the completion of Network Rail's upgrade project around Reading station, which will enable freight trains to link between the Basingstoke line and the slow lines to Didcot without crossing the main high-speed lines. The future electrification of this route and the re-opening of the rail route from Oxford to Milton Keynes will augment these improvements for both passenger and freight.

20. These rail upgrades provide a major opportunity to reduce congestion caused by HGVs travelling through the county on the A34. It will also offer more rail capacity for freight arriving and departing from Oxfordshire, which currently includes aggregates, waste, MOD supplies and finished Mini cars. Rail freight is most competitive in transporting heavy and bulky items like these and we will promote a shift of such goods from road to rail as part of *Connecting Oxfordshire.* However, road transport is necessary for many goods, while providing the bulk of the 'final mile' transport for goods arriving by rail. The growth of light manufacturing, service industries and changing shopping habits – with more click-and-collect and home delivery purchases – means that journeys by delivery vans are increasing in number.

3. Oxfordshire now and in 2031

Oxfordshire now

Population and health

21. Oxfordshire is home to around 635,500 people, a figure that has grown by over 10% in the past decade. The county is divided into five district council areas: Oxford City, Cherwell, South Oxfordshire, Vale of White Horse and West Oxfordshire. Nearly a quarter of the county's residents live in Oxford City with the remainder split fairly evenly over the other four districts. The county is the most rural county in the south east of England, and over 30% of the population live in towns and villages of less than 10,000 people.

22. Overall in the last decade, the population has become older, with the number of people aged 65 and over increasing by 18% while the number of people aged 85 years and over increased by 30%. The age profile of Oxford's population is very different from the rest of the county, however, with a smaller proportion of older people and a much larger population in the 20-30 age group due to the high numbers of students.

23. Oxfordshire's population is relatively healthy, with a relatively high percentage of physically active adults compared to the average for England. However, rising obesity, low exercise levels and related health issues are still concerns, as they are nationally: 20% of people walk for more than 20 minutes less than once a year or never in England. Oxfordshire's overall prosperity masks some stark contrasts, particularly within urban areas. There are nine wards containing small areas among the 20% most deprived in England: two in Banbury, one in Abingdon, and the rest in Oxford. This is reflected in health inequalities across the county, with poor health strongly linked to deprivation: life expectancy varies by 6.2 years for men and 2.8 years for women between the most and least deprived wards.

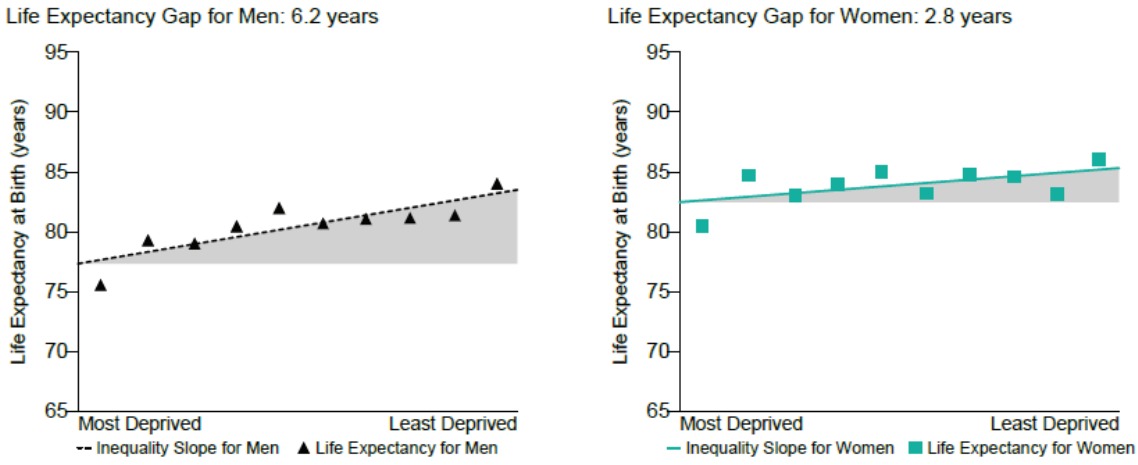


Figure 4: Life expectancy gap between most and least deprived wards in Oxfordshire (Source: Public Health England Health Profile 2014)

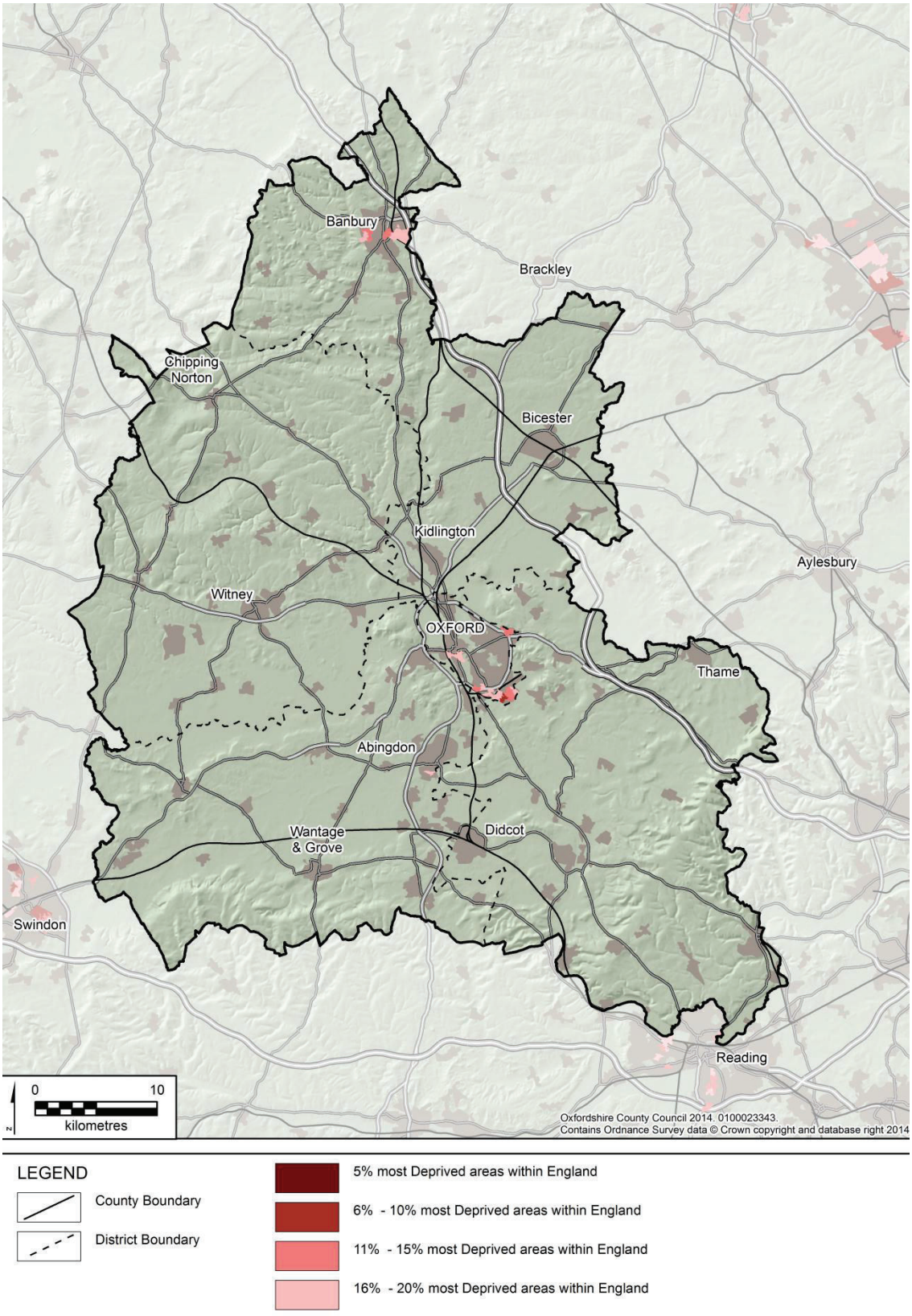


Figure 5: Deprivation in Oxfordshire: wards containing areas among the 20% most deprived in England (Source: DCLG Index of Multiple Deprivation)

Natural and historic environment

24. Oxfordshire has a rich and varied natural and historic environment, which makes it an attractive place to live, visit and work. To the north-west, the rolling hills and golden limestone villages of the Cotswolds are a magnet for tourists. To the south the landscape is dominated by the escarpments of the North Wessex Downs and the Chilterns. In between, the valleys and the flood plains of the Thames and its tributaries dominate the landscape, providing valuable farmland and lowland habitats, active gravel workings as well as a legacy of gravel extraction. The rivers themselves, particularly the Thames, offer a wealth of opportunities for leisure activities, but flood most winters with increasing severity and regularity, affecting the transport network and hundreds of homes.

25. The county contains part of three Areas of Outstanding Natural Beauty (AONB): the Cotswolds, North Wessex Downs, and the Chilterns, and a large area encircling Oxford is designed as Green Belt. There are seven internationally designated conservation sites (all Special Areas of Conservation) wholly or partly within Oxfordshire, 105 Sites of Special Scientific Interest (SSSI) and nine National Nature Reserves. However, despite the presence of these sites, a number wildlife species have been lost from or have been in decline in Oxfordshire. For example, three species of butterfly have been lost from the county in the last ten years. Semi-natural habitats such as grassland and heathland have been in decline across the county. Poorly-managed and poorly-designed developments have also taken place in recent decades in both rural and urban locations that were home to wild plants and animals. More information is in the Strategic Environmental Assessment which accompanies this document.

26. Oxfordshire has a rich heritage and archaeological resource, with Blenheim Palace UNESCO World Heritage Site (WHS), 55 Registered Parks and Gardens, nearly 13,000 listed buildings, 242 Conservation Areas, 2 historic battlefields and approximately 350 Scheduled Monuments. These help make the county a major tourist destination, both for visitors in its own right and for day trips by visitors to London.

Economy and travel characteristics

27. Oxford's unique character as a leading university city and a historic centre sets it apart from the rest of the county, and attracts much more travel than most towns or cities of comparable size. Tourism, as well as business and academic travel are vital to the economy, and 35% of the county's jobs are in the city. Due to the high number of jobs and the shortage and cost of housing in the city, more people commute to Oxford from outside the city than are working residents. The city also provides the majority of the county's hospital services, with three major teaching hospitals, as well as psychiatric and private hospitals. Oxford is therefore by far the most important 'centre of gravity' in the county, though as we have seen in the previous chapter, Bicester and the Science Vale are growing in economic importance as part of a 'Knowledge Spine' through central Oxfordshire.

28. Oxfordshire's rural areas are generally prosperous, however, so although many of its towns are largely commuter towns, they have managed to retain economic vitality as attractive and thriving local centres providing a good range of services.

Banbury is more self-contained and experiencing jobs growth itself, with 60% of working residents having jobs in the town, besides the significant number commuting to Oxford.

29. Oxfordshire is home to nearly 30,000 businesses, providing over 380,000 jobs, including a high proportion in research, science and technology, engineering, and high-tech manufacturing. The county's economy is recognised as one of the best performing in the UK and its contribution to the national economy is well above average. In 2013 Oxfordshire contributed £19.2 billion to the UK economy, giving it a 1.3% share. Workplace Gross Value Added per head in Oxfordshire averaged £28,767 in 2013, compared to the UK average of £23,755.

30. Car ownership and car usage is high outside Oxford, with 87% of households owning a car – compared with only 67% in Oxford. This is reflected in the high proportion of journeys made by car outside Oxford, including a large number of short trips within the county's towns. Although 50% of journeys to central Oxford are by bus, most of the city's jobs are in the more outlying areas to the east of the city, which are less accessible by public transport.

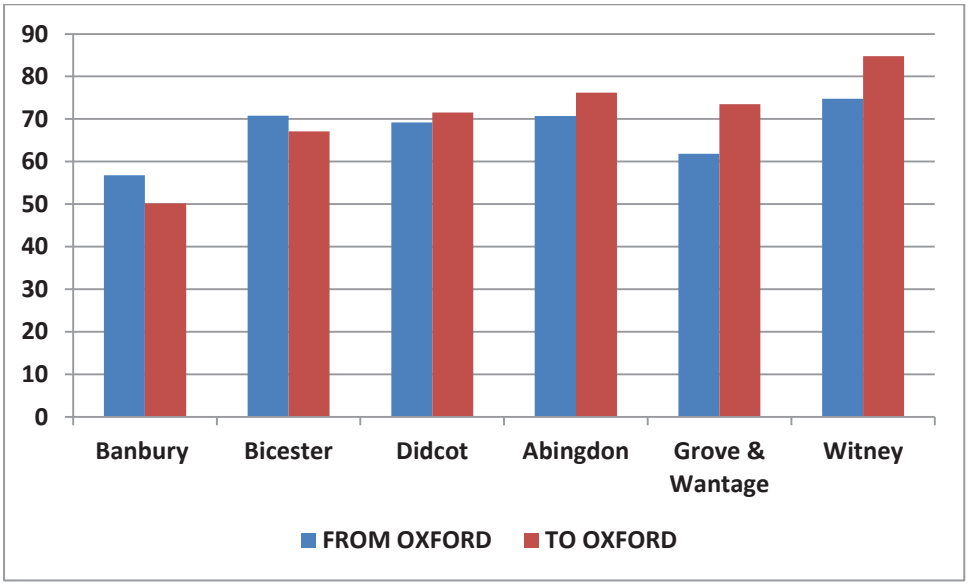


Figure 6: Car commuting between Oxford and large Oxfordshire towns as a percentage of overall commuter journeys [Source: Census 2011]

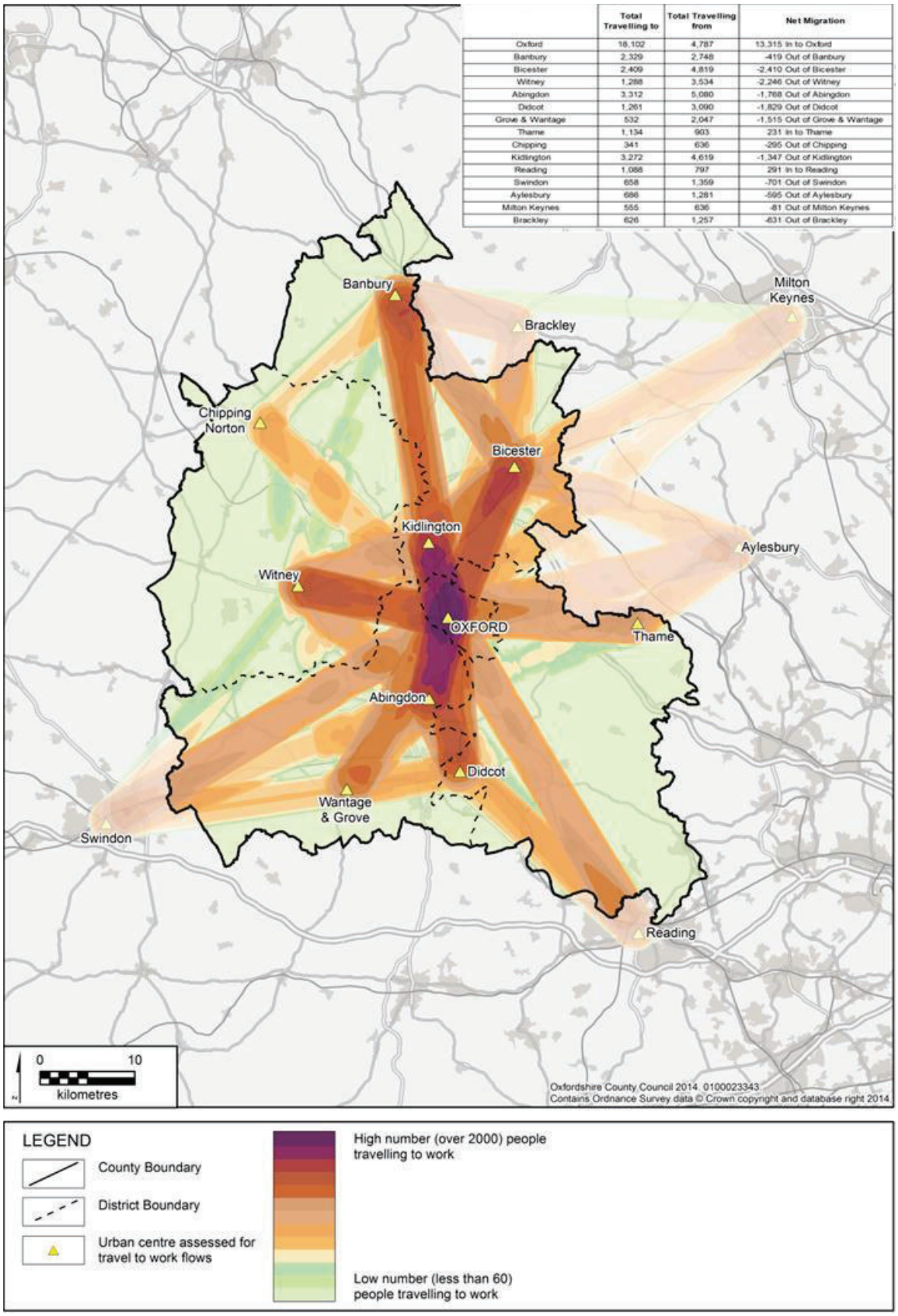


Figure 7: Main travel to work flows in Oxfordshire [Source: Census 2011]

31. Oxfordshire enjoys a location within easy reach of major cities including London, Birmingham and international gateways such as Heathrow Airport and Southampton. However this also means that there is a high volume of through traffic which can result in long delays to local journeys by road. The M40 carries the most traffic, particularly on the stretch between junctions 9 and 10, which links the A34 via the A43 to the M1 and carries over 100,000 vehicles per day. The A34 carries up to 70,000 vehicles per day, including a large proportion of lorries. Because the county relies heavily on the A34 for internal trips, and it forms part of the Oxford ring road, the severe congestion it suffers is damaging to the local, as well as the national economy. It is particularly vulnerable to disruption due to incidents, because of the lack of alternative north-south routes.

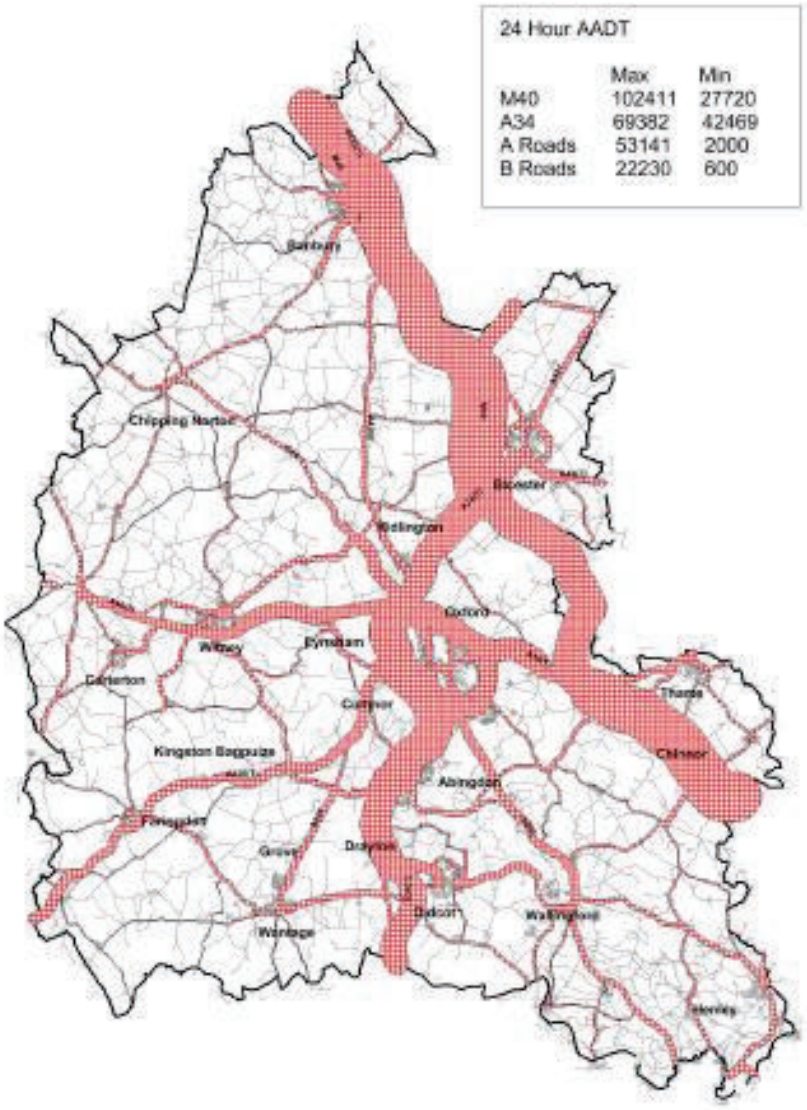


Figure 8: Annual average daily traffic flow bandwidth map – based on automated traffic counts throughout Oxfordshire. (Source: Oxfordshire County Council Transport Monitoring)

32. There is a good network of frequent bus or rail services linking the county's main towns with Oxford, yet the proportion of car journeys between these towns and Oxford remains stubbornly high. In part this is due to the availability and success of Park and Ride on the edge of Oxford, which has been developed since the 1970s in conjunction with restrictions on access to the city centre. However, it means that the road corridors leading to Oxford used by buses all suffer from congestion. The A40, which is a major through route linking Gloucester and London, intersects with three key radial routes to the north of Oxford, where it forms part of Oxford's ring road, causing serious delays between Witney and Oxford. Much of the traffic using this route is accessing the large employment sites on the eastern fringes of Oxford.

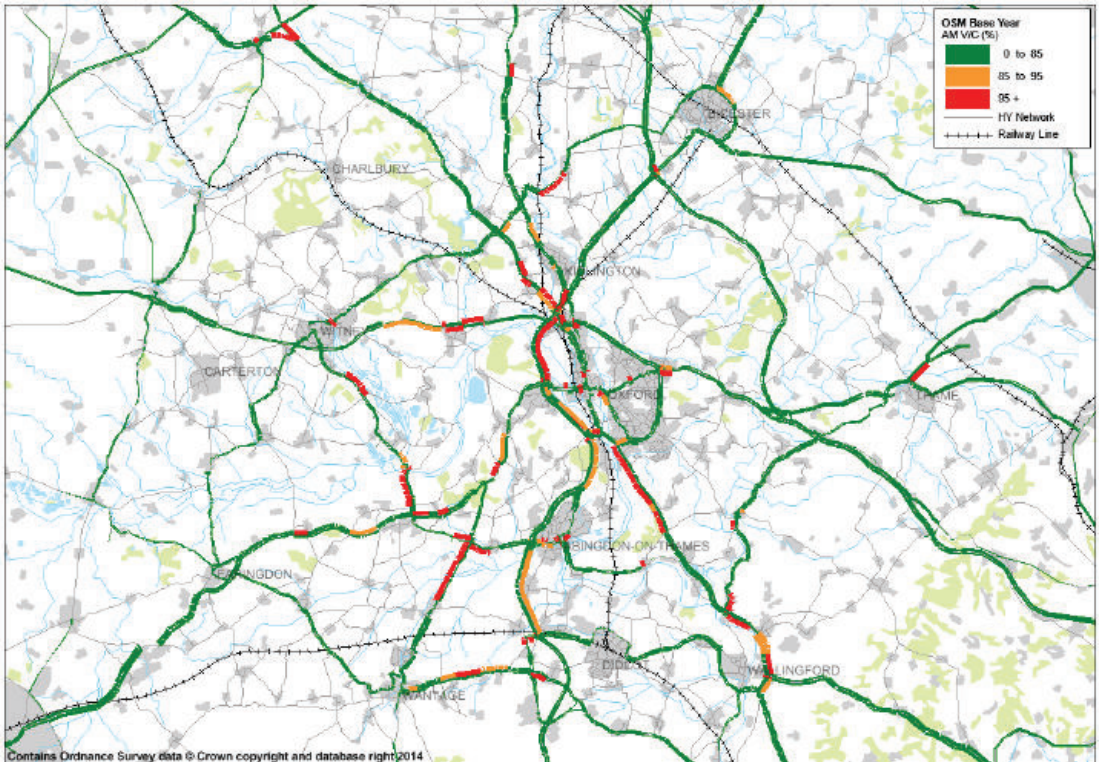


Figure 9: Highway Network in the morning peak – volume of traffic in relation to road capacity (85% to 95% = at capacity, 95% plus = over capacity)

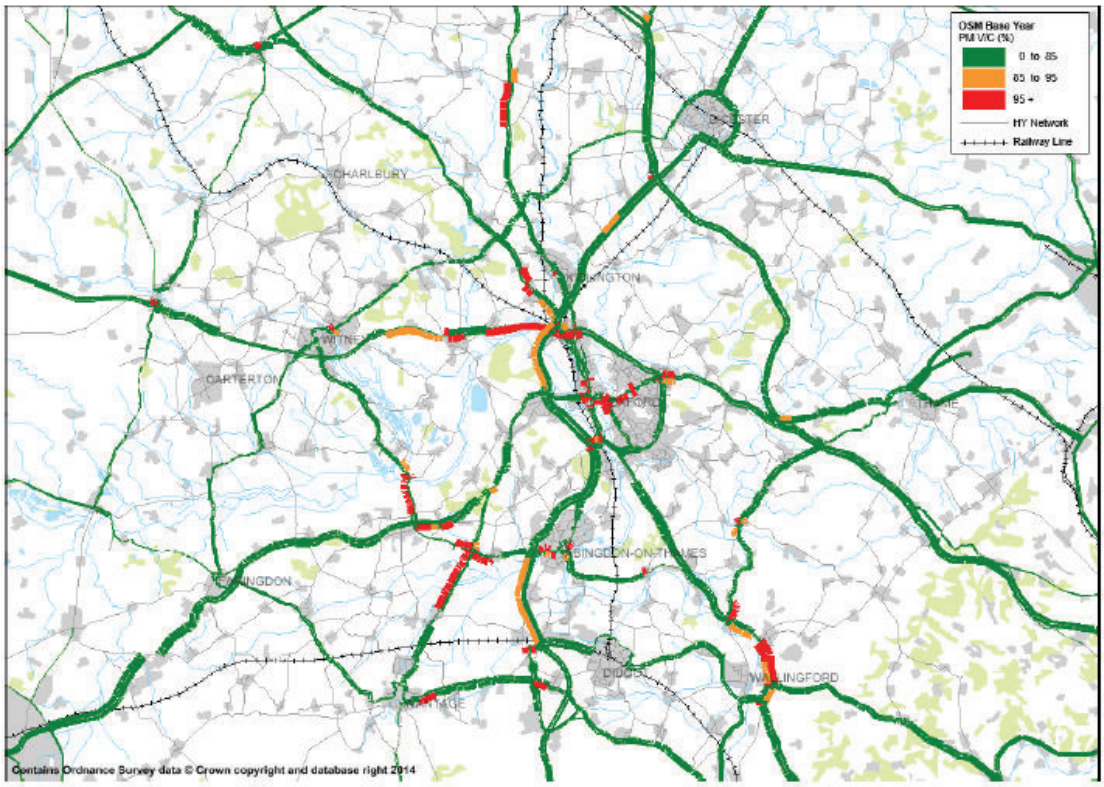


Figure 10: Highway Network in the evening peak – volume of traffic in relation to road capacity (85% to 95% = at capacity, 95% plus = over capacity)

33. Within Oxford, there is a mature and well-used network of largely commercial bus services, including regular services to the city centre from five park and ride sites on the edge of the city. The five major radial routes have stretches of bus lane, but these are not continuous due to lack of available space. A Quality Bus Partnership between the city's two main bus operators and the County Council has led to a joint smartcard ticketing arrangement and consolidation of services on larger vehicles. Vehicles are modern and around 50% of the fleet are electric hybrids.

34. Within Oxfordshire's towns, bus networks are relatively under-developed, offering slow, infrequent routes that are more suited to shoppers than commuters. The quality of cycling and walking networks is variable, with some towns having had very little investment in pedestrian and cycling infrastructure. Although there is a charge for most town centre parking in district council car parks other than in West Oxfordshire, many of the trips within the towns are to workplaces with ample staff parking, edge of town retail, or schools. This means that even for internal trips, a very high proportion are still made by car.

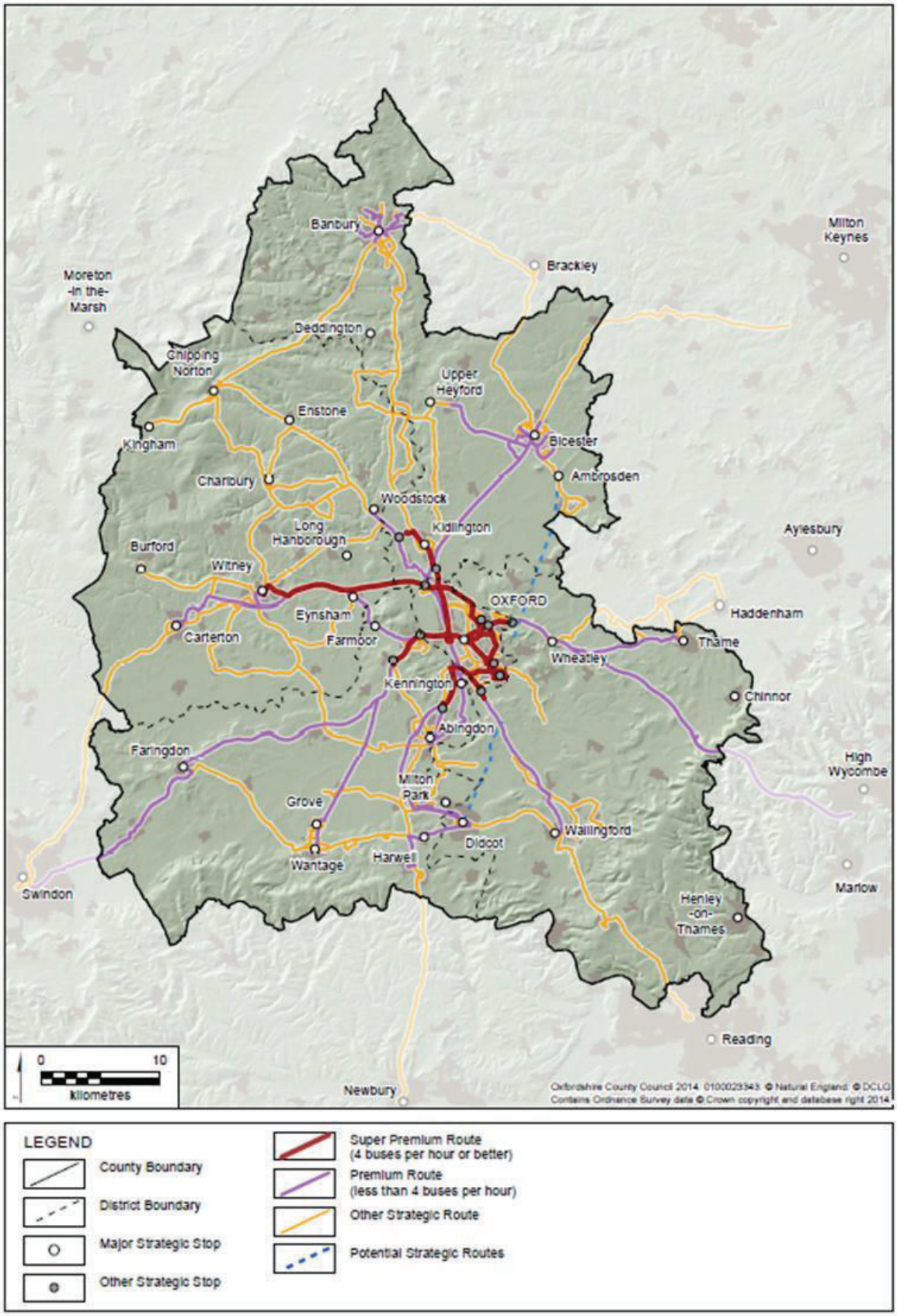


Figure 11: Oxfordshire's strategic bus network

35. In rural areas, away from the main transport corridors leading to Oxford, the county has a network of subsidised local services providing a basic service linking to local town centres. There are a few small voluntary community minibus schemes, as well as some fairly large volunteer car schemes, mainly offering transport to hospital appointments for older and disabled people.

36. Many people without cars, especially disabled people, the elderly and those living in areas that do not have a regular bus service, rely heavily on taxis, which are regulated by the district councils. Over 8250 people are registered on the Oxfordshire Liftshare database, of which 46% of people have contacted others with a view to arranging a liftshare, and registrations are steadily increasing. In Oxford city, socio-economic conditions and high housing density provide suitable conditions for commercial car clubs to succeed, and there are community car schemes in East Oxford, Cowley, Headington and Iffley. Many villages in the county run volunteer hospital transport schemes for those without cars, while school transport and transport to daycare services and offered by our integrated transport unit.

37. Over 25% of Oxford residents who work in Oxford cycle to work, with a further 25% walking and 20% using the bus. Many people commute to Oxford by bike from nearby settlements, particularly Kidlington, Yarnton, Botley and Abingdon. However, the quality of the cycle links is variable, and given the short distance from Oxford, there is scope to increase levels of cycling through targeted improvements to cycling infrastructure. Elsewhere, cycle routes along inter-urban routes are largely non-existent, the notable exception being the cycle track alongside the A40 linking Witney and Wheatley to Oxford. The speed of traffic using inter-urban routes without cycle facilities is a major deterrent to cycling. Cycling levels in other towns are generally much lower than in Oxford.

Maintenance

38. The County Council is responsible for the maintenance of over 4500 km of roads in Oxfordshire. Like in other parts of the UK, the condition of the road network has deteriorated over recent years. This is as a result of a severe shortage of funding for maintenance, of increasing numbers of heavy vehicles using roads which were not originally designed to carry them, and successive harsh winters and flooding. This has led to large numbers of claims for damage to private cars, and some for damage to cycles. For cyclists and pedestrians in particular, poor maintenance is a safety hazard and can deter people from walking and cycling. Funding levels over the last 25 years have been such that roads are able to be rebuilt approximately every 255 years on average, as opposed to the optimal 40 years.

39. Although Oxfordshire is in a better position than the national average, with only 11% of roads in a poor condition compared with 18% nationally, it is estimated that to bring all roads within Oxfordshire alone up to a good state of repair would cost £165 million and then an on-going year on year investment of approximately £20m per year to maintain that condition level.

Emissions from transport

40. Heavy traffic and congestion contributes to high levels of emissions from transport in Oxfordshire. Greenhouse gas emissions from domestic transport in the UK grew by 8% between 1990 and 2007, with continual improvements in the fuel economy of new cars slightly offset by continuing growth in road traffic volumes. This was followed by a fall of 8% between 2007 and 2009, mainly due to reductions in road traffic volumes during the recession and, to a lesser extent, improvements in car fuel economy and the increased use of biofuels. Car travel contributed 58% of the total and heavy and light goods vehicles about 30% in 2009. Under the Climate Change Act 2008 the Government is required reduce emissions in the UK by at least 34% by 2020 and 80% by 2050, from 1990 levels.

41. More immediate and localised effects are felt from emissions of oxides of nitrogen (NOx), which cause respiratory illness and shorten lives. The biggest contributors are heavy diesel engines, and at some locations in the county, NOx levels affecting people near roads exceed maximum levels, and several Air Quality Management Areas have been declared, with a number of areas under investigation. In Oxford city centre, buses are subject to a Low Emission Zone, which means modern, cleaner buses are used in Oxford and on inter-urban services arriving in central Oxford. The Oxford Low Emission zone does not apply to other types of vehicle, and freight contributes a high proportion of NOx at most AQMAs.

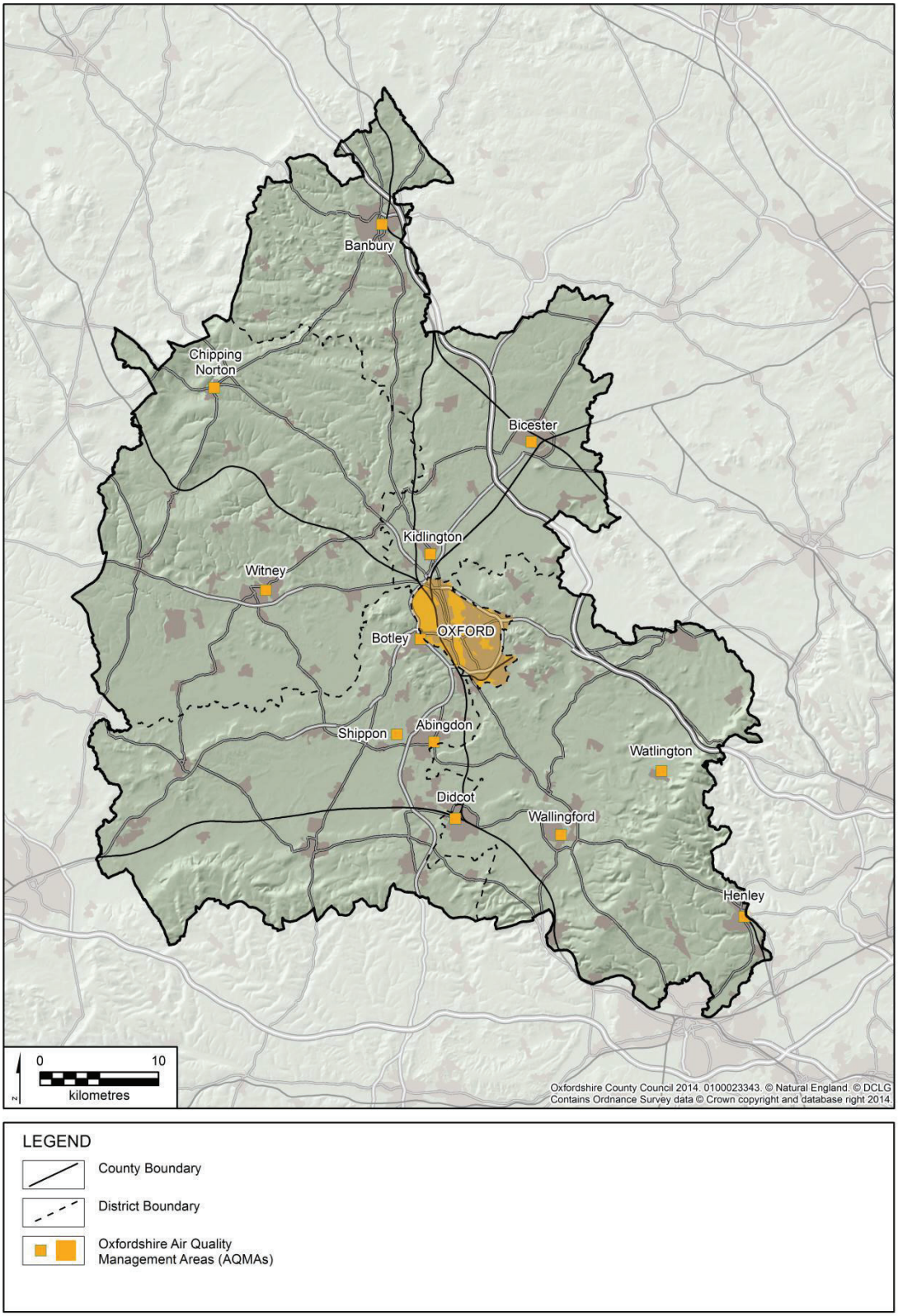


Figure 12: Air Quality Management Areas in Oxfordshire

Road safety

42. While every casualty is one too many, since 2005 there has been a general downward trend in people killed and seriously injured (KSI) on our roads and footways. There were 25% fewer casualties overall in 2013 compared with the average of 2005-2009 figures. This is in line with the reduction nationally.

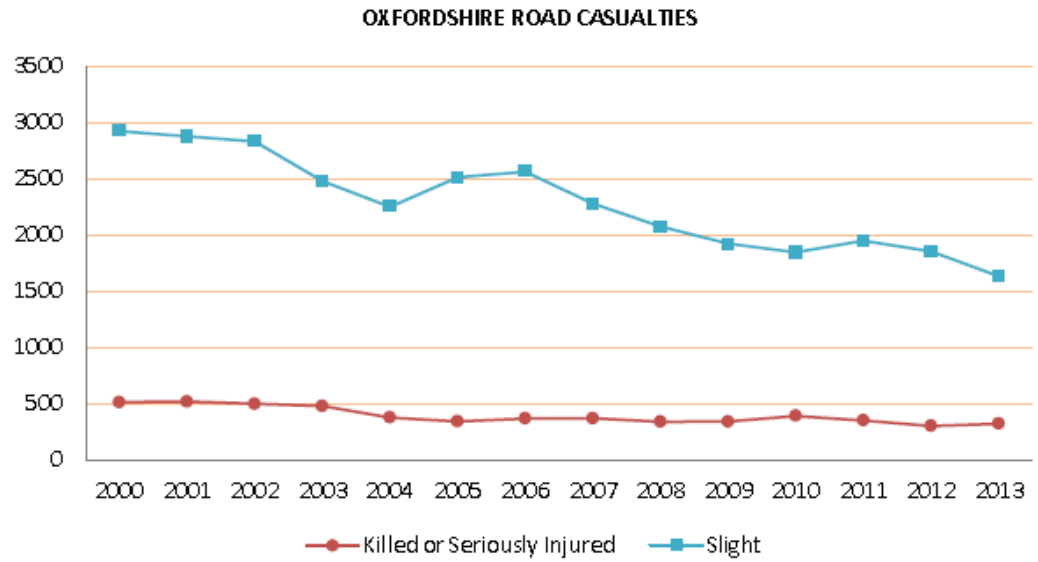


Figure 13: Oxfordshire road casualties 2000-2013

43. The notable exception to the downward trend is in pedal cycle casualties, which are 8.2% higher, though this is much less than the increase nationally, of 18%. This needs to be seen in the context of increasing numbers of people cycling, but nevertheless pedal cyclists nationally suffer around 15 times more casualties per billion miles than do car occupants.

44. Motorcyclists continue to suffer a disproportionately high casualty rate (around 22% of those killed or serious injured (KSI) on Oxfordshire's roads are motorcyclists, but they account for only about 1% of traffic, and collectively they suffer around 56 times more KSI casualties per billion miles than car occupants.)

45. We record and analyse data from casualty reports received from Thames Valley Police. This includes information about weather and road conditions and other factors, as well as the circumstances surrounding the incident. Traffic collisions are most likely to occur when roads are slippery due to rain or ice and when visibility is reduced by poor light or fog. Other major contributing factors to accidents include excessive speed, tiredness, alcohol and drugs, and driver distractions caused by mobile phones or other devices. The severity of casualties is increased when seatbelts are not worn, and when motorcyclists do not wear protective clothing.

46. *Connecting Oxfordshire* seeks to address existing problems arising from the issues described above. It includes a number of schemes already 'in the pipeline', particularly aimed at reducing congestion where it is damaging the economy or hindering economic growth. Looking ahead to the future, *Connecting*

Oxfordshire needs to address the exacerbation of existing problems due to the high level of housing and economic growth expected in the county, but it also needs to take account of likely societal, behavioural and technological changes over the plan period, as well as changes to national strategic transport infrastructure.

Oxfordshire in 2031

47. Oxfordshire's population will grow as a result of normal patterns of fertility, mortality and migration, but also as a result of the planned economic growth set out in the SEP, which will attract workers to live in the county. The Oxfordshire Strategic Housing Market Assessment (SHMA) was carried out in early 2014 to assess the county's level of housing need. Its assumptions were based on an economic forecast reflecting the policy-led economic growth ambitions in the Strategic Economic Plan (SEP).

48. The SHMA predicts around 100,000 new houses will be needed in Oxfordshire, between now and 2031, to support economic growth and meet affordable housing need. Oxfordshire's districts are now taking this into consideration through the development plan process. Figure 14 (below) indicates the development envisaged in very broad terms and the additional commuter trips anticipated. *Connecting Oxfordshire* will be revised to take decisions on where growth and jobs will be specifically located.

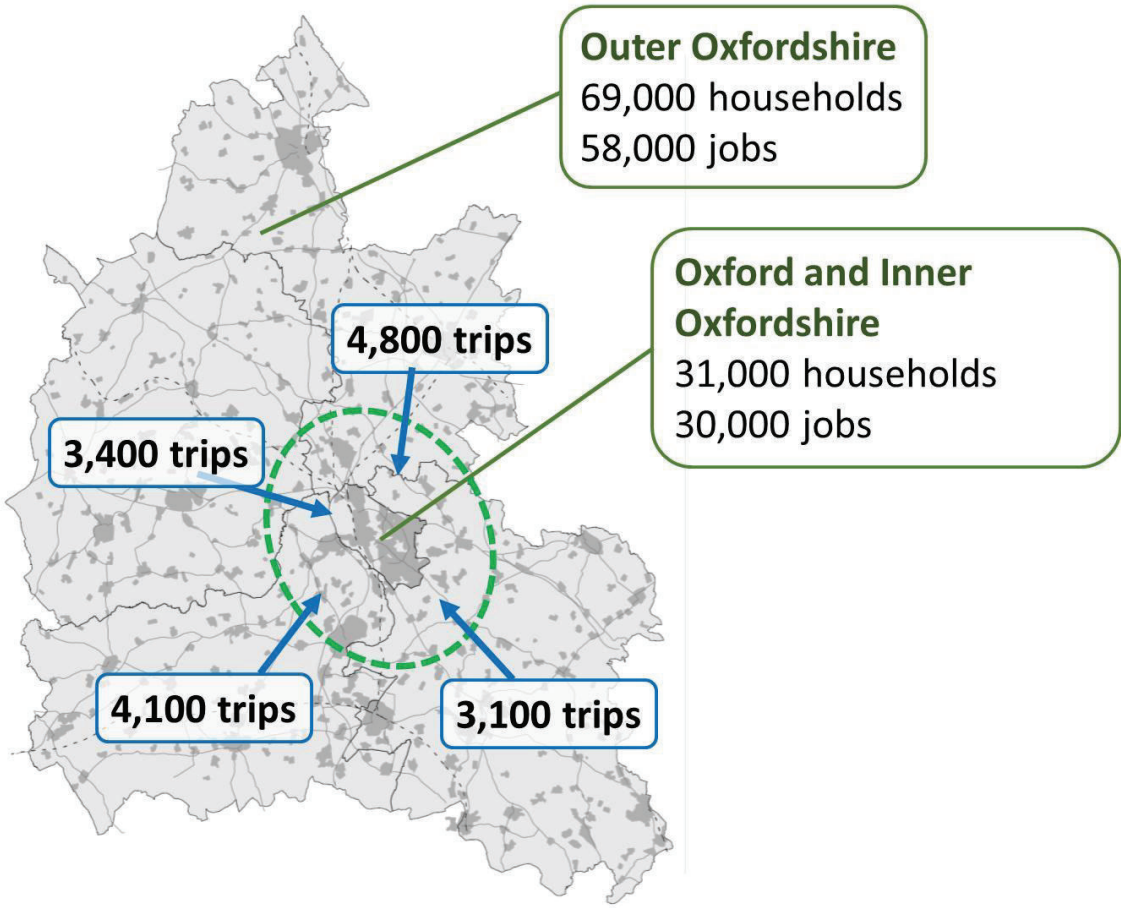


Figure 14: Strategic housing and employment allocations in Oxfordshire in 2031 (SHMA housing growth & Cambridge Econometrics jobs forecast), with our estimate of additional commuter trips into Oxford

49. Population projections have recently been carried out for Oxfordshire up to 2052, and they vary widely depending on various scenarios. The high-end projections indicate that the county's population could almost double (1.15 million by 2052), while the low-end projections suggest population growth by 10% to 723,000. This plan is only to 2031 but nevertheless, the trajectories towards each of these projections will vary significantly by that point.

50. The impact of housing and jobs growth on the county's transport networks, taking into account planned transport infrastructure, has been forecast using a strategic transport model. The model shows many junctions over capacity in 2031, and severe delays on many routes, especially the A34, A40, A338 and A4074. These forecasts do not take into account the full level of housing need in the SHMA; when that is added to the model the situation will be worse.

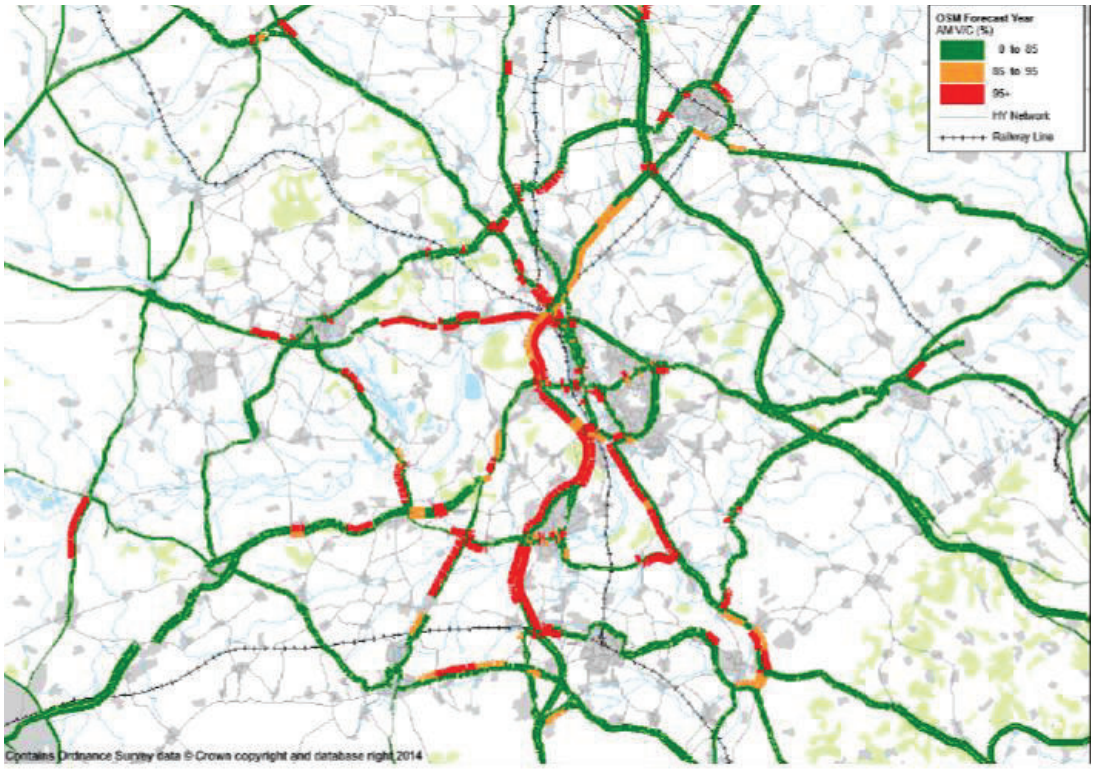


Figure 15: Highway Network in the morning peak in 2031 – volume of traffic in relation to road capacity (85% to 95% = at capacity, 95% plus = over capacity)

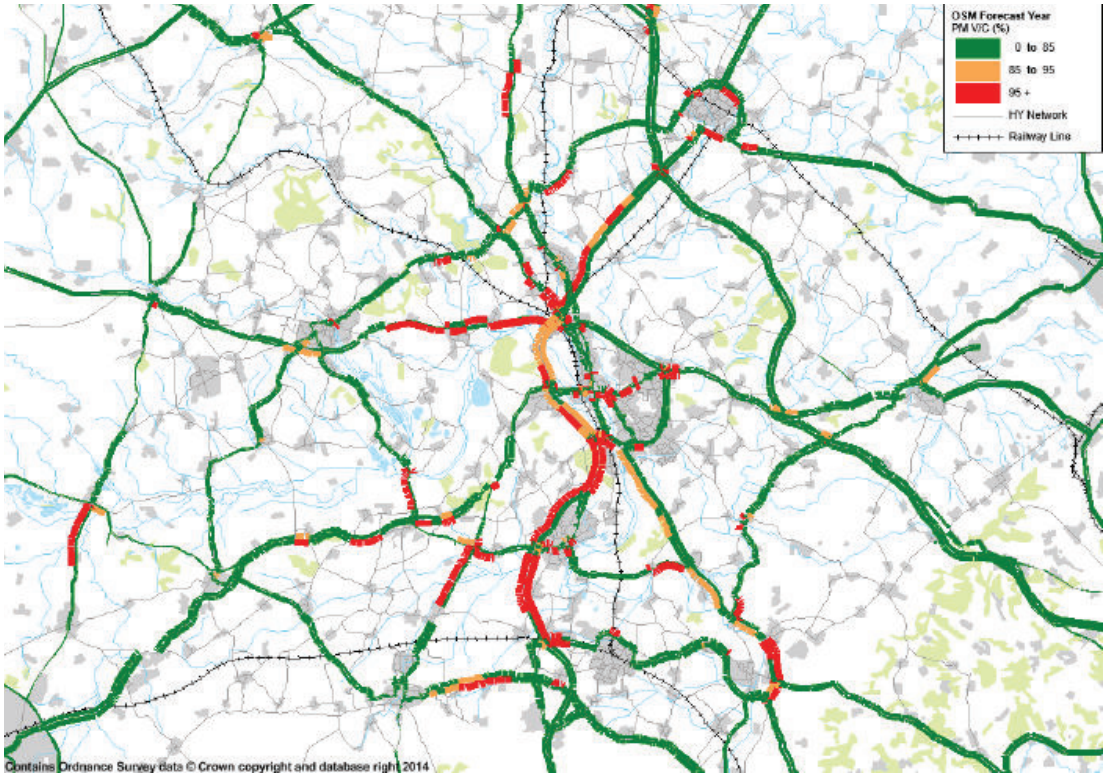


Figure 16: Highway Network in the evening peak in 2031 – volume of traffic in relation to road capacity (85% to 95% = at capacity, 95% plus = over capacity)

51. Unless drastic changes are made by 2031, congestion will have a severe impact on the economy and people's daily lives, with many journeys being effectively impossible. Forecasts show that additional transport capacity is required, though this does not necessarily mean more roads. New strategic road and rail infrastructure will also change travel patterns and have wider impacts in Oxfordshire. Notable new schemes include the Highways Agency's capacity improvements on the A34, and East-West Rail, which will provide access to Milton Keynes and beyond, as well as rail access to Heathrow from the west.

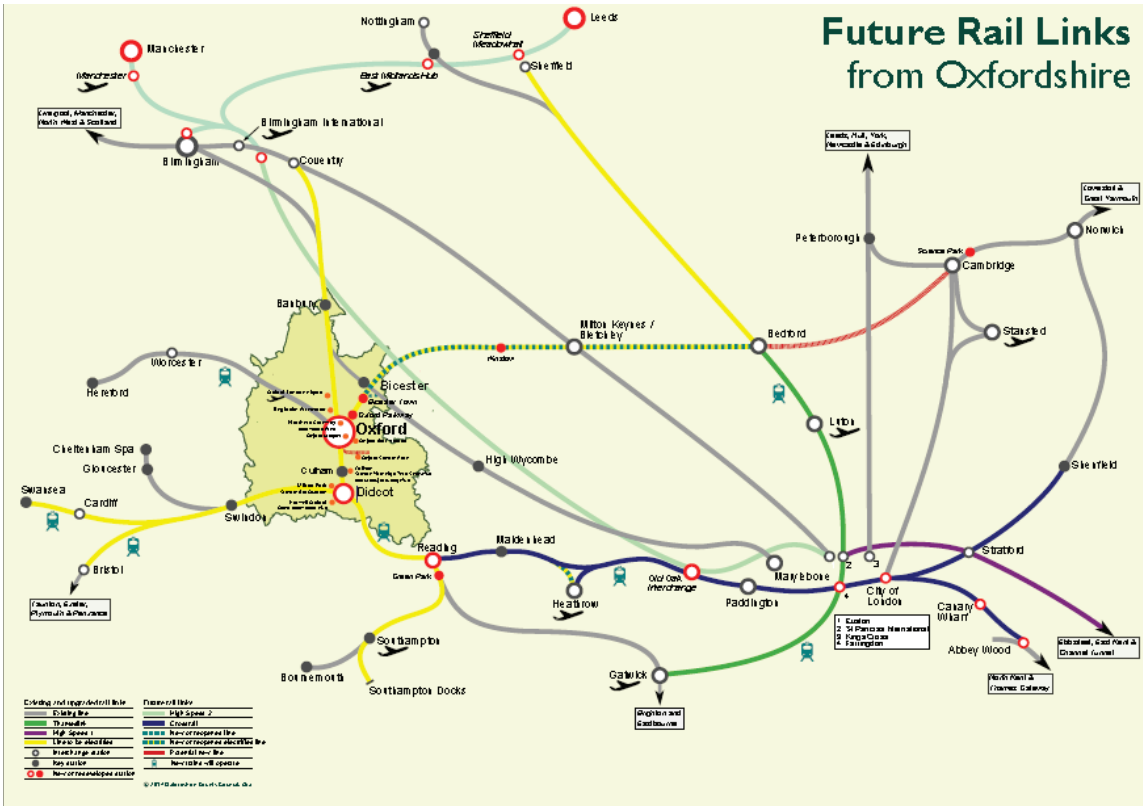


Figure 17: Future rail links from Oxfordshire

52. As the population and economy grows, more and more goods will need to be transported. The plan period is set to see significant rail freight growth, which may offset or reduce the growth in HGV traffic. However, rail freight will not be sufficient to provide for the increase in goods travel around Oxfordshire, which will predominantly be in the form of light commercial vehicles such as vans. Furthermore, rail freight will still need to travel by road to its end destination.

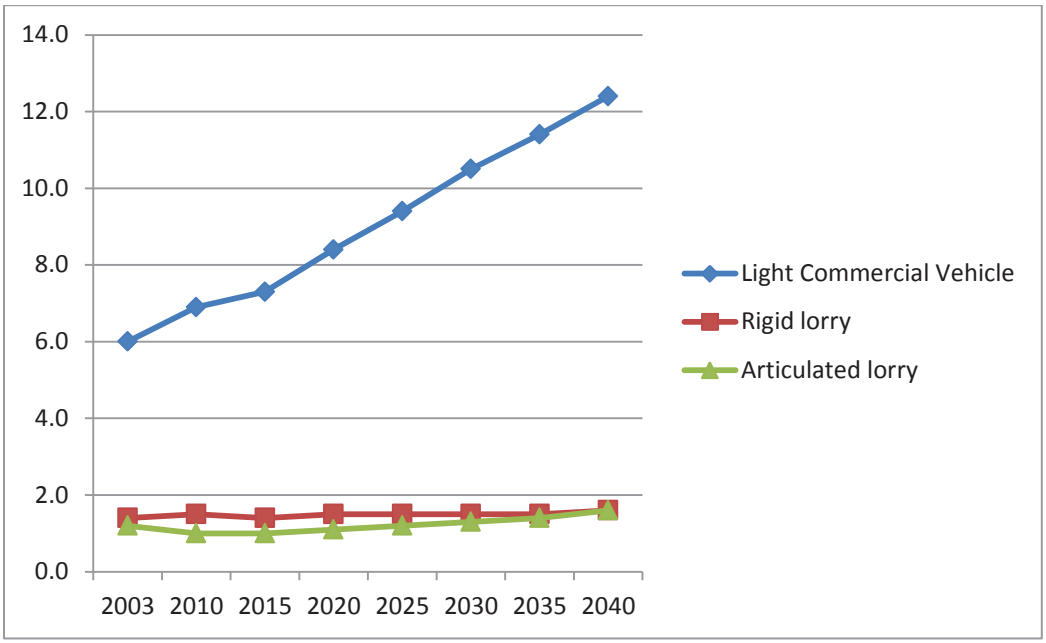


Figure 18: Forecast growth in freight on all types of roads in south-east England excluding London, billion miles per year (source: Department for Transport Road Traffic Forecasts 2013 – central forecast)

53. Emissions from transport will increase, but not proportionately to the growth in motor traffic, due to technological advances. Supported by government policy, uptake of low emission vehicles is set to increase. However, this depends on the success of the policies to support uptake, and market conditions. NOx emissions from HGVs are likely to increase, due to increasing mileage, and a slow replacement rate for vehicles. It is likely that air quality will become a problem at more locations in the county.

54. Even if UK greenhouse gas emissions targets are reached, climate change will continue to generate extreme weather conditions: the county's transport networks will be under attack from more frequent flooding, and harsh winters will continue to damage roads.

55. Growing levels of motor traffic risk a deterioration in quality of life for many residents, for example due to noise, a less safe walking and cycling environment, and associated impact on community life. It also threatens wildlife due to increasingly polluted run-off from roads and animals killed by traffic. Without very careful design and mitigation, new development and transport infrastructure could increase flood risk, destroy wildlife habitats, and blight the landscape.

56. The population will continue to age overall: by 2026 there are expected to be 46% more people aged 65 and over, and 69% more people aged 85 and over, than in 2013. Younger people will be attracted to areas with high jobs growth, provided the housing is affordable and the services and cultural and leisure offer of new neighbourhoods is sufficiently attractive. However, planning policy will result in older peoples' housing developments alongside homes for workers in the new urban areas. In rural areas, people without access to a car will find it harder

to get about if fewer non-commercial bus services are supported. This will particularly affect the older population at first, but in the future, more older and disabled people will be able to drive: fewer will never have driven, and more will be capable of driving due to advances in vehicle technology.

57. Advances in technology will offer huge potential to monitor and manage transport networks more efficiently. 'Big data' collected via sensors, mobile devices and the 'internet of things' can be used to predict network conditions. Intelligent transport systems can then deploy direct control such as altering traffic signals, and information strategies to influence travel behaviour. Autonomous vehicle technology has the potential to reduce safe headway between cars and thereby increase traffic flow. Given the rapid pace of technology, developments could dramatically affect mobility in ways we cannot currently predict.

58. Lifestyle factors are hard to predict and could have a big impact on travel patterns. For example, we do not know to what extent social marketing and policy changes will succeed in encouraging people to be more active. We do not know how the trend for more homeworking, which increased by 35% between 2001 and 2011, will continue. It is difficult to predict how much people will need or want to travel in future for retail or services. There is growing evidence that the model of car ownership is changing, with more people using leased or shared vehicles. Many younger city-dwellers no longer see the car as a status symbol, although how far this attitude will extend beyond big cities is uncertain.

59. It is also difficult to predict future working patterns: despite flexible working the standard working day has persisted for the majority of people. Will more people work part time, on late or early shifts, or have more than one job? How long will people continue to work into older age? Will working patterns respond as resources such as office buildings and factories become more intensively used and business becomes even more globalised?

60. Above all, progress of the economy out of recession may not run smoothly, and this uncertainty favours transport solutions that are incremental and scaleable to respond to demand.

4. Supporting growth and economic vitality

Objectives:

- **Maintain and improve transport connections to support economic growth and vitality across the county.**
- **Make most effective use of all available transport capacity through innovative management of the network.**
- **Increase journey time reliability and minimise end-to-end public transport journey times on main routes.**
- **Develop a high quality, resilient integrated transport system that is attractive to customers and generates inward investment.**

61. *Connecting Oxfordshire* supports the Strategic Economic Plan (SEP), the economic growth strategy for the county. The SEP focuses on growing the high tech industries for which Oxfordshire is already renowned. The main focus of this growth is in the Knowledge Spine, linking Bicester, Oxford and Science Vale. Peak time travel to work is prioritised for attention, because it presents the greatest challenge to transport networks and is vital for the economy. Businesses need to attract high quality staff, and a trouble-free journey to work is an important factor for people in deciding where to live and work.

62. However, other types of journey are important for Oxfordshire's economy. In particular, the county is an attractive location because of its journey time from international gateways, especially Heathrow Airport. This gives business travellers and tourists easy access, and enables airfreighted goods to reach their destination quickly. Avoiding delays to components and finished goods is also very important.

63. Oxfordshire's economy is not just about high tech industry in the Knowledge Spine. There are thriving business parks elsewhere in the county and Banbury in particular has a strong manufacturing base, including motorsport. The economic vitality of the county depends on the success of large and small town centre retail and leisure facilities, and many businesses catering for tourists, which are dispersed across rural areas. Oxfordshire's cultural, visitor and heritage economy is estimated to be worth £3.1 billion per year. Whilst the highest demand for transport along the Knowledge Spine needs to be catered for, Oxfordshire needs good links to all its settlements.

64. We also need to accommodate through-travel: this does little to benefit the local economy, but most of the through traffic on primary routes has no suitable alternative to passing through Oxfordshire. Easing journeys through the county helps to avoid delays to local traffic.

65. To support economic growth and vitality, we will make transport improvements to tackle congestion and provide new connections between homes and jobs, suppliers and customers, with sufficient infrastructure and services to accommodate planned growth. However, we will not ignore the threat this poses to the environment, and will take care not to damage the natural and historic assets and quality of life that make Oxfordshire attractive.

Policy 01: Oxfordshire County Council will work to ensure that the transport network supports sustainable economic and housing growth in the county, whilst protecting its environmental and heritage assets, and supporting the health and wellbeing of its residents.

66. In some cases new roads, or widening roads and junctions may be necessary. Some examples of this include where access is needed to new developments; where the existing road is unsafe; where the existing road brings congestion and pollution to built-up areas; or where the existing road threatens areas of environmental or archaeological interest. However, these schemes often generate new demand and quickly reach capacity again. We will always carry out careful modelling to ensure that effects on the wider network are fully understood, and will consider whether the demand can be met more sustainably.

Policy 02 Oxfordshire County Council will manage and, where appropriate, improve and extend the county's road network to reduce congestion and minimise disruption and delays, prioritising strategic routes.

Enhancements to road capacity

A34

67. Oxfordshire County Council has developed a number of schemes for the A34 including new slip roads at Chilton Interchange to turn this into an all movements junction, a "hamburger" style improvement to the Milton Interchange Roundabout to improve access onto the A34 from Didcot, and a bus priority lane on the northbound approaches to the A34 exit slip road at Hinksey Hill Interchange.

68. The Highways Agency is currently preparing a route-based strategy for the South Coast to East Midlands Route for publication in 2015. This will test how road based issues on the route might be addressed and implemented in the future as well as forming the basis on which decisions on funding will be made in the next Government Spending review period.

69. As part of this review the County Council prepared a Baseline Statement which assessed the problem along the A34 section of this route within Oxfordshire which showed that heavy congestion resulting in poor journey time reliability was a main concern for A34 users together with issues of road safety and speed harmonisation. The Baseline Statement suggested a range of possible solutions which could be considered including traffic Control Measures (including ramp

metering, HGV overtaking bans, extending speed limits or introducing variable speed limits, and variable message signing), capacity increases (including closure of minor road entries, widening to 3 lanes, altering the line of the route or converting Lodge Hill into an all movements junction) and Priority Measures (including addition of bus lanes, high occupancy vehicle lanes or HGV or local traffic lanes).

70. Beyond the measures identified for Local Growth Funding, the A34 Route Based Strategy recognises that a longer term solution is needed to accommodate planned development and trip growth. This would mean a major capacity enhancement either on the line of the existing route (for example widening the A34 to three lanes for all or part of the section through Oxfordshire) or an off-line solution, for example a new link between the A34 and M40 somewhere south of Oxford.

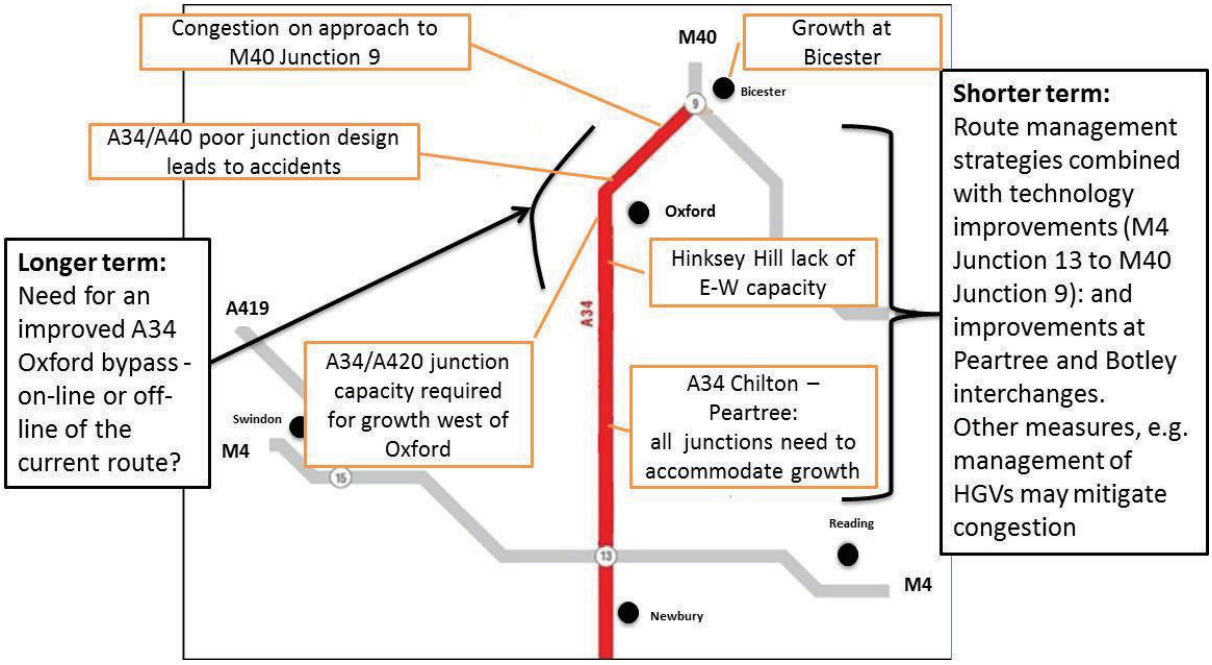


Figure 19: The A34 in Oxfordshire

A40

This is an important through route linking Gloucestershire and London via the M40, but is also critical for linking West Oxfordshire with Oxford and the Knowledge Spine. It currently experiences severe congestion throughout the day. The problems on the A40 are caused by a combination of capacity issues at the junctions in the Oxford area, and to a lesser extent at Eynsham/Cassington, and road capacity issues along the length of the route. We have been developing a series of improvements to the route and these are shown on Figure 20.

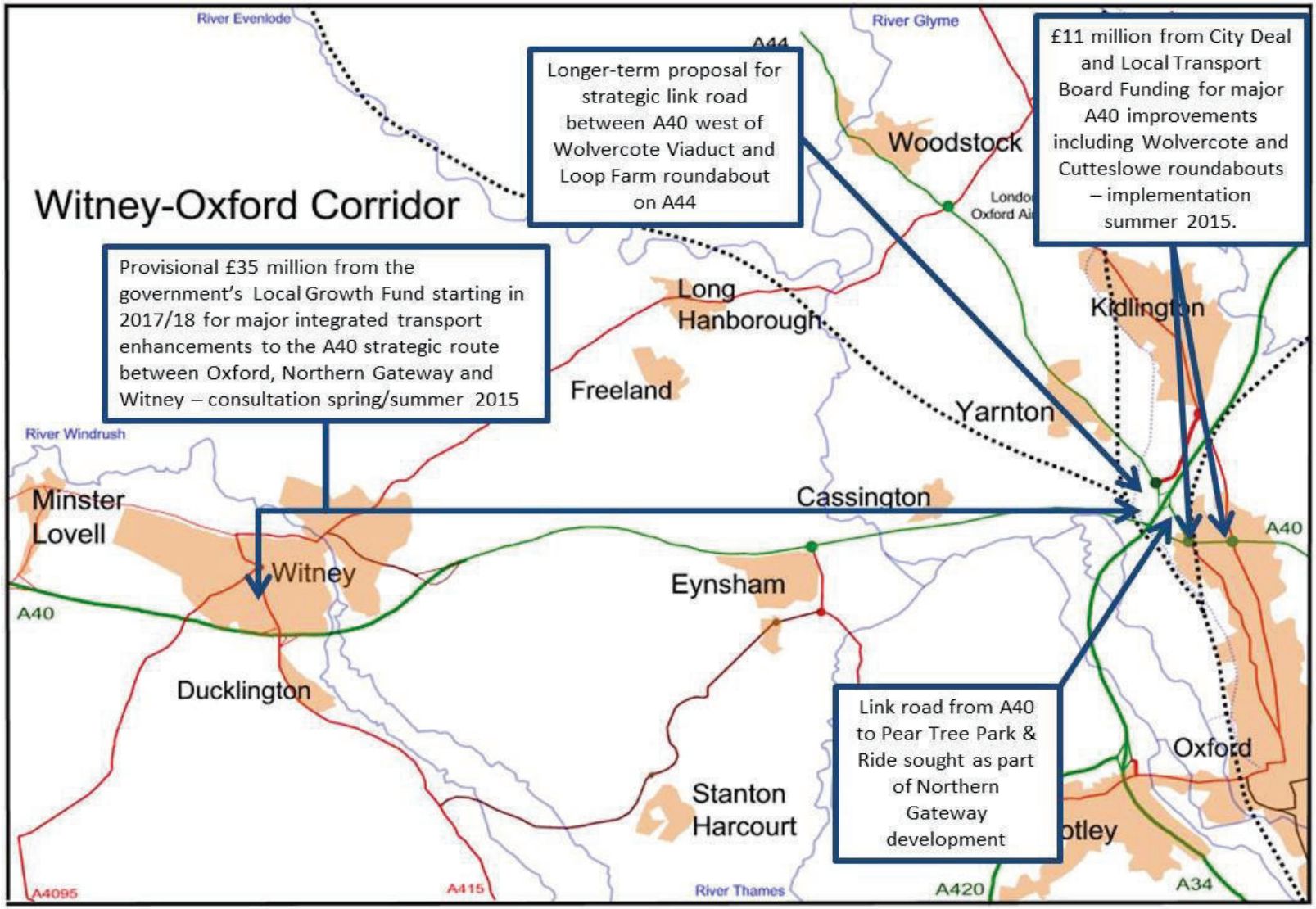


Figure 20: The Witney – Oxford corridor

71. Beyond the Local Growth Fund and City Deal funding for enhancements, we are developing a strategy options report that will identify further investment in innovative solutions and provide long term benefits to the A40. We are currently working on developing a strategic vision for improving the A40 corridor up to 2031 and beyond. This will consider highway improvements, including additional traffic lanes, tidal flow operation and full dualling, public transport improvements including bus, tram and rail improvements, and more innovative solutions.

A420

72. The A420 is an important principal route between Swindon and Oxford which runs through Oxford's Green Belt as it approaches the city. In addition to providing a direct route to Oxford city centre from Swindon, it serves the many settlements along the corridor including: Shrivenham, Watchfield, Faringdon, Kingston Bagpuize and Cumnor. At peak times it operates over capacity resulting in congestion, particularly at the northern end near Botley. Although advised to use the M4 and A34, there is some HGV usage of the route. This is detailed in the A420 strategy in Chapter 14 of this document. Funding to deliver the A420 Strategy will need to be secured through development via Community Infrastructure Levy (CIL), Section 106 and/or Section 278 agreements, working closely with Swindon Borough Council.

Local routes in Science Vale

73. A number of new road links and capacity improvements are necessary to accommodate the large scale of employment and residential development in Wantage, Grove, Harwell and Didcot. These are detailed in the Science Vale Area Strategy.

Local routes in Bicester

74. The Bicester Area Strategy outlines options for a new road linking the eastern perimeter route with the A41. Large residential development in north-west Bicester offers the opportunity to relocate the north western perimeter route around Bicester, creating a boulevard through the new development.

Local routes in Banbury

75. The Banbury Area Strategy puts forward a new link road between the town and a large employment site to be developed east of M40 junction 11. A spine road to be built as part of development at Salt Way south of the town will link the A4260 Oxford Road and A361 Chipping Norton Road.

Witney and Carterton

76. The Witney area strategy outlines a new junction with the A40 already secured from the development at West Witney, and west-facing slip roads at Shores Green junction on the A40, which would enable the A40 to be used by people travelling from one side of Witney to the other.

77. There are other parts of the county's inter-urban road network where congestion is forecast to be severe in 2031. We will develop a programme of further route strategy work to address these, recognising the importance of enabling

development in parts of the county away from the Knowledge Spine, and key cross boundary links.

Reducing pressure on the road network

78. Through our involvement in strategic planning in the county, we will seek to ensure that the need for additional road infrastructure is minimised. By locating housing close to jobs where people can walk or cycle to work, in places where people will be able to use high quality public transport to get to work and where the car is not perceived as the default means of transport, the number of miles travelled by car per individual can be reduced over time, thereby slowing the growth in pressure on the road network. We will also use our influence in the planning process to ensure that new developments are well laid out so that they encourage walking, cycling and the use of public transport rather than the use of private cars.

79. If we continue to see the same proportion of journeys made by sole-occupancy private car in the future, we will simply not be able to accommodate the trips that people want to make. It is vital that demand is met by other modes of transport, with a higher proportion of people choosing to walk, cycle or use public transport.

80. Bus and cycle travel uses less road space per person than car use. Walking and in some cases cycling can be accommodated away from roads. Wherever there is the potential to accommodate more individual person trips through more walking, cycling or use of public transport, we will consider scheme options that give priority to these modes, through traffic signals, allocation of road space, and improving conditions for cyclists and pedestrians. We will improve access to the rail network and work in partnership to improve rail capacity, for passengers and freight.

81. Before developing schemes for additional physical road capacity, we look at ways to make existing road space accommodate more individual person trips. There is great potential across the county to make junctions work more efficiently through investment in updating the management of traffic signals, and coordinating them so that they work together to smooth traffic flows.

82. We will also use travel information to encourage and influence people to choose public transport, walking and cycling over car use, through further developments of the Oxfordshire Journey Planner, an on-line journey planning tool that can be used on mobile devices. We will embrace new technologies and use data and information to predict and influence travel on our transport networks, alongside more traditional network management techniques such as the use of Traffic Regulation Orders. This will be set out in more detail in our Network Capacity Management Strategy, and is outlined in the Science Transit Strategy.

Policy 03 Oxfordshire County Council will support measures that make more efficient use of transport network capacity by reducing the proportion of single occupancy car journeys and encouraging a greater proportion of journeys to be made on foot, by bicycle, or by public transport.

Prioritising different types of journey

83. In order to keep the network moving, it is often necessary to prioritise some routes over others, restricting interruptions to traffic flow on the more important routes. These can be from other vehicles joining or crossing the main route, pedestrians crossing the route, or due to obstructions like parking or loading.

84. All roads function as a link, but some also function as a place. For example, main roads away from settlements function mainly as links, but where the same roads pass through urban centres as a 'high street', they are part of a place as well as being a link. In the latter situation pedestrians would be given a much higher priority, with plenty of opportunity to cross the road even if this means interrupting traffic flow. In the former situation, pedestrian crossings, if provided, would probably give the minimum green time to pedestrians. Each situation must be treated on its own merits, but we have classified the road network, indicating the function of each link. This classification, as set out in Table 1, will be used as a guide in decisions over which type of road user to prioritise.

85. Along main roads in Oxford and our growth towns, we will also prioritise the use of public transport and/or cycling, depending on the potential for more journeys to be accommodated via these methods. This may be through allocating road space to bus or cycle lanes, and through the use of bus priority traffic signals, or signals that give priority to cyclists if and when these are approved for use.

Status	Definition	Characteristics/treatment	Routes in Oxfordshire
Class 1: Motorway	A road suitable for high speed long distance national traffic *Responsibility of the Highways Agency (HA)*	Dual carriageway with limited access and type-restricted use No weight restrictions	M40
Class 2a: Strategic Primary Routes	A strategic road suitable for longer-distance and inter-regional traffic. Main connections between defined primary destinations. Part of the national lorry route network *Responsibility of either the HA or the County Council*	Able to cater for high volumes of traffic. Predominantly dual carriageway No restrictions on access or permanent weight restrictions Presumption against at-grade pedestrian crossings Presumption against speeds below 50 mph	A34, A43 (HA) A40 (M40 J8 to Witney) A41 (A34 to Bicester) A44 (A40 to A4095)* A423, A4142 (Oxford S / E bypass)
Class 2b: Other Primary Routes	A road suitable for longer distance and inter-regional traffic. Main connections between defined primary destinations. May be part of the national lorry network *Responsibility of the County Council*	Able to cater for high volumes of traffic Either dual carriageway or single carriageway No restrictions on access or permanent weight restrictions, may be some height restrictions	A40 (west of Witney) A41 (Bicester to Aylesbury A44 (north of A4095) A420 (west of A34)# A422 (east of A423) A423 (north of A422)
Class 3a: County Principal (A) Classified Roads	A road suitable for important cross- and inter-county traffic where there are relatively large volumes of traffic but not longer-distance travel. Should be able to cater for all types of vehicles *Responsibility of the County Council*	Usually good standard single carriageway Weight restrictions may be considered where there is a suitable alternative route of the same or better standard available	A338 (Wantage to A415); A415; A417; A418**; A421; A4074+; A4130; A4260 (north of A40)

(major)			
Class 3b: County Principal (A) Classified Roads (minor)	A road suitable for important cross- and inter-county traffic where there are relatively lower volumes of mostly local traffic. Minor A-roads would serve to link larger settlements with major A-roads and provide missing links *Responsibility of the Council Council*	Predominantly single carriageway; some sections might be of a lower standard Weight restrictions can be considered where there is a suitable alternative route available	A40 (east of A418); A329; A338; A361; A420 (through Oxford); A422 (west of Banbury); A424*; A436; A3400; A4095; A4129; A4144; A4155; A4158; A4165; A4183; A4185; A4260 (south of A40); A4421
Class 4: Non-principal roads (B/C Classified)	A road suitable for other shorter cross and inter-county movements where volumes are relatively low and no principal road is available *Responsibility of the Council Council*	Weight restrictions can be considered providing diversions are not excessive and do not prevent access to properties	All B and C roads

[#] these roads are in Primary Route Network signed as "unsuitable for HGVs" because of height restrictions at railway crossings
* routes which could be reclassified in whole or part, in accordance with Council strategy on HGV routing
** A418 is signed as alternative Primary Route between Oxford and Aylesbury to A41 for HGVs
[+] A4074 is signed as alternative Primary Route between Oxford and Reading to A34/M4 but signed as "unsuitable for HGVs"

Table 2: Road priority hierarchy

Freight journeys on the road network

86. Light Commercial Vehicles such as vans will lead the increase in freight traffic on the road network in Oxfordshire. These will need to be taken into account in new road schemes and maintenance, such as the programmes discussed above. However, the main concern among residents relating to freight transport is often the unpleasant experiences for cyclists and pedestrians and environmental damage that can be caused by heavy lorries (HGVs).

87. We will define the roads that are suitable and unsuitable for HGVs and develop a freight journey planner for Oxfordshire to advise operators on the best routes through the county. We will install and maintain fixed signage to direct lorry drivers to the advisory freight routes through the county. We will work with Network Rail, rail freight operating companies and businesses in Oxfordshire to increase the proportion of heavy goods being carried to, from and through the county by rail.

88. Where HGVs would cause environmental damage, we will retain environmental weight limits, enforceable by the County Council through Traffic Regulation Orders. These prohibit HGV through traffic, but allow local access. We will consider imposing further environmental weight limits where there is compelling evidence of risk of environmental damage due to through HGV traffic, which outweighs the risks arising from the use of alternative routes.

89. We will also seek to minimise environmental damage from HGVs through the use of Routing Agreements and Construction Logistics Plans associated with new developments. Structural weight limits will be applied to protect the county's bridges where necessary. These measures form part of the Oxfordshire Freight Strategy.

Policy 04 Oxfordshire County Council will classify and number the roads in its control to direct traffic, particularly lorry traffic, onto the most suitable roads as far as is practicable.

Policy 05 Oxfordshire County Council will prioritise the needs of different types of users in developing transport schemes or considering development proposals, taking into account road classification and function/purpose, and the need to make efficient use of transport network capacity.

Policy 06 Oxfordshire County Council will support initiatives to increase the proportion of freight carried by rail, and will identify suitable routes for freight movement by road and, where appropriate, implement measures to support the use of these routes, balancing the needs of businesses with protection of the local environment and maintenance of the highway network.

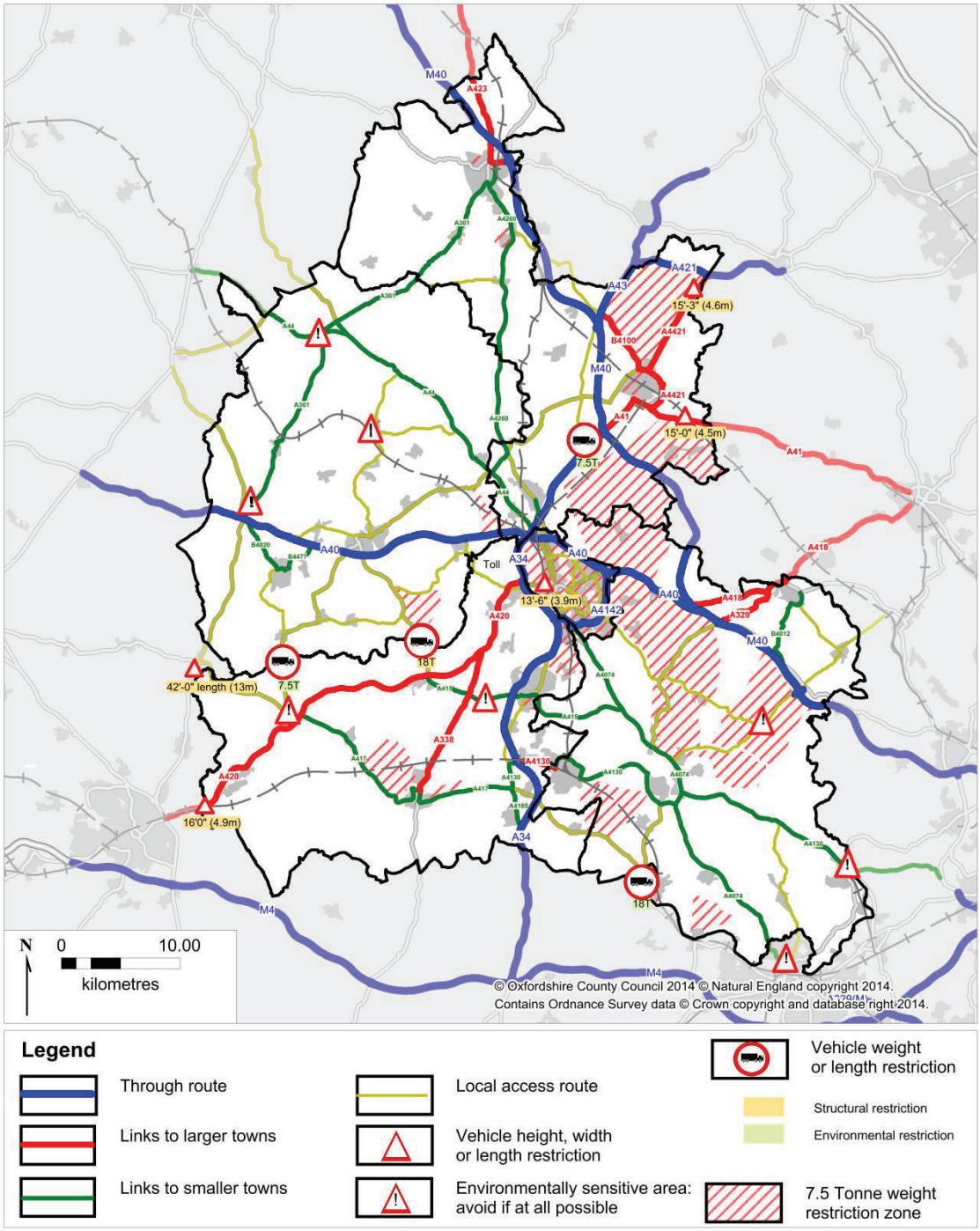


Figure 21: Lorry routes in Oxfordshire

Better-integrated, high-quality public transport

90. A large proportion of journeys to Oxford city centre are by bus and rail. However, increasing public transport use on journeys to other parts of the city, within other towns, and along inter-urban routes will be a challenge. Public transport will need to be more attractive than driving a car. To achieve this it will need to be very high quality, easy to use, and offer seamless integration on journeys involving different types of transport. There will need to be a significant improvement in public transport provision, rather than small improvements to frequency and journey time.

91. The Science Transit Strategy defines both our high-level vision, and outline roadmap, for the development of better-integrated, high quality mobility systems that both serve the Oxfordshire Knowledge Spine and connect it with the rest of the county. It will be made up of four main elements:

- Projects which promote innovation in mobility and integrated transport delivery.
- Projects which encourage intelligent mobility and opening Oxfordshire's data to promote research and enterprise.
- Key infrastructure improvements which will improve connections between key areas along the knowledge spine, for example, upgrading key junctions and constructing new mass rapid transit systems, for example rapid transit bus lanes. These infrastructure projects will sometimes be led by opportunities in funding streams.
- Key route enhancements which will improve connections between key locations along the knowledge spine, including new public transport routes and improved frequency of services on existing routes.

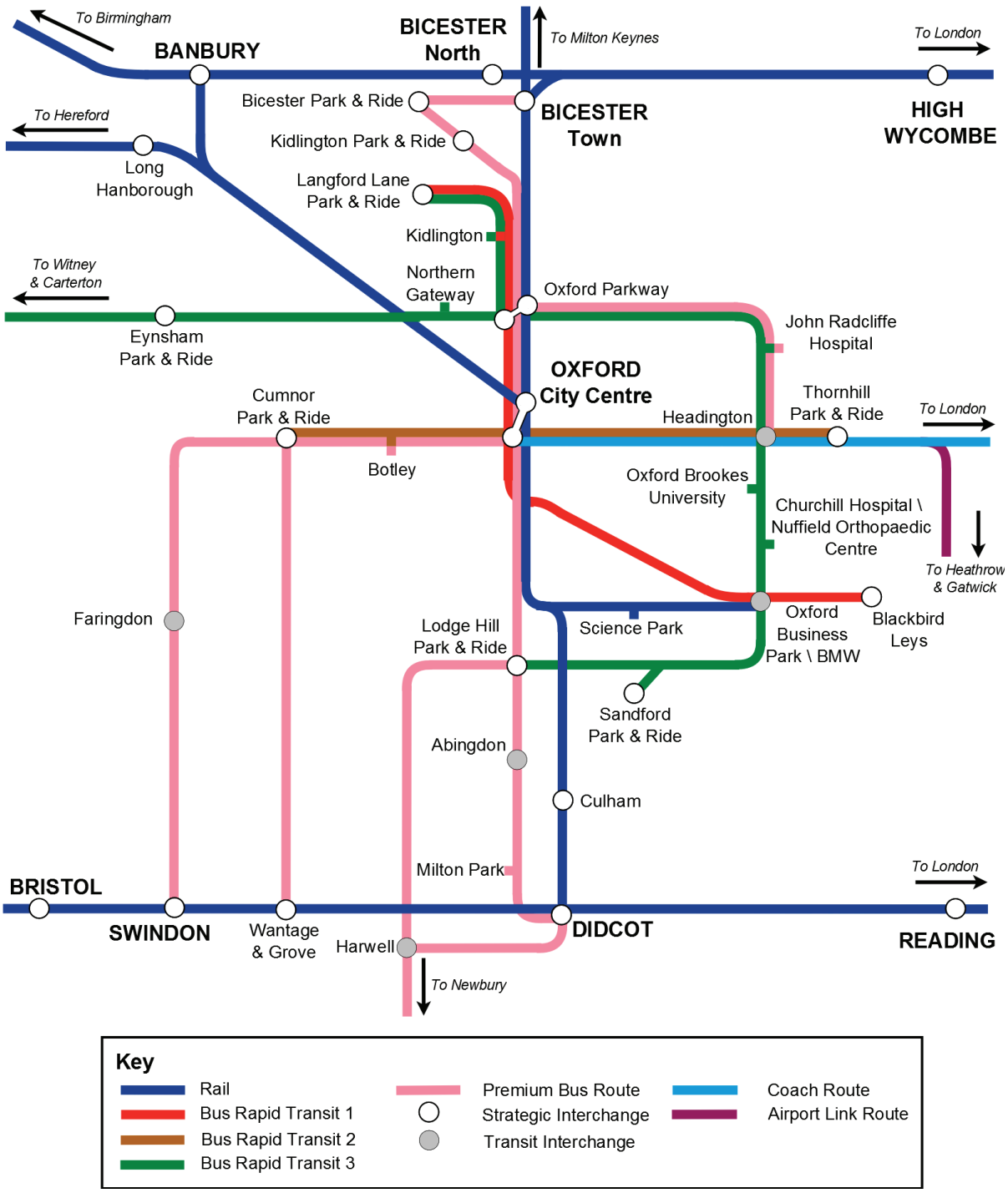


Figure 22: Proposed Science Transit network

92. Oxfordshire is an important destination for coach services. Oxford has a 24 hour a day scheduled coach connection with London, with nine coaches an hour each way on the route at the peak. It has half-hourly coach links to Heathrow Airport and an hourly service to Gatwick Airport. These services all start and end at Oxford's Gloucester Green Coach Station, which also serves as a through-stop for a number of national scheduled coach services, including National Express, which brings 200,000 passengers through the coach station annually. Oxford,

Blenheim, the Cotswolds and Bicester Village are also major destinations for charter coach trips, which benefit the visitor economy but require coach parking and driver break facilities to be available near stopping points. We will need to work with coach operators to ensure that our coach infrastructure has the space and facilities to accommodate growth from both scheduled and charter coach services.

Policy 07 Oxfordshire County Council will work with operators and other partners to enhance the network of high quality, integrated public transport services, interchanges, and supporting infrastructure, and will support the development of quality Bus Partnerships and Rail Partnerships, where appropriate.

Policy 08 Oxfordshire County Council will work with partners towards the introduction and use of smart, integrated payment solutions for a range of transport.

Bus strategy

93. We have been successful in working with bus operators to increase the number of journeys made by bus in the county in recent years, a trend running contrary to many regions in the UK, especially those outside of large cities. We do not have control over commercial rail and bus operators and cannot exercise the same degree of influence over public transport provision as in London. However, we have strong partnership arrangements with the main bus operators and through these we have introduced initiatives such as smart ticketing and payment in Oxford. Further, county-wide improvements to bus services and delivering our Science Transit ambition depend on this relationship.

94. Our bus strategy sets out how we will continue to work with operators to refine and expand the county-wide bus network, developing bus rapid transit services along the busiest routes, upgrading Premium bus services in the county, and developing the wider bus network. Partnership with rail operators will need to be strengthened, and there is a need to bring bus and rail operators together.

95. Within Oxford, increasing bus use will lead to greater pressure for kerb space, to the point where there would be insufficient physical space for buses to stop in the city centre. The Oxford Transport Strategy proposes the introduction of bus rapid transit on routes leading into and through the city centre. This would involve higher capacity vehicles with shorter dwell times at stops. It also proposes a new Park and Ride network, with new sites identified to intercept trips further from the city, thus reducing traffic volumes on Oxford's ring road and approaches to it.

Policy 09 Oxfordshire County Council will continue to provide support for bus services it considers socially necessary, where these cannot be provided commercially, and will develop a strategy for determining where this is applicable.

Rail strategy

Our rail strategy sets out our ambition and priorities for rail investment in Oxfordshire, and is being taken forward in partnership with Network Rail and train operators. It covers both the planning and delivery of short term schemes to be delivered within the current control period for rail investment (2014 to 2019) and sets out the priorities and evidence base to support investment in the industry's subsequent five year planning periods.

Our strategy has been informed by a rail demand forecasting exercise completed by the Council in 2013, which showed that passenger demand is predicted to increase by 68% to 2026, most of this growth being generated by new rail investment. The greatest increases are predicted on the Oxford-London corridor, where from 2015 there will be a choice of routes and increase in services, resulting from the opening of East West Rail (EWR) Phase 1 and Oxford Parkway station, and on the rail network through Oxfordshire linking Didcot, Oxford, Bicester on to Milton Keynes and beyond when Phase 2 opens in 2019. Our strategy for rail investment also includes other route and service upgrades, for example to support growth and investment in Science Vale and further upgrades to the Cotswold Line.

We are also working with Network Rail on their long term planning process to 2043, recognising that there are significant constraints on the rail network – between Didcot and Oxford in particular – which restrict our ability to develop new rail services and the potential of rail to play a much bigger part in meeting the Oxfordshire growth agenda, particularly as an alternative to the A34. This includes a greater role for rail freight in Oxfordshire, taking HGVs off the road.

Our strategic rail priorities include:

- Supporting the EWR consortium and Network Rail in the design and delivery of EWR Phases 1 and 2
- Promotion of a major upgrade to Oxford station, including additional platforms, through lines and a new station building and transport interchange
- Development of the next stage of upgrades to Didcot Parkway, including new multi-storey car park, northern entrance and new station building
- Opening of the Cowley rail line to passenger services, with new stations serving the Oxford Science and Business parks
- Developing a business case for increased freight and passenger capacity between Didcot and Oxford, including opportunities for Culham Station
- Development of a business case for a new rail service linking Bristol and Swindon to Oxford and beyond, including a proposed new station in the Grove / Wantage area
- Supporting provision of enhanced and direct rail services from Oxfordshire to Heathrow Airport
- Supporting the completion of the Cotswold Line redoubling project

- Better integration of rail and strategic bus networks as part of Science Transit
- Enhancing access to local rail stations by supporting appropriate expansion in car parking and the provision of secure and accessible cycle parking

Further investment in the strategic and local rail network through Oxfordshire will also be needed, picking up the outcomes from the Rail Industry's long term planning work to 2043, which has identified future constraints on the rail network in the Didcot and north of Oxford areas in particular.

Policy 10 Oxfordshire County Council will work with the rail industry to enhance the rail network in Oxfordshire and connections to it, where this supports the county's objectives for economic growth.

Air travel

96. International business travel is essential and, despite advances in video conferencing, is likely to remain an important factor in decisions businesses make about where to locate. Proximity to Heathrow also makes Oxfordshire a popular destination for tourists. Being 'within an hour of Heathrow' is very important for the south of the county, but there is growing demand for business and tourist flights to and from Oxford.

97. London Oxford Airport, located to the north of Kidlington, has the capacity for many more domestic flights, and flights to destinations in western Europe, without the need for extending the runway. We will support this growth by working with the LEP to identify and respond to new central government funding announcements. We will seek to avoid increasing pressure on the road network in the vicinity of the site, by working in partnership with the airport to improve public transport access.

Policy 11 Oxfordshire County Council will support the development of air travel services and facilities that it considers necessary to support economic growth objectives for Oxfordshire.

Managing demand

98. In some cases, making public transport more attractive will not be enough to deter car use, and the cost of premium space in the city centre will be such that the introduction of a Workplace Parking Levy or other constraint may become inevitable. To an extent this is already happening with the University and other employers charging for the cost of parking. The Oxford Transport Strategy sets out proposals to introduce a Workplace Parking Levy, as well as restrictions on more through routes in the city. This would need to be combined with a pricing strategy for park and ride charges that incentivise their use over parking within the city, as well as further expansion of controlled parking zones to prevent commuters from parking in residential streets.

99. Elsewhere, we will work with district councils to ensure that parking provision and charging regimes support area transport strategies.

Policy 12 Oxfordshire County Council will manage the parking under its control and work with district councils to ensure that overall parking provision and controls support the objectives of local communities and this Plan.

Ensuring that everyone can participate in economic growth

100. The step change in public transport will not be felt everywhere. There will still be places that cannot viably be connected by bus. With the pressure on Council budgets, more places may fall into this category. Whilst we will seek to ensure that this does not apply to new developments, a significant minority of people living in existing residential areas and rural areas may see no improvement in public transport or may even see a deterioration in service.

101. It is vital that all of Oxfordshire's residents have an opportunity to contribute to, and benefit from, the economic success forecast for the county over the period of this Plan, whether or not they have access to a private car. Above all this requires access to education and jobs, but also to retail, leisure and culture, and health services. For short trips, access can be significantly improved through better walking and cycling links. When developing walking and cycling networks for towns we will ensure that they include connections to areas that are less well served by public transport, and in particular areas with higher levels of deprivation.

102. For longer trips and where walking or cycling is not an option, other solutions may be necessary. We recognise the importance of taxis, particularly for providing links to rail stations, and will work with partners to ensure that they are given full consideration in the design of transport interchanges. They also provide a much needed service to people with disabilities, as well as people carrying large items, so we will work with the district councils who regulate taxis, to ensure there are adequate waiting and drop off facilities in town centres.

103. However, use of taxis on a regular basis is unaffordable for many people. We will work with local research and development partners to scope, design, test, and implement a family of vehicle hire and ride sharing technologies focused on bike hire, car share, car clubs and other on-demand vehicle services. We will also partner with local universities and automotive companies to create and test intelligent, driverless, demand-responsive mobility services.

104. We will also support local communities to help themselves, offering a range of support to community transport organisations that provide minibus and car schemes using volunteer drivers. A package of support could include the use of Council vehicles when they are not required for Council services, insurance or training. We will provide assistance to vulnerable people seeking transport, putting them in touch with community run schemes where appropriate.

Policy 13 Oxfordshire County Council will work with partners and particular sections of the community to identify how access to employment, education, training and services can be improved, particularly for those with disabilities or special needs, or who otherwise have difficulties in walking, cycling or using public transport, or for people without access to a car.

Policy 14 Oxfordshire County Council will support the development and use of community transport to meet local accessibility needs.

Policy 15 Oxfordshire County Council will support the research, development and use of new technologies and initiatives that improve access to jobs and services, taking into account their environmental impact and fit with the other objectives of LTP4.

Resilience and maintenance

105. Keeping Oxfordshire's road and transport infrastructure in good condition is important for the county's economy. Oxfordshire is responsible for maintaining over 4500km of roads, and roads in poor condition can create a bad impression and deter inward investment and tourism, which are key to Oxfordshire's success.

106. While potholes can cause damage to cars, they often make bus journeys extremely uncomfortable and are a hazard to road users on two wheels. Poorly maintained footways can discourage people from walking, or even cause injuries and can be problematic for wheelchair, mobility scooter and pushchair users. Keeping roads and footways in good condition is therefore a key part of our strategy to get more people using public transport, walking and cycling.

107. Maintenance has been a challenge for many years because of insufficient government funding, a succession of cold winters and flooding, and the rise in the number of heavy vehicles using roads that were not originally designed to cope with them. As new transport infrastructure is built, the problem will become greater. The County Council has developed an Asset Management approach to deliver a more efficient and effective approach to the infrastructure assets through longer term planning. Our policy on Asset Management will meet the following aims and objectives:

- *Keep Oxfordshire moving by providing a well-managed, well maintained and more resilient highway network*

108. We will make every effort to understand current and future requirements for the highway infrastructure and its contribution to creating a world class economy. In order to deliver this, we will continue to understand our stakeholders' needs, promote levels of service and maintenance priorities for our highways. Our adoption of an Asset Management approach will take a long term view in making informed maintenance and investment decisions).

- *Improve the safety and condition of local roads, footways and cycleways, including resilience to climate change.*

109. We will improve and maintain the condition of roads and highway related assets with systematic prioritisation where there are safety related issues, Premium bus routes and high pedestrian and cycle usage whilst still maintaining the network as a whole. We will maintain the drainage and associated structures to prevent flooding on and from the highway network.

- *Provide a sustainable approach*

110. We will invest in energy reducing technology for street lighting and associated electrical apparatus.

111. Our aim is to move towards a preventative approach to the maintenance of highway assets by prioritising roads for early treatment that have not yet fallen into the failure threshold. Whilst this may appear to be undertaking maintenance on roads that don't look to be in need of repair, and may seem unnecessary when there are roads in visually worse condition, this will often be the right choice and ultimately deliver the best value for the county in the long-term.

112. The system for prioritising maintenance schemes will take into account the assessed condition, the level of use by different types of road user, the type of road and its position in a hierarchy ranging from primary route to minor lane or track, and the strategic importance of the road or footway as a walking or cycling route. Details are set out in the Highways Asset Management Plan and its annexes.

Policy 16 Oxfordshire County Council will target new investment and maintain transport infrastructure to minimise long-term costs.

Policy 17 Oxfordshire County Council will publish and keep updated its policy on prioritisation of maintenance activity: this will be set out in the Highways Asset Management Plan.

5. Cutting carbon

Objectives

- **Minimise the need to travel.**
- **Reduce the proportion of journeys made by private car by making the use of public transport, walking and cycling more attractive.**
- **Influence the location and layout of development to maximise the use and value of existing and planned sustainable transport investment,**
- **Reduce per capita carbon emissions from transport in Oxfordshire in line with UK government targets.**

113. Reducing carbon emissions from transport sits alongside creating growth as the highest local transport policy priorities for central government. The 2011 White Paper Creating Growth, Cutting Carbon: Making Sustainable Local Transport Happen states that there is a need for a 'coherent plan to reduce the carbon emitted by transport, not least in order to meet our binding national commitments'.

114. In addition to continuing to pledge to make car travel greener through technological advances and more stringent emissions standards for manufacturers, the White Paper placed greater emphasis on non-car, behavioural change transport solutions to reduce carbon emissions, particularly for short journeys. Local authorities, the paper states, are best placed to do whatever works best in their area to get more people to walk, cycle or use public transport.

115. Our strategy to support the achievement of national carbon reduction targets fits neatly with our other objectives. Minimising the need to travel, and getting more people to walk, cycle or use public transport instead of driving not only reduces carbon emissions, but also supports growth by helping to meet the overall demand for travel, and reducing congestion, as explained in the previous chapter. In this chapter we say more about how this will be achieved.

116. Alongside this 'modal shift' objective, we will support the uptake of zero and low carbon emission vehicles – for both private and public transport.

Minimising the need to travel

117. To reduce the pressure on transport networks as the population grows, and minimise emissions and other environmental damage from transport, it makes sense to cut the amount of vehicular travel per head by making some of people's travel unnecessary. If people work close to where they live, their commuting journeys will be shorter, perhaps short enough to make by bike or on foot.

118. Through our role in supporting strategic planning across the county, we will influence the location of development to minimise the need for car travel in particular, and ensure that where new infrastructure is required, it can be justified and is affordable. We will work closely with Oxfordshire's district councils and neighbouring local authorities to coordinate land-use and transport planning, with the aim or ensuring housing is located close to employment or good public transport links where possible, and that new developments have good transport links, and are laid out in a way that enables people to get around easily on foot or by bike, or by public transport. This is in line with the National Planning Policy Framework:

> 'Plans and decisions should ensure developments that generate significant movement are located where the need to travel will be minimised and the use of sustainable transport modes can be maximised.' (from NPPF paragraph 34).

The NPPF also states that developments should

> '…give priority to pedestrian and cycle movements, and have access to high quality public transport facilities..' (paragraph 35)

119. We are required by law to be consulted on the transport implications of all new planning applications. We will look carefully at plans for new developments to ensure that they support the use of sustainable travel, though the way they are laid out, the transport infrastructure and facilities they include, and the way in which the development will be managed when occupied.

120. In line with NPPF we will require all planning applications for developments over a certain size to be accompanied by a Transport Assessment, setting out the likely impact of the development on transport networks, and any proposed mitigation by the developer. Also in line with NPPF, depending on the size of the development, we will require developers to submit a Travel Plan, setting out how targets for the number of trips associated with the development will be achieved. Details of our requirements are set out in our *Transport Assessment and Travel Plan Policy Document.*

121. We will also support development in locations that make use of existing or planned sustainable transport infrastructure, for example development that would help create the demand necessary to make a new rail station feasible. We will ensure that housing and employment developments and investment in the transport network are progressed together. Land may not always be available in the right places, and people may not always be able to find a job or may not choose to work close to where they live or somewhere they can access by public transport, but if more people have these options, it will help to reduce demands on transport networks.

Policy 18 Oxfordshire County Council will seek to ensure that the location, layout and design of new developments minimise the need for travel, encourage walking and cycling for local journeys and leisure, allow the developments to be served by high quality public transport and will support the development of travel plans to achieve this.

122. Approximately 12% of people in Oxfordshire work mainly from home, and there is clearly potential for this proportion to increase as technology develops and the nature of work changes over time. Increasing the number of homes with a fast internet connection will enable more people to work or run businesses from home. The County Council is working in partnership with central government and BT to bring high speed broadband to 90% of homes and businesses by the end of 2015 and we will continue to make this a priority for new developments.

Policy 19 Oxfordshire County Council will help reduce the need to travel by seeking further opportunities to improve internet and mobile connectivity across Oxfordshire and supporting other initiatives that enable people to work at or close to home, and will work in partnership with service delivery organisations to influence the location of key services where possible

Active travel

Increasing walking

123. Walking emits less carbon than any other form of transport. It is free to the user and requires no special equipment. It is age-inclusive: pedestrians include some of the county's youngest and oldest road users. From a strategic perspective, its advantage is that it uses less space than other forms of transport, and does not require any parking or waiting facilities. The more people there are walking about, the safer people feel. Communities benefit from greater interaction, and local shops and businesses benefit from increased footfall.

124. Walking has huge health benefits, and can be built into every type of journey. It is a necessary part of all public transport journeys, so a key part of encouraging people to use public transport is making the walking element of their journey attractive. While ideally properties should be within a short walk of bus stops, it may be necessary for people to walk further to access high quality, frequent, express-type services. Pressure on bus services in the future, particularly in Oxford, means that we want to encourage more walking where it is an obvious alternative to other forms of travel.

125. For people to want to walk, they need to feel safe, secure and comfortable. They need to be able to make good progress along their line of route and feel as though they are as important or more important than car drivers. Being able to make journeys safely on foot provides important independence for the oldest and youngest residents, and being able to get about using walking aids, wheelchairs and mobility scooters allows people with physical disabilities and mobility

impairments to play an active part in the local economy. Given the ageing population, we need to make walking routes accessible and safe for all.

126. In developing area strategies we will review walking networks and focus capital improvements on routes with the greatest potential for increasing the numbers of people walking, particularly where improving the pedestrian environment would support economic growth and reduce car use. We will also prioritise strategically important walking routes for maintenance. Where funding allows, we will carry out targeted safety improvements on routes to school, to encourage active travel and reduce pressure on school bus transport.

127. In planning improvements to walking routes, we will carry out audits with users, and consult people with disabilities. We will focus on improvements that make routes safe for all users, such as pedestrian crossings and improved surfaces, but will also improve the pedestrian environment by removing street clutter, improving drainage, and providing seating where appropriate, as well as making other design improvements to enhance people's enjoyment of public space. To ensure that walking routes are accessible by people with disabilities, we will follow the principles set out in the Department for Transport Guidance, Inclusive Mobility or government guidance that may replace it in future.

128. When improving walking routes in urban areas with high footfall we will sign the routes, and will provide accurate information on walking via the Oxfordshire Journey Planner.

Increasing cycling

129. Cycling as a means of transport emits zero carbon in use. Where trips by bike replace private car or public transport trips, this helps to reduce carbon emissions overall. Cycling also has huge health benefits, so increasing the proportion of people who cycle regularly will help to address the problems of obesity and ill health related to inactivity. Our aim is to triple the percentage share of people who cycle to work in the county from the current estimated percentage figure of 7%[3] to 21% by 2031. We will do this by:

- Treating cycling as a major mode of transport, considering it at an early stage in all policy decisions, new projects, maintenance schemes and developments.
- Allocating more investment to cycling, working towards the £10 per annum per resident spend on cycling recommended in the government's Cycling Delivery Plan.
- Where there is a clear justification and outcome, applying for grant and other funding opportunities announced for cycling and related schemes.
- Engaging with developers to ensure that high quality cycle infrastructure is designed-in to their own development plans and secure Section 106 money to improve cycle facilities in and around the site, to encourage people to cycle as soon as they move in to the development.

[3] 2011 Census data

- Where possible, allocating dedicated road space for cycling, and reducing vehicle speeds where it isn't, focusing on routes where there are already a large number of cyclists, and ones where there is potential for more.
- Creating a network of branded cycle routes, working towards a complete network for the county but prioritising routes where there is most potential for cycling to replace car trips.
- Integrating cycling with public transport, with branded cycle routes linking centres of population with rail stations and Premium bus route stops, safe and secure cycle parking at interchanges, with additional facilities at major transport hubs.
- Planning comprehensive, connected cycling networks for the larger towns, linking existing sections of cycle route together and creating new ones, and collecting developer funding to implement them. These will include routes to schools.
- Providing accurate information about cycling routes via the Oxfordshire Journey Planner, and promoting cycling in partnership with the Oxfordshire Cycling Network.
- Encouraging cycling for recreation, making full use of the potential of Oxfordshire's Public Rights of Way network.

130. The Oxfordshire Cycling Strategy sets out the detail about how we will go about increasing cycling and provides the framework for developing cycling within Oxfordshire's towns.

Design

131. We will ensure that new development adheres to the principles and philosophy set out in the DfT's *Manual for Streets*, which applies a user hierarchy to the design process, with pedestrians at the top. In residential areas this will include restrictions on parking, 20mph speed limits where appropriate, and more through routes for pedestrians and cyclists than motor vehicles. These principles may also be applied to improvements in existing residential areas and town centres where there is potential to increase walking and cycling.

132. We will ensure that travel plans for new developments include measures to increase walking and cycling, and that these travel plans are implemented.

Policy 20 Oxfordshire County Council will encourage the use of modes of travel associated with healthy and active lifestyles and will improve built and green infrastructure to support greater levels of walking and cycling.

Policy 21 Oxfordshire County Council will carry out targeted safety improvements on walking and cycling routes to school, to encourage active travel and reduce pressure on school bus transport.

Influencing travel choice

133. Providing people with excellent public transport and walking and cycling infrastructure, as well as information about their travel options, will not be enough to bring about the shift that we need from car use to other methods of transport. In line with the Government's approach set out in *Creating Growth: Cutting Carbon: Making Sustainable Local Transport Happen* (DfT, 2011), we will adopt the principle of the 'ladder of interventions', enabling choice following provision of better information and education.

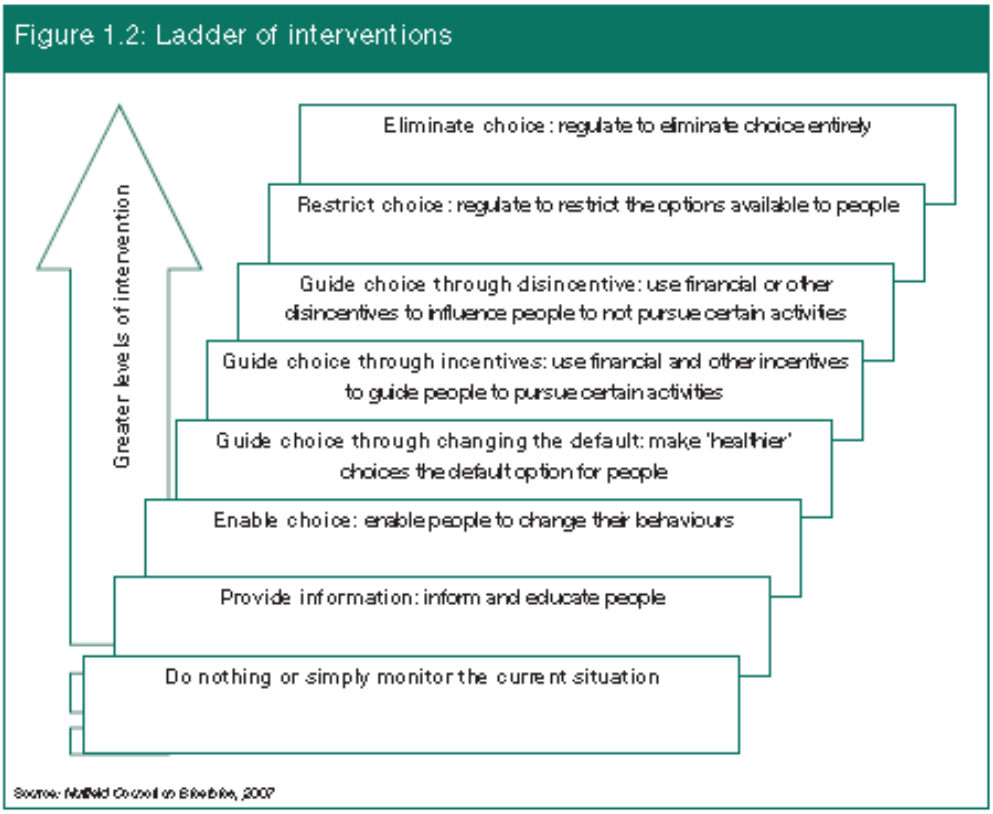


Figure 23: The Ladder of Interventions (from Creating Growth, Cutting Carbon: Making Sustainable Local Transport Happen, DfT 2011)

134. With the widespread use of mobile internet devices, the Oxfordshire Journey Planner will be the primary source of information on all aspects of travel, providing people with the ability to plan their journeys in real time and make the best choices to enable them to reach their destination on time.

135. The journey planner aims to help people make informed decisions about their journeys, allowing more seamless travel and therefore increasing the desirability of Oxfordshire for businesses, reducing congestion and environmental impacts from travel in the county. In addition, the application will pull together journey planning information into one location, thus improving our service offer to the general public and tourists. To maximise reach and take-up, local tourist websites and businesses will be encouraged to integrate the application onto their home pages.

136. It will make use of a wide range of data to predict demand on Oxfordshire's transport networks and give people an accurate forecast of journey time via all modes of transport and combinations of modes. The journey planner will also highlight the carbon savings and health benefits from switching to different modes.

137. The purpose of the journey planner is to provide a tool to support multi-modal journey planning both in advance of a journey and in real time, i.e. at the point in time at which a user wishes to travel, and to help overseas businesses and travellers to make seamless, quicker, informed journeys between innovation areas and tourist destinations, for example.

138. This tool will be developed so that it 'nudges' people towards taking the option that is both quickest for them and best for optimising the capacity of transport networks. For example, on the approach to Oxford by car it will inform people of the time it will take them to drive to their destination, compared with the time they could save by parking and taking the bus or train. It will be used to offer incentives for travelling in a way that relieves pressure on transport networks. Further details are set out in the *Science Transit Strategy*.

139. We recognise that access to the internet is not universal, so we will continue to ensure that basic information on public transport services is available by other channels. Our aim is to make the Journey Planner as accessible as possible to users of all ages and ability, and to make it so easy to use that people will choose it over any other method of planning their journey.

Policy 22 Oxfordshire County Council will support the use of a wide range of data and information technology to assist in managing the network and influencing travel behaviour, and work with partners to ensure that travel information is timely, accurate and easily accessible in appropriate formats for different user groups.

140. The Council will seek opportunities to promote sustainable travel where they can be resourced from external funding streams. In recent years we have successfully obtained grant funding from the government's Local Sustainable Transport Fund to carry out targeted behavioural change initiatives in the Headington area of Oxford, and we will seek similar opportunities in the future.

141. Generally people are most willing to consider changing their behaviour when their circumstances change, particularly when changing jobs or moving house. New housing and employment developments need to be designed and provide information to encourage people to travel sustainably. Employers can have direct influence over their staff and can put in place policies and incentives to encourage people to travel to work by public transport, by bike or on foot. We will therefore place an emphasis on ensuring that good travel plans are in place for new developments, and seek opportunities to develop travel plans with existing organisations, including schools, who wish to promote sustainable travel, where funding allows.

Low emission vehicles

142. We will support the introduction of low emission and renewable energy vehicles to replace existing ones, and will expect any new public transport vehicles to conform to high environmental standards.

Public transport

143. In January 2014 a Low Emission Zone (LEZ) came into effect in central Oxford, applying to buses only. This was introduced primarily to reduce levels of pollution from oxides of nitrogen (NOx). It requires local buses operating in affected streets to comply with the Euro V emission standard for NOx. The main bus operators responded to this and to customer preference, by introducing a number of hybrid electric buses into the fleet. Hybrid electric buses use a combination of an electric battery pack and a diesel engine to provide power, and produce around 40% less carbon dioxide (CO2) emissions than traditional diesel-engined buses.

144. We are supporting trials of wireless induction charged electric buses, which run fully on electricity. As technology develops we expect electric buses and other types of low emission public transport vehicles and propulsion technologies to become more widespread. The County Council will support pilots where appropriate, working with businesses and research institutions. If successful, we will support the provision of the required infrastructure, taking into consideration safety and environmental factors. We will ensure that new infrastructure considers the flexibility to enable the take-up of future low emission vehicle technologies, for example through incorporating sensor or wireless technology in new roads or bus lanes.

145. Network Rail is carrying out a programme of electrification which means that the proportion of diesel trains through Oxfordshire will reduce over the period of this plan. By 2031 we expect that the vast majority of passenger carrying rail lines through Oxfordshire will be electrified. This will reduce carbon emissions as well as NOx pollution. The programme will involve a number of road overbridges being rebuilt to provide sufficient clearance for the overhead wires and masts. We will continue to support this by managing the impacts on the road network during construction. Network Rail will replace bridges on a like for like basis, but where appropriate, improvements will be sought, with the County Council making a contribution from other funding sources.

Private cars

146. Electric hybrid cars are becoming more popular as they become more affordable, and battery technology develops allowing a longer range. The ‘whole life’ carbon benefits of electric over conventional vehicles has been debatable, but as electric power generation moves towards greater use of renewable energy sources, the benefits will become more convincing, particularly as mileage increases. In urban areas, there are clear air quality as well as carbon benefits. However, electric cars take up just as much road space as conventional cars, so from a transport strategy perspective, it would not be desirable if people used them for journeys they could make by public transport, walking or cycling.

147. To encourage the uptake of electric cars, we will focus on support for charging infrastructure and other incentives which do not run the risk of increasing congestion. We will not support policies which undermine bus or public transport priority, such as the use of bus lanes by private electric cars. We will consider the provision of free or reduced price parking for low emission vehicles at Park and Ride sites, but not in town centres.

148. We will seek funding opportunities and work with other local authorities to provide a network of rapid charging infrastructure, which benefits users wishing to make longer distance journeys. We will also seek funding opportunities to provide charging points on street and on Council property, to assist those residents without off street parking where they can charge a vehicle overnight. To allow the use of charging points to be optimised we will implement parking time limits, and we will ensure that any charging infrastructure can be used by all forms of electric vehicles, subject to site-specific vehicle height restrictions. We will also look for opportunities to support the development of a network of hydrogen fuelling infrastructure as this technology develops.

Policy 23 Oxfordshire County Council will promote the use of low carbon forms of transport, including electric vehicles and associated infrastructure where appropriate.

Reducing the carbon footprint of our own operations

149. We and our partners operate a large fleet of vehicles. We will look for opportunities to introduce low emission vehicles into the fleet where this is cost effective.

150. We will seek to reduce energy consumption in our operation of the transport network, by introducing more energy efficient electrical equipment such as street lighting and traffic signals.

151. We will ensure that highway construction is carried out in an energy efficient manner, maximising the use of recycled materials where appropriate, taking into account the carbon emissions of transporting them. Our policy is set out in more detail in the Highways Asset Management Plan.

Policy 24 Oxfordshire County Council will work to reduce the carbon footprint of transport assets and operation where economically viable, taking into account energy consumption and the use of recycled materials.

6. Improving quality of life

Objectives

- Mitigate and wherever possible enhance the impacts of transport on the local built, historic and natural environment.
- Improve public health and wellbeing by increasing levels of walking and cycling, reducing transport emissions, reducing casualties, and enabling inclusive access to jobs, education, training and services.

152. Alongside supporting growth, transport has the potential to improve quality of life for everyone, but can also have side effects which reduce it. Figure 23 represents the ways transport can impact on seven quality of life factors[4] . Our aim is to increase the net positive impact on quality of life; however, there is a risk of environmental impacts, such as climate change and biodiversity, being understated when compared with some of the positive benefits, because they are not felt so immediately.

Figure 24: Transport impacts on quality of life

[4] Seven quality of life factors taken from the Economist Intelligence Unit's Quality of Life Index for countryes. The 2 not included are Political Freedom and Gender Equality. 'Security' is actually 'Political stability and security' in the Index.

Protecting and enhancing the environment

153. To ensure that the environmental impacts of this plan are considered fully, a Strategic Environmental Assessment has been carried, the findings of which are contained in the Environmental Report which forms part of *Connecting Oxfordshire*. It assesses this plan on its impact with respect to:

- Air quality
- Climatic factors – greenhouse gas emissions, and adaptation to effects of climate change
- Noise
- Biodiversity – flora and fauna
- Population and community
- Human health, including safety
- Soil
- Water, including quality, quantity and flood risk
- Material assets, including resource efficiency and waste
- Cultural heritage and the historic environment, including architectural and archaeological heritage
- Landscape and townscape

A Habitats Regulations Assessment and a Health Impact Assessment have also been carried out.

154. Damage to the environment can occur as a result of development of physical infrastructure, or as a result of increasing use of environmentally damaging forms of transport. The policies of this plan generally support a reduction in car mileage per head, which will have a positive impact. However, the plan also proposes the development of transport infrastructure to support growth. This needs to be carried out in a way which minimises damage to the environment and seeks opportunities to enhance it.

155. Environmental factors, including relevant legislation and guidance regarding the impact on the natural environment, will be considered at the outset of every transport infrastructure scheme, while a number of scheme options are still being considered. This will allow proper consideration of less environmentally damaging options, and for the design to be guided by environmental considerations so that the best mitigation and enhancement measures can be incorporated into the scheme. This will deliver better outcomes than considering the environment later in the process, when making changes becomes more costly.

156. We will ensure that consideration of biodiversity impacts informs transport decisions, and that, where impacts are unavoidable, mitigation and compensation are provided for biodiversity loss. In managing our transport assets, we will consider how we can make positive biodiversity gains, including protecting and enhancing habitats for bees in line with the Council's resolution in July 2014. This

includes the way in which we manage highway verges and trees, what materials and the type of equipment we use, and drainage. Details of our plans can be found in the *Highways Asset Management Plan* and the *Tree Management Policy*. Our approach to biodiversity is set out in the *Oxfordshire Biodiversity Action Plan*.

157. We will work with partners to develop Oxfordshire's 'green infrastructure', which includes our public rights of way network. Details of our plans will be set out in the forthcoming Oxfordshire Green Infrastructure Strategy, and the Rights of Way Improvement Plan.

158. We will help to conserve designated Areas of Outstanding Natural Beauty (AONB), though working with the AONB management teams to implement relevant policies or actions from their management plans.

159. We will manage flood risk through our statutory role to coordinate flood risk management for surface water, groundwater and smaller watercourses in the county. The Environment Agency remains responsible for main river flooding. Details of our plans can be found in the *Oxfordshire Local Flood Risk Management Strategy*.

Policy 25 Oxfordshire County Council will work to reduce negative environmental impacts of the operation of the transport network, and where possible provide environmental improvements, particularly in Areas of Outstanding Natural Beauty, Conservation Areas and other areas of high environmental importance.

160. We will ensure that an understanding of landscape and townscape character and sensitivity to development informs transport decisions, recognising that materials, signing and lining can have a negative impact on character and tranquillity. We will use tools such as the Oxfordshire Wildlife and Landscape Study (OWLS), as well as local landscape and townscape character assessments.

161. When responding to development proposals, we will seek appropriate mitigation for environmental impacts, and highlight opportunities for environmental enhancement. Where it is part of a wider highway improvement scheme, we will improve urban public open spaces that are part of highway land, to make them more visually attractive and inviting, taking the needs of all road users into account, and prioritising pedestrians where it is appropriate. This includes removing unnecessary street clutter such as signs that are not legally required and are of little use.

Policy 26 Oxfordshire County Council will work with partners to improve public spaces and de-clutter the street environment.

Improving health and wellbeing

162. Transport can play an important part in contributing to improvements in public health, particularly in four key areas:

- Encouraging physical activity
- Promoting independence for older and disabled people
- Improving air quality
- Improving road safety

Physical activity

163. Low levels of physical activity and increasing obesity are a huge concern nationally. Oxfordshire has a relatively high percentage of people who take part in regular activity per week (26%) but this needs to be maintained and there is room for improvement. Preventing chronic disease through tackling obesity is a key priority of Oxfordshire's *Joint Health and Wellbeing Strategy.*

164. For many people, the easiest way to build in regular physical activity to their daily routine, is through walking or cycling for local journeys. Using public transport is also good, because it usually involves walking or cycling to or from a station or bus stop. Our policies to increase the amount of walking, cycling and public transport use support the priority of tackling obesity. Physical activity has also been shown to improve mental health.

165. The Council is also responsible for management and maintenance of an extensive network of Public Rights of Way (PRoW), which provide opportunities for people to take outdoor exercise as a leisure activity, as well as providing valuable pedestrian, equestrian and cycle links for getting around. Opportunities for leisure cycling can build confidence and encourage people to take up cycling as part of their daily routine. The Rights of Way Improvement Plan sets out our plans for developing the network.

166. We will seek enhancements to the PRoW network from new developments, with additional sections of path where necessary to link the developments to the existing network.

Policy 27 Oxfordshire County Council will record, maintain, improve and waymark the public rights of way network so that all users, including cyclists and horse riders, are able to understand and enjoy their rights in a safe and responsible way.

167. Towpaths along the River Thames and the Oxford Canal provide opportunities for long distance walking and, where it is permitted, for cycling. Particularly in urban areas these form part of important local networks of walking and cycling routes. We will work with the Canal and River Trust to promote the use of these paths and seek funding towards their improvement, mindful of the fact that removing the natural features of river banks can damage valuable habitats, for example that of the water vole.

Policy 28 Oxfordshire County Council will support appropriate opportunities for improving towpaths along the waterways network, for local journeys and leisure, where it would not harm the ecological value of the area or waterway network.

Promoting independence

168. Nationally, the ageing population means that there will be huge pressure on social and health services. Transport has a role in helping more people to stay independent and healthy, which will reduce this pressure. People need to be able to do basic things such as shopping, banking and going to the doctor, as well as activities that keep them healthy and reduce isolation, such as visiting friends and generally being part of the community. Older people also make a vital contribution to the economy: they are more inclined to support local shopping centres, and many of them provide important services as volunteers.

169. In Chapter 4 we discussed the importance of ensuring that older and disabled people can get around and how this can be supported. We will work to remove the barriers to access that these groups of people encounter. We will consider the impacts on disabled people at an early stage in developing new transport schemes, so that improvements can be built into the design. This will involve consulting disabled people or their representatives. It is our policy to carry out a Vulnerable Road User Audit on the design of all new schemes to fully understand the impacts.

170. We will also work closely with public transport operators to ensure that vehicles and infrastructure are fully inclusive and that people with disabilities receive excellent service and feel safe and secure at all times when travelling.

171. The County Council has statutory duties to promote equality, celebrate diversity, improve social inclusion and ensure fairness for everyone in Oxfordshire. Our ambitions for equality in the delivery of Council services are set out in our *Equality Policy 2012-17*. The County Council also has a *Social Inclusion Strategy*, which highlights the importance of improving transport links.

172. Under the Equality Act 2010, the Council has a Public Sector Duty, which includes a duty 'to advance equality of opportunity between people who share a protected characteristic and those who do not.' The protected characteristics are: age, disability, gender reassignment, marriage and civil partnership (but only in respect of eliminating unlawful discrimination), pregnancy and maternity, race – this includes ethnic or national origins, colour or nationality, religion or belief – this includes lack of belief, sex and sexual orientation.

173. A formal assessment (SCIA) has been made of this Plan as a whole and is available along with the other consultation documents. Similar assessments are required under the Council's Equalities Policy for all new schemes, policies and plans.

174. We are committed to ensuring that our transport systems themselves are as inclusive as they possibly can be, and that they advance inclusivity by helping everyone to take an active part in society and the local economy.

Policy 29 Oxfordshire County Council will consult from an early stage in the development of schemes and initiatives so that the needs of individuals, communities and all groups sharing a protected characteristic under the Equalities Act 2010 are considered and, where appropriate, acted upon.

175. When assessing the health impacts of transport schemes and initiatives, we will be mindful of the need to address health inequalities, which are often linked with the differences in levels of deprivation between different areas. In consultation with public health colleagues, we will factor this consideration into our recommendations.

Improving air quality

176. In Chapter 3 we described the problem of air pollution from oxides of nitrogen affecting Oxfordshire. This is a serious public health issue, affecting respiratory health for people using the highway in affected areas. Air quality monitoring, and leading the development of plans to improve air quality, are the responsibility of district councils in Oxfordshire.

177. When an area is declared an Air Quality Management Area (AQMA) because of exceedances of particular pollutants, the district council is required to develop an Air Quality Action Plan (AQAP). As transport contributes most of the problem pollution (in Oxfordshire this is currently NOx in all cases), many of the potential actions are only possible with the support of the County Council. We recognise our responsibility and will work with the district councils to develop appropriate solutions, taking into account our overall transport strategy.

178. The following Air Quality Action Plans are in force in Oxfordshire:

- **Oxford**: The Oxford AQAP covers the entire city within the ring road. Measures to support it are contained in the Oxford Transport Strategy.

- **Chipping Norton**: The Chipping Norton AQAP proposed the introduction of a weight limit for HGVs and re-routing of HGV traffic between south-east England and the Vale of Evesham via the A40. This included 'de-priming' the A44 and associated modification to signage. We have commissioned a feasibility study for the implementation of the lorry management measures.

- **South Oxfordshire:** There are three AQMAs in the district, in Henley, Wallingford and Watlington. South Oxfordshire District Council has drafted an

action plan that contains some suggestions on how the air quality issues in these three areas, and South Oxfordshire as a whole, can be tackled.

- **Vale of White Horse**: Vale of White Horse District Council has drafted an action plan covering the two AQMAs in the district: Abingdon town centre, and Botley, adjacent to the A34. Abingdon has had an AQAP since 2009, and the Abingdon Integrated Transport Strategy, which smoothed traffic flows in the town centre, has helped to reduce levels of NOx. Botley AQMA has not previously had an AQAP: specific actions to reduce NOx in Botley are very difficult because the pollution is created by a busy trunk road controlled by the Highways Agency. The Highways Agency has introduced a 50 mile per hour speed limit on the A34 to reduce air pollution; however levels remain above the air quality standard. Our ongoing work with the Highways Agency to develop a strategy for the A34 will take into account the need to reduce NOx pollution in Botley and support the AQAP.

179. We will work with the district councils to develop transport measures as part of AQAPs for the county's other existing AQMAs, in Witney, Kidlington, Bicester and Banbury, and other AQMAs that may be declared during the period of this Plan.

Policy 30 Oxfordshire County Council will work with district councils to develop and implement transport interventions to support Air Quality Action Plans by reducing harmful emissions from vehicles where feasible, giving priority to measures which also contribute to other transport objectives.

Improving road safety

180. When evaluating the costs and benefits of new road schemes, the Department for Transport uses an estimate of just under £50,000 for the average value of preventing each road casualty, however serious. This reflects not only medical costs, but also the suffering of those involved as well as any lost economic output. This figure excludes the wider costs such as the severe congestion that is often caused even by comparatively minor collisions on the strategic roads in the county.

181. Our strategy for improving road safety by preventing casualties is set out in the *Oxfordshire Community Risk Management Plan*. Our approach consists of:

- Gaining an understanding of the problem through analysing casualty reports and monitoring the casualty history of all roads in the county, and targeting our work accordingly;
- Changing road users' attitudes and behaviour so they take more responsibility for their own and other people's safety;
- Maintaining transport infrastructure in a safe condition;
- Highway engineering improvements where appropriate, and designing in safety to all new highway schemes including those being constructed as part of new development; and

- Changing speed limits where appropriate and reinforcing these with specific measures like variable message signing, where this can be justified.

182. During the period of this Plan, technologies to improve safety will very likely be further developed or become more widely available. The Council will respond positively, so that road users in Oxfordshire have the opportunity to take advantage of new technologies, for example through:

- The use of new, safer materials and infrastructure in highway schemes;
- Considering road safety adaptations that may become permissible under new legislation – many of these are likely to relate to in-vehicle technology that will alert drivers to risks and potentially manage, for example, the headways between vehicles; and
- Providing information to support the development of road safety technologies.

183. We process and analyse all reports of injuries on the road received from Thames Valley Police. This allows us to identify collision problem sites and routes, and trends in numbers overall and for specific road user groups, as well as to explore behavioural and other factors. Prompt processing of data allows us to respond quickly to maintenance issues such as gully clearing to reduce localised flooding or worn road markings.

184. Monitoring casualty history allows us to target our behaviour-change programmes, and identify sites that would benefit from maintenance or improvement schemes. Because casualties are dispersed, and therefore the number of casualties at any site is low, we monitor them over a five year period to detect patterns. However, we acknowledge that many casualties, particularly minor ones that don't involve motor vehicles, are not reported to the police. For this reason, we also receive summary information from the NHS on road accident casualties to complement the police data.

185. We deliver Road Safety Education programmes, sometimes in collaboration with other agencies such as the police or local community safety officer. We use casualty data to identify road user groups most at risk and target our programmes to achieve casualty reduction within those specific groups, either county-wide or to address specific local problems. Events include child cycle training, child pedestrian training, child seatbelt fitting and young drivers and motorcyclist themed events.

186. Each year a proportion of our maintenance budget is spent on planned road safety maintenance schemes, such as rectifying substandard skid resistance. Schemes are identified from analysis of casualty records and surveys. This is in addition to routine maintenance such as vegetation cutting to maintain visibility, and reactive maintenance to repair serious safety defects such as large potholes and damaged safety barriers.

187. We investigate road engineering solutions for parts of the road transport network where collisions occur most frequently. It is important to understand the causes of collisions and that engineering solutions may not always be possible or cost-effective, in many cases, have little impact. An assessment of the priority of a safety scheme will take account of its cost and anticipated accident savings.

188. We have a legal duty to regulate traffic in the interests of safety, through our powers as a highway authority. It has the power to set speed limits, following strict Government guidance and subject to consultation. Lower speed limits have been found to be effective in reducing casualty rates, in particular on rural single carriageway routes. A general review of the county's A and B roads was completed in 2011, and this may be repeated within this Plan period. However, we will investigate additional changes in response to new development, and our ongoing casualty monitoring.

189. In Oxford, most residential roads were reduced to 20mph in 2009 and this has been successful in reducing collisions and encouraging more walking and cycling. Recent Government guidance (January 2013) urges traffic authorities to consider introducing more 20 mph limits, over time, in primarily residential urban areas and built-up village streets, to increase safety for pedestrians and cyclists.

190. We are aware that a number of communities across Oxfordshire have expressed an interest in 20mph limits, and, subject to funding, we will work in partnership with local councils and Thames Valley Police to investigate and promote them where they can be justified and funded. This includes areas where 20mph limits could help meet wider objectives, such as encouraging more cycling and walking.

191. While we use casualty records to target sites for potential engineering or speed reduction improvements, we are also mindful of the importance of perceived safety on people's behaviour: that is where people view a situation as unsafe even though this may not be borne out by casualty records. This is particularly relevant to our objective to develop and increase cycling and walking, for local journeys, recreation and health.

192. In some locations safety improvements may not appear to be justified by casualty records, but they could remove barriers to walking and cycling, and in particular support parents in allowing children to walk or cycle to school. However, we try always to present a balanced view of walking and cycling, weighing the risk of accidents against the greater health risk to the population of not taking sufficient exercise.

193. People with reduced mobility feel particularly vulnerable, and the fear of a collision or of falling can discourage them from going out. Targeted safety improvements, such as improved crossings, can support the key priority of the Oxfordshire Health and Wellbeing Strategy to support older people to live independently with dignity whilst reducing the need for care and support.

Policy 31 Oxfordshire County Council will identify those parts of the highway network where significant numbers of accidents occur over a monitoring period of five years, and propose engineering solutions where these would be effective in helping to prevent accidents.

Policy 32 Oxfordshire County Council will work with partners to support road safety campaigns and educational programmes aimed at encouraging responsible road use and reducing road accident casualties, and will keep speed limits under review, including giving consideration to the introduction of 20mph speed limits and zones.

7. How we will implement this Plan

194. The strategic approach and policies outlined in the preceding chapters will be applied across the whole county in the following ways:

- Through our key role in integrated strategic land use and transport planning for the county;
- Through our involvement in the development of Local Plans and Neighbourhood Plans;
- In our response to strategic infrastructure and development proposals;
- In our response to planning applications;
- Through the development of area strategies for areas planned for growth;
- Through the development of supporting strategies;
- Through our work with partners to develop transport solutions; and
- In our decision making process for all aspects of transport for which we have control.

Development of area, route and supporting strategies

195. For those parts of the county due to experience significant housing and/or employment growth, we have developed draft Area Strategies reflecting emerging Local Plans. These are:

- Oxford
- Science Vale (the area encompassing Wantage and Grove, Abingdon, Didcot, Culham, and Harwell Campus)
- Bicester
- Banbury
- Witney
- Carterton

196. These set out a clear strategy for transport in those areas to guide decision making and support future funding arrangements to mitigate the impact of the growth proposed. We are also developing route strategies for the A40, A34 and A420 and we are considering the need for further route strategies. These will consider the transport impact on smaller settlements and key junctions along the routes.

197. Area and supporting strategies will be formally adopted as part of the Local Transport Plan. The proposed make up of *Connecting Oxfordshire* is set out at the start of this document.

Influencing and supporting neighbourhood plans

198. For smaller towns, villages and rural areas where there is less growth to impact on transport demand, and less of an impact on strategic transport networks, in the spirit of localism we are not planning to develop detailed

transport strategies for local communities. Many of these communities are developing Neighbourhood Plans, and we will expect these to set out priorities for transport in keeping with the policies in the preceding chapters.

199. To guide and support the development of Neighbourhood Plans we have developed an on-line toolkit for use by communities. We will respond fully to consultations on draft Neighbourhood Plans, and once they are adopted, we will support them through our role as statutory consultee on the transport aspects of planning applications. We will seek to ensure that developers provide or contribute towards the Neighbourhood Plan's transport infrastructure requirements, in proportion to the transport impact from the development.

Policy 33 Oxfordshire County Council will support the development of Neighbourhood Plans (as outlined in its published Toolkit) and seek to influence neighbourhood plans with a view to ensuring consistency with the Local Transport Plan. Where a Neighbourhood Plan has been adopted, the Council will seek funding to secure the Plan's transport improvements from local developments and the Community Infrastructure Levy as appropriate.

Funding transport improvements

200. Councils no longer receive block funding to spend on transport improvements. Capital funding for local projects from the Departments for Transport, Business Innovation & Skills, and Communities & Local Government has been pooled into a single Local Growth Fund (LGF). The government have given sole responsibility for deciding on priorities for investment and putting in bids for the LGF to the Local Enterprise Partnerships (LEP).

201. This means that for each transport scheme for which the Council wants to seek government funding, it has to prepare a bid and is then dependent on the LEP selecting it for submission. It then is considered in competition with non-transport schemes and schemes from other LEPs across the country. This more challenging route to funding requires us to prepare strong business cases that show how schemes contribute towards economic growth.

202. From time to time specific grant funding opportunities arise, but these are moving towards becoming funding streams within the LGF, for example the Local Sustainable Transport Fund. Under current conditions of tightening local authority budgets, government grants with revenue elements are particularly valuable, allowing us, for example in the case of LSTF, to carry out promotional activities no longer affordable from Council budgets. We will seek to bid for every available opportunity, and this means that we need to have schemes and projects ready to put forward.

203. The other main route to funding is from development itself, via planning obligations. Developers either contribute towards improvements to mitigate their transport impacts, or carry out works themselves under S278 Agreements with the Council.

204. While development can 'pump-prime' public transport service improvements, in the long term these must be provided commercially because there will be insufficient funds to subsidise further public transport services. Private sector funding is therefore a key part of the funding mix in delivering our transport strategy.

205. We will work in partnership with the district councils and the LEP to develop a prioritised programme of capital transport schemes, taking into account the various funding sources. This will be updated annually. Our current programme is set out in Chapter 14 of this document .

Policy 34: OCC will work in partnership with the Local Enterprise Partnership and developers to meet the objectives of the plan and seek external funding to support the delivery of transport infrastructure priorities as set out in the SEP, City Deal and Local Investment Plan.

Influencing development

206. Much of what we want to achieve depends on how we can guide development, and raise funding for transport improvements through planning obligations. Our approach is both proactive (strategic planning) and reactive (responding to development proposals).

207. The County Council works closely with district councils, who are each responsible for preparing a Local Plan. Local Plans - together with any neighbourhood plans - form the development plan for an area. They set out the opportunities for development and contain policies on what will be permitted, and where. The County Council provides transport input and advice into Local Plan development and works with district councils to set priorities for strategic transport infrastructure.

208. In most cases district councils decide whether a development can go ahead (the County Council only determines planning applications for minerals and waste developments such as quarries and landfill sites, and developments on County Council-owned land). Planning applications should be determined in accordance with the development plan for the area unless material considerations indicate otherwise.

209. The County Council provides pre-application advice to developers to help ensure the development proposals meet transport objectives and do not create unacceptable safety or congestion problems.

210. In determining planning applications district councils are legally required to consult and take account of the advice of the County Council in its capacity as highways authority and in relation to its other statutory responsibilities. The County Council provides co-ordinated advice on development proposals through its consultation response on planning applications. This may specify

requirements for measures to mitigate the transport and other impacts of the development, which can be secured through legal agreements.

211. Ultimately, the County Council can recommend refusal, but district councils are not obliged to follow our recommendation and need to balance it with other factors.

212. We will work in partnership with the district councils to ensure that new development:

- Is located in accordance with the relevant spatial planning policies and proposals;
- Contributes to the timely delivery of improvements to the transport network and services, either for better management of existing infrastructure and services or for the provision of new facilities to support growth;
- Has a minimal adverse impact on the existing highway network by providing appropriate highway mitigation works;
- Is designed to encourage and support the increased use of sustainable means of transport;
- Does not impose undue stress on ongoing highway maintenance costs; and
- In terms of the transport and highway elements complies with current national and local policy guidance, is designed to modern contemporary design standards, and built to the Council's specifications.

213. In responding to consultations on planning applications the County Council will prioritise the assessment of strategic and large major applications which contribute to economic and housing growth and which raise significant issues for the provision of supporting transport and highways infrastructure.

214. Applications need to be accompanied by the right supporting information to enable a proper assessment of the proposals and identification of any necessary mitigation measures. The County Council encourages developers to enter pre-application discussions so that key issues can be identified early and it can advise on the information that is required.

215. We will normally expect a Transport Assessment to accompany a planning application, or, in the case of smaller developments, a shorter Transport Statement will be requested. This sets out the transport issues relating to a proposed development and identifies what measures will be taken to deal with the anticipated transport impacts and contribute towards our transport objectives. It will be used to determine whether the impact of the development is acceptable.

216. In particularly sensitive locations, such as Air Quality Management Areas, the environmental impacts of the traffic generated by the development will need to be addressed in a separate Environmental Statement or included in the Transport

Assessment. A detailed assessment of air quality and noise impact may be required.

217. Where the development will generate a significant increase in lorry movements during construction or in operation, the applicant should provide information of routeing arrangements to avoid sensitive locations such as villages and residential areas. This may lead to a formal routeing agreement being signed.

218. For the largest developments, we will ensure that there is a comprehensive travel plan in place. This sets out how a development will be managed, post occupation, to meet targets for car journeys to and from the site and promote sustainable travel.

219. The County Council will develop and publish guidance documents to assist developers in meeting our requirements.

Mitigation and developer contributions

220. If proposed new developments are considered to undermine the efficient, effective or safe operation of the transport network, the County Council will expect the developer to remedy any identified impact. This can be either through carrying out remedial works themselves, to our satisfaction, or by making an appropriate contribution to allow this work to be done by us.

221. Developers can be required to mitigate transport impacts which occur away from the development site. For example, a pedestrian crossing might be needed to help people get from a new development to the centre of a village across a busy road. Developers are required to protect rights of way or enhance those running over or near their developments; applications for diverting or stopping-up rights of way are dealt with under a separate process.

222. Where the cumulative impact of a number of developments in an area over the plan period will require improvements to transport infrastructure and services, all developments will be expected to make a contribution towards the wider improvements. The contribution from each development will be linked to its transport impact and the transport need it generates. This contribution will be additional to any works or contributions aimed at resolving any particular problems caused by the development alone.

223. The system for obtaining contributions is likely to change, as districts now have the power to impose a 'Community Infrastructure Levy' (CIL). The County Council will input into the CIL process by agreeing priorities for local transport which will then be used to set the level of the CIL in each district.

224. Our aim is that most new development in Oxfordshire will be located where it can be served by existing high quality public transport services, especially the commercial Premium routes network. Where the existing public transport is inadequate we expect developers either to secure services in agreement with us, or to provide funding for them. This will normally be required until services reach

a point where they are commercially viable and can operate without subsidy. This is in LTP policy 35, the implications of which policy for buses are set out in more detail in our bus strategy.

Policy 35 Oxfordshire County Council will:

- secure transport improvements to mitigate the cumulative adverse transport impacts from new developments in the locality and/or wider area, through effective travel plans, financial contributions from developers or direct works carried out by developers;
- identify the requirement for passenger transport services to serve the development and seek developer funding for these to be provided until they become commercially viable;
- secure works to achieve suitable access to and mitigate against the impact of new developments in the immediate area, generally through direct works carried out by the developer;
- require that all infrastructure associated with the developments is provided to appropriate design standards and to appropriate timescales;
- set local routeing agreements where appropriate to protect environmentally sensitive locations from traffic generated by new developments;
- seek support towards the long term operation and maintenance of facilities, services and selected highway infrastructure from appropriate developments, normally through the payment of commuted sums;
- ensure that developers promote sustainable travel for journeys associated with the new development, including through the provision of effective travel plans.

Oxford Transport Strategy

CONNECTING OXFORDSHIRE

OXFORDSHIRE COUNTY COUNCIL

Contents

1. The Oxford Transport Strategy

The purpose of the strategy

The Oxford Transport Strategy (OTS) sets out Oxfordshire County Council's transport vision and strategy for Oxford over the next 20 years, as part of our fourth Local Transport Plan. It identifies the current and future challenges for transport in the city and sets out a strategy based on a combination of infrastructure projects and supporting measures to enable economic and housing growth.

This strategy builds on a legacy of success in tackling Oxford's transport challenges through pioneering and innovative approaches which have enabled the city to grow and develop without year on year rises in traffic levels. For instance, our world first Park & Ride system, which began in the 1970s, has not only proven successful in containing traffic in the city, it has gone on to become a model subsequently adopted by cities around the world to address their own congestion problems.

This strategy builds on the successes of the past, quantifies the scale of the future challenges and proposes bold and innovative solutions.

Place

The future economic growth and attractiveness of Oxford is dependent on improving the quality of the entire city as a place

High quality and sustainable transport access is essential to accommodating growth and changing travel demand within the city's physical and environmental constraints

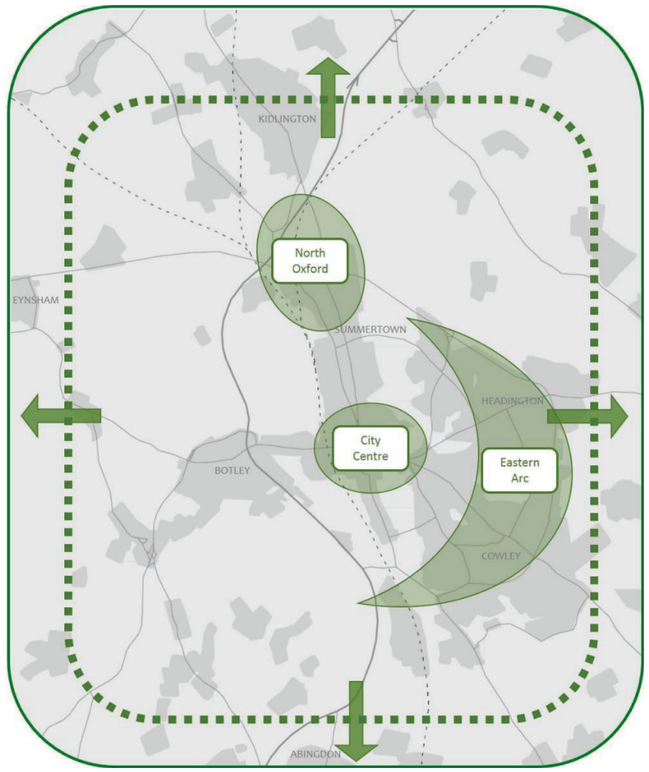
Access

The area it covers

Oxford's influence on transport does not stop at the city boundary. The OTS has been developed to cover the urban area of Oxford as well as the main transport corridors to and from the city.

There are three locations which will be the focus for future employment, housing and regeneration. These are:

- the **City Centre** – the cultural and historic heart of Oxford;
- the **Eastern Arc** – the largest employment area and most populated part of the city (which includes Marston, Headington, Cowley and Littlemore); and
- **North Oxford** – which includes Cutteslowe and Wolvercote and major corridors into Oxford from north of the outer ring road.



2. The Scale of the Challenge

Transport impacts of growth

Oxford is an attractive, enterprising and dynamic city – a place that people from around the world want to visit and increasingly want to live and work in.

Oxford's population has grown at an unprecedented rate in recent years, with the number of residents rising by 14% between 2001 and 2013 (from 135,500 to 154,800 people). Despite the sizeable impacts of recession, overall job growth has been equally impressive, with 118,000 jobs in 2012, compared to 99,000 in 2001. Oxford has 33% more jobs per head of working age population (aged 16-64) than the South East as a whole.[1]

The additional travel demand generated by this growth has been well-contained in Oxford: overall, rises in traffic within the city have been avoided or minimised by the local authorities' transport and planning policies and schemes.

But despite these successes, the trend of sustained growth has brought challenges.

As a medieval city, Oxford's often narrow streets are, in many areas, unsuited to motorised vehicles. Peak period congestion is a persistent problem, with traffic building at bottlenecks which cannot realistically be entirely removed. Within the centre, cars, buses and delivery vehicles compete for limited space with pedestrians and cyclists. These create an uneasy tension between the demands for movement and access, and the desire to ensure the centre offers a highly attractive and vibrant environment for people.

As more people have moved to Oxford, pressure has been added to the city's housing stock, helping to drive up house prices at a faster rate than other areas and intensifying population density. Limited space for new development has contributed to a significant shortfall in affordable housing (particularly around the centre), resulting in changes to where people are able to live and accordingly how far and how they travel.

Oxfordshire has ambitious plans for growth, with proposals for 100,000 new homes and 85,000 new jobs to be created by 2031. The county has evolved into one of the UK's major hubs for knowledge-based industries, with Oxford at its heart. The recent Strategic Housing Market Assessment (SHMA) identifies that, within the city, there will be a need for up to 24,300 jobs and 28,000 new homes.

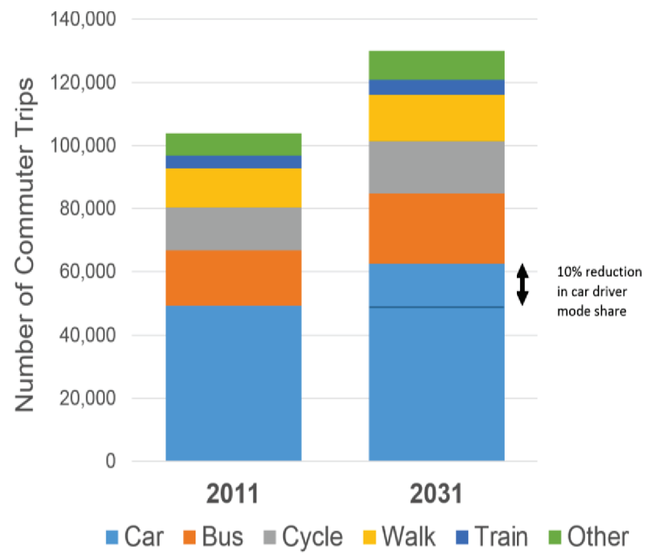
Whilst the modal share for public transport for trips to the city has increased steadily in recent years, travel by car remains the dominant form of transport to all destinations other than the city centre. With existing congestion already requiring extensive engineering solutions to junctions on the ring-road, the predicted growth of homes and jobs in Oxford and throughout the county will only exacerbate the problem.

What this means in future

Growth on this kind of scale requires a transport strategy of comparable ambition. A continuation of existing travel behaviour amongst new residents would threaten to over-burden the transport network and in turn significantly compromise the character of Oxford and quality of life of those living and working here.

It is estimated that job growth within and outside Oxford, could result in 26,000 additional journeys within the city boundary by 2031 – a 25% increase from 2011. Initial estimates suggest that, without improvements to the transport network and changes of travel behaviour, this could result in approximately 13,000 more commuter car trips each day.

The graph on the right illustrates what the impacts of growth could be on the number of commuter trips into and within Oxford if current preferred modes of travel remain unchanged. A 10% decrease in the car driver mode share is needed to prevent traffic levels rising.



Even the current Local Plans' pre-SHMA housing allocations in Oxfordshire are forecast to result in a 16% increase in traffic on

[1] Figures provided by the Office for National Statistics

Oxford's radial roads and 21% on the ring road in peak hours. By 2031, the impact of the resulting congestion is forecast to result in a loss of around £150 million from the economy of the city. Car journey times from the surrounding Oxfordshire towns are anticipated to increase on average by 18% to the city centre and 14% to Headington.

This increased demand for movement will also have significant adverse impacts on the environment, quality of life and health of the city's population.

More demand also means more buses, with the number of vehicles entering the city centre set to grow by over 40% if left un-checked, putting substantial strain on the historic core. Increased traffic will impact on local communities, and longer journey times will make it more difficult to reach jobs and services.

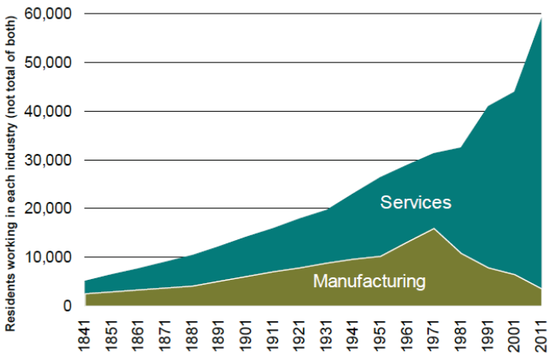
Without a step change in the provision of transport infrastructure and travel options, the city faces serious consequences.

The key challenges for the OTS

The OTS has therefore been developed to correspond to the eight most crucial challenges for transport in the city.

Challenge 1: Oxford's economy is growing and changing

Oxford's key economic strength lies in high-skilled, knowledge-intense industries (including science, research and technology), building on the city's international renown as a centre of excellence in education and research. These sectors now account for the majority of jobs, whilst the relative number of positions within more traditional sectors (such as manufacturing and retail) is declining (see graph).



Employment in service related positions has grown rapidly since 2001

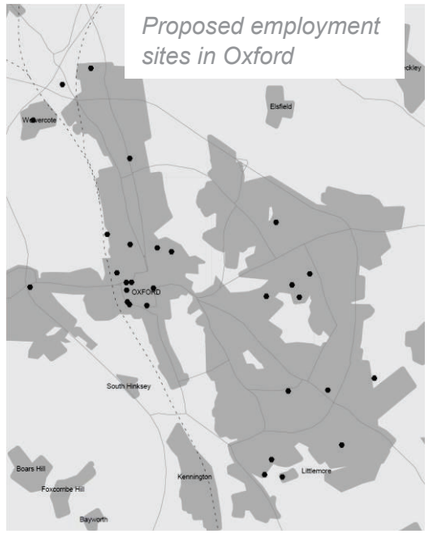
The city's tourism industry also goes from strength to strength, with 9 million visitors each year, and an estimated worth of £770 million for local businesses.

Oxford's businesses typically function within a global marketplace making strategic transport connections as important as local ones. High-skilled roles also frequently attract a more mobile and affluent workforce, who are able and prepared to travel greater distances to work. This is likely to be contributing to an increase in commuting into Oxford.

Key implications for the OTS: Congestion is a barrier to a competitive economy and future growth requires a well-connected, reliable and efficient transport network. Capacity is needed, but with space a key constraint, **the on-going provision of more road space is not a long-term option**.

Challenge 2: Economic growth is happening in new locations

Economic growth is bringing changes to the location as well as the nature of development. The Eastern Arc now surpasses the centre as Oxford's main area of employment (with 43,600 jobs compared to 39,800 within central Oxford). As the city develops in future, the largest proportion of new growth will occur outside the centre.



Proposed employment sites in Oxford

Oxford's transport networks have historically been developed to provide access to the city centre. New areas of growth require appropriate levels of access and strengthened linkages. The growth of the "Knowledge Spine" that includes the Eastern Arc, North Oxford, Science Vale and Bicester will also increase the importance for strengthened connectivity between these locations and good connections to strategic road and rail networks – particularly to maintain access to and from London and Heathrow airport.

Key implications for the OTS: High quality and integrated public transport is needed to support good connectivity across the city and to areas beyond traditional boundaries. This needs to be accompanied with measures to manage growth in demand for car travel.

Challenge 3: Oxford is a tale of two cities

Whilst, overall, Oxford's economy has thrived, not all residents have been able to share in the city's success. Large pockets of inequality exist, with significant areas of economic and social deprivation – particularly within the Eastern Arc.

Persistent issues of unemployment, low income and health inequalities are most concentrated within these locations, with a decline in low-skilled jobs leaving significant numbers of residents mismatched to local employment opportunities. A shortage in housing availability has pushed up the cost of accommodation relative to income, placing further pressure on the finances of lower-income residents.

With these types of challenges, travel can be a contributing factor. If communities are not well connected to employment or higher education and essential services and amenities, the opportunities and overall quality of life of individuals can be compromised.

Key implications for the OTS: The OTS must support initiatives to overcome the inequalities that continue to exist in Oxford. In particular, transport has an important role to play in supporting regeneration by strengthening access and providing opportunities for reaching employment, training, essential services and amenities.

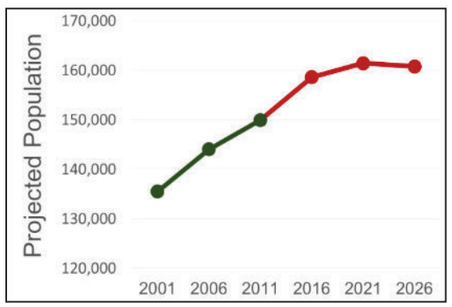
Challenge 4: Oxford is experiencing rapid population growth and demographic change

Oxford's rate of population growth is showing no sign of immediately abating as the city's universities and knowledge-based businesses continue to attract new residents.

With population growth comes increased demand for travel, but also opportunity for increased public transport. More densely populated places are more likely to support commercially viable public transport, supporting opportunities to manage traffic growth.

Whilst the majority in Oxford will remain of working age, particular increases are predicted in those aged 14 or younger and 70 or older.

Key implications for the OTS: Managing the impacts of an increased population will require a strategy that seeks to encourage trips by walking, cycling or public transport over car travel. Changing demography means the OTS must deliver high quality transport choices which are accessible to all (irrespective of age, mobility level, or ethnic background).



Oxford's population is projected to exceed 161,000 people by 2021

Challenge 5: More people are travelling into Oxford each day and travel patterns are changing

The journey to work remains the most significant challenge for the transport network, and increasingly this involves people travelling in from outside the city. More jobs which require a commutable journey in Oxford are now held by those living outside the city (45,750) than those living within it (42,406).

Commuters who travel from outside of Oxford are typically far more car dependent and the total number of car commuting trips rose by 9% between 2001 and 2011. Trips to work by public transport have increased for those travelling from outside, but at far more modest levels.

People's travel is also changing: it is now the Eastern Arc, rather than the centre, which is home to more jobs than anywhere else in the city (43,600 compared to 39,800 within inner Oxford). As the city's growth plans are realised the transport network within the Eastern Arc is set to become even more important to Oxford's economic success.

Key implications for the OTS: A continuation of current commuting travel trends would represent a significant challenge to Oxford's growth. Congestion builds significantly at peak periods on the Outer Ring Road and along the A34 and A40 creating delays and unreliability. With more commuters travelling in, the only way that this future problem can be sustainably addressed is through a step change in commuting behaviour towards public transport.

Challenge 6: Housing demand is not being met and we need new high quality neighbourhoods

There is a currently a large gap between housing demand and new house completions within the Oxford area, contributing to a growing shortfall in supply. This is especially significant for the availability of affordable homes.

House prices are accordingly rising quickly and the urban population density increasing, as higher costs drive up occupancy levels (with 6.2% of houses considered to be overcrowded in 2013). The impact of increasing population density may be beneficial to making public transport more commercially viable, but the housing gap is also resulting in more people commuting into Oxford from other areas, adding to commuting traffic on the ring road and key radial routes.

Scattered small settlements and dispersed patterns of growth favour car travel and make commercially viable public transport more difficult. Delivering housing at the volume and of the type which is required in locations where travel demand can be largely accommodated through

public transport, walking and cycling will be crucial to managing future traffic growth. This is particularly important in the context of declining budgets for subsidised bus services.

Key implications for the OTS: The OTS should be used to help ensure development is located where it can be well served by public transport and where short-distance journeys can be made by walking or cycling.

Challenge 7: We need to better balance different needs in the city centre

The historic city centre and its narrow streets are part of the charm of Oxford to millions of visitors from around the world. But these streets also represent a challenge, with a public realm which is not befitting of a global tourist destination. With many major transport routes converging in the city centre, space for movement is at a premium.

Buses, coaches, cars, delivery and other motorised vehicles all need to gain access to the centre. But with large numbers doing so, they increase potential conflict with pedestrians and add traffic which impacts on Oxford's character.

Key implications for the OTS: The OTS has to strike the right balance between enabling efficient access to the city centre and providing a high quality place for people to enjoy once they arrive. Dealing with the implications of future growth in bus use is vital. The OTS needs to capitalise on current and committed public realm improvements and create a consistent character and feel that permeates across the city centre.

Challenge 8: There are major challenges with the urban environment and air quality

With space at premium, creating spaces for people and public enjoyment without compromising access becomes challenging.

Oxford provides an array of green areas, waterways and historic open spaces for outdoor enjoyment. But the city is affected by notable problems with airborne pollution which are a cause of health problems in some areas. Traffic noise affects some residential areas and certain city centre streets with high traffic or bus flows.

A citywide Air Quality Management Area was declared in 2010, with targets set for keeping Nitrogen Dioxide emissions at safe levels (below 45 µg/m3 by 2020) and reducing emissons of Carbon Dioxide (by 35% by 2020 from 2005 levels), Nitrogen Oxide and Particulate Matter (a 50% reduction of both).

Motorised vehicles are a key contributor to noise and poor air quality and a lasting solution will require a step-change in emission levels from vehicles within the built area. Without this, an increasing number of residents and visitors may be affected.

Key implications for the OTS: The OTS will need to consider how to work towards the targets for reducing transport-related noise and air pollution within the city. This will require measures to reduce traffic and to promote quieter, lower emission vehicles.

3. Objectives

A Vision for Oxford

By 2035 Oxford will have a progressive transport network, providing reliable and sustainable methods of movement, enabling growth and comprehensively linking all communities. This network will support:

- a thriving knowledge-based economy, by enabling businesses to draw on a wide pool of talented people, innovate and collectively grow through strong connections and interactions and trade within global markets;
- an enviable quality of life for Oxford's people, by providing safe, inclusive, healthy and convenient travel choices providing access for all to employment, services, retail and leisure opportunities; and
- Oxford as a city which best promotes its outstanding heritage through an attractive and vibrant public realm which offers a highly attractive environment to live and work and a visitor experience of global renown.

The OTS has been developed to complement the vision and goals of the Oxfordshire Local Transport Plan. The objectives of the OTS therefore respond to these goals, identifying the specific requirements for Oxford within the context of the LTP.

The OTS Objectives

LTP Goal	OTS Challenge	OTS objective
To support jobs and housing growth and economic vitality across Oxfordshire	Oxford's economy is growing and changing	Support the growth of Oxford's economy by providing access to appropriately skilled employees and key markets.
	Economic growth is happening in new locations and needs effective connectivity	Ensure business sectors are well connected to each other and are provided with effective and reliable access to strategic networks
	More people are travelling into Oxford and travel patterns are changing.	Provide effective travel choices for all movements into and within the city
To support the transition to a low carbon future	Oxford is experiencing rapid population growth and demographic change	Promote modes of travel and behaviours which minimise traffic and congestion
	Housing demand is not being met and we need high quality new neighbourhoods	Focus development in locations which minimise the need to travel and encourage trips by sustainable transport choices
To support social inclusion and equality of opportunity	Oxford is a tale of two cities.	Provide a fully accessible transport network which meets the needs of all users
To protect and, where possible, enhance Oxfordshire's environment and improve quality of life	We need to better balance different needs in the city centre.	Provide an accessible city centre which offers a world class visitor experience
To improve public health, safety and individual wellbeing	There are major challenges with the urban environment, air quality and obesity in the population.	Tackle the causes of transport-related noise and poor air quality and encourage active travel in the city.

4. The strategy components

An integrated approach

The strategy has three components: **mass transit, walking and cycling and managing traffic and travel demand.** There is no single solution to tackle Oxford's long-term challenges: all three components are needed in combination to deliver the objectives of the OTS.

The OTS draws together these components into a city-wide strategy. A new mass transit network for Oxford will be critical in meeting future connectivity needs in the city. This will deliver a step-change in travel choices for diverse movements within and into the city. A city-wide walking and cycling network will include continuous pedestrian and cycle routes and high quality spaces for pedestrians in areas of high footfall. Mass transit and walking and cycling improvements will be enabled and supported by an ambitious agenda of road space reallocation, and a much stronger focus on reducing traffic demand in the city.

The OTS also includes detailed proposals for the city centre, Eastern Arc and north Oxford. Within these areas, we have considered how each component (mass transit, walking and cycling, and traffic management) can be integrated.

The OTS will not mean "business as usual" for transport in Oxford. The proposals described will require a strong will for change from stakeholders, concerted leadership from the local authorities, and major capital investment. However, the county council considers that the proposals in the OTS could be truly transformational and will provide an effective platform to unlock the future growth of the city.

The OTS provides a "2035 vision" for each of the core components, showing how the continuous, integrated transport networks will look once complete. Rather than detailing the exact specifications of how every link or junction will work, the OTS provides the framework and technical principles from which future studies and programmes and schemes can be developed.

The OTS is an evolving strategy that will be adaptable to future challenges and new technologies. It aims to serve the needs of Oxford's growing population and economy, but also provide a vital influence in decisions about where future housing should be located. It seeks, in particular, to direct growth to places where sustainable travel options are more attractive.

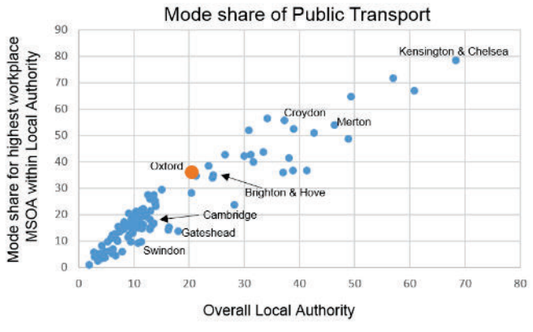
4. Mass Transit

Mass transit in Oxford is currently made up of the network of bus and rail services that provides strategic and local access to residents and visitors to the city. The anticipated growth of travel demand in the next 20 years means that the role of mass transit in the city, and throughout the county, will become increasingly important because of its ability to move large numbers of people efficiently, making the best use of available infrastructure and minimising environmental impacts.

The existing situation

Mass transit in Oxford has been key to containing growth in traffic congestion in the city over the past 10 to 20 years, both enabling movement around the city for residents and for those entering the city from the wider county and beyond for work, education, retail and leisure.

In addition to dedicated city and inter-urban bus routes, the city's five peripheral Park & Ride sites provide excellent alternatives to the use of the private car in reaching the city, while Oxford's mainline rail station provides access for 5% of commuters to the city centre.



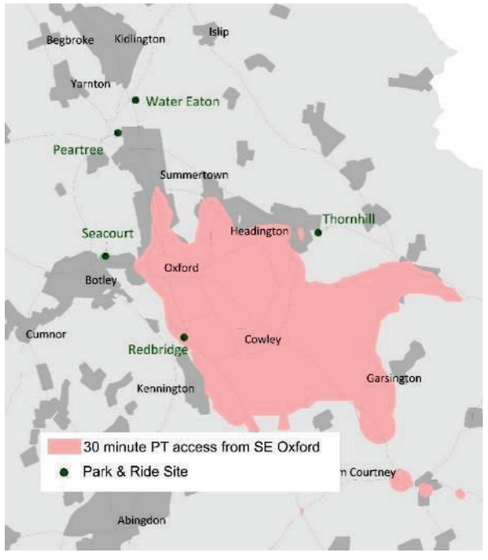
Oxford's position relative to other local authorities which have comparative workday populations, shows that the maturity of the public transport market is matched by few authorities outside of London (see the graph to the left showing 2011 Census Data).

Limitations of the existing provision

Whilst the success of the bus network in the city has led to a continued rise in patronage, over the last decade the proportion of commuters travelling by bus has remained relatively static, particularly to areas such as Cowley and Blackbird Leys in the south-east of the city. At a city level, this has been partly due to the beneficial increases in walking and cycling as a major mode of travel for the city's residents.

However there are still areas of major employment for which have there have been no significant improvements to services to match the scale of growth. These include the area around Cowley and Blackbird Leys, home to over 18,000 jobs, which has no direct connection to a Park & Ride site and relatively poor connections to anywhere other than the city centre.

A drawback to the excellent bus service frequencies to the centre of Oxford (from a range of destinations both locally and further afield) is that upwards of 190 buses and coaches enter the city centre per hour at peak times, leading to noise, air pollution and substantial use of space in city centre streets.



The experience and movement of shoppers, students, workers and visitors to the city's 'flagship destination' are compromised by high volumes of buses, not just travelling through the centre, but also stopping and laying over. Since mass transit (and buses in particular) will be an even more important element of the city's transport system in future, it is vital that these negative impacts are recognised and addressed.

Oxford opened the world's first Park & Ride site in the 1970s. The Park & Ride system has grown since to provide over 5,000 parking spaces, helping to reduce traffic in the city centre by providing an easy and attractive option for traffic entering the city. All five sites are located close to the ring road, and are a popular choice for longer-distance commuting movements. However, this is exacerbating congestion on parts of the ring road, particularly around the junctions with the A40 and A34 in north Oxford. This congestion delays all traffic, including buses coming into the city. Traffic congestion is a serious issue affecting journey times and reliability of bus services from all parts of the city and county, particularly when approaching and crossing the

ring road and on the radial routes into the city. Congestion also has a serious impact on public transport within the Eastern Arc, making journeys on the orbital routes longer and less reliable (notably those which use the B4495).

Like many other cities of comparable size, Oxford's rail mode share is limited. The major commuter trip producers of Banbury, Didcot and Bicester are served by two or three direct Oxford services in the peak hours, whilst the position of the city's only station, to the west of the city centre, makes the Eastern Arc relatively inaccessible by rail without interchange onto local buses.

Future demand

Demand forecasting undertaken for Oxfordshire's 2013 Rail Strategy has estimated that the proposed growth in trips to Oxford Station could be as much as 70% by 2026, largely as a result of the improved connections and infrastructure proposed by Network Rail and the operators. Fulfilling this growth estimate will require a marked improvement in access to the station from across the city, as well as major improvements to Oxford Station itself.

The bus network is also predicted to witness substantial increases in demand as a result of growth to 2031. Were travel to work patterns to remain as existing in terms of the main origins and destinations, over 4,500 new two-way bus trips would be made by commuters each day either into, within or out of the city – the equivalent of an additional 70 bus loads. With most services routing through, or terminating within the city centre, the additional congestion and conflict will only be exacerbated without a strategy to address the pressures placed on the city centre.

Vision for mass transit

The aspiration for 2035 is that Oxford will provide its residents and visitors with a connected, modern mass transit network which provides a cheaper, faster, and more reliable travel option than the private car for the majority of journeys to and between destinations in the city.

Mass transit in Oxford will consist of three modes:

- Rail;
- Bus Rapid Transit (BRT); and
- Buses and coaches.

The rail network serving the city will be modernised and extended. Existing and new stations will be integrated with the city's other transport networks and will provide a first-class passenger experience.

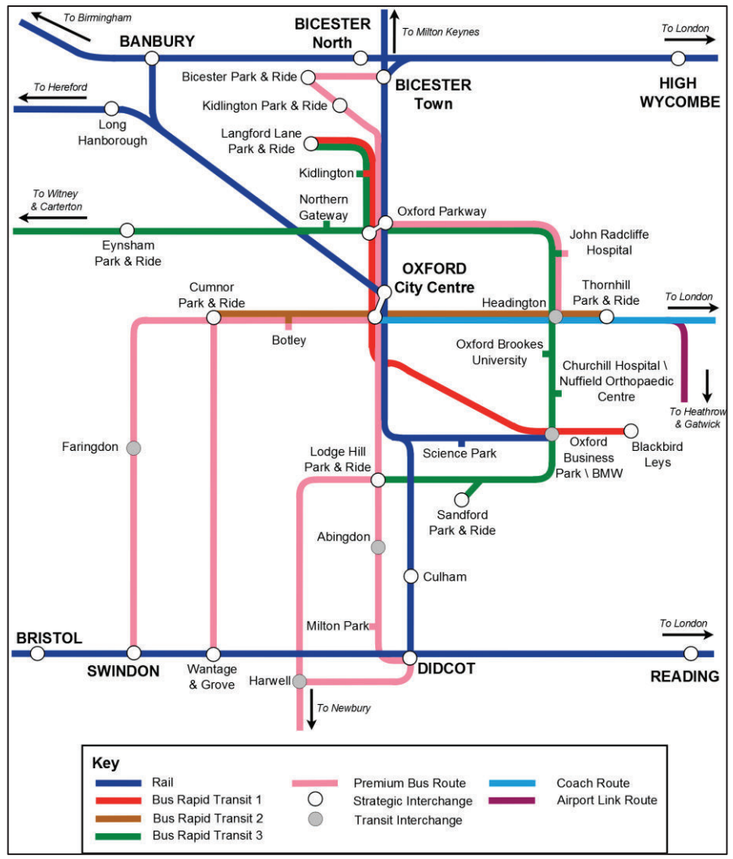
A new Bus Rapid Transit network will provide fast, affordable, high-capacity, zero emission transport on the city's busiest transport corridors, providing a tram-like level of service and passenger experience, but with the flexibility of buses.

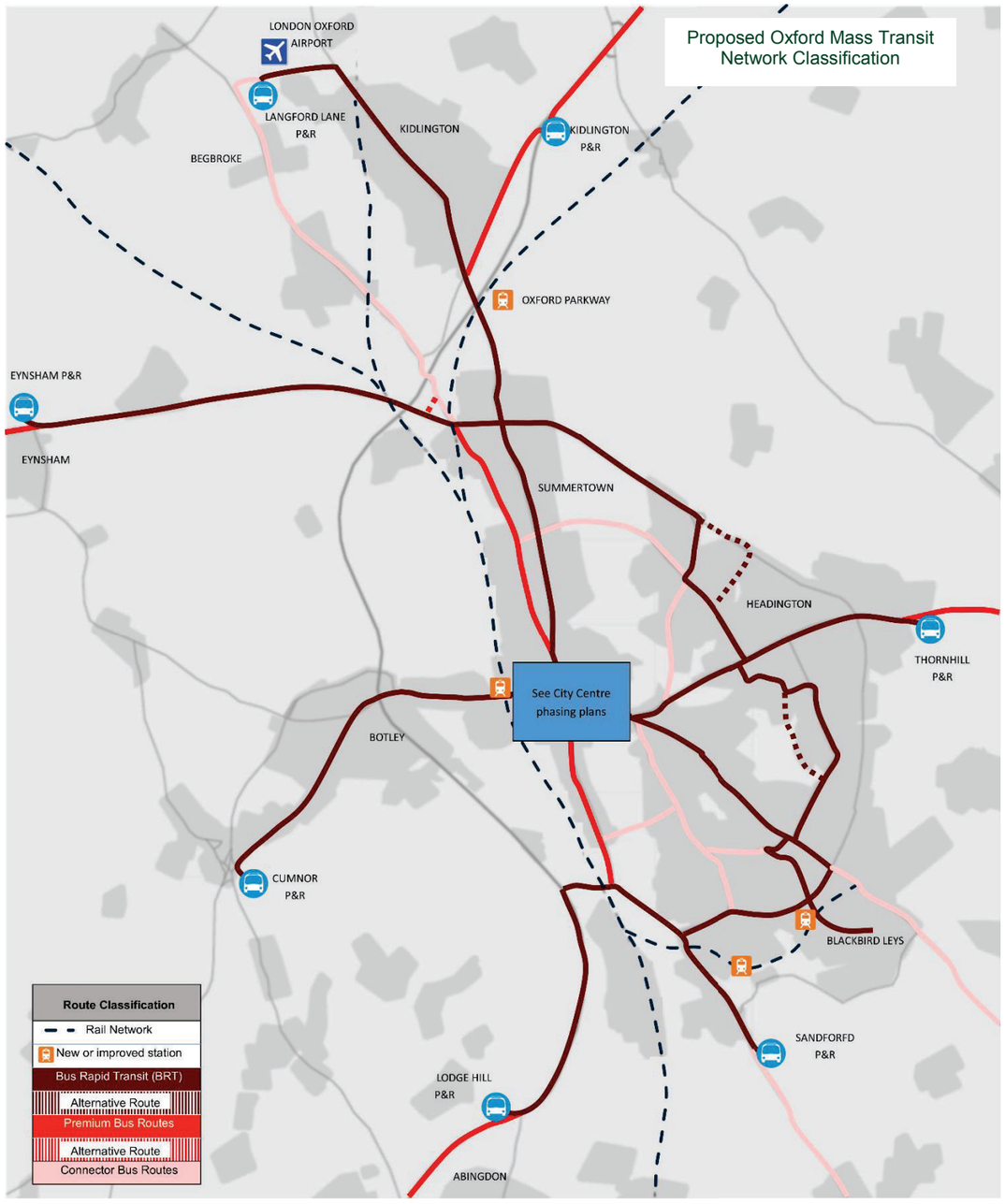
The bus and coach network will continue to grow to complement the BRT and rail network, with more advanced vehicles and better infrastructure to improve journey speeds and reliability.

The problems associated with the predicted high intensity of BRT and bus operation in the city centre will be tackled through a staged approach, culminating in the long term in the creation of transit tunnels under the city centre to fully reconcile the objectives of place-making and accessibility.

Proposed network

In combination with our work on the Oxfordshire Science Transit and Oxfordshire Bus Strategy, the OTS has helped to define our strategic transit network for the county (shown in the schematic plan below). With Oxford as the central hub, the network will improve Oxfordshire's transport links to the county and beyond; improve access for our residents; and increase the connectivity to our locations of major growth.





The OTS mass transit proposals are shown in more detail below.

Improvements to rail

Were the *status quo* of travel patterns and services maintained, growth in Oxfordshire's population would increase patronage amongst commuters by 20% by 2031. However, with the committed schemes being undertaken between now and 2020, forecasting of potential demand which would be attracted by the rail network improvements strategy suggests a 70% increase in patronage at Oxford Station by 2026.

Oxford Station Masterplan

The city and county councils and Network Rail have produced a joint master plan for Oxford Station (shown right). The master plan provides a bold vision and implementation strategy for the comprehensive redevelopment and improvement of the station, including:

- Major rail capacity and passenger improvements;
- A new transport interchange, including bus station, taxi area and car parking;
- Twice as much cycle parking as now, integrated into the station buildings;
- Widening of Botley Road under the railway bridge to provide wider pavements and segregated cycle lanes; and
- Complementary development to help fund the improvements and make the station a destination in its own right.

East-West Rail phase 1

From 2016, Chiltern Railways are to provide a new service from Oxford to London Marylebone, operating via Bicester Town and a new Oxford Parkway Station at Water Eaton. These new links will provide Oxfordshire new strategic rail connections (e.g. High Wycombe and Aylesbury) and an alternative route to London.

East-West Rail phase 2

The second phase will involve the re-opening and electrification of the line between Bicester Town and Bletchley, enabling passenger and freight trains to connect between the south and west of England and the West Coast and Midland Main Lines. This will place Oxford at the centre of this expanded network.

Great Western Modernisation

Network Rail are implementing the re-signalling and electrification of the main line from London to Newbury and Oxford by 2016, and then Bristol and South Wales to 2017. This will include the introduction of new Inter-city Express (IEP) trains.

Cowley Branch Line

The Cowley branch line is currently used only for transporting freight by BMW. However, the line's proximity to the new and expanding employment area of the southern Eastern Arc, suggests that it could play a key role in future increased transportation of both freight and passengers.

The County Council is currently working with Chiltern Railways on their proposal to reopen the Cowley branch for passenger trains, creating stations at Oxford Business Park and Oxford Science Park and served by an extension of the London Marylebone to Oxford East-West Rail Phase 1 service. This would provide a useful new connection to the Eastern Arc, intersecting BRT Line 3 at Oxford Business Park.

Bus Rapid Transit

Where rail provides a strategic connection to the city for longer distance trips, at a more local level, the ease of movement within the city and from the nearby towns of central Oxfordshire will be transformed by developing a level of prioritised road-based travel over and above the standard bus services.

In considering the available options for road based mass transit solutions, we have recognised a number of major constraints to delivery caused by the geography and urban form of the city including:

- narrow road widths;
- limited scope for dedication of entire corridors to mass transit due to the need for access via all transport modes and a lack of diversion routes for alternative means of access;
- the need to ensure a quality of place in district centres on the radial routes; and
- Environmental constraints such as the flood-plain.

The above constraints make the possibility of delivering a mass transit system that requires major infrastructure and segregation extremely difficult without having a substantial disbenefit to all other modes of transport.

For these reasons (in additional to factors such as cost, demand and network resilience) Bus Rapid Transit (BRT) is considered the optimum solution for Oxford, as it has been in many other cities and towns throughout the world.

The table below, provides a comparison of the modes of mass transit based on a SWOT (strength, weakness, opportunity, threat) analysis.

System	Conventional bus	Guided Bus	Bus Rapid Transit	Light Rail Transit/ Tram
Strengths	Lowest cost of infrastructure and vehicle technology. Increases in capacity deliverable immediately. Vehicle size enables access throughout the road network.	High degree of priority on bus way sections. Can divert off the guided bus way if necessary. Outside of the city, space is available for widening and providing dedicated lanes.	Greater operating flexibility. Mixed running with traffic. Significantly lower capital and operating costs than LRT. Suited to disperse urban form.	Permanence of infrastructure, vehicles and operations create confidence and aid long term locational decisions. High capacity services.
Weakness	High volumes of buses already add to congestion issues in the city centre and along the radial routes. The status quo is unlikely to encourage mode shift.	Sections of parallel guided kerb limit the scope for other traffic to cross the corridor. Width constraints make delivery within the ring road unfeasible. Shared use with cyclists not possible	Opportunities for additional priority over existing situation limited. Construction cost (£2m to £5m per km) is higher than standard bus prioritisation methods; Vehicles and technology are more expensive than conventional buses.	Space unavailable to allow complete segregation within ring road. On road operation with other traffic or roads would be closed to traffic. Inability to divert should problems be experienced on the road network.
Opportunity	Timed slot booking at stops will reduce bunching. Bus stop departure charges could raise revenue. Operators already implementing low emission technology.	High existing demand on radial routes within the city. Higher speeds from neighbouring towns would encourage modal shift.	Can be incrementally implemented - priority/stops/vehicles. Higher capacity vehicles to be introduced to reduce total volume of buses and deal with additional demand.	Connecting denser urban areas. High existing demand of corridors will be increased with growth.
Threat	Population and patronage growth are expected to be so high that excessive numbers of buses will add to congestion, noise and pollution	High construction cost. Ineffectual without BRT-type solutions on most of the route (where guided track cannot be provided)	Increases in traffic flow caused by growth creates so much congestion that BRT is not effective where road space is shared.	Very high construction cost (£20m+ per km of route), vehicle and operating cost. Failure to deliver necessary patronage will require subsidies. Technological advances could render scheme obsolete.

The BRT concept

Bus Rapid Transit systems are an increasingly popular response, adopted in successful cities and city regions around the world, to high volumes of traffic and ensuing congestion along

specific transport corridors. They can make the public transport offer significantly more attractive and expand its capacity to move very high volumes of passengers.

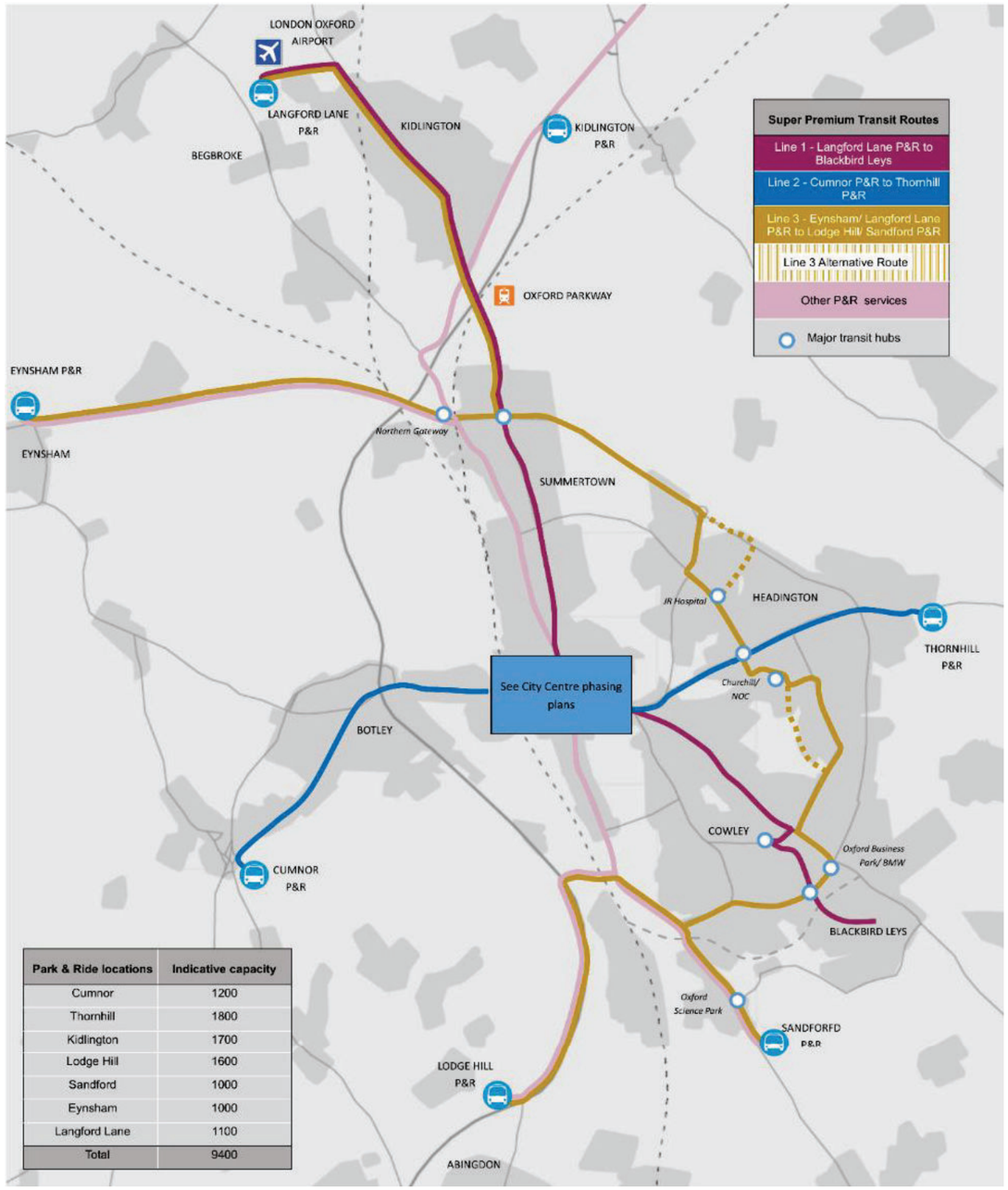
Compared to conventional bus services the key characteristic of Bus Rapid Transit (BRT) is that it is significantly faster, however it is not simply a bus route with a higher level of priority over other traffic – it is a whole integrated system of facilities, services and amenities that collectively improve the speed, reliability, comfort and image of bus transport.

Typical features of BRT may include: a high level of road priority up to full segregation; larger, modern-looking, higher quality buses; off-board ticket purchasing systems; faster methods of passenger boarding and fare collection; high quality passenger waiting facilities; real-time information systems; the extensive use of 'Intelligent Transportation Systems' in the operating control system; and a unique and attractive public image and identity. In many respects BRT is a more cost effective and flexible alternative (i.e. some bus services may deviate off-route) to mass light rail transit systems, that delivers very similar benefits. With the large population growth in Oxford and in its wider catchment area over the next 20 years BRT will be a vital component of Oxford's transport network.

Oxford BRT routes

As shown on the plan opposite, three BRT routes have been identified for the city, linking a network of new Park & Ride sites with the major employment and housing growth areas of the city centre, North Oxford and the Eastern Arc. All lines have significant resident and workplace populations (see table below). Lines 1 and 2 are centred on existing corridors of significant bus patronage, serving as they do, the city centre, key radial routes and three of the city's Park & Ride sites.

Line		Length (km)	Catchment within 400m of proposed route	
			Resident Population	Workplace Population
1	Langford Lane P&R to Blackbird Leys	18.435	64,251	54,499
2	Thornhill P&R to Cumnor P&R	13.289	38,916	35,567
3a	Eynsham P&R to Sandford P&R	23.248	45,022	32,091
3b	Langford Lane P&R to Lodge Hill P&R	25.547	53,473	37,418



Park & Ride locations	Indicative capacity
Cumnor	1200
Thornhill	1800
Kidlington	1700
Lodge Hill	1600
Sandford	1000
Eynsham	1000
Langford Lane	1100
Total	9400

Line 3, separated into two branches to the north and south of the city, delivers an orbital service, which has the potential to transform attitudes to travel both within and to the Eastern Arc. This is likely to be the most challenging line to deliver since existing bus use on this orbital

route is relatively low, traffic congestion is substantial, and there are few existing bus priority measures in place.

The bus network

In addition to the proposed BRT routes serving the city, the use of conventional buses, particularly as inter-urban connections will remain a vital part of Oxford's mass transit network.

Whilst there will be clear benefits to many existing bus services as a result of partial sharing of routes with the BRT services, we are committed to improving journey times and reliability through prioritisation on the network whilst working with operators to ensure that customer experience is maximised.

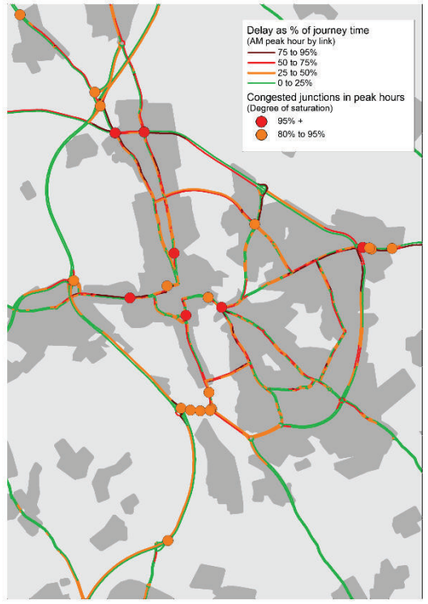
In line with the Oxfordshire Bus Strategy, bus corridors outside of the BRT routes have been divided into 'Premium' and 'Connector' routes.

Within the city, routes which continue to provide services to the Park & Ride sites (but which do not follow the BRT routes) will be classified as Premium routes, as will those which have service frequencies higher than two per hour. All other routes are classified as Connector.

Proposed Oxford BRT and Park & Ride network

The future of Park & Ride

Oxford's Park & Ride sites have been hugely successful in reducing traffic in the city centre by providing an easy and attractive option for visitors entering the city.



However, in order to reduce congestion on the approaches to the city it is now necessary to 'intercept' car trips further away from the city. Substantial link and junction delays (as shown opposite) occur on all approaches to the ring road, with particular hotspots located to the west (A420, A40), north-west (A44) and south (A34, A4074).

Arrivals in the AM peak hour at the Peartree, Water Eaton, Redbridge and Seacourt P&R sites result in a combined 460 car trips at the three A34 interchanges to the west of the city. Removing this demand through capturing those users further from the city would have an immediate positive impact on the operation of the A34 and the other roads that it intersects with at junctions.

We propose that the following broad locations should be considered for the new Park & Ride sites:

Location	Corridor(s)	Replaces	Main Catchment	Proposed car park capacity
Eynsham	A40	Peatree, Botley	Witney, Carterton, Cheltenham, Gloucester	1,000
Langford Lane	A44, A4260	Water Eaton, Peartree	Chipping Norton, Banbury, Worcestershire, Warwickshire,	1,100
East of Kidlington	A34 (north)	Water Eaton, Peartree	Bicester, Banbury, Milton Keynes, Bedfordshire	1,700
Cumnor	A420	Seacourt	Cumnor, Farringdon, Swindon, Wiltshire	1,200
Lodge Hill	A34 (south)	Redbridge	Abingdon, Didcot, Science Vale, Newbury, Hampshire	1,600
Sandford	A4074	Redbridge	Wallingford, Didcot, Henley, Reading, Berkshire	1,000

Eynsham, Langford Land and Kidlington would serve as the replacements to Park & Ride at Peartree and Water Eaton. Cumnor will replace the existing site at Seacourt and Abingdon and north of Sandford the site at Redbridge. Oxford Parkway will retain its Park & Rail facilities

These new sites will be particularly important in providing attractive points for drivers to transfer from their cars to mass transit services across the city: either making use of direct services or being able to seamlessly transfer between services at key interchanges across the network.

In order to build upon the success of Park & Ride, attract new users and cater for the new demand generated by growth, the new sites will provide almost double the existing capacity. This increased capacity will be essential as more of Oxford's visitors and workforce originate from outside the city.

Facilities at the Park & Ride sites will fulfil the criteria required at high quality interchange hubs, and include significant provision for those wishing to cycle for part of the journey, whether that is from their point of origin to the bus service (Cycle & Ride), or from the Park & Ride site to their destination (Park & Cycle).

The closure of the Park & Ride car parks at Water Eaton, Peartree, Seacourt and Redbridge (which will be phased to coincide with the opening of the alternative proposed sites) presents the opportunity for redevelopment. Given their size and accessibility, these sites on the periphery of the city have the potential to accommodate various land uses, including other transport uses such as freight consolidation centres.

Supporting infrastructure

Central to the vision for road-based mass transit, and the scope of infrastructure work that will be implemented, is the classification of the route network, based on not just the existing strategic value of buses on corridors throughout the city, but also on future demand and enabling economic growth.

Bus corridor classification
BRT
BRT services will be prioritised through the application of the standard principles for Bus Rapid Transit design. Services will be frequent, utilising higher-capacity and more advanced vehicles.
BRT corridors are those which form the most strategic level network, connecting key destinations, business clusters and providing access for skilled employees and key markets.
BRT corridors are those which have the highest levels of existing bus patronage or are expected to play critical roles in linking growth areas.
The interchange between standard bus services and modes of transport to allow ease of movement to all destinations will be a core element of a BRT.
Premium Bus Route
Premium routes will be applied to corridors on which there are high levels of existing inter-urban or local patronage and which connect workers to employment destinations, and visitors to city centre.
Premium routes will interchange with BRT at key destinations along their routes, providing users with an increased level of flexibility for how they complete their journeys.
Connector Bus Route
Connector routes will link local destinations within Oxford.
Service frequencies will be lower than on other routes.

Corridor prioritisation

BRT and buses will be prioritised to enable smooth, fast and reliable progress through:

- Segregation (e.g. bus lanes);
- Selective vehicle detection and prioritisation at traffic signals;
- Traffic reduction;
- Traffic management (e.g. queue relocation); and
- Removal of obstacles such as loading and parking.

In turn this will help to attract new users and, by reducing numbers of cars, this will also help to tackle congestion on these corridors.

For the BRT lines in particular, the aim of the above measures will be to create a continuous part-physical, part- virtual "track" for vehicles to make unimpeded progress. However, within the ring road, existing road space is at a premium along all corridors, particularly in the district centres where speed of movement will be secondary to the quality of place. In these instances it will be necessary to have a greater emphasis on ensuring that public realm provides excellent opportunities for stop and interchange facilities, and managing traffic, loading and parking to minimise delays to mass transit

Bus corridor prioritisation
BRT
Full bus detection and prioritisation at traffic signals.
Dedicated or fully segregated lanes included where achievable.
Bus lanes extended to junction stop-lines.
Bus gates and access restrictions to reduce traffic levels.
Uncluttered low-traffic or traffic free streets in the city centre.
Strict kerbside controls and daytime loading bans.
Premium bus routes
Stricter kerbside control/ urban clearways.
Kerbside parking removed at pinch points.
Bus detection included at key junctions.
Bus lanes where achievable.
Connector bus routes
Some bus detection at signals.
Kerbside parking removed at pinch points.

The level and type of prioritisation will therefore vary significantly by corridor. For example:

- on the ring road and the approaches to the city, land is often available for widening to include dedicated or segregated bus lanes, possibly including tidal bus lanes;
- on Botley Road west of Osney there is sufficient highway land to provide a continuous outbound bus lane whilst improving the quality of cycle infrastructure;
- on Cowley Road, limited road width would be better allocated to improving the public realm in the district centre and the prioritisation of buses will be provided by relocating or rationalising kerbside parking and reducing traffic;
- along much of the inner ring road, widening to provide segregation will not be an option; instead, general traffic will be controlled through metering at traffic signals or restricted through the implementation of access controls such as bus gates, and parking and loading will be restricted.

- along each corridor the potential to alter priority at junctions, include or improve bus priority at traffic signals, and to extend bus lanes to stop lines will be assessed against the related expense to general traffic.

Stops

Bus stops along the BRT routes will be located and designed to create the best possible access and environment for all users. Design features will include:

- sufficient length to accommodate multiple services at once, and for higher capacity multi-door vehicles in future which will enable free-flow boarding through multiple doors and fixed, short dwell times at stops as at tram or light rail stops;
- provision for level boarding - initially for existing low-floored vehicles but future proofed to ensure that all boarding points on higher capacity vehicles are equally accessible;
- off-board fare recognition;
- real-time arrival and onward journey displays;
- battery charging infrastructure for electric buses;
- being safe and convenient, minimising conflict between those waiting and other road users by allocating sufficient shelter capacity; and
- being inset from the main carriageway and offset to stops for services in the opposite direction to minimise the opportunity for services blocking other vehicles.

Buses using BRT corridors will also benefit from many of these facilities.

Transit hubs

At strategic locations along the routes, such as the Park & Ride sites, rail stations and district centres, high quality interchange hubs will facilitate seamless interchange between bus services or onto an onward mode. Proposed hub locations are shown on the network diagram on page 12. Whilst hubs will differ in scale from one location to another they will offer all or most of the following elements:

- waiting and off-board payment facilities will be well sheltered or enclosed;
- accommodate high frequency services, and large flows of people, at peak times;
- facilitate seamless, stress-free transfer across multiple modes of travel;
- be situated in locations that are close to the strategic highway network, providing maximum opportunity for park and ride and mode-shift from private car use;
- maintain safe walk and cycle access by keeping people segregated from public transport and vehicle movements;
- have appropriate levels of convenient and secure cycle parking; and
- become an integral part of the land-use mix to create vibrant centres of activity that reduce ‘dead-time’ commonly associated with interchange between travel modes.

City centre

In the city centre, the key challenge is to provide capacity for bus and BRT patronage to grow substantially over the next 20 years, whilst also improving the visitor experience. This requires some radical thinking about how mass transit is accommodated in the city centre, in terms of terminals, stops and routeing.

The proposals for transit terminals in the city centre build up in phases (detailed in the table and plans overleaf).

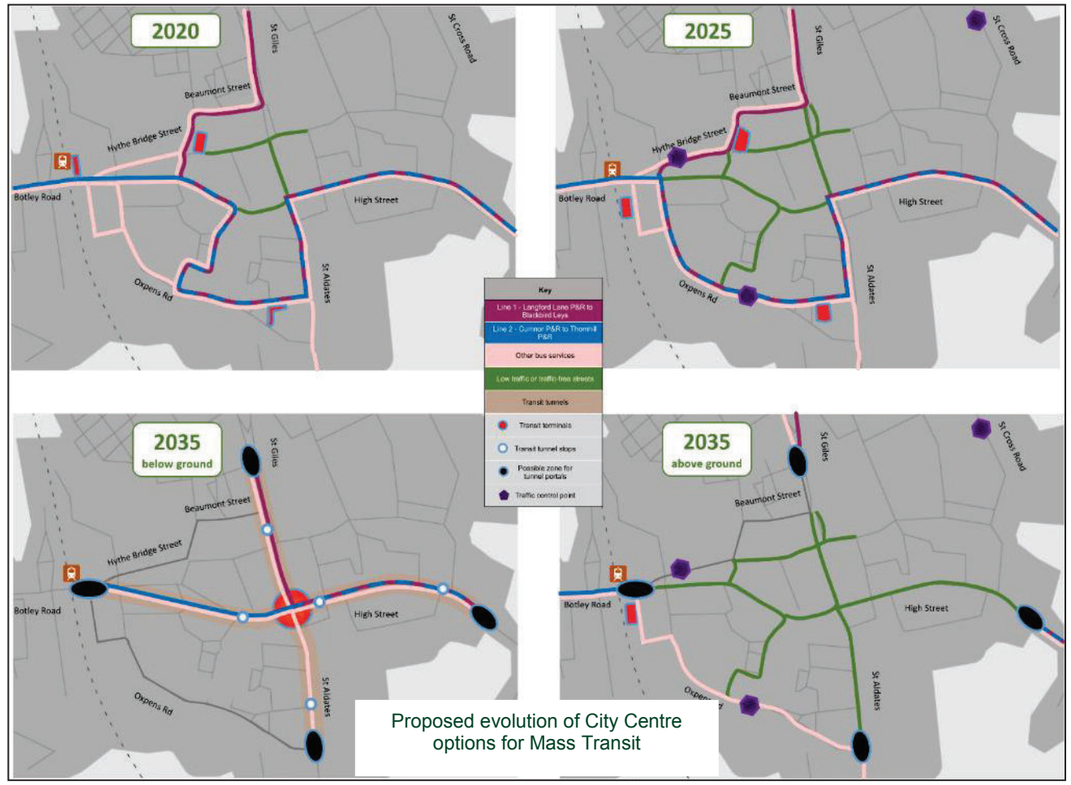
These will act as terminal points for many of the existing services which currently require access and layover facilities in the central core. Increasing the overall capacity of off-highway terminal points, initially by developing surface level sites, will enable a better operating and passenger environment and reduce conflicts with other road users in busy city centre streets.

The measures identified for 2020 and 2025 will lead to a significant reduction in the number of buses in several key city centre streets. However, even with the 2025 proposals in place three issues remain: very intensive mass transit operation in High Street and St Aldate’s; the ambition for mass transit to have *direct* access through the city centre (only possible via the pedestrianised Cornmarket Street and proposed pedestrianised Queen Street); and walking distances between transit terminals and destinations (such as those experienced due to the pedestrianisation of Cornmarket Street).

Phasing of city centre bus terminals and access			
Terminal	**2020**	**2025**	**2035**
Oxford Rail station	The continued use of the existing stops and stands in the station forecourt and Frideswide Square prior to the completion of the Oxford Station Masterplan	Relocated bus facility to the south of Botley Road to include 13 stands on site and a further 5 on Becket Street.	Continued operation of station interchange, linked to transit tunnel stop(s) nearby
Gloucester Green	Refurbishment of the existing facility to improve passenger experience and operation	Complete refurbishment and expansion of the site to increase the capacity make better use of space including passenger facilities	Closure of the bus facility and the opportunity to redevelopment the site. All stops relocated to transit tunnels nearby.
Speedwell Street	Continued use and extension of existing bus stands at the Butterwyke Turn.	Closure of the on-street stands and change of use of an identified development site on Speedwell Street such as the Telephone Exchange.	
Transit tunnels	-	-	Terminals and stops within the tunnels for the majority of services
	2020	**2025**	**2035**
Access	Queen Street and George Street closed to buses.	Magdalen Street, Park End Street, New Road, Castle Street and Norfolk Street closed to buses. Services will route through Hythe Bridge Street and Oxpens Rd/ Thames St/ Speedwell Street with the benefit of traffic restrictions.	Majority of bus services in the city centre will operate within the tunnels, with limited surface running only.

A longer-term option which would address all these problems would be to tunnel under the city centre, removing the majority of the mass transit operation from street level. New 'stations' would be constructed underground, close to the main attractions in the city centre. BRT and bus services could run with ease directly across the city centre, without being impeded by other road users or using indirect routes. Interchanges between north-south and east-west routes would be provided, solving several issues faced by passengers and operators in the existing situation.

Whilst the construction cost would be very high (benchmarked costs for similar schemes suggest a capital cost in excess of £500 million), the resulting positive impacts on the public realm, conservation, safety and accessibility would be substantial.



Proposed evolution of City Centre options for Mass Transit

We have not yet considered in detail the technical or environmental feasibility of constructing transit tunnels. Clearly, there would be very substantial construction works (and construction risks) and environmental impacts. Within the central core, parts of commercial properties may need to be purchased to allow for street-level entrances to the tunnel stations.

If this option were to be explored further, the business case would need to be developed in more detail. This would need to consider the benefits to passengers and reduced operating costs for the service operator(s). Innovative sources of financing would need to be considered, including financing of borrowing costs through departure charges for all services (such as those often used to pay for maintenance or renewal of bus stations).

Vehicle technology

As the resident and workforce populations of the city grow, there will be additional impetus on providing capacity for bus passengers. To meet this challenge on the BRT routes, we propose to cater for the additional demand whilst mitigating the impacts of additional vehicles on the network. Vehicles on the BRT Lines will be:

- higher capacity than existing double-deckers;
- capable of allowing free-flow boarding and alighting from multiple entrance points;
- fitted with on-board technology to facilitate fare recognition; and
- fully accessible from all stops along routes.

As BRT becomes a standard convention in the provision of mass transit in cities, technology is improving to provide high-capacity, zero-emission vehicles. A fleet of vehicles (similar in style to the articulated Citea recently introduced in Cologne (pictured) are envisaged to provide short/medium distance trips along all BRT lines.

Through the application of a Traffic Regulation Condition, Oxford city centre is already a Low Emission Zone and operators have made great efforts in delivering vehicles which met Euro V emission standards, and are working on introducing even cleaner technologies in the near future.

However, the ambition of the OTS is to start a city centre zero-emission zone for all vehicles by 2020, with the zone being gradually expanded over time as the required infrastructure and technology develops. This will require further private sector investment from operators on all routes, not just the short to medium range services, and be achieved through the deployment of electric buses, advanced electric-diesel hybrid vehicles with an electric drive mode, and routeing changes as outlined above.

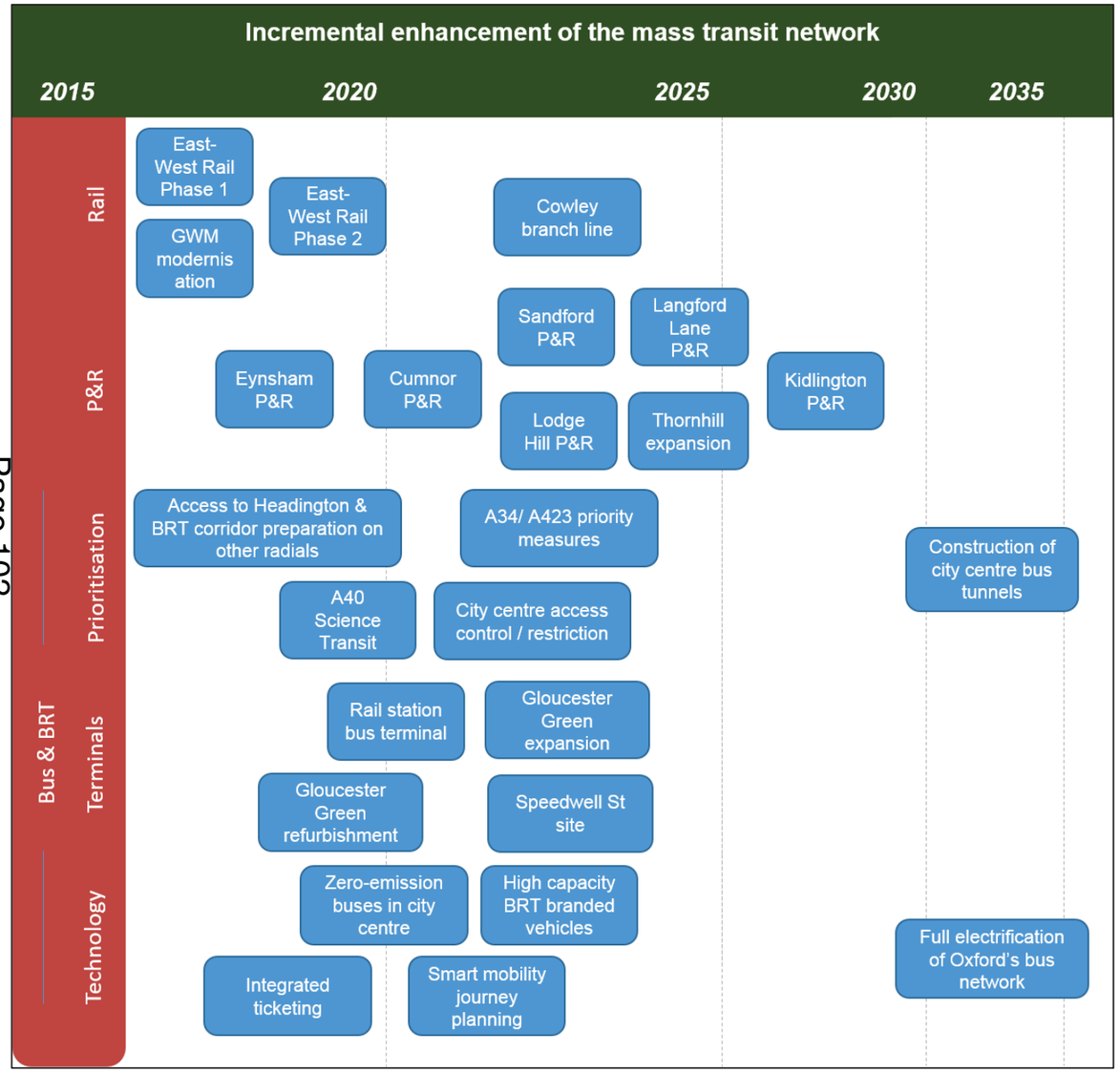
As battery and induction charging technology improves, vehicles will be able to cross the whole city whilst on full electric power, enabling the creation of a city-wide zero-emission zone by 2030. Vehicles which cannot comply with specific emission standards will be required to terminate at Park & Ride sites outside of the city.

Smart mobility

The Science Transit Strategy is leading initiatives for public and private sector partnership in the county to deliver cutting edge Smart Mobility Information in the form of digital data sources that will be:

- relevant to different user contexts and journey purposes at all journey stages;
- available via multiple sources (web, smartphone app, digital TV);
- updated in real-time, to provide the latest insights and intelligence; and
- capable of providing comparative travel time and cost information for an individual's options.

For those without access to personalised digital data sources, all information will be linked to displays at stops, hubs and on-board services.



Implementation

Phasing of capital investment

Future evolution of operator partnerships

From providing direct services from the Park & Ride initiative in the 1970s, the signing of a voluntary Quality Bus Partnership in 2006 to provide a policy framework for improvements to routes and corridors, to the creation of the city centre Low Emission Zone through the introduction of a Traffic Regulation Condition, and a Qualifying Agreement to coordinate bus timetables signed in 2011; OCC has a long tradition of working in partnership with bus operators. This has been a key element in achieving a significant level of bus patronage amongst residents and visitors of the city.

The Oxfordshire Bus Strategy, completed in tandem with LTP4, proposes the renewal of county-wide and area specific QBPs, in association with the operators and with particular focus within Oxford being on ensuring a quality of service and establishing the principles of BRT operation:

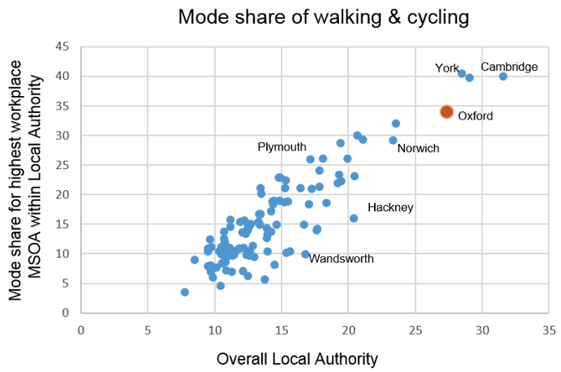
- Greater time-based and geographic coverage of bus services based on evidence of when and where people want to travel;
- Punctuality and reliability improvements through identifying the source of delays to bus services and jointly developing evidence-based solutions;
- Operation on busy radials and within the city centre to be managed through techniques such as Departure Slot Booking;
- Commercially appropriate consolidation and joint operation of services to further reduce the number of buses entering the city centre;
- Further availability of inter-operator (and multi-modal) smart ticketing building on the work in Oxford;
- Quality, capacity and environmental performance of vehicles; and;
- Interchange with other modes such as the rail services and facilities for improving onward journeys by foot and bicycle and for those will mobility impairments.

4. Walking and Cycling

Walking and cycling are extremely efficient forms of movement over short distances in terms of road space and impact on the highway network. Oxford is already one of the leading UK cities in terms of mode share of walking and cycling, however the ambition is to continue enhancing this position. To do so will require influencing further mode shift through encouraging people to walk and cycle by making their journeys easier, safer and more cost and time efficient in comparison to other modes.

The existing situation

A significant proportion of trips within Oxford are made by walking or cycling and account for 50% of commuter trips made by residents of the city. Investment in the transport network, including local public realm and cycle schemes, has contributed to a 30% increase in walking and cycling to work by residents in the city between 2001 and 2011. Oxford now has one of the highest mode shares for walking and cycling when compared to other local authorities (see graph of 2011 TTW Census data) with similar sized workforces, and is of a similar maturity to many inner London authorities. Walking and cycling are also the favoured modes of the 30,000 full time students in the city.



Limitations of the current network

Given the size of the city (with no two points within the ring road being more than 11 km apart), Oxford should be able to challenge Cambridge as the city with the highest proportion of residents walking or cycling to work.

In consultation for the OTS, cycling interest groups have suggested the biggest barriers to further improving the cycling mode share are related to the lack of high quality routes which provide continuous facilities, conforming to a specific standard. The piecemeal, location specific approach is seen as discouraging new, inexperienced and safety-concerned cyclists from choosing to cycle as a preferred mode of transport.

Public realm improvements and pedestrian route enhancements have been made, particularly in the city centre and district centres. However, there is much more to do to make walking in Oxford a better experience.

The severance of walking and cycling routes is also a common issue at the edges of the city. As Oxford has expanded to include significant residential and workplace populations on the outside of the ring road, the dominance of motor vehicles in the transport hierarchy at junctions has not been challenged. With the committed developments at Northern Gateway and Barton Park likely to be added to in future, the issue of severance caused by the ring road will become even more critical, even for short journeys between homes and workplaces.

Future demand

The main commercial streets within the city centre already experience very high footfalls. In peak hours, Queen Street has an hourly footfall of between 3,000 and 4,000 – comparable to that of the wider and fully pedestrianised Cornmarket. Elsewhere in the centre, Broad Street and High Street can see footfalls of up to 2,300 people per hour at peak times.

The redevelopment of the Westgate Centre is expected to result in a 54% increase in retail space in the entire city centre and an increase in visitors to the Westgate Centre from 5 million to 16 million per year.

Were travel to work patterns to remain as existing, over 5,500 new two-way commuter trips would be made by walking or cycling as the main mode each day within the city. It is also expected that they will feature as the critical modes for onward journeys for the additional 5,400 commuters arriving by bus or train.

Vision for walking & cycling

By 2035 Oxford will be a world-class cycling city that will be accessible to everyone, regardless of age, background or cycling experience.

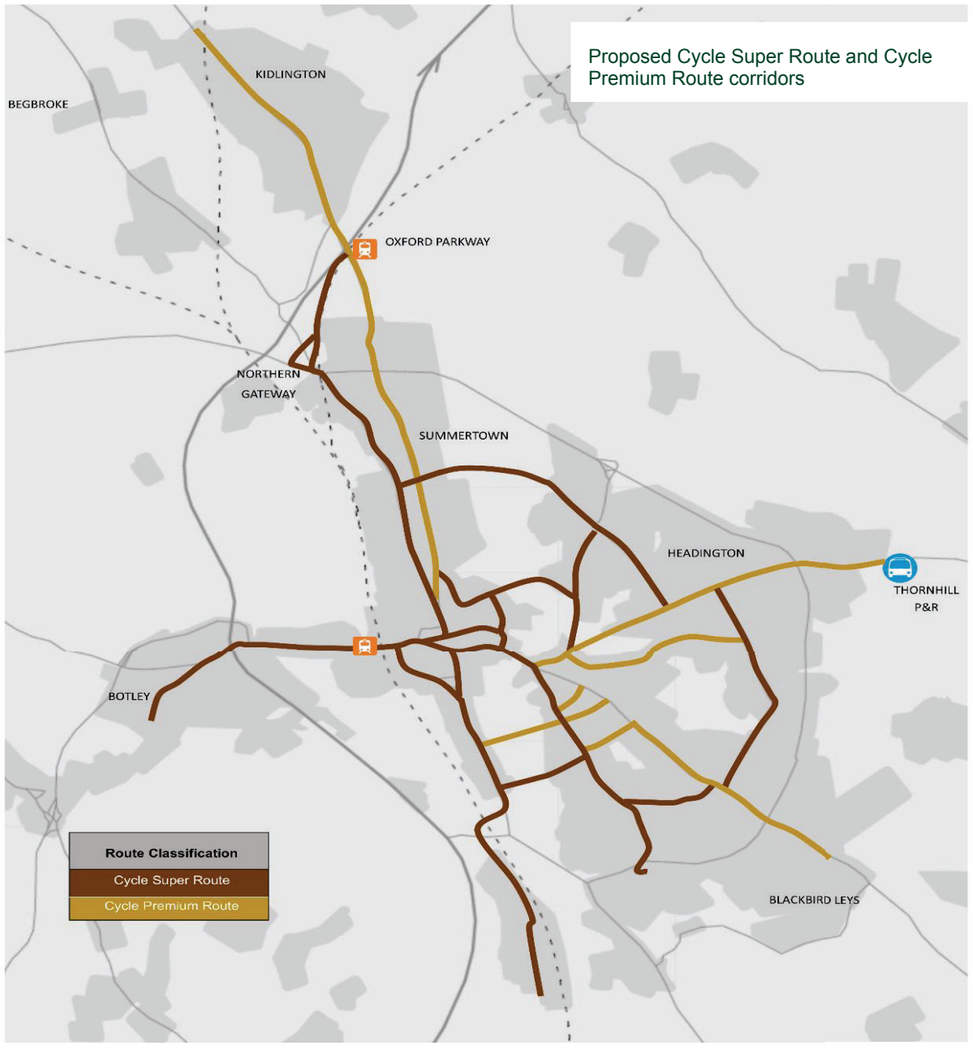
Walking in the city will be a pleasant, comfortable experience, with an outstanding public realm in the city centre and district centres.

Cycling and walking will be at the heart of continued and sustainable growth and contribute to a higher quality of life for its residents and workers while maintaining its visitor appeal as a world renowned city of culture and history.

Enhancing the cycle network

Cycle route enhancements are needed to provide safe and direct access to employment, educational and commercial destinations, but also to extend coverage across residential areas. Achieving this will require a combination of high quality routes providing access to key destinations, better cycle parking and other measures which make cycling easier and more attractive for short and medium-distance trips.

We propose a network based on a hierarchy of Cycle Super Routes, Cycle Premium Routes (shown in the figure opposite) and Connector Routes linking major origins and destinations. As with mass transit, particularly improvements are needed in the Eastern Arc, where 69% of journeys to work are 5km or less, but only 44% of trips (made by Eastern Arc residents within the city) are made by walking or cycling. The routes shown represent corridors - where possible, the actual route will follow the main road highlighted, but in some cases a direct parallel alternative may be necessary or more desirable.



Cycle corridor classification

Cycle Super Route

- As a minimum requirement, there will be a high level of continuous and uniform provision for cyclists travelling in both directions;
- On some corridors, cyclists will share wide bus lanes in at least one direction;
- Complete or semi-segregation will be provided wherever possible (otherwise mandatory cycle lane markings will be used);
- Cycle lanes will be designed for a minimum width of 1.5m; however 2m will be considered the default width for the busiest sections;
- Advanced Stop Lines, already present at many signalised junctions in Oxford, will be the default standard and will include 1.5m feed-in lanes. Cycle lanes will continue through junctions to reaffirm the position of the cyclist in the view of other road users;
- Loading and parking bans or timed restrictions will be in place and enforced during peak times or throughout the day;
- Where segregation is not possible or desirable (e.g. parts of the city centre or the narrow part of Hollow Way) , traffic levels and speeds will be reduced to create shared-use low or traffic free streets.

Cycle Premium Route

- Premium routes will also provide cyclists with uniform cycle lane provision in both directions. However these are likely to be shared with bus lanes, and will in many cases be standard width;
- Dedicated cycle lanes will be mandatory in places and should continue through junctions to reaffirm priority;
- As a minimum requirement, premium routes will be free from obstruction;
- Advanced Stop Lines will have at least some form of feed-in lane;
- In future development sites, design guidance for internal roads should meet the premium route criteria.

Connector Routes

- Connector routes will be strategic quiet ways with a particular role in connecting Cycle Super Routes and Premium Routes to residential areas;
- It will not always be possible or necessary to provide a continuous physical features on a connector route because of the need to balance road space for other users, however clear and consistent signage will be present along the routes and will be accompanied by wayfinding totems at decision points;
- One-way streets will, where possible, be upgraded to include marked or segregated contraflow cycle lanes.

Particular priorities for cycle route improvements are:

- Links to the city centre, especially radial routes;
- Orbital routes in the Eastern Arc; and
- Links to and between Northern Gateway and Oxford Parkway.

Whilst it would be desirable to provide Cycle Super Routes on all major routes in the city, this is not likely to be possible on all corridors, particularly where Bus Rapid Transit facilities are proposed (e.g. Banbury Road), or where there are busy shopping areas (e.g. Cowley Road). In these cases a Cycle Super Route will be provided on a near-to-parallel alternative if possible (in the above cases, on Woodstock Road and Iffley Road).Those corridors considered appropriate for classification as Cycle Super Routes are:

  - The B4495 from Summertown in the north through to Abingdon Road in the south;
  - Woodstock Road and through the Science Area;
  - Abingdon Road;
  - Marston Road;
  - Iffley Road;
  - Botley Road; and
  - Routes within the city centre.

Other routes may be added to this list, but based on known constraints and the need to provide BRT infrastructure in other corridors this is considered a realistic starting point.

This long term blueprint for cycling in Oxford can be implemented on a phased basis. Measures will be designed to enable them to be enhanced to accommodate a significant increase in future levels of cycling in the city.

Route treatment

The constraints of narrow highway boundaries, mature trees and street furniture are a challenge to providing continuous fully segregated cycle lanes or paths on most of the roads in the city. In many cases where full segregation is feasible, those schemes have already been implemented, albeit that in some cases improvements are still required to those schemes to bring them up to a higher standard. Where possible, every effort will be made to provide a similar level of segregation, however in most instances the most achievable (and best) form of high quality cycle provision on Cycle Super and Premium Routes will be on the carriageway.

In all cases, the reallocation of road space must consider other roads users and the built environment, but providing cycle lanes - whether mandatory, semi-segregated or advisory - will enable a far greater degree of continuity and uniform design than seen at present. As detailed in the cycle corridor classification table, on-street lanes will be designed to an absolute minimum width of 1.5m, with a recommended width of 2m on Cycle Super Routes. To achieve these widths it will often be necessary to undertake reallocation measures such as removing on-street parking, reducing footways to a minimum 1.8m width (in areas with a low footfall) and removing road centre lines.

To improve safety for cyclists, when placed into shared lanes with buses and BRT vehicles, lane widths of 4m to 4.5m will be provided unless total road widths do not allow this.

Oxford already has a good network of recommended quiet routes for cyclists but a lack of signage and wayfinding information means they can be difficult to find or navigate. Essential to the success of the network will be improvements to those roads and paths which serve the purpose of connecting Super and Premium cycle routes to homes, workplaces and services which do not fall on the main corridors. In most cases it will not be necessary to provide any physical infrastructure beyond navigational aids, however we will work to provide contraflow cycle facilities on one-way streets, and will progress opportunities to create additional crossings between the eastern and western halves of the city such as the Jackdaw Lane Bridge.

Junction treatment

In the 5 years between 2009 and 2014, 75% of all cycle casualties occurring within Oxford as a result of traffic collisions, took place at or within 20m of a junction. Whilst improving the continuity of the network will encourage more people to take up cycling, without improvements to junction safety the casualty rate at junctions is likely to rise as flows increase.

A central concept of the Oxford Cycle Strategy is therefore to address key junctions with segregation, priority or safer treatments for cyclists.

Many of the signalised junctions within the city have had Advanced Stop-Lines (ASLs) added in recent years to provide priority for cyclists. It is proposed that these are added to the remaining junctions, or to new signalised junctions as standard. In all instances cycle lanes should be continuous providing a feed-in lane to the ASL. Where necessary this will require narrowing or

reducing vehicle lanes on the approaches to junctions. Other, innovative treatments such as pre-signals for cyclist, two-stage right-turns, or cycle bypass-tracks will be considered in improving safety at large signalised junctions.

A significant barrier to cycling to and from the communities and workplaces outside of the ring-road is the lack of sufficient safe crossing opportunities. To reduce the severance caused by the ring-road, crossings, both at street-level or grade-separated will be provided. The signalisation plans for the Wolvercote and Cutteslowe roundabouts include toucan crossings for this purpose, for example

Cycle lanes on Super or Premium cycle routes will be continued through junctions, emphasising cyclists' priority at side road junctions. Side road entry treatments with raised tables and reduced corner radii to reduce vehicle speeds will further improve safety. On the Connector network, contraflow routes will be designed with physical protection for cyclists at entry points.

Cycle parking and signage

A significant increase in cycle use will require a substantial increase in secure cycle parking. The demand for cycle parking in the city and district centres considerably exceeds the formal provision in places and, at present, there is very little opportunity for substantial on-street expansion in the locations where it is needed most. Public realm schemes, which include rationalisation of on-street vehicle parking such as those for St Giles and Broad Street, will provide opportunities for increasing cycle parking. However they are still unlikely to meet demand as street level space is still scarce.

Throughout the city, innovative short-term approaches such as renting commercial premises and conversion to cycle parking facilities will provide additional parking supply, however these are likely to be expensive due to the limited supply of sites at the very centre of the city.

A longer term solution to providing significant quantities of cycle parking will be to provide underground or basement cycle hubs. The Oxford Station masterplan includes 1000 spaces within two such facilities on either side of Botley Road. Another example, which could be delivered in the short to medium term, is the conversion of the existing Gloucester Green underground car park to a dedicated cycle hub. These could become commercially operated cycle hubs which are run in partnership with private operators, providing bike hire and bike maintenance facilities.

Signing to all primary and secondary destinations will be provided throughout the city. This will be comprehensive and immediately recognisable along whole routes, and as a minimum each sign will show Destination, Direction and Distance. Further information such as named or branded routes, and whether a route is lit or unlit could also be provided. In conservation areas signing will need to be sensitive to the surroundings, whereas on busier routes, such as Super or Premium cycle routes, advanced and at junction signing will be required to enable cyclists to adopt the correct road position. Consideration will also be given to the use of road markings and other measures to avoid sign clutter.

Encouraging walking

Walking is the most sustainable travel option: it is feasible for the vast majority of the population, it is relatively quick for short distances, and it is a practical way of introducing physical activity into day-to-day life. Walking is already popular for many journeys in Oxford, particularly for relatively short distance journeys to work; approximately 25% of journeys to work for people who both live and work in the city are made on foot. However, 39% (over 17,500 trips) of all journeys to work within the city are under 2km in length, suggesting an opportunity to improve the mode share.

The key challenge is to improve the quality of the walking experience in the city – not just for existing pedestrians, but also to encourage more people to walk as a logical choice for short trips in the city.

As part of the proposed mass transit and cycle enhancements, pedestrian improvements will be implemented. There is a clear opportunity for local walking networks to integrate with the city-wide cycling network, to ensure a coherent approach to the roles of walking and cycling on quiet streets, and ensuring that pedestrians and cyclists can co-exist in the busier corridors, sharing space where appropriate.

There is also a clear role for public realm improvements to be integrated with measures to improve access on foot and transit stops and interchange hubs. The mass transit programme should, in particular, be considered as an important opportunity to improve public realm and simplify the local streetscape in Cowley, Headington and the Cowley Road. Public realm improvements should be integrated into multi-modal access improvements in the centres of Cowley and Headington, to improve pedestrian footfall, promote local shopping and stimulate local regeneration.

There is a need for major improvements to public realm and 'sense of place' in the city centre. In the short term, the pedestrianisation of George Street and Queen Street, as well as public realm improvements to St Giles, Magdalen Street and Frideswide Square will greatly improve the quality of public place within the city centre. By 2025, the establishment of the city periphery transit terminals and traffic control measures will allow Park End Street, New Road, Castle Street and Norfolk Street to become an extension of the low trafficked central core and will provide an almost uninterrupted walking route from the station to the centre. In the longer term, the ambitions for shifting bus movements underground will allow for more radical public realm improvements on High Street and St Aldates where opportunities are currently limited due to their key role as the only access to the centre from the east.


Artist's impression of George Street

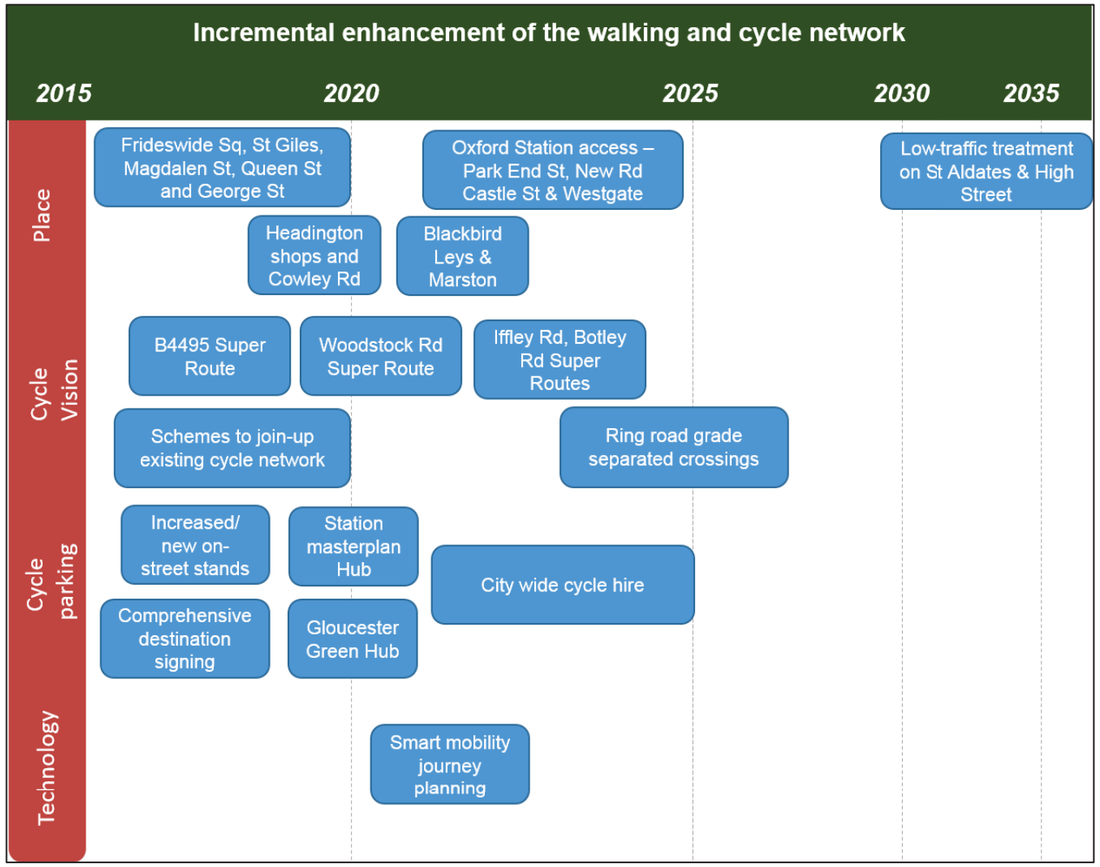
The walking improvements can be implemented on a phased basis, building on the interventions that have already been identified. The reduction in traffic in the city centre and, over the longer term, transformation of mass transit will enable an ambitious approach to walking and public realm improvements.

Technology

Journey planning information for walking and cycling, and the benefits to health and the environment will be prioritised within the future intelligent mobility technology which is being progressed as part of our Science Transit project. This will include real-time comparative information for trips made by walking or cycling against other modes.

Implementation

Phasing of capital investment



4. Managing Traffic and Travel Demand

Why manage demand?

Demand for travel arises from – in very broad terms – economic and social activity. Densely populated, thriving and prosperous places have the highest levels of travel demand (though not necessarily the highest levels of *traffic* demand).

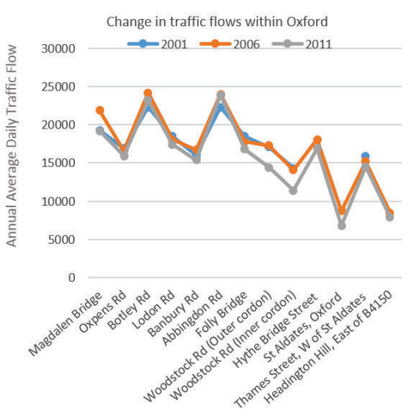
Transport planning tends to be focused on accommodating ever increasing travel demands by providing more capacity for travel, whether in the form of mass transit capacity, new pedestrian and cycle routes, or more road space for car traffic. We need to increase total transport capacity to enable growth in housing and employment. However we know that providing extra capacity (for any mode) also generates additional demand.

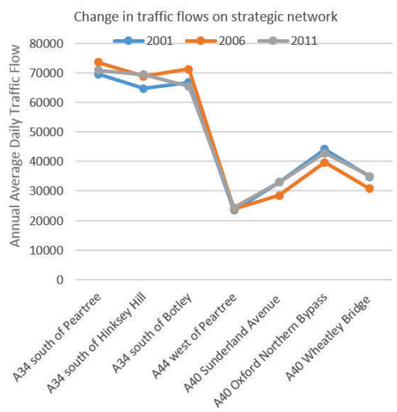
For road improvement schemes, for example, this sometimes means congestion relief is temporary because new capacity is quickly used up by new trips. Similarly, schemes that reduce car traffic through mode shift create new capacity in the road network, which then re-fills with new car trips. Neither case is a zero-benefit outcome, since the network is carrying more people, but congestion has not necessarily been reduced.

For this reason, in Oxford we need to combine schemes that increase transport capacity (for example the mass transit, walking and cycling schemes outlined in the previous two sections) with measures to manage car traffic and total travel demand.

Existing situation

In the ten years between the national census surveys of 2001 and 2011, Oxford's population grew by over 16,000 people (a change of 13%) whilst the number of jobs in the city increased by around 14,000 (16%).





Despite this, traffic flows on most key roads within the city (shown in the left-hand graph below) have actually dropped over the same period. On the ring-road and the strategic network outside of the city (shown on the right-hand graph), traffic flows have increased, albeit marginally, or remained relatively constant. Looking even further back, traffic flows into Oxford city centre have reduce by 24% since 1993.

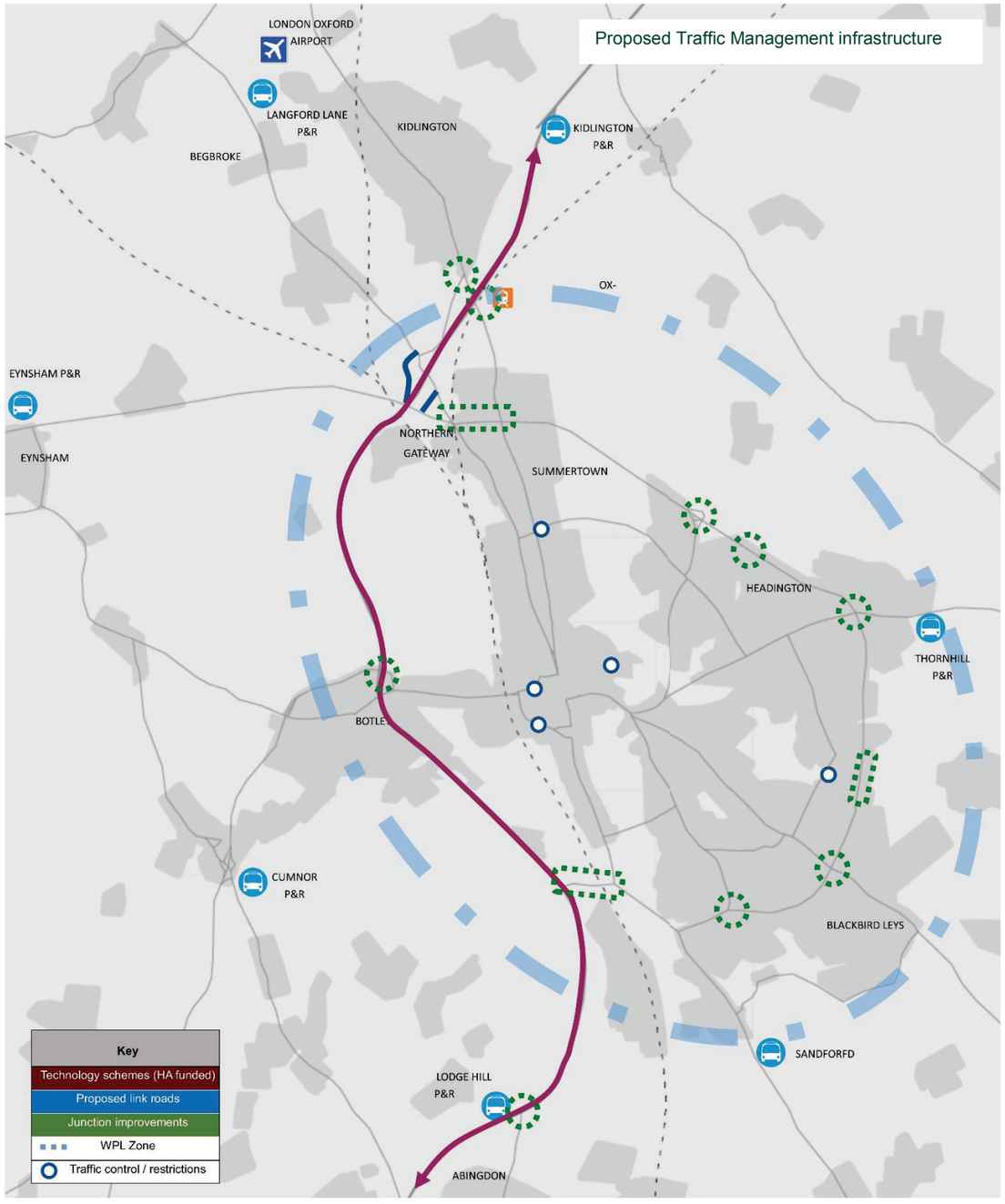
- This has been achieved through a combination of measures, including city centre traffic restrictions (e.g. the bus gate in High Street);
- High public parking charges;
- Planning policies that restrict parking supply in new developments;
- Controlled parking zones to remove free on-street visitor and commuter parking;
- Public transport, walking and cycling improvements, including Park & Ride expansion; and
- Targeted road capacity improvements – largely on the ring road

Vision for managing traffic and travel demand

By 2035, mass transit, walking and cycling will be seen by residents and visitors alike as the best and cheapest way to travel around the city. The wealth of information on travel conditions and options will enable people to make an informed choice of how best to access their chosen destination by any mode.

Driving alone to places of work will be significantly less desirable than other travel options, and there will be a general presumption against movement by car in favour of other more space-efficient modes within the urban area.

Learning from Oxford's past successes, this will be achieved through a combination of charging, traffic restrictions, planning policies, and targeted capacity improvements. We will also use current and emerging network management and journey planning technology.



Future demand for travel

Despite the relatively stable level of traffic flow since 2001, the DfT's prediction for traffic change for the period between 2011 and 2035 (taken from the National Trip End Model forecast) predicts a 37% increase in vehicle trips in peak hours in Oxford based on the development growth outlined in the Local Plans.

Were travel to work patterns to remain as existing, over 13,000 new two-way commuter trips with an origin or destination within the city would be made by car as a result of the SHMA related housing growth by 2035 (an increase of 27% against 2011).

With existing levels of congestion in and around the city already resulting in significant delays, any increase in traffic, let alone at the levels predicted above, will present serious challenges to enabling economic growth in Oxford.

Highway capacity improvements

The implementation of access restrictions in the city centre and Eastern Arc and reallocation of road space to other modes will support the goals and objectives of the LTP4 and the OTS by providing excellent sustainable movement networks. This fundamental principle relies on the general presumption against travel by car within the urban area.

However, it is acknowledged that access by car is still a necessity in a dynamic city, and the outer ring road will be promoted as the primary route for all short-distance car trips.

The outer ring road will be increasingly important for cross-city movements because the OTS proposes to reallocate road space and introduce traffic restrictions on some of the roads within the city to enable mass transit, walking and cycling improvements,

The existing policy of improving the key ring road interchanges is therefore consistent with the proposal to remove trips from the 'inner ring road' (the B4495) and other inner city routes. This will be continued in the short-term with the schemes at Cutteslowe and Wolvercote Roundabouts; whilst longer term plans at the A34 Botley and Peartree interchanges are being considered by the Highways Agency, along with Intelligent Transport Systems (ITS) such as Variable Message Signs and variable speed limits to be applied along the A34 corridor. The proposed ring road improvements are shown on the plan opposite.

Workplace Parking Levy

Workplace parking in Oxford

Whilst the package of OTS measures already examined will provide their own contributions to increase mode share of non-car modes, the abundance of free workplace parking within the city is a significant threat to achieving the step-change required to avoid the considerable negative impacts of growth. Results of the 2011 Census, indicate that over 39,000 employees within the city use the private car as their main mode of travel to work, with a quarter being residents of the city. In common with most other towns and cities, parking charges levied by the local authorities in Oxford currently target public parking – i.e. on-street parking and parking in public car parks. This has been a useful tool in managing traffic, but given that a) there are many times more workplace parking spaces in the city than public parking spaces and b) car trips to workplace parking spaces are generally made at peak times, there would be clear benefits in being able to influence the use of these spaces.

An Oxford WPL

In order to gain much needed control over the use of the private car as a means of travelling to work within Oxford we propose – subject to further work and consultation – the introduction of a city-wide Workplace Parking Levy (WPL).

We believe that a WPL would have three significant benefits for the city, which will be critical to ensure growth is not limited by the constraints of traffic related congestion:

- Mode shift – Those staff who have parking charges passed down by their employer will be incentivised to seek alternative methods of getting to work.
- Funds generated through the application of a WPL would be ring-fenced solely for the reinvestment into the transport network (including operation of the WPL), improving alternatives to the private car and thus further influencing mode choice; and
- A charge on spaces - regardless of whether they are used - will encourage employers to reduce their supply of private parking; saving the employer money spent on maintenance but also presenting the opportunity to redevelop land previously used for parking for employment or housing.

We propose to follow a similar overall approach to that used in Nottingham, but adapted for Oxford and its employers, some of whom (e.g. the University of Oxford) already charge staff to park at work. With minimal exceptions, the levy would apply to all employers with a provision of employee parking over a certain threshold. Whilst the OTS proposes that the whole city is subject to a WPL, the city centre could be charged at a premium rate, and we will consider a pricing strategy depending on the levels of accessibility throughout the city.

Traffic control points

The implementation of the five city centre bus gates in 1999 marked a considerable improvement in the control of traffic volumes within the city centre. During peak hours, vehicles passing directly through the city centre only account for 15% to 20% of all trips entering the area, with the majority of people accessing workplace, education or retail destinations. Most users of the road network therefore already expect to use orbital traffic routes further out: either the B4495 route through the Eastern Arc connecting Summertown with Abingdon Road, or the A34/A40/A4144 ring road as the means of moving around the city.

Reducing city centre through trips

The ambition of maximising the city centre's value as a shopping and tourist destination depends on being able to vastly improve the public realm for pedestrians. There is also a risk that a WPL could, by reducing traffic into the city centre, release capacity which would be filled by through traffic. Therefore we are proposing to reduce traffic levels in the longer term by placing further restrictions on through traffic (whilst allowing unimpeded bus movements) by implementing access controls:

- On Thames Street – allowing access to Westgate from the south or west only but preventing or discouraging any through trips.
- In the vicinity of Worcester Street or Frideswide Square – thus preventing or discouraging trips from west to north but maintaining access close to the Oxford Rail station; and
- On St Cross Road, preventing or discouraging traffic from using the Science Area as a city centre ring road.

These are shown on the map on the previous page.

These restriction points could be full or part-time closures – similar to the existing bus gates – or road user charging points (see below).

A permit based system for those requiring access (residents, blue badge holders etc) will be investigated.

Inner ring road

To provide the necessary service journey time improvement for BRT Line 3, it will be necessary to reduce the impact of congestion caused by high vehicle flows on the B4995. This will be achieved in part through junction improvements and priorities, as described in the mass transit section. In addition, traffic restrictions in the form of access restrictions (e.g. bus gates) or charging points will be used to redistribute traffic to the outer-ring road. Two measures already identified include:

- A timed access restriction (e.g. bus gate) or road user charging point, on Hollow Way
- Turning restrictions onto Banbury Road from Marston Ferry Road.

Road user charging

Road user charging could be a potential option, in conjunction with a workplace parking levy, for reducing traffic levels on certain routes without a complete closure. Some examples of where this could be applied are listed above.

Despite the successful implementation of the London (2003) Congestion Charge schemes, no other UK city has since implemented a similar scheme, and there are relatively few examples in other European countries. This can be attributed to a lack of political will, but also as such schemes require large capital investment costs for the infrastructure, payment mechanisms and back-office equipment as well as significant operating costs - the 21km^2 London CC zone cost over £200m to implement and requires an operating budget of £120m per year.

Charging only for use of very specific "premium" road links in the city centre and Eastern Arc, would enable start-up and operating costs to be minimised. Nevertheless, a road user charge is unlikely to raise significant revenue and is best seen as a network and traffic management tool rather than a means of generating funding for transport improvements.

Public parking

Public parking in Oxford is already very limited compared to other cities, particularly in the city centre. In 2013, Oxford city centre had 1670 off-street car parking spaces, compared to 3300 in Cambridge city centre and 5200 in the centre of Reading. Despite this, city centre spaces are rarely fully occupied, though this is likely to change once the Westgate Centre is redeveloped. Oxford's economy, including the retail and leisure sectors, is not heavily dependent on people driving into the city centre, largely because the Park & Ride, bus, walking and cycling networks provide convenient alternatives.

In the district centres, which are less well served by alternative modes, public parking is important to maintain the vitality of shops and services located close to residential areas.

City centre parking

In the city centre, levels of public parking will be maintained at approximately the same levels as in 2014, albeit reorganised to make better use of land. Specific measures include:

- Consolidate public parking into fewer locations, predominantly underground (e.g. new Westgate car park), with existing surface car parks redeveloped for other uses and on-street parking rationalised as part of public realm improvements (for example, St Giles and Broad Street);
- All parking to meet high standards of security and design to provide a welcoming experience;
- Charges to encourage good use of parking capacity throughout the day and year – no half-empty car parks – and to discourage arrivals during network peaks;
- Charges should discourage or prevent long stay or commuter parking;
- Consider discounts for full cars (4 + occupants);
- Provide easy-to-use payment options, linked to retail/leisure discounts or other incentives to encourage off-peak arrivals;
- Provide live parking space information from journey origin to parking space via journey planner, apps, web, electronic signs, GPS devices and in car-park systems;
- All public car park exits to be signal controlled with generous internal queuing space to allow controlled discharge of traffic onto the road network; and
- All car parks to provide for electric vehicle charging.

District centres

For district centres, our approach is to:

- Support the vitality of district centres (which offer local amenities in sustainable locations close to residential areas) by maintaining a modest level of attractive, low cost and easily accessible short stay parking;

- Maintain current levels of public parking in all district centres, except Cowley primary district centre which currently has substantial over-provision occupying land which could be redeveloped for other uses;
- Deck or build above car parks to make efficient use of land;
- Discourage or prevent commuter or long stay use through pricing or fines.

Zone-based parking charges

We will adopt a zonal parking charge system across the city, including Park & Ride car parks. Classification of charging zones will be based partly on their level of accessibility by other modes, so may change as and when the other OTS measures (such as a BRT or cycle super route connection) are introduced. The zonal system will be designed to encourage alternatives, in priority order:

Parking charges will therefore be lowest at Park & Ride sites, but are unlikely to be free because a) this could create an incentive to use Park & Ride even when another alternative is available and b) the operators of Park & Ride car parks will need to cover their costs.

Freight/ deliveries

Demand forecasting for 2031 indicates that around 2,500 HGV trips will be made to, from and within the city between 8am and 6pm per day, over a third of which would occur during the AM peak hour. To reduce the impact of freight on congestion, noise and air quality, the following measures will be developed:

- Delivery & Servicing Plans;
- Construction Logistics Plans;
- Out of hours deliveries;
- Freight will be expected to comply with increasing emissions requirements.
- Local consolidation points; and
- Freight Consolidation Centres for business, retail and construction.

Role of taxis

Taxis and private hire vehicles will continue to be an important part of Oxford's integrated transport network; perhaps even more so as further traffic controls and restrictions reduce the attractiveness of the private car as a means of accessing the city centre. As the nature of the city centre streetscape changes, with more streets becoming access only or closed to vehicles at certain times, so will route management for taxis.

Given the importance of taxis throughout the city, it will be vital to ensure that a high level of interchange is provided with the proposed BRT routes at Park & Ride and major hubs, plus also at Oxford and Oxford Parkway stations.

As part of the objective for a zero-emission Oxford city centre by 2020 (and city-wide by 2030), taxi operators are being encouraged by Oxford City Council to invest in electric vehicles for their fleets. Oxfordshire County Council will work in partnership with taxi and private hire business to ensure that designs for BRT transit hubs, Park & Ride sites, and other council run public locations with taxi stands will have facilities for electric vehicle charging.

Development management policy

The evolution of policy will have a critical role to play in delivering growth without adding unnecessary traffic.

Existing policy will therefore be reviewed to ensure that parking standards throughout the city are seen as an absolute maximum, which are to be applied only in exceptional circumstances. This will include the use of a formula to determine a development's parking standard based on the assessment of future public transport and walking and cycling access.

In planning new development, there is increasing evidence that neighbourhood design – including housing density and layout of routes for public transport, walking and cycling – is a strong influence on use of these modes by residents. Traditional densely populated areas have lower overall travel demand and car ownership and higher use of sustainable modes than newer suburban developments.

In addition the strategy will need to "nudge" people towards travelling less or choosing sustainable modes, by promoting neighbourhood design that is based on research and best practice from other cities. Developers of homes and workplaces will also be required to apply vastly enhanced requirements to provide access and facilities for cyclists. Any new commercial operation will be required to adhere to standards for the management of logistics.

The role of the OTS in planning new development

The Strategic Housing Market Assessment for Oxfordshire has presented a highly ambitious growth target of 28,000 houses for Oxford. Research undertaken by the city council suggests that a maximum allocation of 10,228 houses will be achievable within the city boundary, made up of committed developments and other sites identified in the local plan plus an element of 'windfall' housing.

It is anticipated that Oxford's remaining unmet demand could, with agreement from the other Oxfordshire District Councils, be accommodated outside of the city boundary. More pressure is therefore likely to be placed on edge of city locations, within the outlying towns / villages and potentially in entirely new locations. There is a danger that a rush to build more houses could favour speculative development of sites that are harder to serve by sustainable transport modes.

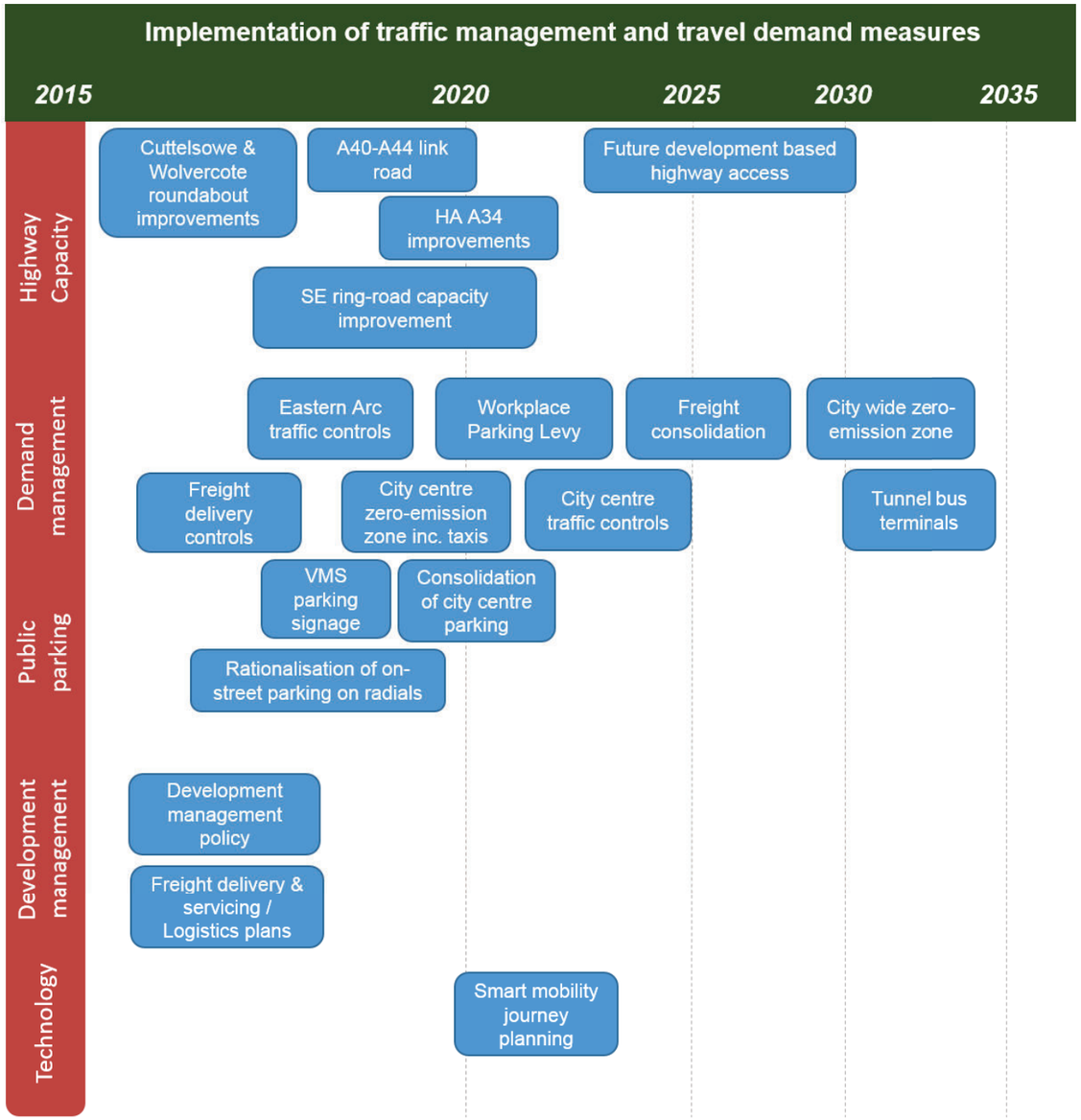
The OTS has defined the optimum corridors for BRT and cycle networks, extensions of which should help to influence decisions about where future housing should be located.

To the south of the city, BRT Lines 1 & 3 will provide a fast, high capacity transit service directly into the City Centre and Eastern Arc, with both having potential to be extended towards Abingdon and south of Grenoble Road.

Similarly, to the north of Oxford, BRT Lines 1 & 3 route through Kidlington and Eynsham, opening up large areas with access to a direct BRT service to Oxford city centre and growth areas in the Eastern Arc.

Implementation

Phasing of capital investment



5. Implementation of the OTS

The cost of improvement

The OTS calls for a step change in transport investment within Oxford to preserve the vitality of one of the most important centres to the economy of the South East. Investment needs to reflect the scale of change needed to achieve the city's vision for growth, but equally must be achievable with a recognition of the need to deliver the best value for money from constrained resources. This consideration is implicit with the principle of the incremental development of mass transit, where networks will be developed on the basis of allowing for future expansion as needed, not precluding this through fixed and inflexible infrastructure or technologies. Should demand in future necessitate greater segregation, the potential cost should be considered now.

Detailed costing will be determined through more in-depth studies into the measures identified within this strategy. However, initial estimates suggest that the implementation of the OTS will require a total capital investment (including funded schemes) of around £1.2 billion. When factored against the level of growth expected within the county in the next 20 years, this equates to an investment of approximately £14,000 per additional job and home.

Approximately half of this figure would be required to fund the city centre transit tunnels alone (which will require the most significant shift in the way our transport infrastructure is funded). The remaining c£600m of capital investment would represent an annual investment of £30 million per year over the next 20 years, roughly double our current annual spend.

The next steps

The transport improvements detailed within the OTS sets out a framework for progressive transformation of the transport network within the city by 2035. However, many of the more ambitious schemes will be developed incrementally, as and when the need for them to mitigate for the planned growth is established, and when funding is secured.

Our 2 and 5 year capital investment programmes will see us deliver the schemes for which committed funding has been secured, including utilising the £93 million City Deal and Oxfordshire Growth Deal investments; developer funds and Community Infrastructure Levy funding, and local authority funds. The design, consultation and implementation of many of these short-term schemes are already underway.

The OTS provides a framework and context for future funding bids. Each corridor contains a combination of interconnected transit, cycle, place and demand management elements. In many cases, schemes will be developed and implemented on a whole corridor – rather than mode-specific – basis.

The OTS has introduced our ambitions for several high-profile schemes which will enable radical changes in how people move around the city. At present, schemes such as zero-emission BRT and the Workplace Parking Levy are in the feasibility stage, and in the next year we will be looking to develop the optimum solutions and funding programmes through collaborative working with public transport operators, major employers and other stakeholders.

We will look to utilise our position as a home to a truly world-class research and development sector to work with the university, college and science sectors to help take the strategy forward, including the innovative Smart Mobility and technology proposals identified under our Science Transit Strategy.

Crucially, in light of the substantial potential housing and job growth within Oxford and the wider county, we will work closely with the city council and district planning authorities to implement the principles and infrastructure of the OTS.

Funding the OTS

The delivery of the measures and interventions recommended by the OTS will rely in part on private and private sector funding streams of an appropriate level, phasing and balance between revenue and capital funds.

- The long-term focus of the OTS means uncertainty for future availability of funding. The investment plan must therefore:
    - Be flexible and scalable to adjust to the value of future funding streams and the timescales for funding availability; and
    - Provide a business case for securing funding from the private and public sectors.

Central and local government, the private sector and transport operators and users all have a key role in future funding and delivery. Our approach to funding will need to be as ambitious and forward-thinking as the strategy itself. A series of opportunities have been identified which are presented within the table opposite.

Potential Sources of Funding (£ = modest contribution; ££ = moderate contribution; £££ = significant contribution)		
Private sector	**Transport operators**	**Transport users**
Developer contributions (££) Contributions for new developments to be maximised and prioritised towards public transport wherever possible, over road infrastructure.	**Freight fees (£)** To be applicable until companies sign up for the use of a consolidation centre. Revenue can be ring-fenced for use on freight management and air quality improvement schemes.	**Workplace Parking Levy (£)** This will likely be a modest but valuable source of income for investment into further Mass Transit, walking and cycling schemes.
Local business rates (££) To be retained by Oxford City Council to generate funding for infrastructure, including transport. At a countywide level, business rate growth within the Enterprise Zones should be retained for reinvestment.	**Operator investment (£)** The roll-out of very low and zero emission vehicles is welcomed and must continue. Further support to schemes which will provide more reliable services should be sought.	**Parking charges (££)** Increases in public car parking charges outside of the city centre should be used to support the implementation of the Mass Transit lines.
Tax Increment Financing (£££) An increasingly used financing tool which uses future business rate income from new development to provide backing for infrastructure, including transport.	**Bus stop / bus stand departure fees (£)** Bus stop or bus stand departure fees should be implemented to help fund city centre revisions to the transit network. This may also encourage operators to consolidate services.	**City centre cordon / entry charges (£)** Given the limited existing through trips in the centre it is assumed that only a limited return on investment in operating costs would be gained.
Tourism business levy (£) Local business leaders should be encouraged to establish an Oxford Tourism Business Improvement Districts (TBIDs) which draws together private sector funding based on a scalable business rate levy to collectively invest in local improvements, including transport.	**Rail station use charges (£)** Rail station use charges on Train Operating Companies **Tourist coach entry fee (£)** Charge to be applied to companies for city entry (payable on parking within designated coach bays) will be used to pay towards Mass Transit prioritisation schemes.	

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Connecting Oxfordshire: Local Transport Plan 2015-2031

Area Strategies: Science Vale, Bicester, Banbury, Witney, Carterton and A420 Corridor

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CONTENTS

Science Vale Area Strategy

Local Context

1. The Science Vale area strategy is focused around the UK's leading centres for science, technology and innovation at Harwell Oxford, Milton Park and Culham Science Centre and includes the fast growing settlements of Didcot, Wantage and Grove. Figure 1 shows the Science Vale area.

2. Although Science Vale does not include Abingdon-on-Thames and Wallingford, this strategy does contain some schemes to recognise the interaction of Science Vale with these towns, with many trips being made into Science Vale for work and leisure.

3. Science Vale is already one of the most successful areas of science-based industry in the country. The area has a high concentration of employment in industries such as research and development, publishing, education and hi-tech manufacturing activities such as motor vehicles and IT, reflecting the presence of some large and prestigious employers in these industries.

Employment and Housing Growth

4. South Oxfordshire Core Strategy 2027 (adopted December 2012) and the Vale of White Horse Local Plan 2031 Part 1: Strategic Sites and Policies (published November 2014) outline the need to deliver up to 20,000 new jobs, principally at the main employment centres of Harwell Oxford, Culham Science Centre and Milton Park.

5. Employment growth is also supported by the Oxfordshire Local Enterprise Partnership Strategic Economic Plan, which recognises Science Vale as being part of the 'Oxfordshire knowledge spine.' In particular it notes that the area provides high value research infrastructure, particularly at Harwell Oxford and Culham Science Centre, supporting high-tech and science related job growth. This growth is facilitated by the Science Vale Enterprise Zone covering 64 hectares (ha) within Harwell Oxford and 28ha within Milton Park. Development within the Enterprise Zone will generate income for the Local Enterprise Partnership (LEP) for investment in infrastructure to support wider economic growth in Oxfordshire. We are working with partners to implement the projects and work streams identified to support the enterprise zone. Our role is predominately leading projects around transport, skills, inward investment, and broadband.

6. There is also significant potential for employment growth in Didcot on the site of the decommissioned Didcot A Power Station. The Vale of White Horse

District Council supports the redevelopment of the site to provide a high quality mixed use development, supported by improved transport infrastructure. Around 47ha of land at Didcot A is available for redevelopment and up to 29ha of the site has been reserved for employment uses.

7. Concerning future housing growth, the Oxfordshire Strategic Housing Market Assessment (SHMA) was published in April 2014. The aim of the SHMA is to help local planning authorities understand how many homes will be needed in the period 2011 – 2031. It identified that between 725 and 825 homes are needed per year in South Oxfordshire and 1028 homes per year are needed in the Vale of White Horse District. Each District Council is planning for the provision of additional homes as part of updating their Local Plans.

8. Our main focus is to create the conditions to facilitate residential and employment growth, ensure that the transport network can continue to operate efficiently, promote sustainable travel and create a thriving, attractive place in which to live and work. Expansion of the science and technology business and creation of attractive town centres that offer good local services and amenities are key to achieving this.

9. Effective partnership working with the public and private sector including the Highways Agency, Bus Operators, Network Rail, North Wessex Downs Area of Outstanding Natural Beauty, District, Town and Parish Councils, and businesses, will be essential to deliver the vision and transport aims for the area.

10. In particular, we are working closely with the District Councils to agree a shared vision for growth set out in their Local Plans and supporting documents such as the Science Vale Area Action Plan and supplementary planning documents. This includes working with them to evaluate the transport impacts of the additional housing growth identified by the SHMA. A number of transport infrastructure improvements are likely to be needed to support additional housing allocations.

Connecting Science Vale to wider Oxfordshire and beyond

11. To support planned growth it is vital that new and improved transport infrastructure is provided as well as measures to encourage and facilitate sustainable travel. Movement within Science Vale and connections with the rest of Oxfordshire's transport network also need to be efficient and reliable. High quality, efficient transport links along what is known as the 'Knowledge Economy Spine' which connects Oxford, Science Vale and Bicester are also essential. This is where existing science and technology industries are focussed and where there is the greatest development potential for both

employment and housing growth. Connectivity along this corridor will also be supported through development of technology and innovation, with new measures supported by the Science Transit Strategy.

12. Excellent access to international gateways is also vital. Fast, reliable access to Heathrow Airport and international rail at London St Pancras is a critical factor in attracting investment and growing the knowledge sector business in Science Vale. Didcot Station, as the main transport hub for the area, has a key role in achieving this.

Transport Aims

13. The transport priorities for Science Vale are to improve access to the Enterprise Zone sites at Milton Park and Harwell Oxford for international, national and local travel, to enable economic growth at other key employment sites in the area, to plan ahead to manage the impact of future housing growth on the transport network, and to improve connectivity between employment, services and areas of housing growth.

14. To achieve this we will improve:

- access to strategic road and rail networks;
- opportunities for sustainable travel, on foot, by bike and using public transport to help to deliver a real step-change in the provision of alternative modes of travel to the car;
- journeys across Science Vale;
- the capacity, resilience and reliability of the transport network for all modes of travel
- connectivity between employment, services and housing;
- journeys between Didcot and the Enterprise Zone;

trips within Didcot to town centre facilities and amenities;

15. The proposals described in this chapter will be implemented at different stages of the Local Transport Plan period 2015 – 2031. These timescales are influenced by a number of different factors and may be subject to change.

Strategic Transport

The Highway Network

16.. Reliable access to and along key routes such as the A34 is crucial to support the global nature of businesses within Science Vale. The A34 provides essential access to Birmingham, Heathrow, and the ports at Southampton. We are working closely with the Highways Agency in the development of their

route-based strategy covering the full length of the A34, to ensure that it provides the capacity improvements needed to deliver growth in Oxfordshire.

17. In Science Vale, significant investment to improve key junctions of the A34 to enhance access to the area and connect businesses to the trunk road network includes schemes at Milton Interchange and Chilton Interchange.

18. In addition, a scheme to provide south-facing slip roads at Lodge Hill in Abingdon-on-Thames is being progressed through feasibility. The Vale of White Horse District Council's emerging Local Plan 2031 proposes new homes to the north of Abingdon-on-Thames. The transformation of Lodge Hill into a full movement interchange will help to accommodate additional traffic generated through housing growth, improve accessibility and connections to the trunk road network, and help to alleviate congestion in Abingdon town centre.

19. We are also evaluating the feasibility of providing new Park and Ride sites on routes leading to Oxford, to enable more people to travel into the city by bus and reduce congestion on key routes. Lodge Hill Interchange is a potential location for a new Park and Ride site. Measures to improve public transport access to Oxford are described in more detail in the Oxford Transport Strategy chapter of LTP4.

20. With economic growth, particularly in and around Didcot, there will also be increased freight traffic on certain roads. We will seek to ensure that freight uses the most appropriate routes as outlined in Oxfordshire's Inter-urban Freight Strategy and Oxfordshire Lorry Routes guidance, and that development plans leading to increased freight movements are appropriately mitigated. We will also ensure that recommended freight routes are clearly sign posted.

Public Transport

21. Strengthening the public transport networks between Science Vale, Oxford and other important centres of employment is essential to enable the vision for Science Vale to be achieved.

22. At Didcot Station a new transport interchange has created a modern transport hub for Didcot and Science Vale. The new interchange has additional pedestrian space, a larger bus station, two-tier cycle parking, Brompton Dock cycle hire, a taxi rank, drop-off zone and disabled parking.

23. Our ambition is for Didcot Station to be further transformed into a 'state of the art' multi-modal interchange and gateway to the area, fronted by a new public square. The masterplan for the station envisages a new pedestrian / cycle

entrance north of the railway, additional platforms, a larger station building, and increased car parking, including a multi-storey car park. This will support the plans for regeneration of Didcot town centre, including the adjacent gateway site.

24. Improved rail services will also enable journeys to connect to rail services from London and airports at Heathrow, Birmingham and Gatwick as well as the growth areas of Oxford, Milton Keynes and Reading.

25. Partners in Science Vale are also keen to improve the first impression that people have of Didcot when arriving by train. There are plans to redevelop the area opposite Didcot station so that a welcoming gateway to Didcot and Science Vale is created. Proposals include a public square, traffic calming, and a mixed use development including a hotel, serviced apartments, office, retail, restaurant, a nursery and residential units.

26. Culham Science Centre benefits from Culham Station being close to the site. Full utilisation of this by Culham Science Centre and the rail operators is key to support and enable economic growth. Improved services with better station integration will achieve this.

27. As part of our Science Vale and Science Transit strategies, our ambition is to provide a new railway station / interchange at Grove. This will help to serve and meet the needs of new development across western Vale area, and ensure the future ambition of connecting Wantage and Grove with Didcot, Swindon and beyond.

Proposal SV 1 – We will work with partners to improve access to the strategic road, rail and bus network by:

Timescale	Proposal	
2015 - 2020	**SV 1.1**	**Delivering access and journey reliability improvements at Milton Interchange.** To improve capacity, relieve congestion and accommodate additional traffic from planned development.
	SV 1.2	**Delivering north-facing slips at Chilton Interchange to provide a full movement junction.** To enable more direct access to and from Harwell Oxford from the A34, helping to attract investment.
	SV 1.3	**Promoting south-facing slips and investigating the provision of a new Park & Ride and bus priority measures at Lodge Hill Interchange, Abingdon-on-Thames.** The provision of a full movement interchange will improve capacity and accommodate additional traffic from potential future development. A new Park &

		Ride will enable more trips into Oxford to be made by bus and alleviate congestion on Oxford's approach roads.
	SV 1.4	**Developing Didcot Station into a 'state-of-the-art' multi-modal interchange,** to meet demand from new development and improved rail services. This includes a multi-storey car park, station access from the north, and a new station building.
	SV 1.5	**Working with Network Rail and other partners to support the overhead electrification of the Great Western Mainline.**
Beyond 2020	**SV 1.6**	**Promoting the provision of a station at Grove**, working with partners as part of a wider proposal to improve rail connectivity with Didcot and neighbouring areas, such as Swindon and Bristol, and in the longer term with East-West Rail to Milton Keynes.
On-going throughout the plan period 2015 – 2031	**SV 1.7**	**Promoting an improved level of rail service at Didcot,** seeking a minimum of four trains per hour to Oxford and Bicester, and securing future direct services to Birmingham International and Heathrow airports as new rail infrastructure comes forward.
	SV 1.8	**Promoting greater presence, accessibility and an improved level of rail service at Culham Station.** To improve accessibility for the local area and Culham Science Centre and to encourage further business investment.
	SV 1.9	**Promoting an improved and fully integrated public transport system with bus priority measures,** linking Science Vale with innovation hubs and research locations in Oxford, in accordance with Science Transit and the Oxfordshire Bus Strategy.
	SV 1.10	**Promoting the efficient transport of freight,** using the most suitable routes as outlined in Oxfordshire's Inter-urban Freight Strategy and Oxfordshire Lorry Routes guidance.
	SV 1.11	**Providing clear signage across Science Vale** and establishing a clear hierarchy of routes to assist with way finding for all modes of transport.

Supporting growth across the Science Vale area

28. People need to be given a real choice about how they travel, so that additional travel demand associated with growth can be met across a range of modes of transport. It is therefore essential to promote sustainable travel and provide more opportunities to encourage people to walk, cycle and use public transport.

29. As part of this, a substantial upgrade and expansion of the cycle network is required to provide an attractive and safe alternative to driving within Science Vale. LTP4 includes a cycling strategy for Science Vale, in accordance with the Oxfordshire Cycling Strategy, setting out the vision for improvements to the cycle network. This network is based around strategic corridors linking the main towns, housing developments and Didcot Station to key employment sites. Schemes will include improvements to existing cycle routes, as well as developing new high quality cycle routes. Strategic cycle corridors in Science Vale are outlined in figure 2. More details of the specific proposals are in the Science Vale Cycling strategy.

30. The Oxfordshire Bus Strategy has been developed to outline the overall vision for the bus network county-wide. Bus service and infrastructure improvements discussed in this chapter are part of this wider strategy for Oxfordshire. Public transport will be significantly improved and bus priority measures implemented. This will provide high quality, high frequency bus services linking Didcot station with major Science Vale residential and employment sites, as well as connecting to other towns outside of Science Vale. Figure 3 shows the indicative strategic public transport routes and proposed bus priority routes required to support development in the Science Vale area.

31. In addition, highways schemes to provide extra capacity and accessibility on key routes to Harwell Oxford, Milton Park and Culham Science Centre will offer route choice and travel options between homes and workplaces, helping to spread the impact of increased traffic on the roads.

32. The Science Vale transport strategy contains a key new scheme, involving a proposed new road from north Didcot, an additional Thames river crossing, supplementary access to Culham Science Centre and a direct link to the B4015. This scheme would help to provide an additional link from south to north between Science Vale and Oxford, in particular the major employment areas of Oxford in the Eastern Arc, as well as providing an alternative route to the A34. Improvements to access to Culham Science Centre through increased connectivity by bus and cycle are also important.

33. The following additional schemes are seen as a priority to improve connectivity between new growth areas, key employment sites and residential growth areas.

Proposal SV 2 – We will work with partners to improve journeys across the Science Vale area, connecting new homes with jobs and service centres, by better connecting Wantage & Grove, Abingdon-on-Thames, and Wallingford with Didcot, Milton Park, Harwell Oxford and Culham Science Centre through:

Timescale	Proposal	
2015 - 2020	**SV 2.1**	**Delivering cycle route upgrades and maintenance** through the Local Sustainable Transport Fund. This includes provision of new routes, branded signs, trial bike hire scheme and marketing measures to provide a high quality, safe and attractive network.
	SV 2.2	**Securing new strategic bus services and associated infrastructure** between major residential sites at Didcot, Wantage and Grove, Wallingford, Abingdon-on-Thames, town centres / retail and the employment sites at Milton Park, Harwell Oxford, Culham Science Centre, and Oxford. A minimum of two buses per hour during the morning/evening peak travel periods is required to provide a credible level of service.
	SV 2.3	**Securing improvements to existing bus services and associated infrastructure** between Oxford, Didcot, Wantage and Grove, Abingdon-on-Thames, Wallingford and employment sites in Science Vale.
	SV 2.4	**Strengthening public transport links from Didcot Station** through improved bus connections, including segregated priority sections of route, to improve bus reliability and journey times. Bus priority measures will be investigated on the A4130 from Science Bridge into Didcot, through the Valley Park development site located to the west of Didcot; and between Grove, Milton Park and Didcot via Steventon.
	SV 2.5	**Delivering Wantage Eastern Link Road** to support developments in Wantage and Grove and provide relief to central Wantage.
	SV 2.6	**Providing relief to Manor Bridge, Didcot through the delivery of Science Bridge; a new bridge over the railway and associated highway link at the Didcot A Power Station site. The scheme also includes capacity improvements to the A4130 between Milton Interchange and Science Bridge.** This will realign the A4130, help to relieve congestion,

		open up the Power Station site to redevelopment, improve access to Milton Park and accommodate traffic generated by new developments in the area.
	SV 2.7	**Completing the A4130 Didcot Northern Perimeter Road part 3** (NPR3), to relieve congestion on local roads, and to improve access to Milton Park and Didcot A Power Station site from the east.
	SV 2.8	**Delivering Harwell Link Road section 1 (B4493 to A417) and Harwell Link Road section 2 (Hagbourne Hill)** to improve access and connections to Harwell Oxford and Didcot, reduce congestion on the local network, and protect villages from unnecessary through traffic.
	SV 2.9	**Improving Harwell Oxford campus entrance** to facilitate additional trips into/from the site and supplement the improved Chilton Interchange.
	SV 2.10	**Delivering improvements along the A417 corridor** to address congestion, safety and the conflict between the volume of traffic, east-west travel, and access to the villages along this route. Elements of the strategy include junction improvements, bus stop infrastructure, footpath and cycleway improvements and speed limit reviews.
	SV 2.11	**Delivering improvements at Steventon traffic lights at the A4130 / B4017 junction and improvements to Featherbed Lane.** To remove the 'bottle-neck' and improve journey times to the A34, Milton Park and other Didcot employment sites.
	SV 2.12	**Reducing congestion at Rowstock roundabout** through measures to increase capacity of the junction.
	SV 2.13	**Investigating new links to Culham Science Centre** including a new Culham river crossing, Clifton Hampden Bypass and a road connecting Culham Science Centre to the B4015 to link to the Eastern Arc of Oxford.
	SV 2.14	**Promoting schemes to provide relief to villages** within Science Vale which are affected by high levels of through traffic.

2021 - 2025	**SV 2.15**	**Providing improvements to the A4130 between Didcot and Wallingford** to reflect the volume of trips between Wallingford and Didcot. The ability to move reliably and safely along this corridor is important, particularly in helping to support planned employment growth in Science Vale.
2026 - 2031	**SV 2.16**	**Undertaking a corridor study on the A338 from Wantage to the A420, and promoting capacity improvements to the A338 /A415 Frilford lights junction.** This will help to improve accessibility between Wantage, Grove and Oxford.
On-going throughout the plan period 2015 - 2031		**SV 2.17 Promoting the use of sustainable transport** and reducing single occupancy car use for the journey to work through undertaking travel promotions and marketing measures, particularly with partners at Milton Park, Culham Science Centre and Harwell Oxford.
	SV 2.18	**Providing new and substantially upgraded strategic cycle routes** to Milton Park, Harwell Oxford and Culham Science Centre through the Science Vale cycle strategy.
	SV 2.19	**Securing safe and attractive walking and cycling routes as part of planning for new developments.**
	SV 2.20	**Establishing links from new development to Public Rights of Way.**
	SV 2.21	**Establishing a bus route between Grove, Wantage, Milton Park and Didcot.**
	SV 2.22	**Promoting improved sustainable access to Culham Science Centre** through enhanced bus connections and improved cycle routes to Abingdon-on-Thames and Didcot.

Trips within Didcot to town centre facilities and amenities

34. To attract new residents to the area, Science Vale needs to provide a high quality of life by being an attractive place to live, with good access to vibrant town centres providing a wide range of facilities and services.

35. This section focuses on Didcot to reflect the significant scale of the changes that will be happening in Didcot in the coming years. This includes the regeneration of the town centre, extensive housing and employment growth, and the redevelopment of Didcot Station and the Gateway area.

36. Good transport links to access the town centre, as well as provision for active travel and sustainable travel options will enable Didcot to grow. This will be achieved through the following schemes:

Proposal SV 3 – To improve local connectivity to Didcot town centre facilities and amenities by:

Timescale	Proposal	
2015 - 2020	**SV 3.1**	**Ensuring appropriate bus access, infrastructure and service patterns to complement plans for new development and suitably serve key destinations in Didcot town centre** including Didcot Parkway Station, the Orchard Centre and Broadway.
	SV 3.2	**Securing the delivery of capacity improvements at Jubilee Way roundabout,** to improve access to the town centre and support the on-going vitality of the Orchard Centre.
On-going throughout the plan period 2015 - 2031	**SV 3.3**	**Pedestrian and cycle network enhancements** providing improved routes to the town centre and Didcot Station together with better facilities at employment and residential sites, to encourage the use of sustainable, active modes of travel.
	SV 3.4	**Promoting a strategic approach to planning for parking in Didcot** to identify an appropriate balance of parking provision in the town and at the rail station to support town centre vitality.

37. Greater accessibility from Ladygrove to Didcot station and town centre is recognised as important, and the creation of a new northern entrance to Didcot Station is promoted as a way to achieve this. The widening of Cow Lane is not an identified scheme within the Science Vale area strategy due to the significant cost and implications of such a scheme.

Safeguarding

38. We will support South Oxfordshire District Council and the Vale of the White Horse District Council in safeguarding land for schemes in areas where it is possible that significant development may occur in the future, most likely beyond the period of this Plan.

Proposal SV4 – to safeguard and maintain the ability to deliver strategic pieces of infrastructure if required in the future due to significant additional development:

Timescale	Proposal	
On-going throughout the plan period 2015 - 2031	**SV 4.1**	**Safeguarding and protecting the ability to provide a Southern Didcot relief road** to relieve the town centre if significant additional development is allocated to the south of the town in the future.
	SV 4.2	**Safeguarding and protecting the ability to provide a South Abingdon-on-Thames relief road** if significant additional development is allocated to the south of the town in the future. This will provide a direct link from west Abingdon to the A415 to the east and relieve congestion in Abingdon town centre.
	SV 4.3	**Safeguarding and protecting the ability to provide a Wantage Western Link Road** if there is substantial additional development in west Wantage. This would complete the perimeter route for Wantage and provide relief to key roads within the town.
	SV 4.4	**Safeguarding and protecting the ability to provide a station at Grove**

39. A number of other schemes described in this chapter are safeguarded within the Vale of White Horse Local Plan 2031 Part 1: Strategic Sites and Policies (published November 2014).

Funding

40. Funding for the Science Vale area strategy will be from a variety of sources. Due to the large scale of growth we will seek central Government funding where possible and work with the Local Enterprise Partnership, and Local Transport Board to secure income from the Enterprise Zone business rate retention to fund infrastructure.

41. The County Council has successfully been awarded Government funding towards transport schemes from a number of sources including the Local Growth Deal, Local Growth Fund, City Deal, Local Sustainable Transport Funding, and Growing Places Funding through support from the Oxfordshire Local Enterprise Partnership. We will actively seek and bid for future funding as and when it is announced.

42. Developer funding is also important. The Science Vale area strategy identifies a package of transport measures that are required to mitigate the cumulative impact of development across the Science Vale area where the impact of development is not attributable to a single development. Developer contributions will be sought for specific schemes within the Science Vale package using the strategic transport infrastructure contribution rate to mitigate the cumulative impact of development.

43. The level of contribution has been calculated by dividing the funding required to deliver the package of transport measures by the amount of planned growth. This calculation will be reviewed and updated following changes in planned housing growth and infrastructure requirements within Science Vale as part of the Local Plan process.

44. Major residential development sites are required to fund new or improved public transport services to key locations agreed with the County Council until they become commercially viable. Other residential sites should make a contribution based on the estimated cost of an improved commercially viable service across Science Vale, divided proportionally by the amount of planned growth to give a cost per development site.

45. Developments are also required to provide modern bus stop infrastructure, including shelters and Real Time Information, to enhance access to the public transport network. These are usually secured through Section 106 or Section 278 agreements.

46. When the Community Infrastructure Levy (CIL) is introduced by the Vale of the White Horse District Council and South Oxfordshire District Council, contributions will be sought via this new mechanism, as well as via S106 or S278 agreements.

Proposal SV 5 – To mitigate the cumulative impact of development across the Science Vale area and implement the transport measures identified in the Science Vale area strategy we will:

Timescale	Proposal	
On-going throughout the	**SV 5.1**	Secure strategic transport infrastructure contributions from all new development based on

plan period 2015 - 2031		the contribution rate per dwelling or per m2 for non-residential developments.
	SV 5.2	Secure strategic public transport service contributions for new or improved public transport services as well as bus stop infrastructure to support sustainable development.

47. The Strategic Transport Contribution does not include direct mitigation measures, which will be sought separately.

48. This Area Strategy replaces the Didcot Integrated Transport Strategy - 2004/2005 (DidITS). The new Area Strategy accommodates the measures of the DidITS. Planning obligation contributions, secured in order to mitigate the impacts of development, towards DidITS will be able to be used on the LTP4 Science Vale Area Strategy and be in accordance with the planning obligations.

Maps and Plans

49. Figures 1- 3 summarise the key pieces of transport infrastructure required to support the proposed growth and investment in the Science Vale area. Figure 1 shows the main employment sites, future housing developments, and required strategic highways infrastructure. Figure 2 shows the cycle network required to support the proposed growth in the Science Vale area. These include both existing routes and future routes. Figure 3 shows the proposed public transport network and indicative bus priority routes.

References

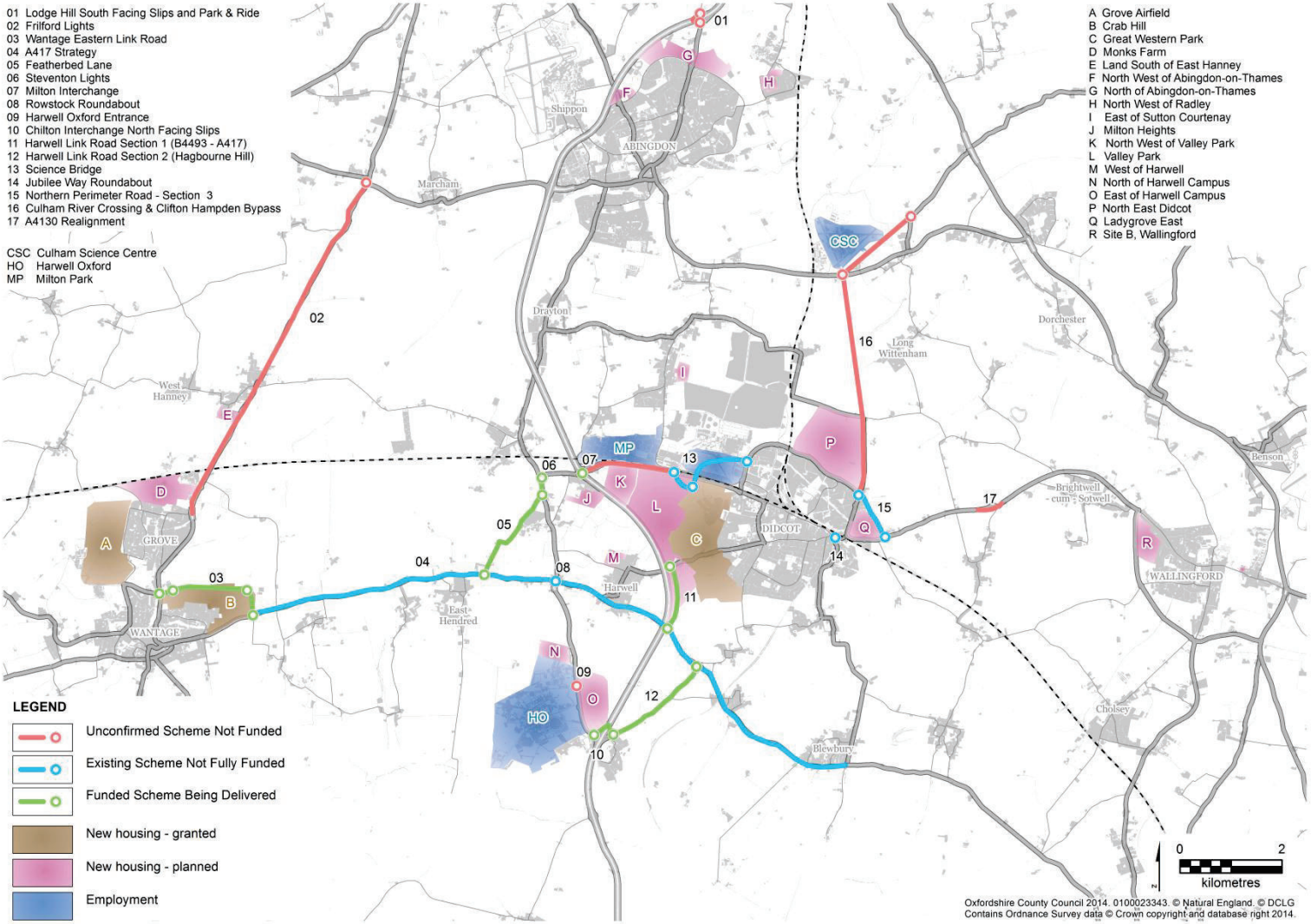
Science Vale Enterprise Zone - http://www.sciencevale.com/

Oxfordshire Local Enterprise Partnership http://www.oxfordshirelep.org.uk/cms/

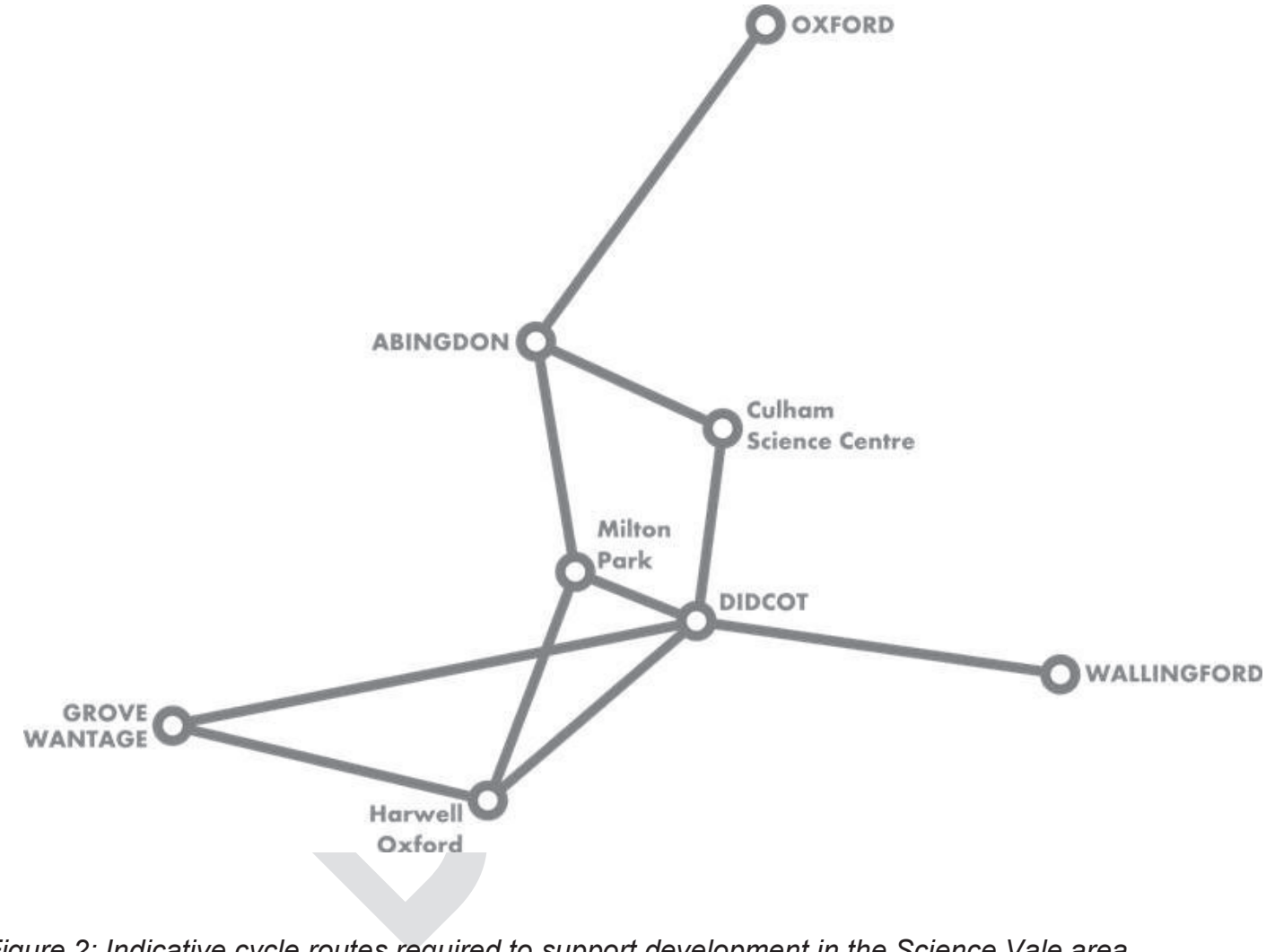
Vale of White Horse Local Plan 2031 Part 1: Strategic Sites and Policies (published November 2014) http://www.whitehorsedc.gov.uk/services-and-advice/planning-and-building/planning-policy/new-local-plan-2031

South Oxfordshire Core Strategy 2027 (adopted December 2012) http://www.southoxon.gov.uk/services-and-advice/planning-and-building/planning-policy

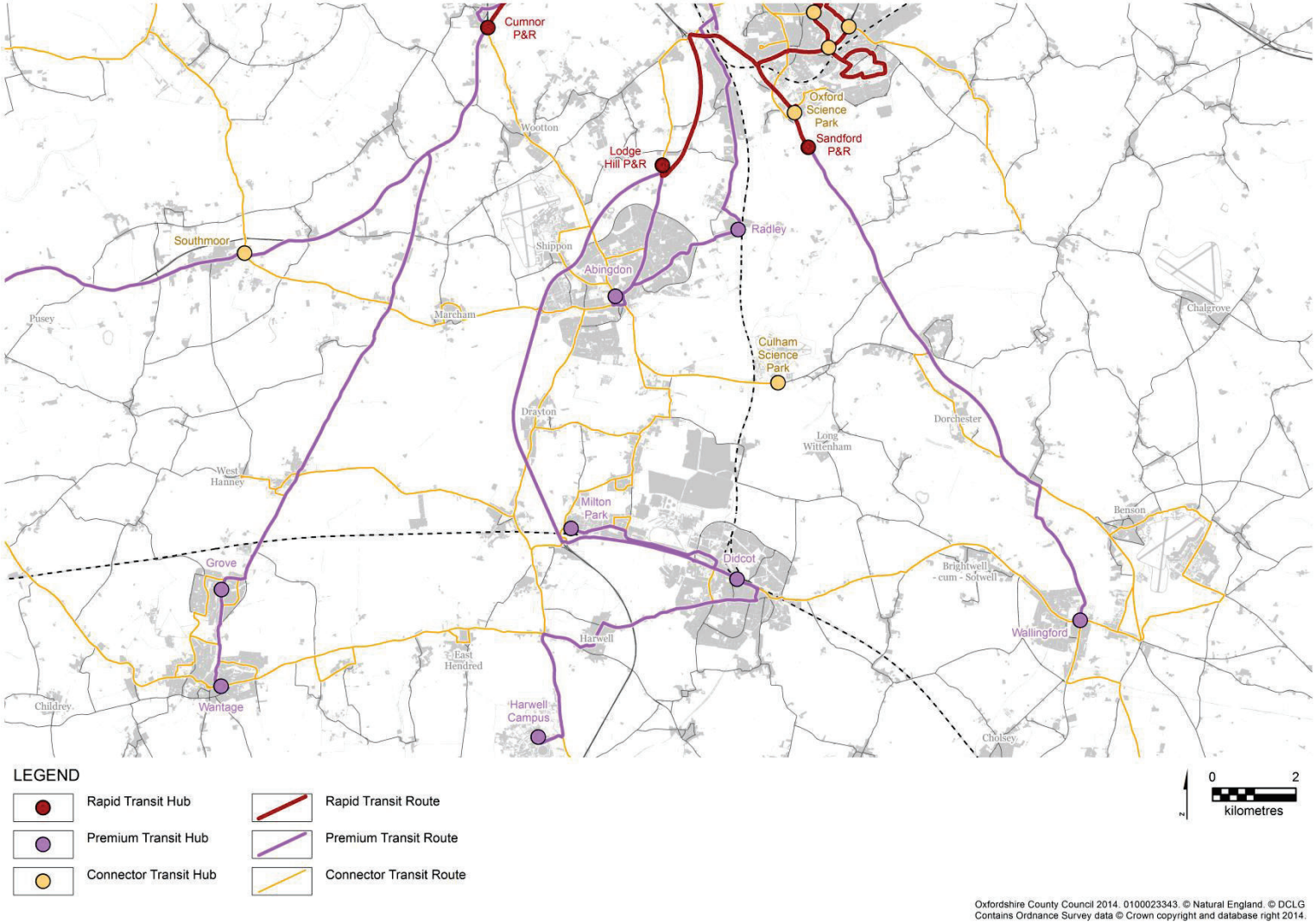
Oxfordshire Local Transport Board - http://www.oxfordshire.gov.uk/cms/content/oxfordshire-local-transport-board-0



Science Vale Figure 1: Indicative plan of highways infrastructure required to support development in Science Vale



Science Vale Figure 2: Indicative cycle routes required to support development in the Science Vale area



Science Vale Figure 3: Science Vale strategic bus map

Bicester Area Strategy

The Local Context

1. Bicester is one of the fastest growing economic centres in the country, with a population of approximately 33,000 people. Its economy is focused on storage, defence and distribution activities, food processing and engineering. Bicester Village shopping outlet is a significant UK tourist attraction, drawing in nearly six million visitors a year, including many from overseas. It benefits from good rail connections with London, which will be improved by a direct connection to London from Bicester Town Station as part of East-West Rail Phase One. Further improvements will come forward as part of East-West Rail Phase Two which will connect Bicester with Milton Keynes, Bletchley and Bedford to the north and Didcot and Reading to the south.

2. The Oxfordshire Local Enterprise Partnership identifies Bicester as part of the Oxfordshire Knowledge Spine (Science Vale – Oxford – Bicester) and within the Strategic Economic Plan this is seen as a key driver for economic growth. Given its advantageous location on the transport network which connects the town with Oxford, Science Vale and the wider south-east region, Bicester is identified for significant residential and economic growth. This is demonstrated through the expansion of Bicester Village, proposed business parks and employment sites allocated in the emerging Local Plan, investment in the town centre as shown by the recently completed £70m town centre redevelopment, and the shift to a low carbon community exemplified by North West Bicester eco development.

3. The Cherwell Local Plan seeks to use this potential to deliver jobs-led growth, supported by housing, with 138.5 ha of employment land, and approximately 10,000 further new homes are planned for Bicester. The Local Plan also sets out an ambition for Bicester to become a greener more pleasant place to live, work and visit.

4. This strategy supports the *Cherwell Local Plan.* The implementation of the *Local Plan* will be helped by proposals and initiatives in the *Bicester Masterplan*. These documents promote an enlarged and vibrant town with a comprehensive range of employment opportunities and local amenities to complement its substantial role in the wider region's economy. The *Local Plan* stresses the importance of securing jobs-led growth in the town to address the critical employment shortfall, and the high levels of out-commuting.

5. The *Local Plan* will enable employment development on allocated sites, with the aim of creating a diverse economy that attracts growth and investment from the business, manufacturing, science and hi-tech sectors. Amongst other sites, employment sites include the Bicester Business Park and South East Bicester that are expected to create up to 9000 jobs. The *Local Plan* also seeks to strengthen the town centre and create additional green and recreational space.

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6. Bicester has been awarded Garden Town status by the government, which will provide funding to help with the delivery of homes, jobs and open space as well as transport infrastructure. The proposal for this includes the provision of a new motorway junction to the south of Junction 9, near to Arncott. This needs further investigation to determine its impact and how this could fit within the overall transport strategy in the area.

7. Enhancing access to the strategic transport network and making it easier for people to travel between homes and jobs is critical in accelerating and accommodating future growth in Bicester. Investment in core transport infrastructure will boost the attractiveness and desirability of Bicester as a place where businesses want to locate and grow, and where people want to live and work.

Transport Strategy Aims

8. The priority for Bicester is to provide the transport infrastructure which supports the aspirations set out in the *Local Plan* and the initiatives for their implementation in the forthcoming *Bicester Masterplan*. This includes tackling the challenges identified in the *Bicester Movement Study* and the further technical reports prepared as part of the Main Modifications to the Local Plan, as well as those specific to Central Government standards for transport in Eco Towns which will be re-stated within the Supplementary Planning Document for NW Bicester. These plans and policies will enable the town to thrive and realise its full growth potential, and its essential role in Oxfordshire's economy.

9. This strategy identifies a series of improvements to increase the overall capacity of transport networks and systems within the locality, enabling them to accommodate the additional trips generated by development; to adapt to their cumulative impact and to mitigate the local environmental impact of increased travel. Where schemes are needed to mitigate one particular development, the developer will be expected to either construct or provide funding for the scheme; where a scheme is required due to the impact of more than one development, each developer will be expected to make a contribution proportional to the scale of their impact. Additional funding may also be sought via the Local Transport Board to the Local Growth Fund and other sources.

10. There is a need for a significant increase in the proportion of trips to be made by public transport, cycling and walking if the anticipated level of growth is to be accommodated. It is essential to provide high quality access to the strategic highway and railway network to secure business investment and encourage people to make Bicester their home.

11. We will:
    - Increase highway capacity on the peripheral routes to make these attractive to employment and longer distance traffic and thereby reduce the strain on the town centre and central corridor.

- Implement a sustainable transport strategy within the town centre, reaching out to residential areas and key destinations.
- Accommodate proposed strategic rail initiatives, including East West Rail and plans for electrification, and a possible future Rail Freight Interchange, in order to strengthen Bicester's position on the national rail network and maximise access to regional economic centres, such as Milton Keynes, Oxford, Banbury, London and Birmingham.

BIC1 – We will improve access and connections between key employment and residential sites and the strategic transport system by:

- **Continuing to work with the Highways Agency to improve connectivity to the strategic highway, including future proposals for the A34, Junctions 9 and 10 of the M40.** We will continue to work in partnership on the A34 and A43 route strategies, as well as the two motorway junctions to relieve congestion, particularly in the peak periods, and connect Bicester into the Science Transit proposals to emphasise the town's attractiveness as an end destination, as well as accommodating trips to Oxford, Science Vale, Banbury, and other nearby centres (along the A41, A34, M40, A43).

- **Delivering effective peripheral routes around the town.** This would enable the delivery of the sustainable transport strategy within the central area by providing a local distributor function as well as offering effective connections to strategic corridors for new residential and employment sites. A package of phased improvements will be agreed alongside the introduction of the sustainable transport measures, including:

  - **Western peripheral corridor:**

    - **Increasing capacity at the Howes Lane / Bucknell Road junction and approaches** to maintain this as part of the strategic peripheral route corridor and to accommodate the increase in traffic using this route, further enabling development in the area, including the North West Bicester development.

    - **Enabling a new more efficient junction with the rail-line** as part of improving the strategic western peripheral route for Bicester.

    - **Improvements to the Lord's Lane / B4100 roundabout** to enable this junction to cope with future growth at an important radial route into / out of the town.

  - **Eastern peripheral corridor:**

    - **Improvements to the Buckingham Road / A4221 junction** to provide the necessary capacity for the additional trips generated from nearby employment and residential development, as well as support the heritage tourism development of the neighbouring Former RAF Bicester site.

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- **Implementing increased link capacity on the A4421 between the Buckingham Road and Gavray Drive** to complement the transport solution at the railway level crossing at Charbridge Lane and facilitate development in the area. This scheme will improve the operation of this section of the eastern perimeter road, and enhance the integration of the North East Bicester Business Park site with the rest of the town.

- **A new link through the South East Bicester development site** is required from the A41 Pioneer Road junction up to Wretchwick Way as an extension to the south east perimeter detailed below and also to provide connectivity through the site, in particular for buses.

o **Southern peripheral corridor:**

- **Improvements to Boundary Way** – the scheme proposed to be implemented by Bicester Village's expansion is essential to this corridor. Further improvements along Boundary Way may need to be undertaken.

Investigating options for a **South East Perimeter Road** from the A41 north of Junction 9, round to the south of Graven Hill and then crossing the A41 to form a new link up to Wretchwick Way. The Graven Hill development will deliver the section round to the south of this site, joining the A41 at the Pioneer Road junction. There are two route options to connect westwards from Graven Hill to the A41 which need fully assessing and taking through a public consultation and decision process.

- The Garden Town proposal for a new motorway junction near Arncott also needs to be assessed in terms of its impact on the need for a south east perimeter road.

- Possible future improvements to the peripheral route may include a potential new link road to the north of the NW Bicester site. Although not required during the timeframe of the Area Strategy, assessment and viability will be undertaken and opportunities to safeguard a route will be taken if they arise.

- **Working closely with the rail industry to deliver solutions at the Charbridge Lane level crossing affected by the East West Rail Project.** A road bridge over the railway at Charbridge Lane is critical for this crucial part of the highway to remain open. We are working with the rail industry to deliver an effective solution that meets the overall transport strategy in terms of the peripheral route corridor and considers the impact on the village of Launton.

- **Working closely with the rail industry and the Department for Transportation to develop a solution to the likely restrictions affecting the London Road as a result of the East West Rail project.** At London Road careful consideration will be given to the reduced accessibility into the town centre resulting from an increased frequency of rail services across London Road level crossing. A solution is required for motorised vehicles, pedestrians

and cyclists where the rail line crosses the road network, as the current proposals will mean that rail traffic inhibits this key corridor connecting to the town centre. This will have a significant negative highway and economic impact and also has the potential to slow the delivery of development sites south of the rail line due to reduced access to the town centre.

- **Supporting the proposals to secure a potential freight interchange at Graven Hill and working with the district and developers to achieve this.** This would reinforce Bicester as a distribution hub within the region's economy and make a significant contribution to the future employment provision in Bicester, especially in the Graven Hill site, which in itself could provide 26 ha of employment land. The south east quadrant of Bicester is viewed to be the most appropriate area for B8 employment uses given the strategic road and rail access. The facility would also assist in removing freight traffic on the M40, A34 and A43, further reducing strain on the strategic road network and benefiting the environment.

- **Working collaboratively on longer term aspirations to rationalise rail station locations within the wider Bicester area.**

- **Delivering a Park & Ride facility adjacent to the A41, close to the Vendee Drive junction**, to serve Bicester town centre, employment centres and rail stations, Bicester Village and Oxford, alleviating congestion along the A41 by intercepting car trips and promoting increased use of the high quality bus services.

- **Reviewing key county road links out of Bicester, including those that cross the county boundary**. A review of whether the B4100 between Bicester and A43 is still fit for purpose will be undertaken including whether an upgrade is required from its 'B' road status. Similarly a review of A41 to Aylesbury and A4421 to Buckingham will also be undertaken. The interrelationship of development at Upper Heyford with that of Bicester, connected by the B4030, will be considered carefully.

12. Providing the above infrastructure and connections will be critical to attracting employment growth in Bicester, especially for the peripheral development sites. Effective transport links between the residential areas, employment sites and other facilities will facilitate economic growth, and provide more opportunities for people to live and work in Bicester, thus reducing the current level of out-commuting. The reduction in the length of people's journeys provides opportunities for them to use non-car modes of travel. Complementary investment in the town's bus, walking and cycling network will have an essential role in accommodating growth, encouraging sustainable travel choices, and raising the quality of the environment. A sustainable transport strategy for Bicester is being developed by Cherwell District Council and has particularly concentrated on the cycle infrastructure improvements and changing travel behaviour through Smarter Choices. This needs to be imbedded within the overall transport strategy.

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12. Bus priority measures may be required at anticipated pinch points on the main approaches to the town centre as future developments come forward. This is likely to include the Bucknell Road/Field Street junction, and the Buckingham Road approach to the three arm roundabout.

BIC2 – We will work to reduce the proportion of journeys made by private car by implementing a Sustainable Transport Strategy by:

- **Implementing Bicester town centre highway modifications.** In combination with improvements to the peripheral routes, highway restrictions in Bicester Town Centre will be considered on through routes in order to reduce through traffic in the town centre, constraining it to the peripheral routes and promoting more sustainable travel options in the town.

  A review of the purpose and impact of the Buckingham and Banbury Road chicanes will be undertaken to understand whether they have a positive impact on reducing town centre through traffic movements any more, particularly for HGVs. If there is no clear benefit, they shall be removed.

- **Enhancing pedestrian, cycle and public transport links to the Bicester Town Station and Bicester North Station and key employment sites**. Sustainable access between the railway stations and business areas will also be improved and promoted to attract businesses to locate in Bicester. New employment should be located where there are effective, reliable, frequent and well-timed bus and rail services and safe and appropriate cycle access. Accessibility should be considered not only to and from the sites within the town itself, but also to key external destinations.

- We will use the opportunities offered by the redevelopment of **Bicester Town Railway Station t**o create a 'state-of-the-art' multi-modal interchange offering high quality facilities for pedestrians, bus users and cyclists, including a cycle hub incorporating hire and repairs. We will also improve walking and cycling routes leading to the station, in particular, the walking route between the station and the town centre, as well as creating a new walking route linking the station with Langford Village and the expanded Bicester Village outlet and the Kingsmere estate.

- **Improving Bicester's bus services along key routes** to connect residential areas with existing and future employment centres, particularly Graven Hill, North West Bicester, the Launton Road Industrial estate, Bicester Business Park, South-East Bicester and North-East Bicester Business Parks. This will be achieved by using funding from development to enhance the quality and frequency of existing services, with the aim of services reaching full commercial viability.

- **Providing bus priority where feasible to ease movements** – in particular there is the need to find a solution to issues at the Bucknell Road / Field Street junction which is proposed to become an important bus route as North West Bicester builds out.

- **Significantly improving public transport connectivity with other key areas of economic growth within Oxfordshire**, through access to high-quality, high frequency services on the core network between Bicester, Oxford, Banbury, Witney and Science Vale, operating on a 'turn up and go' basis throughout the day; integrated connections between local bus services and services on the core network; and flexible, cashless payment, with the ability to switch between modes of travel without penalty or the need to make separate payments. Proposed network improvements are shown in Figure 2.

- **Growth at Upper Heyford** will need to be considered in terms of improved public transport frequency and connectivity with Bicester.

- **Providing improved public transport infrastructure** where there are identified needs arising from strategic development sites and working with Bicester Town Council to enhance passenger information at strategic locations, and potential bus priority measures.

- **Improving access to Bicester Village.** An essential element of mitigating Bicester Village's impact is to improve connectivity with the local area through walking and cycling route improvements to key destinations. This in combination with Highway and Public Transport Infrastructure improvements will reduce the local impact in the area. Specifically a new Park and Ride service in close proximity to Bicester Village will be provided in 2015, improving its connections with Oxford and Bicester town centre.

- **Providing new sections of urban pedestrian and cycle routes to better connect residential developments with the town centre and key employment destinations**. The sustainable transport strategy has identified a number of cycle improvement schemes. This work and other strategy work has included the need for:

i. Off road cycle facilities will be considered along premium cycle routes;
ii. A direct link from the centre of North West Bicester (Eco Town) to Bicester North Station and onwards to the Launton Road industrial estate;
iii. Options along Buckingham Road will be investigated, such as a shuttle working system under the rail bridge for vehicular traffic, in order to enable higher quality cycling and pedestrian improvements along this key corridor into the town centre;
iv. Improved pedestrian connections to Graven Hill including A41 crossing options to reduce severance and increase the accessibility of this site;
v. A new link through the town park to Kings End to reinforce the east-west pedestrian and cycle links across Bicester;
vi. Promoting George Street as a pedestrian route linking to the Sports Centre, Community College and town centre;
vii. Providing a pedestrian footbridge over the railway as part of East West Rail to maintain access to the national cycle route;
viii. Southern connectivity project to provide sustainable connections between housing and employment developments to the south of the town;
ix. Improved cycle provision on the north side of Boundary Way would provide clear connectivity benefits; and

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x. Middleton Stoney Road will become increasingly heavily trafficked in the coming years; the provision of a cycle facility along this route is considered increasingly necessary.
This is not an exhaustive list.

- **Public realm improvements in Bicester Market Square and The Causeway** to enhance the quality of the pedestrian environment by creating a sense of 'place'. This will complement the major investment in the town centre redevelopment and will be progressed once other developments impacting on the Market Square are completed.

- **Securing green links between proposed development sites on the outskirts of the town and existing Public Rights of Way, providing a series of leisure / health walks.** We will also pursue opportunities to join a number of missing links in the Public Rights Of Way network through working with developers.

13. The Eco Bicester Travel Behaviour Demonstration Project showed that working closely with a small number of adults to get them back into cycling was effective. The Bike Loan element of this project has now been taken on by the community through Bicester Green. It is clear that a combination of behavioural change, as well as physical improvements, is required to really make a difference. The sustainable transport strategy is identifying ways to continue with influencing behaviour through Smarter Choices.

BIC3 – We will increase people's awareness of the travel choices available in Bicester, which should improve public health and wellbeing, by:

- **Undertaking travel promotions and marketing measures** to complement the wider Bicester Vision place-making initiatives to strengthen the town as a place to live, work and invest in commercial enterprises. With the Park & Ride and significant rail service improvements due to be available over the next few years, there is an opportunity to work collaboratively with others to promote these modes. Developer's Travel Plans will also offer the opportunity to increase the use of walking, cycling and public transport measures by increasing people's awareness of the travel choices available.

- **Developing a coordinated parking strategy in partnership with Cherwell District Council** to identify commuter parking areas and provide an appropriate balance of parking provision in the town and around the railway stations, including the quantity and location of short stay and long stay parking, as well as appropriate parking management and pricing mechanisms. This may require rationalising parking in some areas.

- **Discourage undesirable routeing of traffic by developing a signage strategy**, improving the directional signage on the town's road network by directing strategic traffic away from the town centre. This will alleviate congestion on the central corridor and enhance the quality of the environment in the town centre. It will also support Cherwell District Council's emerging Air Quality Strategy, which aims to tackle air pollution in the Kings End / Queens

Avenue Air Quality Management Area.

Encouraging changes in travel behaviour through Smarter Choices

- **Coordinated information and advance notice of construction closures and traffic related issues** will be needed to ensure that the town's transport network operates efficiently during the various improvement and building works.

- **The North West Bicester development site** will provide new approaches to transport, including a heavy emphasis on sustainable modes and travel choice advice, as well as early provision of bus services and cycle routes. This may unlock opportunities for wider travel choice options.

Scheme Delivery

14. Where transport schemes are needed to mitigate the impact of a particular development, provision of infrastructure and/or Transport Contributions will be secured from the developer.

15. This Area Strategy identifies a package of transport measures that are required to mitigate the cumulative impact of development in Bicester. Developer contributions will therefore be sought towards schemes within the Area Strategy using a strategic transport infrastructure contribution rate to mitigate the cumulative impact of development. Additional funding for these strategic schemes may also be sought via the Local Transport Board to the Local Growth Fund and other sources.

16. Major residential development sites are required to fund new or improved public transport services to key locations agreed with the County Council until they become commercially viable. Other residential sites will be required to make a public transport contribution towards improving bus services based on the size of the development.

17. Developments are also required to provide modern bus stop infrastructure, including shelters and Real Time Information, to enhance access to the public transport network. These are usually secured through Section 106 or Section 278 agreements.

18. When the Community Infrastructure Levy (CIL) is introduced by Cherwell District Council contributions will be sought via this new mechanism, as well as via S106 or S278 agreements.

19. This Area Strategy replaces the Bicester Integrated Transport and Land Use Strategy – 2000 (BicTLUS). Planning obligation contributions, secured in order to mitigate the impacts of development, towards BicTLUS will be able to be used to deliver the proposals in this strategy and be in accordance with the planning obligations.

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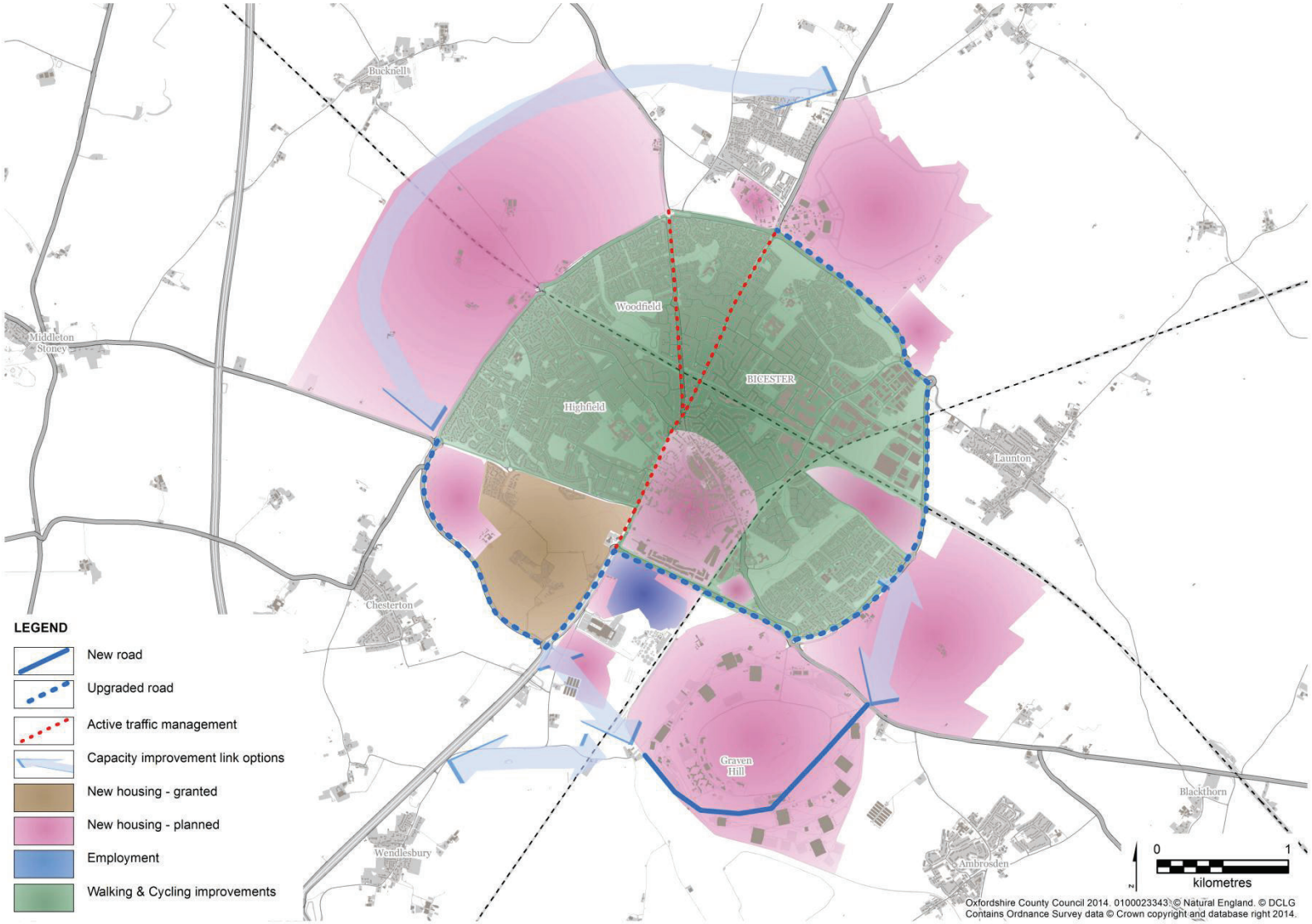
BIC4 – to mitigate the cumulative impact of development within Bicester and to implement the measures identified in the Bicester area transport strategy we will:

- **Secure strategic transport infrastructure contributions** from all new development based on the contribution rate per dwelling or per m2 for non-residential developments
- **Secure strategic public transport service contributions** for new or improved public transport services as well as bus stop infrastructure to support sustainable development.

Maps and Plans

20. The maps below show the key pieces of transport infrastructure required to deliver the proposed growth and investment in the area.



Bicester Figure 1: Indicative map of transport infrastructure and proposed growth in Bicester

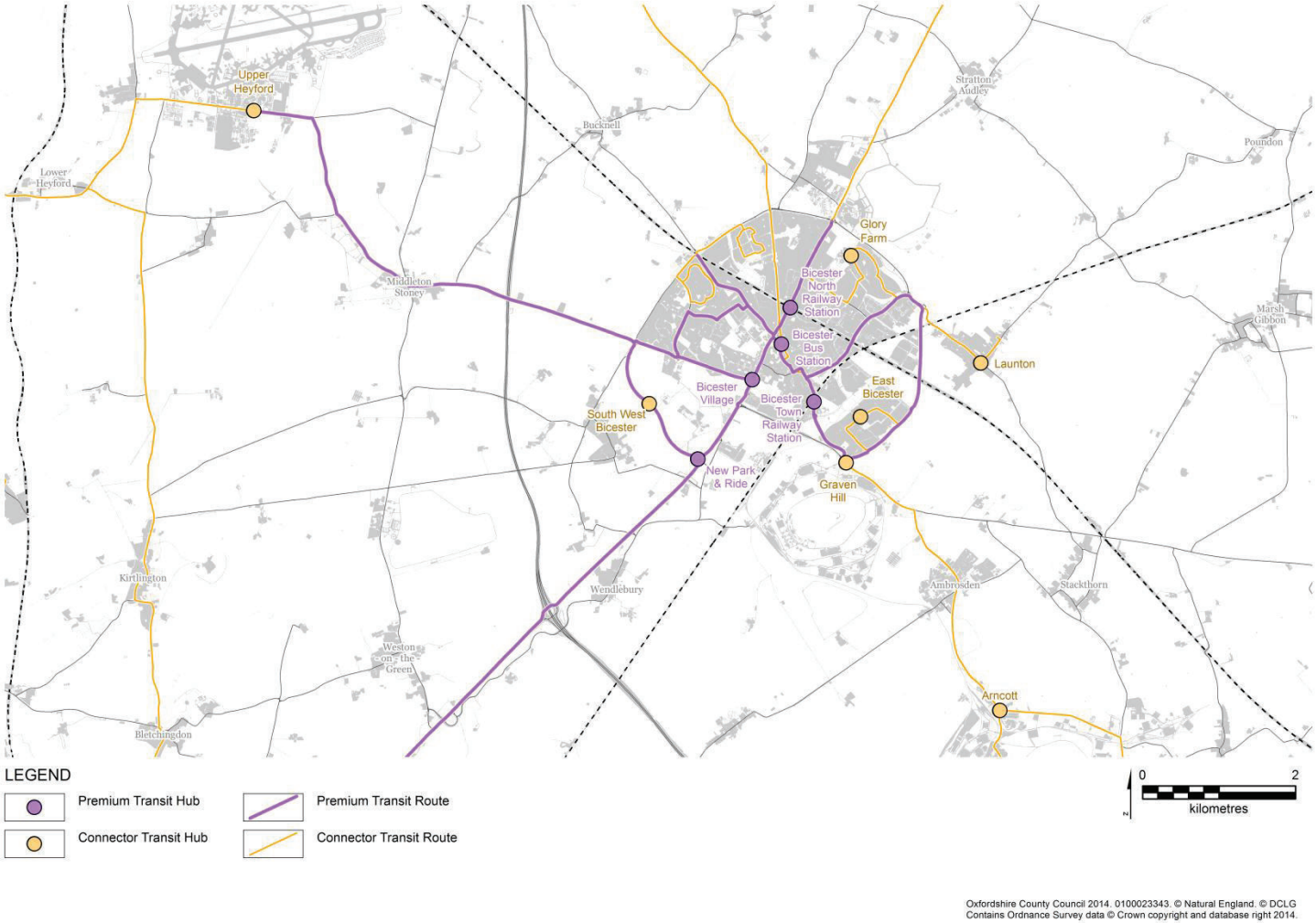


Figure 2: Bicester's strategic bus network

Banbury Area Strategy

The Local Context

1. Banbury is Cherwell's largest town and Oxfordshire's second largest settlement, with a population of nearly 47,000[1]. Banbury acts as a Primary Regional Centre that serves a wide sub-region, with a diverse economy focused on manufacturing, logistics, distribution and services and increasingly, high tech manufacturing. In addition to provision of significant employment opportunities, the town also provides a focus for major retail, housing, cultural, leisure and community activities.

2. Located in north Oxfordshire, Banbury's central position in the wider region and its excellent transport links means that the town has a far-reaching catchment and area of influence extending north to Birmingham, Coventry and Northampton; east to Milton Keynes, Brackley and Buckingham; west to Stratford on Avon and Chipping Norton; and south to Oxford, Bicester and Aylesbury.

3. The aim in Banbury is to strengthen the town centre and its economy by boosting its vitality and attractiveness through strategic investment and regeneration thereby providing a full range of facilities, whilst safeguarding the town's historical character.

4. The Cherwell Local Plan anticipates that the town will continue to grow significantly by 2031, with new employment and residential areas proposed, and creation of a more diverse economy. By 2031, the Local Plan[2] proposes that there will be an additional 7,000 houses[3] and 7,000 jobs in Banbury, at key employment sites including Central M40, to the east of Banbury (2,500 jobs); Southam Road (1,000 jobs); and on land North East of M40 Junction 11 (3,500 jobs)[4]. These are shown in Figure 15.1.

5. The emerging Banbury Masterplan supports the Local Plan proposals and will provide the overall framework and Vision for guiding the sustainable growth of the town to 2031 and beyond. It aims to rejuvenate the town centre with a focus on developing shopping, leisure and night time economy activities, and to secure the long term role of the town centre.

6. This Transport Strategy for Banbury supports delivery of the Cherwell Local Plan; the Banbury Masterplan and its overall Vision for Banbury; and the Canalside Masterplan/ SPD.

[1] Census Data 2011, NOMIS
[2] Proposed Modifications to the Submission Local Plan 2016-2031 (August 2014)
[3] Inclusive of committed development and Cherwell Local Plan Main Modifications (August 2014)
[4] Land North East of Junction 11 is the 'Banbury 15' proposal in the Cherwell Local Plan Main Modifications (August 2014), subject to an EiP in December 2014.

Transport in Banbury

7. Banbury has excellent road connections, with access to the M40 via Junction 11 and with several strategic A roads serving the town. Movement to, from and within Banbury has historically been influenced by a range of physical and environmental constraints including the rail line through the centre of the town and the Oxford Canal and River Cherwell, both of which dissect the town from north to south. The historic areas of Banbury also influence traffic movements, particularly around the town centre where there are a number of one-way, narrow and pedestrianised areas.

8. Banbury rail station is strategically located on the rail network, between London and Birmingham. New investment in rail infrastructure has substantially reduced the travel time from Banbury to both cities, with regular high quality train services serving Banbury and excellent links to other centres including Bicester and Oxford. Nationally, there are emerging rail proposals for strategic electrification upgrades which are to be undertaken on the Oxford to Banbury line and which are likely to have a significant impact on the town's rail station and adjacent infrastructure.

Transport Strategy Aims

9. This Transport Strategy identifies a series of improvements to address the existing transport issues in Banbury, and to manage the increased travel demand that will be generated by development in the town. The Strategy will:

    - Deliver infrastructure improvements to increase the overall capacity of the local transport network whilst also supporting sustainable travel.
    - Facilitate and promote sustainable travel for trips to, in and around Banbury, including use of the bus, walking and cycling. A step-change in the increased use of sustainable transport modes is essential to support growth in Banbury. The Sustainable Transport element of the Strategy will play a key role in reducing the volume of traffic associated with the town's significant growth and mitigating the traffic impacts on local roads serving Banbury and the surrounding villages.

Infrastructure Improvements

10. Infrastructure improvements to improve operation of the existing highway network; address current transport issues in the town; and protect sensitive areas, continue to form a key element of the Transport Strategy for Banbury[5]. These improvements comprise:

    - Traffic calming along A361 the South Bar Street/ Horsefair corridor to

[5] As identified in the Banbury Movement Study, 2013

reduce traffic speeds and deter use of this route. This is an historic corridor which has recently been declared an Air Quality Management Area (AQMA), highlighting the importance of protecting this corridor.

- Promotion of Bankside, comprising: i) Removal of traffic calming along Bankside; ii) Signalisation of Hightown/ Bankside junction; and iii) Signal timing optimisation at Swan Close Road. This is being progressed and funded as part of the Bankside development.
- Developing the Cherwell Street 'Eastern Corridor' as the preferred north-south route through the town. This will include improvements to the Bridge Street / Cherwell Street junction, and provision of additional capacity at the Bloxham Road (A361) / South Bar Street junction. This will be delivered in conjunction with town centre redevelopment and the Canalside development.

11. Additional infrastructure improvements will also be delivered to support future regeneration of Banbury and the Local Plan Modifications development proposals:

- A361 Bloxham Road to A4260 Oxford Road Link Road: The co-ordinated approach to development to the south of Banbury as proposed in the Local Plan Modifications (August 2014), will enable provision of essential infrastructure including delivery of an east-west link from A361 Bloxham Road to join White Post Road. This link will support operation of commercially viable bus services through the site, increasing accessibility and long term sustainability of the development.
- Improvements along the Hennef Way to M40 Junction 11 corridor (an AQMA), including:
    i. Hennef Way/ Southam Road and Hennef Way/ Concord Avenue improvements.
    ii. Hennef Way/ Ermont Way improvements: replacement of the existing roundabout with a signalised junction.
    iii. Ermont Way/ Middleton Road improvements: increased capacity provided at entry to roundabout.
    iv. Junction improvements/ traffic signal optimisation along Hennef Way and at M40 Junction 11.
    v. Increasing the capacity of junctions along Warwick Road (B4100), including the roundabout junctions with A422 Ruscote Avenue and Orchard Way.

12. In the longer term (post 2024), there is likely to be a need for additional road capacity to manage anticipated traffic growth at M40 Junction 11. A link road east of Junction 11 is a potential option and would provide a strategic solution, helping mitigate the impact of traffic travelling to/from Banbury from surrounding areas including from the M40. A link road over the railway from Tramway to Higham Way or a south east link road may also be required in the longer term to manage traffic movements within the town. These options will be assessed by the County Council.

13. To improve traffic circulation around Banbury, signage will be reviewed and enhanced. Car parking in the town centre will also be reviewed and the distribution of car parks improved. Car parking matrix signs will be introduced to signpost drivers more effectively to car parks with spare parking capacity.

BAN1 – We will seek opportunities to deliver transport schemes which will support the regeneration and growth of Banbury to 2031 and protect the historically sensitive areas of the town through:

- Traffic calming along A361 the South Bar Street/ Horsefair corridor.
- Promotion of Bankside .
- Bridge Street/ Cherwell Street improvements.
- Bloxham Road (A361)/ South Bar Street improvements.
- Increasing the capacity of junctions along Warwick Road (B4100).
- Hennef Way/ Southam Road improvements.
- Hennef Way/ Concord Avenue improvements,
- Hennef Way/ Ermont Way improvements.
- Ermont Way/ Middleton Road improvements.
- Provision of a link road from Higham Way to the Central M40 site.
- Provision of A361 Bloxham Road to A4260 Oxford Road Link Road.
- Provision of a link road east of M40 Junction 11 (Overthorpe Road to A422), if required.
- Potential link road crossing from Tramway to Higham Way.
- Reviewing the highway signage on routes into the town centre to sign north-south through-traffic away from sensitive areas of the town centre and promote appropriate route choices at key decision making junctions, especially on Oxford Road A4260.
- Car park review and improvements, and provision of car park matrix signs.

Sustainable Transport Strategy

14. Travel to Work Census data (2011) highlights the significant opportunity that exists for encouraging sustainable travel in Banbury and delivering a step-change in the use of sustainable modes for travel around the town. Whilst a significant number of Banbury residents travel to Oxford for work, 60% of journey to work trips are currently undertaken within the town i.e. with a home origin and a work destination in Banbury. However, despite the local pattern of work trips, whilst 32% of these trips are undertaken on foot, 57% of these local trips are undertaken by car. Only 3% are undertaken by bus and 6% by cycle.

15. A Bus Strategy for Banbury is therefore being developed with the aim of increasing use of the bus, particularly for peak hour journeys. A

comprehensive review is being undertaken of bus operations in the town which will identify short, medium and long term infrastructure and service requirements.

16. Service improvements will include enhancement of the town's bus network, with a focus on improving direct links between residential areas and key employment, leisure and retail destinations, and the rail station. There will be a particular emphasis on improving bus links between residential development in the west of Banbury and employment sites on the east side of town (see Figure 15.2). This will involve working closely with a range of stakeholders including Cherwell District Council, bus operators, developers, local employers and business groups.

17. Bus priority at key congestion pinch points within Banbury will also be considered and improvements, including bus-only access links, will be delivered where required. This will complement bus service enhancements by enabling faster, more reliable bus journeys to ensure that the bus becomes a genuinely viable alternative to the car.

18. The existing bus station in Banbury is unwelcoming and under-used. The Bus Strategy will therefore include a review of the need for a bus station, including layover requirements, and the appropriateness of its current location in relation to town centre regeneration proposals. A new bus station facility on the George Street car park, including linkages with the town centre, has been identified as one option to be explored.

BAN2 – We will work closely with Cherwell District Council and other strategic partners to deliver infrastructure and junction improvements to support increased bus use in Banbury. This will focus particularly on the provision of direct links between existing and proposed residential areas, key employment sites and the town centre by:

i. Delivering short, medium and long term infrastructure improvements in the town centre to support quicker and more reliable bus journeys.

ii. Reviewing and developing the town's bus network and enhancing existing bus services/ providing additional services, with the long term aim for services to reach full commercial viability. Service enhancements will be funded through developer contributions. Developing inter-urban services through enhancement of existing bus services or providing new services.

iii. Working with public transport operators to ensure the public has access to high quality public transport infrastructure and passenger information.

iv. Reviewing the need for a bus station in Banbury, and rejuvenating and/or relocating the existing Bus Station

19. The Government's plans to electrify the rail line through Banbury will

provide a catalyst for economic growth and will result in increased passengers at Banbury Rail Station. We will take advantage of the opportunities created by electrification, to revitalise the Rail Station and improve access to it. The Bus Strategy will include identification of proposals for improving bus links to the Rail Station.

20. Improvements to the Bridge Street junction, together with supporting public realm enhancements, will also enhance connectivity of the railway station with the town centre, to accommodate trips associated with development in the area and promote sustainable access.

BAN3 - We will strengthen Banbury's position on the rail network through revitalising the railway station and improving pedestrian, cycle and bus access to the station.

- We will work with our strategic partners to develop Banbury Station as a transport interchange. This is likely to involve re-designing the station forecourt to create an interchange that will feature a taxi rank, better cycle facilities (including cycle storage), and more pedestrian space, with improved public realm giving a sense of arrival.
- We will improve walking, cycling and public transport links to the station in order to meet future demand and to better connect the station to the town.

21. Walking and cycling will be promoted and encouraged for short trips in Banbury, through improvements to pedestrian and cycle infrastructure. As well as reducing car trips on the network, this will also promote healthy and active transport, as well as complement Cherwell District Council's emerging Air Quality Strategy.

22. The current cycle network is fragmented and does not encourage people to consider cycling. We will involve local users in auditing potential cycling routes within the town using cyclability audits. A network of cycle routes will be developed over time to serve those areas which are identified as having the greatest potential for an increase in cycling. The initial focus will be on improvements to cycle routes connecting residential areas in the west of Banbury to employment areas in the east but more generally, work, school and shopping trips, and access to the rail station, will be prioritised.

BAN 4 - We will work closely with Cherwell District Council and other strategic partners, local users and developers to provide facilities for pedestrians and cyclists and we will work to fill in the gaps in the walking and cycling network, including Public Rights of Way.

23. Residential Travel Plans and Workplace Travel Plans will be secured for all new developments that meet OCC's thresholds. Residential developers will be expected to support and promote sustainable travel options to new occupiers e.g. through personalised travel planning,

whilst occupiers of employment sites will be required to implement a Workplace Travel Plan.

24. With the significant amount of employment proposed in Banbury, Delivery & Servicing Plans (DSPs) will also be an important tool for managing trips on the road network and protecting historic and sensitive areas. For example, DSPs will provide a mechanism for encouraging deliveries to take place outside of peak hours, and for larger vehicles to use designated routes.

25. Construction Logistics Plans will also be required for development sites.

BAN 5 - Travel Plans; Delivery & Servicing Plans; and Construction Logistics Plans will be secured for all new developments that meet OCC's thresholds. Travel Plan/ DSP monitoring contributions will be secured.

This policy supports delivery of the Sustainable Transport Strategy.

Scheme Delivery

26. Where transport schemes are needed to mitigate the impact of a particular development, provision of infrastructure and/or Transport Contributions will be secured from the developer.

27. This Area Strategy also identifies a package of transport measures that are required to mitigate the cumulative impact of development in Banbury. Developer contributions will therefore be sought towards schemes within the Area Strategy using a strategic transport infrastructure contribution rate to mitigate the cumulative impact of development. Additional funding for these strategic schemes may also be sought via the Local Transport Board to the Local Growth Fund and other sources.

28 Major residential development sites are required to fund new or improved public transport services to key locations agreed with the County Council until they become commercially viable. Other residential sites will be required to make a public transport contribution towards improving bus services based on the size of the development.

29. Developments are also required to provide modern bus stop infrastructure, including shelters and Real Time Information, to enhance access to the public transport network. These are usually secured through Section 106 or Section 278 agreements.

30. When the Community Infrastructure Levy (CIL) is introduced by Cherwell District Council contributions will be sought via this new mechanism, as well as via S106 or S278 agreements.

BAN 6 - Where schemes are needed to mitigate one particular development, the developer will be expected to deliver the infrastructure directly, or

provide funding for the scheme. Where a scheme is required due to the impact of more than one development, each developer will be expected to make a contribution proportional to the scale of their impact. This will include contributions towards infrastructure improvements set out in Cherwell District Council's Infrastructure Delivery Plan for Banbury, as well as bus service enhancements and infrastructure improvements.

Oxfordshire County Council is working towards establishing a strategic Transport Contribution rate for developer funding, which will be adopted in a future update of this strategy.

31. This Area Strategy replaces the Banbury Integrated Transport and Land Use Study – 2000 (BITLUS). Planning obligation contributions, secured in order to mitigate the impacts of development, towards BITLUS will be able to be used to deliver the proposals in this strategy and be in accordance with the planning obligations.

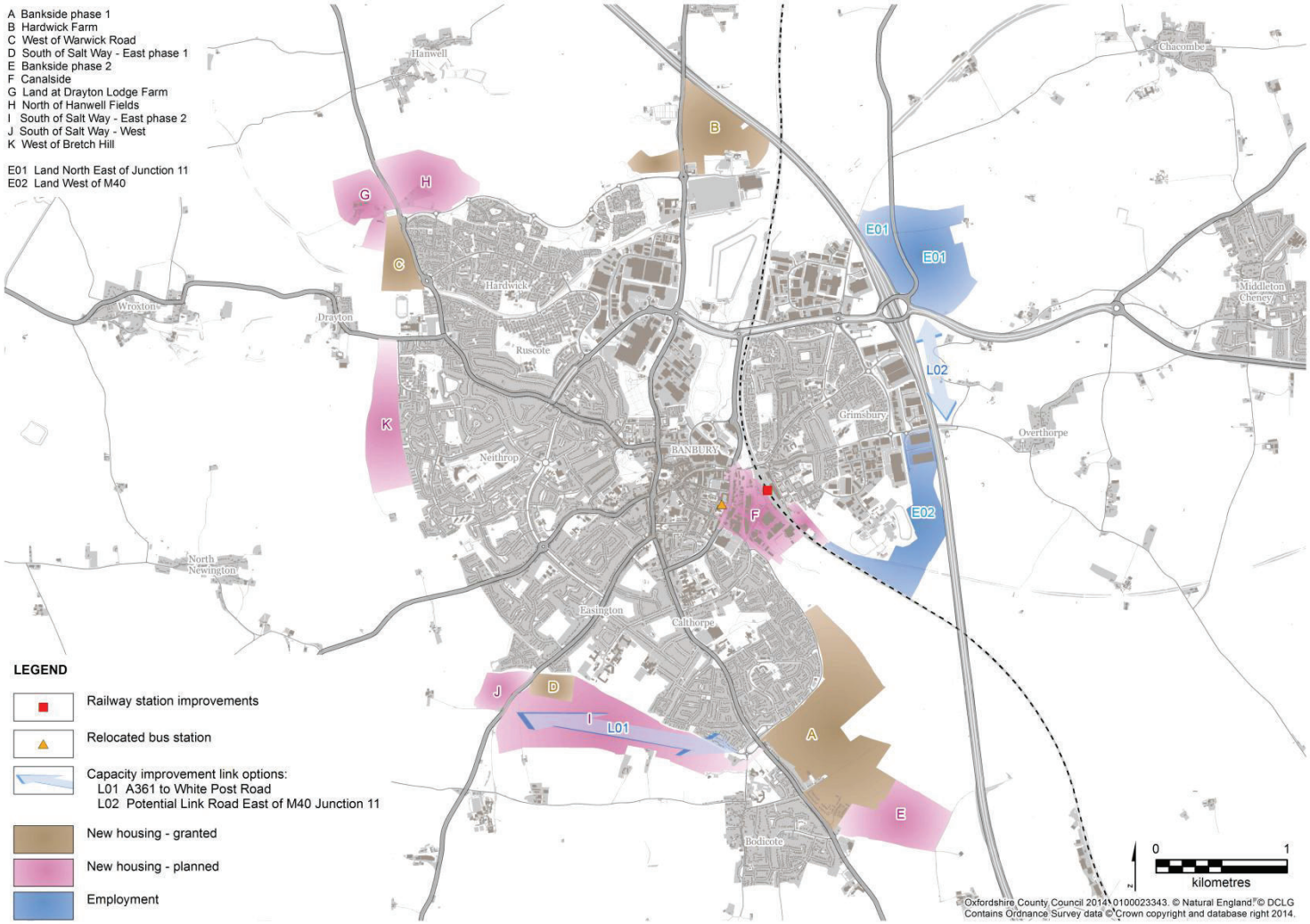
32. A comprehensive list of transport schemes proposed for Banbury can be found in: Link to infrastructure development plan produced for CDC Local Plan (Nov 2014)

References

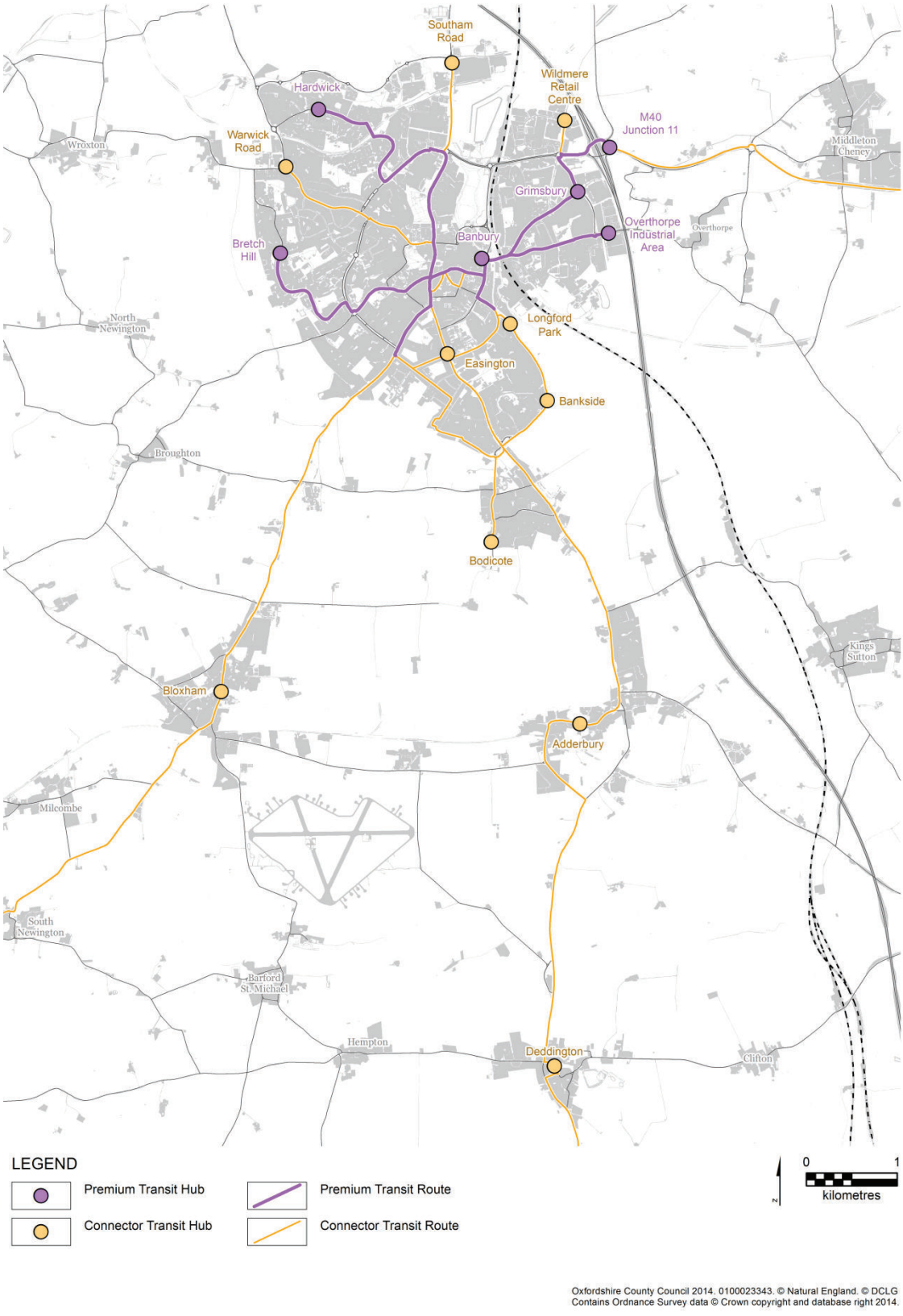
- Cherwell Local Plan – and Main Mods., August 2014
- Banbury Movement Study, Feb2013 – but soon to be updated
- CDC Infrastructure Delivery Plan, Nov 2014
- Banbury Masterplan, Nov 2014
- Banbury SATURN Modelling Technical Reports, Atkins, Nov 2014

Maps and Plans

The maps below show the key pieces of transport infrastructure required to deliver the proposed growth and investment in the area.



Banbury Figure 1: Indicative map of transport infrastructure and proposed growth in Banbury



Banbury Figure 2: Banbury Strategic Bus Network

Witney Area Strategy

1. Witney is the largest town in West Oxfordshire, containing the main commercial, leisure, health and other services for the district. It has a diverse economy and is home to some of Oxfordshire's most successful high technology manufacturing and engineering firms. The historic Market Square, High Street, Woolgate Centre and Marriott's Walk make Witney an outstanding retail and leisure attraction.

2. The travel to work data from the 2011 Census indicates that 32% of all trips to work by residents of Witney are to workplaces within Witney. Of those internal trips, 47% travel by car, 34% by foot, and 11% by bicycle. Only 2% travel by bus, indicating that existing bus routes may not be providing attractive travel between residential areas and employment areas. The level of walking and cycling at 45% may mean the size and character of Witney makes walking and cycling convenient travel options.

3. For residents that work outside of Witney, there are strong trends for travel to employment in Oxford and locally in West Oxfordshire. For trips to Oxford 71% are travelling by car (this would include those using Park and Ride), whilst 19% are using the bus services, and 2% cycling.

4. This Area Strategy is being developed alongside the emerging West Oxfordshire Local Plan. Growth proposals from the West Oxfordshire District Council (WODC) Housing Consultation paper (July 2014) comprise 3,550 new homes in the Witney sub area by 2029. Three Strategic Development Areas are identified: 1,000 homes at West Witney, 400 at East Witney and 1000 homes at North Witney. Twenty hectares of land has been identified for employment to enable Witney to attract inward investment and new jobs. The draft Local Plan (2012) also contains policies to maintain and enhance Witney's town centre shopping, leisure and cultural attractions.

5. The Witney Area transport Strategy will be revised following the adoption, by West Oxfordshire District Council, of the Local Plan. This chapter has been updated since the publication of Local Transport Plan 3 (May 2014) in light of changes to overarching policy, and progress on schemes in the Witney area.

Transport Strategy Objectives

6. The key transport objectives for Witney are to:

- Establish a transport network that supports future growth and attracts economic investment by improving access to the strategic transport networks and managing through traffic;
- Mitigate the local environmental impact of increased travel by addressing congestion and poor air quality through improving opportunities for people to travel on foot, by cycle, and public transport;

- Support town centre vitality, by providing a local transport network that enables easy access to services by sustainable means.

7. This strategy divides travel demands at Witney into three categories, which are discussed in turn:
   - Witney's Strategic Transport Networks
   - Witney's Local Transport Networks
   - Beyond Witney

Witney's Strategic Transport Networks

8. The A40 is the main strategic route through West Oxfordshire, however there is limited access to the A40 at Witney. The A415 Ducklington Lane junction acts as the main all movement junction with the A40, this has recently been upgraded to improve capacity. To the east of Witney the B4022 Shores Green junction provides west facing slip roads only for trips to and from Oxford. This restricted movement junction, coupled with Bridge Street providing the only river crossing, linking central and east Witney, results in considerable congestion and journey time delay. Housing and employment growth at Witney will place increasing demand on the existing junctions with the A40.

9. Access to the A40 from West Witney will be enhanced by an all movement junction at Downs Road, which has been secured through the Strategic Development Area at West Witney. The A40 Downs Road junction will relieve some pressure on Witney's roads and reduce levels of through traffic by providing direct access from the A40 to both the West Witney housing and employment sites. Better access from east Witney is planned by upgrading the A40/B4022 Shores Green junction to an all movement junction. This will allow the A40 to be used for trips from east Witney to employment areas at West Witney, as well as for a wide range of trips.

10. Witney's main bottleneck is at Bridge Street. With an average of 29,000 vehicles a day, it is the only vehicular crossing of the River Windrush for local journeys and through traffic from the northeast. The constraint of the river combined with the level of demand for vehicular travel, results in severe congestion, delays to buses and air pollution (it is an Air Quality Management Area). The environment deters cyclists and pedestrians from using the route. Proposals WIT1 and WIT2 identify a sequence of schemes to overcome these issues by enabling traffic to use peripheral routes, thus freeing up routes within Witney for walking, cycling and bus use.

POLICY WIT1 – To establish a transport network that supports future growth and attracts economic investment at Witney we will work closely with the District Council, developers and local partners to improve access to the strategic transport networks and manage through traffic by securing:

- **An all-movement at-grade junction on the A40 at Downs Road, related to**

the West Witney strategic housing and employment site to provide a new access to the A40 for businesses and residents to the west of the town;

- **West-facing slip roads at A40 Shores Green junction and improvements to the B4022 Oxford Hill junction with Jubilee Way and Cogges Hill Road to be delivered by housing development at East Witney.** This will provide an all-movement junction east of Witney, and a second river crossing for local journeys. Complementary measures in the surrounding rural area may also be sought to support this scheme.
- **A feasibility and viability assessment of West End Link Road 2 (WEL2), a new road bridge crossing the River Windrush, to be provided** by housing development at North Witney and assuming west-facing slip roads at A40 Shores Green has been delivered.

14. Following the opening of the Shores Green slip roads, a series of further improvements can be realised to initiate greater opportunity for travel by sustainable transport:

POLICY WIT2 – We will work with the District Council, Town Council, bus operators, local businesses and residents as well as local transport interest groups and developers to manage through traffic and improve the environment of Witney's central areas by:

- **Re-designating the A4095 via Jubilee Way, Oxford Hill, A40, Ducklington Lane and Thorney Leys** so through traffic travels around the edge of the town rather than through it;
- **Implementing schemes to deter through traffic from using Bridge Street and the Woodstock Road** to improve the environment and safety and encourage through traffic to use the re-designated A4095
- **Improving the environment in the town** centre by reducing congestion, and enhancing the Air Quality Management and Conservation Areas.
- **Discouraging undesirable routing of traffic by** improving directional signs.

POLICY WIT3 – We will work with West Oxfordshire District Council to safeguard land for future transport infrastructure, to support Local Plan growth, by:

- **Protecting the line of the Shores Green Slip** Roads and promoting its safeguarding in the Local Plan.
- **Continuing to safeguard land for the proposed West End Link stage 2** pending adoption of the WODC Local Plan.

Witney's Local Transport Networks

15. The proposed Local Plan presents a significant transport challenge, particularly to accommodate trips within Witney. Whilst proposals for increased road capacity, such as A40 Shores Green, will be brought forward by strategic developments sites, road schemes alone will not mitigate nor reduce the levels of congestion experienced now, and predicted to persist in the future. There needs to be a significant shift away from dependence on private cars, towards more people walking, cycling, or using public transport. Improving opportunities for people to travel on foot, by cycle, and public transport, for trips within Witney and for commuting Oxford, is essential to reduce the proportion of journeys made by private car, improve air quality, and improve journey times for trips by all modes.

Public Transport

16. Congestion currently delays buses on the key Oxford-Witney routes via Newland and Bridge Street. Buses are significantly delayed in the morning peak due to the way the double-mini roundabouts favour traffic from West End and from Woodgreen, despite Newland being the more important route for buses.

17. Witney benefits from high quality, high capacity frequent bus services to Oxford, including Oxford rail station. Whilst development will place increased pressure on bus services, it also offers the opportunity to improve bus services to make travel by bus attractive and practical for journeys to work by Witney residents.

Proposal WIT4 identifies how access to public transport and service enhancements will be achieved:

POLICY WIT4 – We will work with the District Council, bus operators and developers to make improvements to public transport and encourage its use by:

- **Improving the frequency of bus services** by using funding from new developments:
  - Between Witney to Oxford; including City Centre, Oxford rail station, hospitals and Oxford Brookes University;
  - Between Woodstock and Burford via Hanborough rail station and Witney;
  - Between Witney's main residential and employment areas;

- **Implementing measures to reduce delays to bus services**
  - through Witney particularly along Corn Street, Market Place, Bridge Street and Newland;
  - joining the A40 eastbound at B4044 Shores Green
- **Improving the environment and quality of bus stops** along these routes, pedestrian and cycle paths to them and the facilities available such as cycle

parking.

Walking & Cycling

18. Walking and cycling are the most sustainable form of travel. It is recognised that Witney already has good levels of walking and cycling for some journeys, particular via the Cogges/Church Lane path. However, in some locations high levels of traffic, poor quality surfaces and on-street parking deter walking and cycling. Improving and maintaining the attractiveness of walking and cycling is a key challenge as the population grows. Providing high quality walking and cycling routes will enable people to seriously consider walking or cycling for some trips within Witney as an alternative to travel by car. Witney has some good foot and cycle paths, but signing to and along them could be improved and there are many gaps in the provision of cross town cycle routes. There is scope to join up existing foot and cycle paths to improve the overall network and to link through to Rights of Way in the countryside

19. Developing the cycle premium route networks Good to see the Premium Route brand here (DE) between Witney and nearby settlements, specifically Carterton, will enable greater levels of commuting by cycle between the two towns, as highlighted in Proposal WIT5.

POLICY WIT5 – the County Council will improve facilities for pedestrians and cyclists focusing on enhancing links between homes, schools, employment and the town centre. Improvements will include:

- Enhancing pedestrian and cycle routes from Witney's existing and future residential and employment areas to the town centre; improve connectivity by cycle within the town centre
- Developing a network of Cycle Premium Routes in collaboration with users
- Improving cycle routes from residential areas to schools;
- Improving conditions and infrastructure for pedestrians and cyclists in Bridge Street, the town centre and Station Lane areas;
- Providing a cycle route between Witney and Carterton.

20. Once the Local Plan is adopted the County Council will work with West Oxfordshire District Council to develop proposals for a Witney Town Centre Transport Strategy, to address the cumulative impact of transport needs arising from new housing and employment sites. Initial modelling has indicated that even with the Shores Green and potential WEL2 the highway demand exceeds capacity at several junctions and links across Witney.

Beyond Witney

21. Although the A40 Witney by-pass is generally free flowing, congestion on the A40 to the east of the town causes very lengthy delays for journeys to and from Oxford, especially at peak times. This impacts on the ability of local businesses to achieve growth, and makes Witney a potentially less desirable place for new businesses to locate. A long term strategy for the A40 corridor is under development and will consider the potential role of public transport improvements, additional highway capacity and/or traffic management measures.

POLICY WIT6 - We will improve access between towns in West Oxfordshire, and Oxford, including the new employment site at Oxford's 'Northern Gateway', by

- In the short term, using Oxfordshire's Local Growth fund allocation to develop and implement a scheme to provide a step change in public transport provision on the A40 Witney-Eynsham-Oxford corridor, by providing significant bus priority measures on the A40 between Eynsham and Wolvercote. This scheme would be complemented by enhanced bus services.
- Explore the opportunity for an Eynsham Park & Ride site, as part of the Oxford Transport Strategy, to provide increased accessibility to Oxford.
- Retention of the Witney to Oxford cycle route along the A40 and development of this into the Oxfordshire cycle premium route networks.

Delivery and Funding

22. Providing transport services and infrastructure in a timely manner is essential to support and enable growth. The proposed Local Plan Strategic Development Areas (SDA) will be required to mitigate the transport impact arising from the development. Where schemes are needed to mitigate one particular development, the developer will be expected to either construct or provide full funding for the scheme. Schemes identified as direct delivery by the developer are:

    - A40 Downs Road by West Witney SDA
    - A40 Shores Green by East Witney SDA
    - West End Link 2 by North Witney SDA

23. The package of investment in Witney's transport infrastructure be undertaken in four phases:

Witney Transport Infrastructure Package		
Phase	**Scheme**	**Delivery**
Phase 1	Ducklington Lane/Station Lane junction	Completed 2014/15

	improvement	
Phase 2	A40 Downs Road junction	January 2015 – Summer 2016
Phase 3	A40 Shores Green slip roads	2017 - 2019
Phase 4	Bridge Street	Linked to Shores Green slip roads

24. The Witney area strategy identifies a package of transport measures that are required to mitigate the cumulative impact of development across Witney where the impact of development is not attributable to a single development. Developer contributions will be sought for specific schemes within the Witney package using a strategic transport infrastructure contribution rate to mitigate the cumulative impact of development.

25. The level of contribution will be calculated by dividing the funding required to deliver the package of transport measures by the amount of planned growth. This calculation will be reviewed and updated following changes in planned housing growth and infrastructure requirements within Witney as part of the Local Plan process.

26. When the Community Infrastructure Levy (CIL) is introduced by the West Oxfordshire District Council, contributions will be sought via this new mechanism, as well as via S106 or S278 agreements.

Policy WIT 7 – To mitigate the cumulative impact of development across the Witney area and implement the transport measures identified in the Witney area strategy we will:

Secure strategic transport infrastructure contributions from all new development based on the contribution rate per dwelling or per m2 for non-residential developments.

27. The Strategic Transport Contribution does not include direct mitigation measures, which will be sought separately.

28. Every development site will be required to fund improvements to public transport services and infrastructure serving Witney in order to mitigate the cumulative impact of development, including development sites that are not allocated in the Local Plan and sites that are considered speculative.

POLICY WIT 8 – To mitigate the cumulative impact of development across the Witney area and implement the public transport measures identified in the Witney area strategy we will:

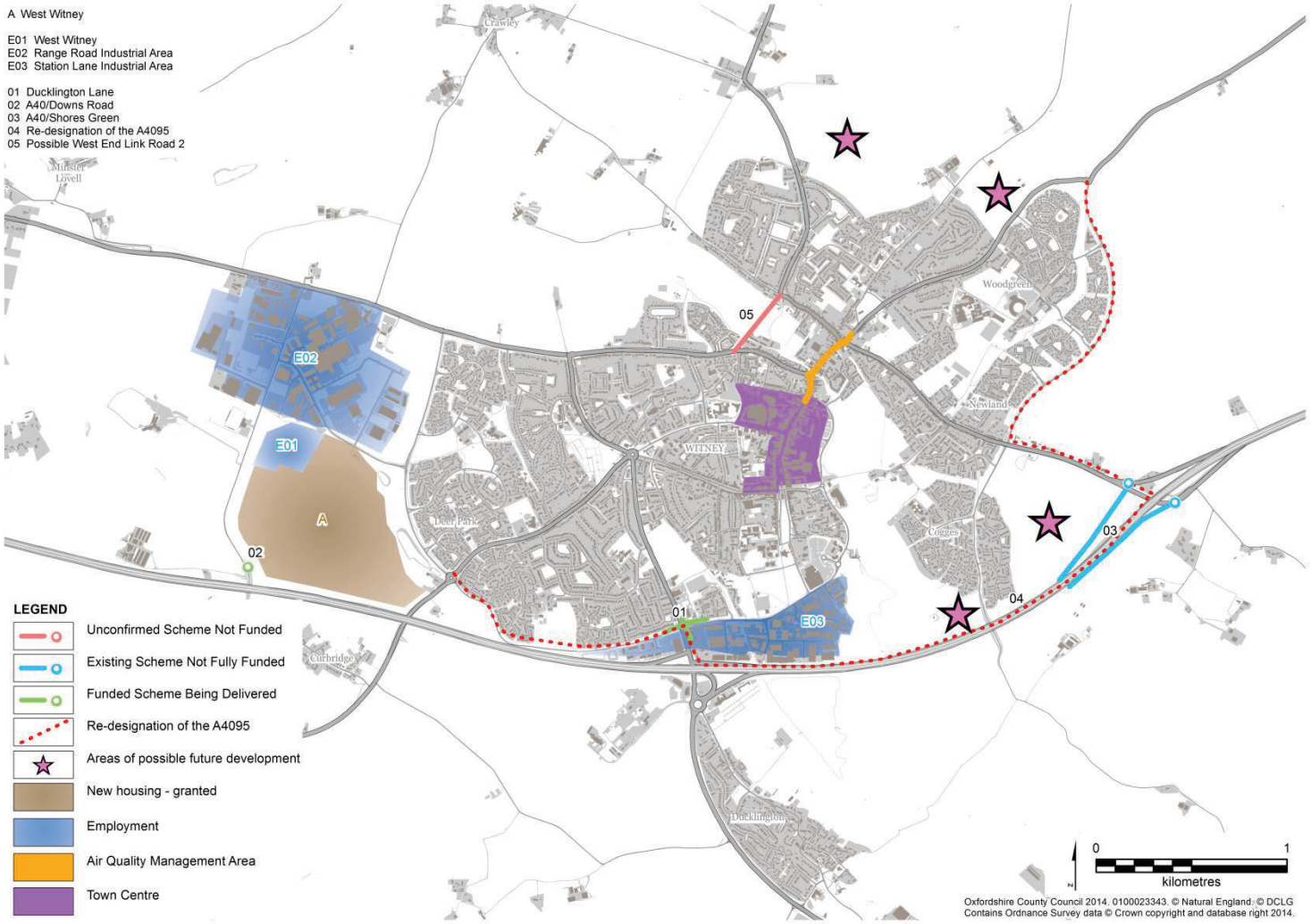
Secure strategic public transport service and infrastructure contributions based on the contribution rate per dwelling or per m2 for non-residential developments

29. This Transport Strategy replaces the Witney Integrated Transport Strategy (WITS) 2003 and Local Transport Plan 3. The new Area Strategy accommodates the measures of the previous strategies. Planning obligation contributions, secured in order to mitigate the impacts of development, towards WITS will be able to be used on the updated LTP4 Witney Strategy and be in accordance with the planning obligations.

References

WODC Housing Consultation paper (July 2014)
http://www.westoxon.gov.uk/residents/planning-building/planning-policy/local-development-framework/local-plan-(part-1)/

West Oxfordshire's Draft Local Plan 2012
http://www.westoxon.gov.uk/planning/CoreStrategy.cfm?frmAlias=/corestrategy/?frmAlias=/draftlocalplan/



Witney Figure 1: Indicative map of transport infrastructure and proposed growth in Witney

Carterton Area Strategy

1. Carterton, the second largest settlement in West Oxfordshire, is a relatively modern town which has grown, in the main, to serve RAF Brize Norton. It has a small but varied economy, largely focused around the provision of local services, and has been identified as a growth area by West Oxfordshire District Council, and Carterton Town Council with opportunities for both residential and employment growth.

2. The travel to work data from the 2011 Census indicates that 38% of all trips to work by residents of Carterton are to workplaces within Carterton. Of those internal trips, 45% travel by car, 30% by foot, and 20% by bicycle, indicating that Carterton is a small enough settlement for walking and cycling to be attractive travel options. Only 1% travel by bus, which may indicate routes are not serving the areas people live or work; or that other factors make bus use unattractive, such as car ownership, or timetable or cost implications of using the bus.

3. For residents that work outside of Carterton, there are strong trends for travel to employment at Witney and Oxford. For trips to Oxford 75% are travelling by car (this would include those using Park and Ride), whilst 17% are using the bus services. Travel to work in Witney is also dominated by car use at 73% of trips, compared to 14% using the bus, and 2% cycling.

4. The role of the Ministry of Defence (MOD) within Carterton is very strong with many local people associated with RAF Brize Norton. The MOD seeks to sustain the strategic importance of RAF Brize Norton, as the largest RAF base in the country through Programme Gateway – the RAF's plan for the future as the UK's Global Air Mobility hub. In recent years Air Mobility operations have consolidated at Brize through the transfer of C130 Hercules air transport operations and introduction of Voyager aircraft (undertaking air to air refuelling). This has led to an increase in activity at the base, which is likely to continue in the short term, with the introduction of A400M Atlas aircraft from 2014 to 2019.

5. West Oxfordshire's growth proposals from the WODC Housing Consultation paper (July 2014) comprise 2,450 new homes by 2029 in the Carterton sub area, including Strategic Development Areas to the east of Carterton (700 homes) and 400 homes at REEMA North and Central (current military personnel housing areas). The draft Local Plan (2012) also seeks to deliver a more attractive and vibrant town centre.

6. Carterton Town Council's emerging master plan for Carterton will focus on strengthening the employment offering in the town and local area, which will in turn, present greater opportunities to work and live in the Carterton area, thus reducing out commuting and the need to travel. The master plan will seek

transport infrastructure and services to support regeneration initiatives, sustain the local economy and attract business investment.

7. The Carterton Area Transport Strategy will be revised following the adoption, by West Oxfordshire District Council, of the Local Plan and Carterton master plan. This chapter has been updated since the publication of Local Transport Plan 3 (May 2014) in light of changes to overarching policy, and progress on schemes in the Carterton area.

Transport Strategy Objectives

8. The key transport objectives for Carterton are to:

9. Establish a transport network that supports residential and employment growth, attracts economic investment and enables the operation of RAF Brize Norton;

10. Encourage people to access jobs and services by sustainable modes of transport by improving opportunities for people to travel on foot, by bike, and public transport;

11. Improve the environment of the town centre, and reduce the impact of traffic accessing the town centre.

12. This strategy divides travel demands at Carterton into three categories, which are discussed in turn:

- Carterton's Strategic Transport Networks
- Carterton's Local Transport Networks
- Beyond Carterton

Carterton's Strategic Transport Networks

13. The routes between Carterton and the A40 are currently only of 'B' road standard. This results in military freight using unsuitable routes, particularly through Carterton town centre and local traffic using a variety of routes, of varying standard, to access Witney and the A40. Improving access to the A40 is therefore a key objective reflected in Proposal CA1 below.

Policy CA1 – To establish a transport network for Carterton that supports residential and employment growth, attracts economic investment and enables operation of RAF Brize Norton, we will work closely with the District Council and key local partners to:

- Improve the B4477 between Carterton and A40 at Minster Lovell and upgrade from B classification road to A classification. Complementary

measures in the surrounding rural area may also be sought to support this scheme.
- Promote West facing slip roads at A40/B4477 Minster Lovell junction, to serve operations at RAF Brize Norton, and future employment growth.
- Continue to work with RAF Brize Norton to establish the implications of Programme Gateway on the existing transport network, to ensure new infrastructure is provided by the Ministry of Defence to enable its intensification of activity.

Carterton's Local Transport Networks

Public Transport

14. There are frequent bus services operating between Carterton, Witney and Oxford, including a service of approximately two buses per hour to Oxford Rail Station. The introduction in July 2014 of a bus service from Carterton to Headington has improved access to the hospitals and Oxford Brookes University, although the attractiveness of this service to commuters is limited by the timetable. Whilst there is good patronage of bus services to Oxford and Witney, increasing the frequency and journey time will make these more attractive to users, which is essential to reducing reliance on private car, particularly for commuting.

15. The Carterton to Swindon bus service frequency, at one bus every two hours, restricts the attractiveness and usefulness of the bus service, particularly for commuters, and people in education. Improving the number of services at peak times will increase the opportunity to travel by bus to jobs and education in the Swindon area.

Policy CA2 – To enable people to access jobs and services by public transport we will work with the District Council, bus operators and developers to make improvements to public transport and encourage its use by:

- Improving the frequency of bus services between Carterton Witney and Oxford; including City Centre, Oxford rail station, hospitals and Oxford Brookes University;
- Improving the frequency of bus services to Swindon, through pump-prime funding from new developments, to eventually run these services on a commercial basis;
- Providing bus stops close to the RAF Main Gate;
- Improving the environment and quality of bus stops along these routes, pedestrian and cycle paths to them and the facilities available such as cycle parking.

Walking & Cycling

16. Walking and cycling are the most sustainable form of travel. It is recognised that Carterton already has good levels of walking and cycling for cross town journeys. Maintaining the attractiveness of walking and cycling is a key challenge as Carterton's population grows. In some locations within Carterton, poor quality surfaces, personal safety concerns and lack of directional signage deter walking and cycling. Ensuring high quality walking and cycling routes throughout the town is essential to enabling people to travel sustainably. Cycle networks linking the town to Witney and nearby villages could also be improved to enable cycling to work and for leisure.

Policy CA3 - We will improve facilities for pedestrians and cyclists focusing on enhancing links between homes, employment and the town centre. Improvements will include:

- a high quality cycle route(s) from the employment and residential areas in the north and east of the town to Carterton town centre;
- high quality cycle links from the west of the town to the town centre;
- establishing a network of high quality cycle routes throughout Carterton;
- work with RAF Brize Norton to improve traffic flow for all modes of transport at RAF Brize Norton's Main Gate including pedestrians and cycle routes;
- support the redevelopment of Ministry of Defence housing stock within Carterton to provide excellent pedestrian access throughout the redeveloped site and clear pedestrian links to facilities across the town, including, where financially practical, the removal of the Upavon Way pedestrian subway;
- provide a high quality cycle route between Carterton and Witney.

17. Carterton Town Council is working on master plan for the town. The main aims are to promote retail and service growth by improving the environment in the town centre including reducing the impact of traffic, whilst maintaining access. On completion of the strategy the County Council will review the transport issues that are highlighted.

Policy CA4 – To improve the environment of the town centre, and reduce the impact of traffic accessing the town centre the County Council will work with the District Council, Town Council, key local partners and developers to secure improvements to:

- reduce queuing traffic and improve the environment in the town centre;
- discourage undesirable routing of traffic by improving directional signs and traffic calming measures;

Beyond Carterton

18. Congestion on the A40 to the east of the Witney causes very lengthy delays for journeys to and from Oxford at peak times. This impacts on the ability of local businesses to achieve growth, and makes Carterton a potentially less desirable place for new businesses to locate. Bus services are vulnerable to delay because of congestion within Witney, through Eynsham and approaching Oxford on the A40.

19. Improving journeys by all modes on the A40 in Oxfordshire is vital to serving the residents and economy of West Oxfordshire as well as operations at RAF Brize Norton. A long term strategy for the A40 is under development which will look at the potential role of public transport improvements, increased highway capacity and/or traffic management improvements.

Policy CA5 - We will improve access between towns in West Oxfordshire, and Oxford, including the new employment site at Oxford's 'Northern Gateway', by:

- Developing, in the short term, public transport enhancements to facilitate trips along the A40 corridor;
- Explore the opportunity for an Eynsham Park & Ride site;
- Retention of the cycle route along the A40 and improving the route if funding permits.

Funding

20. Funding for the Carterton area strategy will be largely secured from developer contributions using the strategic transport infrastructure contribution rate.

21. The Carterton area strategy identifies a package of transport measures (excluding public transport) that are required to mitigate the cumulative impact of development across the Carterton area, where the impact of development is not attributable to a single development.

22. The level of contributions has been calculated based on the scale of funding required for the identified transport infrastructure necessary to support growth at Carterton and the quantum of planned growth. This approach has been taken to ensure contributions are directly related to the development; and fairly and reasonably related in scale and kind to the development. The contribution rate will be reviewed as the planned housing growth or infrastructure requirements change. Funding will be sought from both allocated development sites and speculative or windfall development sites.

23. The Strategic Transport Contribution does not include direct mitigation measures, which will be sought separately.

Policy CA5 – To mitigate the cumulative impact of development across the Carterton area and implement the transport measures identified in the Carterton area strategy we will:

- Secure strategic transport infrastructure contributions from all new development based on the contribution rate per dwelling or per m2 for non-residential developments.

24. Every development site will be required to fund improvements to public transport services and infrastructure serving Carterton in order to mitigate the cumulative impact of development, including development sites that are not allocated in the Local Plan and sites that are considered speculative.

Policy CA6 – To mitigate the cumulative impact of development across the Carterton area and implement the public transport measures identified in the Carterton area strategy we will:

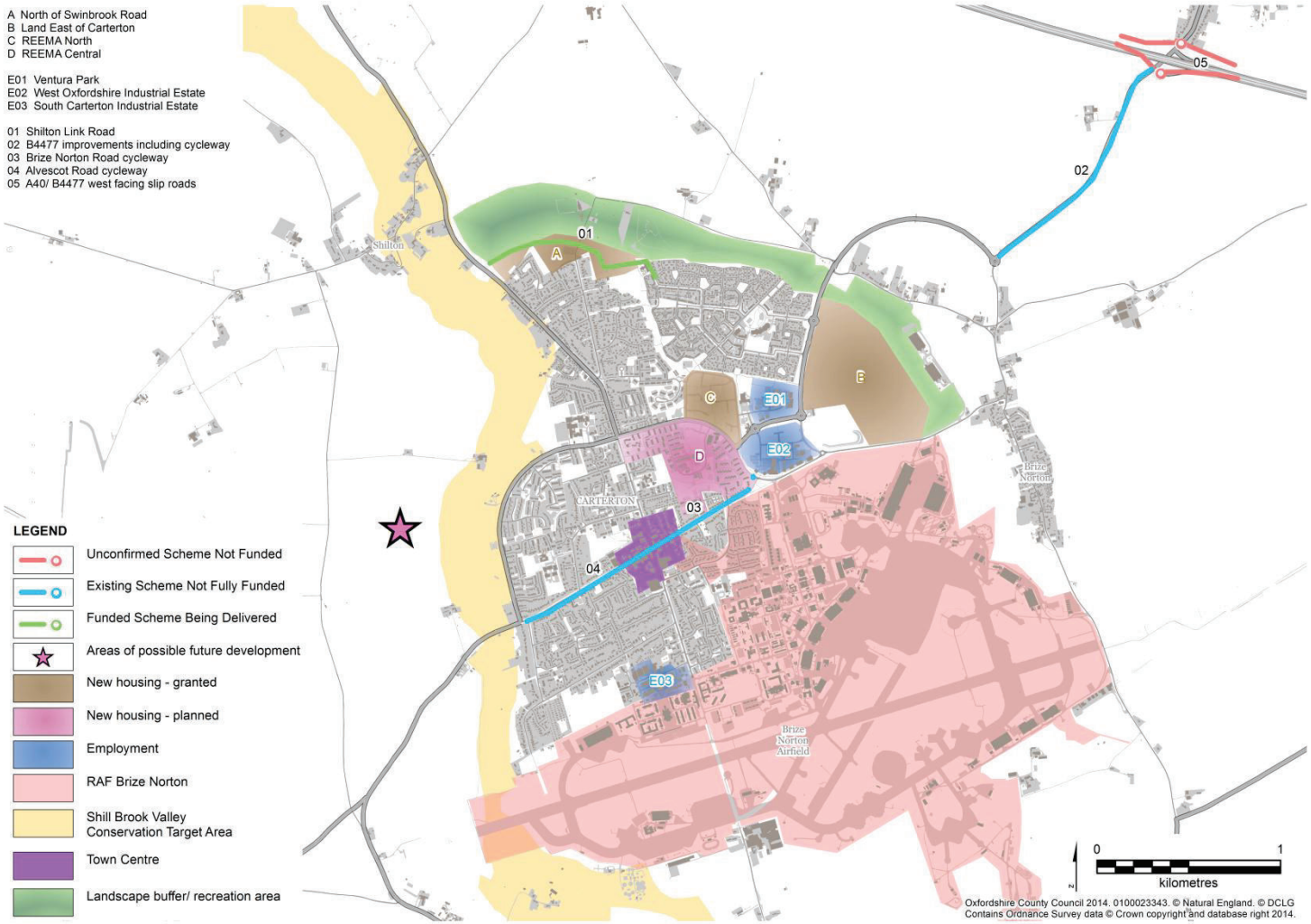
- Secure strategic public transport service and infrastructure contributions based on the contribution rate per dwelling or per m2 for non-residential developments.

References

RAF Brize Norton Programme Gateway
http://www.raf.mod.uk/rafbrizenorton/organisation/proggateway.cfm

WODC Housing Consultation paper (July 2014)
http://www.westoxon.gov.uk/residents/planning-building/planning-policy/local-development-framework/local-plan-(part-1)/

West Oxfordshire's Draft Local Plan 2012
http://www.westoxon.gov.uk/planning/CoreStrategy.cfm?frmAlias=/corestrategy/?frmAlias=/draftlocalplan/



Carterton Figure 1: Indicative map of transport infrastructure and proposed growth in Carterton

A420 Strategy

The Local Context

Role/function of A420 as principal route

1. The A420, the principal route between Swindon and Oxford is an important strategic link in the Oxfordshire hierarchy. It is a primary route which the Council expects to be of a standard to allow for free passage of current and expected future traffic for the majority of the traffic day. It should therefore operate with minimal congestion in order to avoid rat running on minor roads.

A420 route within Oxfordshire

2. In addition to providing a direct route to Oxford city centre from Swindon, the A420 serves the many settlements along the corridor including: Shrivenham, Watchfield, Faringdon, Kingston Bagpuize and Cumnor. At peak times it operates over capacity resulting in congestion, particularly at the northern end near Botley. Although lorries are advised to use the M4 and A34, there is some HGV usage of the route for through as well as local journeys.

3. The A420 is also a premium bus route corridor, a highly successful commercial bus route with a frequency of two buses per hour Monday to Saturday, with an enhanced peak time service frequency of three buses per hour, plus evening and hourly Sunday services. Significant growth has been experienced on the service over the last 5 years – a doubling in use - which has resulted in increased service frequency and plans for further upgrades.

Growth Context - Oxfordshire growth, Vale Local Plan, Swindon Local Plan and Eastern Villages

4. This Strategy will take account of and evaluate the likely individual and cumulative effect on the capacity of and operational effect on the A420 of planned growth in Swindon Borough and the Vale of White Horse District.

5. The Vale of White Horse Local Plan 2031 aims to make provisions for growth of 23,000 new jobs and at least 20,560 new homes by 2031. It lists 21 strategic site allocations, 6 of these are along the A420 – as shown on the Plan **(cross reference).** These housing figures include the indicative additional allocation for the Vale arising from the Oxfordshire Strategic Housing Market Assessment, although as yet they do not take into account any unmet need arising from neighbouring authorities. This is likely to be taken into account in a future Local Plan review.

6. Swindon Borough Council's Local Plan (2026) identifies an area called 'Eastern Villages' with an allocation of around 8,000 new homes plus employment land on the eastern edge of the town, adjacent to the Oxfordshire boundary and the A420. Work is taking place with Swindon to understand and plan for the transport impacts on Oxfordshire and infrastructure requirements arising from this development.

7. The Council will continue to work with the VWHDC and Swindon Borough Council to develop a strategy for the A420 corridor to mitigate the impacts of growth within the Vale and at Eastern Villages, Swindon. Contributions would need to be sought towards the transport infrastructure and proposals for the development of the strategic bus service identified in the A420 strategy.

8. Any planning application for development in Swindon Borough or The Vale of White Horse District that will generate significant amounts of movement shall be supported by a Transport Statement or Transport Assessment that takes into account the planned growth in both authorities and the proper accommodation of its traffic consequences on the network.

Transport Aims

9. To have a strategic highway and public transport corridor capable of moving a significant number of people along it whilst maintaining suitable access to and from the A420 from communities along the route , both for vehicular access to the A420 and pedestrian or cycle access to bus stops for the premium bus route. This will be achieved by:

- Improved junctions on the A420 to improve access to main settlements including Faringdon and Shrivenham, focusing on where new Local Plan development is proposed and existing 'priority' junctions require upgrading. Critical junctions Within Oxfordshire on the A420 for evaluation in the Route Strategy will include the following:
    - A420 / Townsend Road junction, west of Shrivenham (upgrading the current t-junction to a controlled junction such as a roundabout)
    - The A420 / B4508 roundabout at Watchfield
    - A420 slip road to Great Coxwell, where a developer funded upgrade, including a new roundabout junction on the A420, is now proposed
    - A420 / A417 Park Road, Faringdon – in particular increased capacity on the approach from Faringdon
    - Additional junctions may be identified through transport modelling work.
- Enhancement of the A420 premium bus route, focusing on enhancing service frequency initially to three, and then to four buses per hour per direction, improved Bus Stops (including changing on-carriageway stops to bus stop laybys where feasible), better walk/cycle connections and crossing provision, cycle parking and high quality waiting/shelter provision (including real time passenger information) and, where appropriate, parking provision at selected bus stops

- Improved access and increased capacity of the A420 and associated junctions on the approach to Swindon, including White Hart Junction, Gablecross Roundabout, Police Station Access, Old Vicarage Lane, new Eastern access to Rowborough and New / existing access to the Eastern Villages development area south of the A420, as identified in the Swindon and Wiltshire Growth Deal package of schemes.

- Improved access into Oxford, including approaches to the A420/A34 interchange at Botley to be developed as part of the Oxford Transport Strategy, together with improvements to this junction announced by the Highways Agency and the development of a new A420 corridor Park & Ride site at Cumnor as identified in the Oxford Transport Strategy.

- Reviewing and managing the impact on the surrounding road network, including parallel roads to quantify the likelihood of rat running being caused by proposed and allocated development traffic and identify effective measures to combat this. Potential mitigation measures required to reduce the impact of through traffic on these include local traffic calming and traffic/speed management measures, to be agreed with the relevant local communities. Key other routes to be evaluated are:

    - B4508 east of Shrivenham
    - B4000 south of Shrivenham
    - B4507 Swindon – Wantage

Baseline Information

10. There is local concern over safety along the route. Accident data for 2009 to 2014 shows there were 157 accidents and along the A420 between Botley and the county boundary. Of these accidents, 5% were fatal, 22% serious and 73% slight. These accidents created 251 casualties: 4% fatal, 17% serious and 80% slight. 146 (93%) of the accidents were motor vehicle only. The forecast increase in traffic flows could increase the number of accidents along the route. Automatic traffic counter data along the route for the period 2009 to 2014 shows a 4.4% increase in vehicle numbers travelling towards Oxford, and a 2.5% increase in vehicle numbers travelling towards Swindon.

11. Traffic modelling data for forecast year 2030 (base year 2007) shows that:

- The eastbound route will be over capacity in the AM peak period at Botley Interchange, Fyfield, Buckland, Faringdon.
- The eastbound route will be over capacity in the PM peak period at Botley Interchange
- The westbound route will be over capacity in the PM peak period at Fyfield and Buckland
- Many other sections of the route will be near capacity in both the AM and PM peak periods

Strategy

12. A major upgrade of the A420 corridor is not proposed for the current LTP period. Any significant scheme (such as further dualling of all or part of the route) would attract more traffic and be likely to encourage further sites on this corridor to be identified for development. However there is a need to balance this approach with allowing for the significant transport impact arising from planned development, particularly in terms of providing appropriate route/junction improvements and enabling access onto and off the A420 from local communities.

13. Proposal 1 - Ensure the A420 continues to perform a strategic function operating as a principal road moving people quickly and efficiently between Swindon and Oxford by

- Promoting improvements to Botley Interchange as part the Highways Agency's A34 Route Strategy
- Ensuring junction designs continue to support the main east-west general traffic and bus flow, with a consistent approach to junction type.
- Reviewing speed limits to ensure that changes in limit are at the most appropriate locations
- Identifying opportunities for bus priority as required

14. Proposal 2 - Maintain suitable access from settlements along the A420 ensuring:

- safe and timely movement onto and off of the A420 by ensuring new and enhanced junctions enable local access and egress along the route – as shown by the proposed new A420/Great Coxwell junction
- safe access to and from bus stops along the A420
- high quality bus stop facilities, including cycle parking at key locations

Safeguarding

15. We will support the Vale of the White Horse District Council in safeguarding land for transport schemes in areas where it is possible that significant development may occur in the future, including that which is more likely to take place beyond the period of this Plan.

16. Proposal 3 – to safeguard and maintain the ability to deliver strategic pieces of infrastructure if required in the future due to significant additional development. For the A420 corridor these include the Townsend Road junction with the A420 (Local Plan reference E17) and the Great Coxwell Road junction (E18).

Funding

17. Funding to deliver the A420 strategy will primarily need to be secured through development. Developer contributions will either be sought through s106 agreements or CIL. It may also be appropriate for development to directly deliver the proposed strategy elements.

18. Major residential development sites are required to fund new or improved public transport services to key locations agreed with the county council until they become commercially viable. Other residential sites make a contribution based on the estimated cost of an improved commercially viable service across the western Vale area, divided proportionally by the amount of planned growth to give a cost per development site.

19. Developments are also required to provide modern bus stop infrastructure including shelters and Real Time Information, to enhance access to the bus network. These are usually secured through Section 106 or Section 278 agreements.

20. When the Community Infrastructure Levy (CIL) is introduced by the Vale of the White Horse District Council and South Oxfordshire District Council, contributions will be sought via this new mechanism, as well as via S106 or S278 agreements.

21. Proposal 4 **–** To mitigate the cumulative impact of development across the Science Vale area and implement the transport measures identified in the A420 strategy we will:

    - Secure strategic transport infrastructure contributions from all new development based on the contribution rate per dwelling or per m2 for non-residential developments.

    - Secure strategic public transport service contributions for new or improved public transport services as well as bus stop infrastructure to support sustainable development.

22. The Strategic Transport Contribution does not include direct mitigation measures, which will be sought separately.

Timescales

23. The schemes and projects described in this chapter will be implemented at different stages of the Local Transport Plan period 2015 - 2031, as outlined in the table below. Please note, these timescales are influenced by a number of different factors and may be subject to change.

Project / Scheme	Date of commencement	Date of completion

Maps and Plans

References

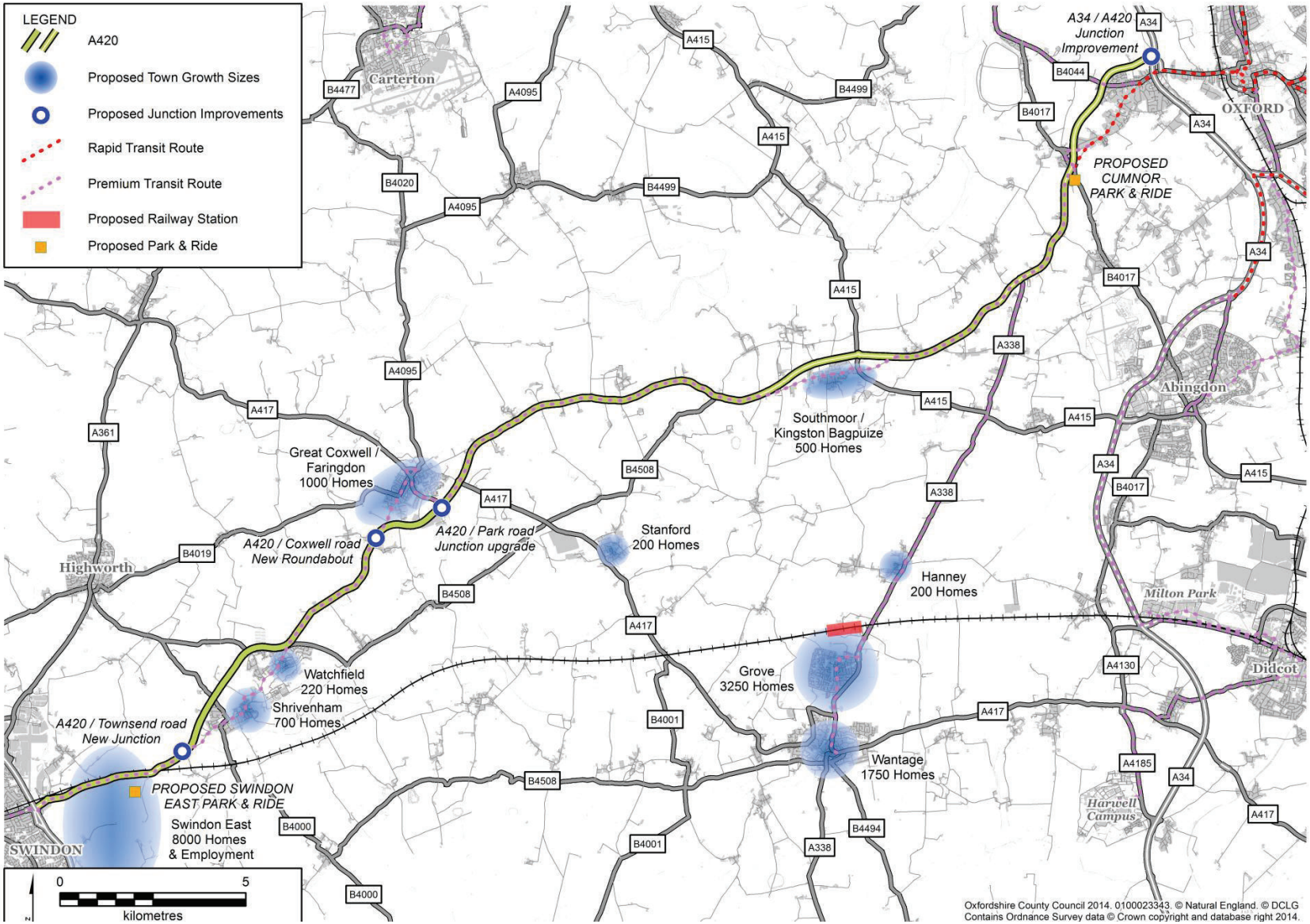
Oxfordshire Local Enterprise Partnership http://www.oxfordshirelep.org.uk/cms/

Vale of White Horse draft new Local Plan 2031 (published November 2014) http://www.whitehorsedc.gov.uk/services-and-advice/planning-and-building/planning-policy/new-local-plan-2031

South Oxfordshire Core Strategy 2027 (adopted December 2012) http://www.southoxon.gov.uk/services-and-advice/planning-and-building/planning-policy

Oxfordshire Growth Board - http://www.oxfordshire.gov.uk/cms/content/oxfordshire-local-transport-board-0

Swindon Local Plan http://www.swindon.gov.uk/localplan



A420 Figure 1: Indicative plan of transport infrastructure and proposed growth along the A420 corridor

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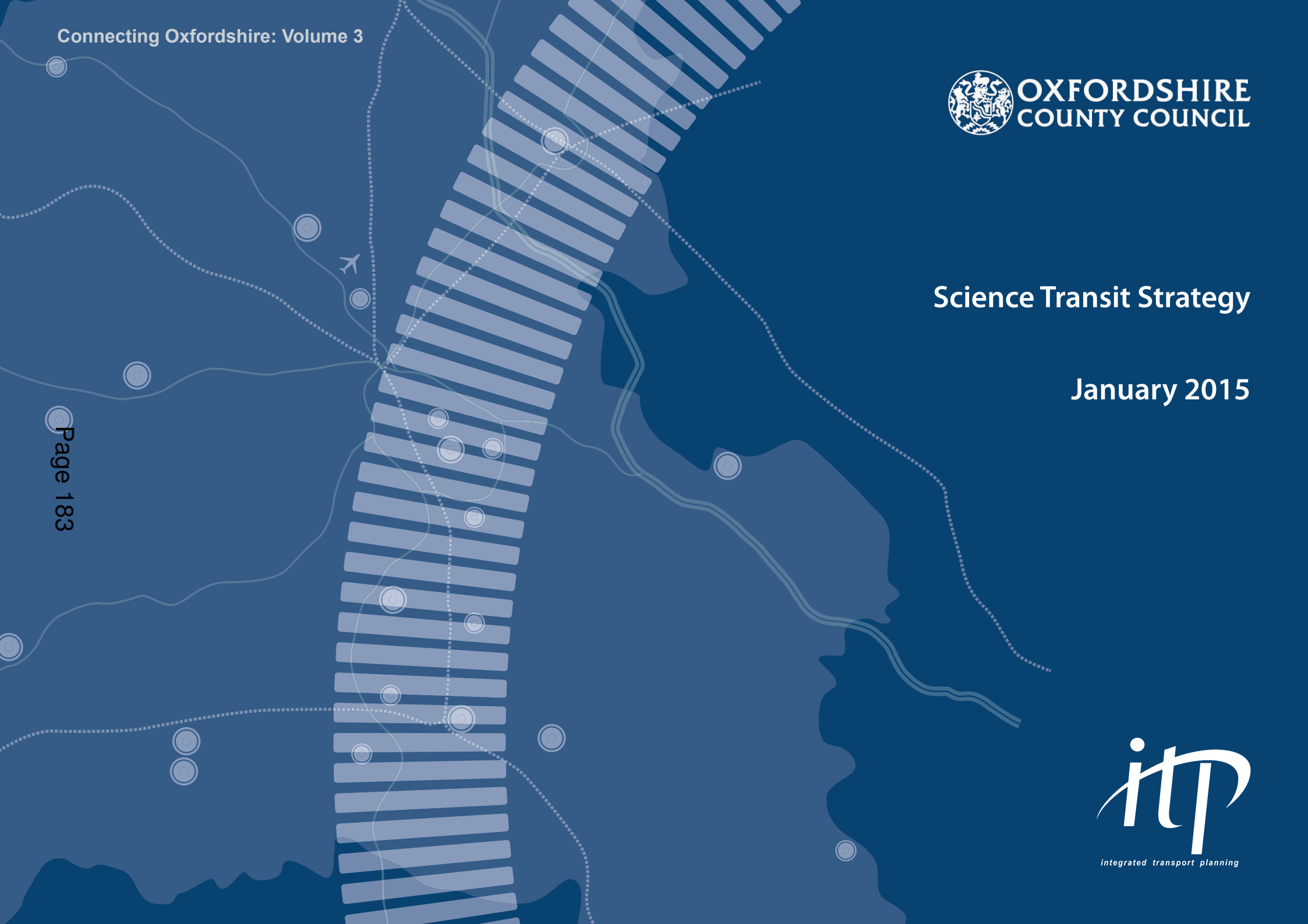
Connecting Oxfordshire: Volume 3



OXFORDSHIRE COUNTY COUNCIL

Science Transit Strategy

January 2015

integrated transport planning

CONTENTS

Glossary of Terms

ATOC RJIS	Association of Train Operating Companies' Rail Journey Information Service. The IT system used to provide the timetables, fares, route planning, ticketing and transaction services needed to buy rail tickets and complete travel enquiry requests in the UK.
Autonomous vehicles (driverless vehicles)	Vehicles able to sense the road environment around them and navigate themselves to destinations by negotiating other traffic and road hazards. Vehicles are being manufactured with increasing degrees of autonomy and are anticipated to become fully driverless within the next 10-15 years.
Bleeding edge	Technologies considered so new that they could have a high risk of being unreliable and require considerable investment in order to make use of them. A proportion of bleeding-edge technology will find its way into the mainstream (e.g. email).
Crowd sourcing	A distributed problem-solving and production process that involves outsourcing tasks to an undefined public ('crowd') rather than a specific entity.
Data mining	The computational process of discovering patterns in large data sets involving methods that combine artificial intelligence, machine learning, statistics, and database systems.
Digital exhaust	Virtual 'trails' of data that are generated by individuals and things through their electronic interactions and transactions with both private and public sector organisations.
Disruptive innovation	Innovations which help to create new markets or value chains, and eventually disrupt existing markets and value chains (over a period of years or decades), to the extent they displace earlier technologies. E.g: the DVD player was a disruptive innovation for VHS players.
GNSS	Global Navigation Satellite System (GNSS) receivers commonly-used for surveying and navigation.
GPS	A space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more global positioning satellites.
Hackathon	A hackathon (also known as a hack day, hackfest or codefest) is an event, typically lasting between a day and a week, in which computer programmers and others involved in software development come together to create usable software. Transport hackthons can focus on building exciting transport-related apps, visualisations, or conduct insightful data analysis.
Innovate UK	The organisation formerly known as the Technology Strategy Board, which is responsible for disbursing innovation funding, mentoring and networking in order to accelerate the uptake of innovative technologies and practices across UK industrial sectors.
INRIX	One of the major global providers of live traffic and road network incident data, which is also increasingly being made available for analysis and transport modelling.
Intelligent Mobility	More responsive and predictive transport systems that: Better meet the needs of an inclusive society by efficiently and sustainably connecting goods, services, events and people; Optimise the use of available infrastructure capacity to maximise the time, energy and resource efficiency of travel and transportation. Are more readily connectable and flexible - promoting seamless intermodal journeys that can flex according to disruptions, changes in schedule or priority, and competing demands for seemingly unrelated services Generate smaller environmental and social impacts than current transport systems

Internet of things (IoT)	The proliferation of devices and ICT applications connected to the internet (such as smart meters, smart grids, and smart transport services) based on sensor networks and machine-to-machine communication. The number of networked sensors and information generators is growing at over 30% per annum, creating a rapidly expanding 'Internet of Things' (IoT) that is projected to contain as many as 50 billion devices by 2020.
Interoperability	The ability of different networks or discrete, closed systems (e.g. bus, rail, coach) to integrate and work together in order to allow for the seamless transfer of information, people and things. Interoperable transport systems are expected to form the basis for future intelligent mobility systems.
Knowledge Spine	A linear corridor running North – South along the alignment of the A34 dual carriageway between the M40 and M4 motorways. It runs from Harwell and Culham in the south, to the life science Bio Escalator in Oxford, on to the advanced engineering hub at Begbroke, and through to Bicester in the north.
Living Lab	An experimental real-world environment being set-up in Oxfordshire that is intended to support the accelerated design, prototyping, and testing of new technologies and mobility systems.
Mobility as a Service	The concept through which the movement of people and things (e.g. goods and services) can be bought and sold on a pay-as-you-go basis, or through subscription models. These approaches have become increasingly common in the world of software and technology, and are anticipated to underpin the development of intelligent mobility services. ITS Europe defines Mobility as a Service (MaaS) as a mobility distribution model in which a customer's major transportation needs are met over one interface and are offered by a service provider.
Open data	Open data is information that is available for anyone to use, for any purpose, at no cost.
OXybeles	The development of a local "catapult" to provide a central point through which local authorities can develop partnerships with Universities and business to develop innovative transport led approaches and technology that enhance services, manage infrastructure more efficiently and provide a basis for local business to address problems thus reducing burden on public sector finances.
Sentiment data	Subjective information collected through social media and other sources that can be mined using natural language processing, text analysis and computational linguistics techniques.
Transport Systems Catapult	The organisation set up by InnovateUK to accelerate the UK's development of intelligent mobility systems and their export to other locations in the world.
UTMC	Urban Traffic Management Control systems are used to manage traffic lights, bus and light rail priority, and car parks in UK cities.

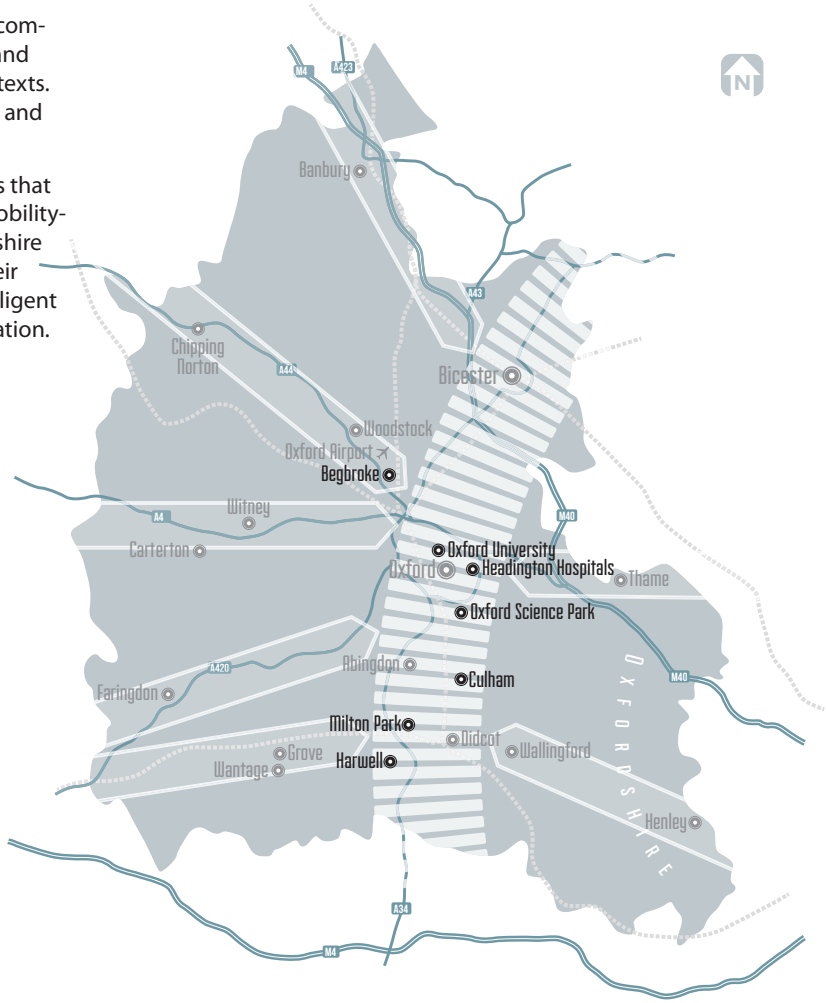
1 SCIENCE TRANSIT – FUTURE MOBILITY IN OXFORDSHIRE

1.1 A fresh approach to planning and delivering local transport is needed if we are to successfully, and sustainably, connect the places in Oxfordshire where the majority of people will live and work over the coming 20 years. This is particularly true for the Oxfordshire Knowledge Spine (Bicester - Oxford - Science Vale UK), which the Oxfordshire Local Enterprise Partnership's (LEP) Strategic Economic Plan (SEP) identifies as the key driver for local economic growth. Other parts of Oxfordshire will also be key contributors to the success of the county's growth strategy. Banbury in particular is a hub for employment in its own right. Banbury, Witney and Carterton each have individual area strategies which provide housing for significant numbers of people who work in the Knowledge Spine. **Science Transit relates to connectivity within, to and from the Knowledge Spine**.

1.2 A number of strategic challenges, which also present significant opportunity for purposefully directed growth and local improvement, emerge in relation to this area and its connectivity:

- The anticipated scale of housing and employment growth will place significant additional demands on the county's transport infrastructure:
  - With an integrated approach to transport and land use planning, major new developments can be located and designed to support new transport services, providing the catalyst for change and bringing benefits to existing communities
- Reducing carbon emissions to address climate change, requires a radical change in the way transport is provided and used:
  - Over the next 20 years, new, innovative products and systems will create a very different environment for mobility, with new ways of travelling and more efficient use of time, vehicles and space
- Travel from highly desirable and affluent areas, predominantly rural market towns and residential hinterlands, is contributing to rising traffic levels and road congestion. Predicted local economic and population growth is likely to increase demand for car travel in the absence of viable and equally attractive alternatives, placing greater strain on existing networks:
  - There are planned improvements to nationally important road, rail, and air connections that run through the County and serve local, regional and strategic national mobility needs. These will make it easier for people to travel through the county of Oxfordshire, as well as get to Heathrow and London. These improvements are likely to make the county an even more attractive location for businesses and people but may increase traffic volumes on local feeder roads.
- Continued rapid development of technology and communications will further accelerate the collection and transfer of data in both business and personal contexts. Much of the data in Oxfordshire is currently closed and not integrated:
  - More intelligent, data-driven transport systems that better integrate with personal and business mobility-needs are widely expected to emerge. Oxfordshire has an opportunity to be at the forefront of their emergence by acting as a live test bed for intelligent mobility system development and implementation.

The Oxfordshire Knowledge Spine



1.3 Science Transit is a direct response to these challenges. It defines a high-level vision, and outline roadmap, for the development of better-integrated, high quality mobility systems that both serve the Oxfordshire Knowledge Spine and connect it with the rest of the County. We envisage a future system made up of four main elements:

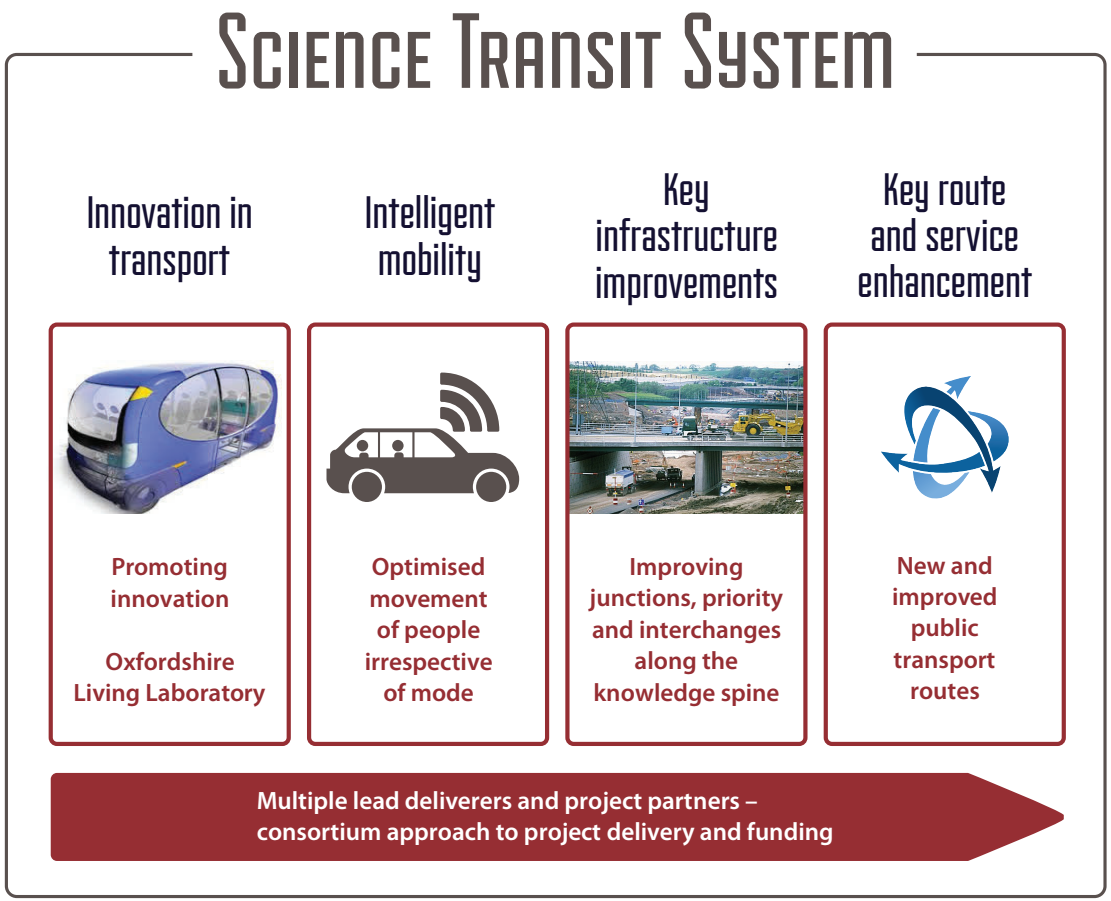
- Projects which **promote innovation** in mobility and integrated transport delivery.
- Projects which e**ncourage intelligent mobility** and opening Oxfordshire's data to promote research and enterprise.
- Key **infrastructure improvements** which will improve connections between key areas along the Knowledge Spine, for example, upgrading pinch-point junctions and constructing new rapid transit bus lanes. These infra-structure projects will sometimes be led by opportunities in funding streams.
- **Route enhancements** which will improve connections between key locations along the Knowledge Spine including new public transport routes and improved frequency of services on existing routes.

1.4 Science Transit is aligned with the County Council's practically-focused strategies for improving the county's transport networks: LTP4, accompanying area strategies, bus, rail and cycle strategies.

1.5 By implementing Science Transit alongside the strategies described above, we aim to:

- Embrace new technologies and data innovation to unlock intelligent mobility, presenting information to all users to allow them to make truly informed choices about the way they travel.
- Accelerate local growth through innovative R&D, providing opportunities for forward-looking business and research organisations and their highly skilled workforces to test and bring new products and technol-ogy to market.
- Improve connectivity between places where people live, work and spend their leisure time, ensuring all aspects of the door-to-door journey are fast, reliable, seamless and affordable.
- Integrate transport and land-use planning to improve non-car-based mobility, creating an environment where sustainable travel is the simplest and obvious choice.
- Deepen public and private sector partnership delivery for the mobility of people and goods, harnessing the respective skills of the different partners to fund, develop and implement new and improved transport systems.

The diagram below illustrates how the Science Transit System works together with interdependent elements.

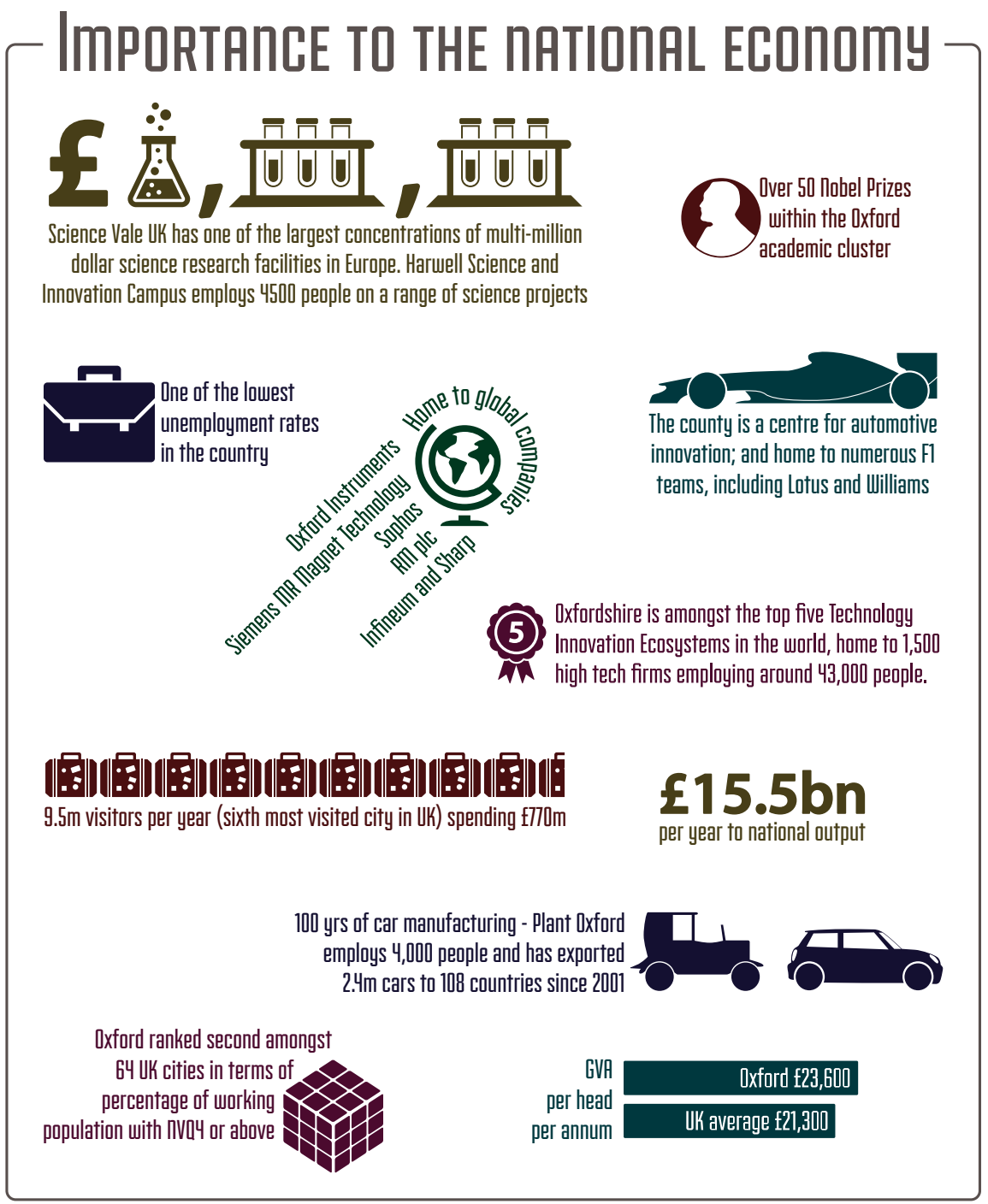


2 STRATEGIC CONTEXT

Oxfordshire – a global centre for innovation

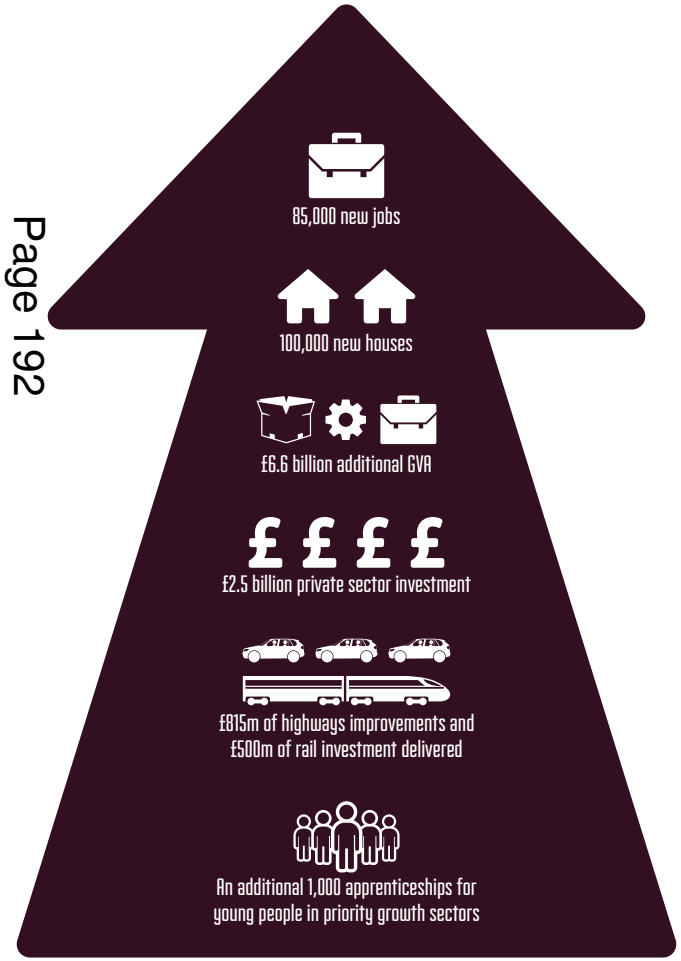
2.1 Oxfordshire is renowned across the globe for its academic excellence, innovative business culture and the quality of its built and natural environment. The county is home to Europe's largest concentration of multi-million pound science research facilities, underpinning our leading position in advanced engineering, manufacturing and life sciences, as well as sitting at the heart of the UK's growing international space cluster. We are therefore primed for investment with solid economic foundations and ambitious plans to support growth and the creation of sustainable jobs for local communities.

2.2 Oxfordshire makes a disproportionately large contribution to UK economic performance in relation to its geographic size and population:



A prosperous and growing county

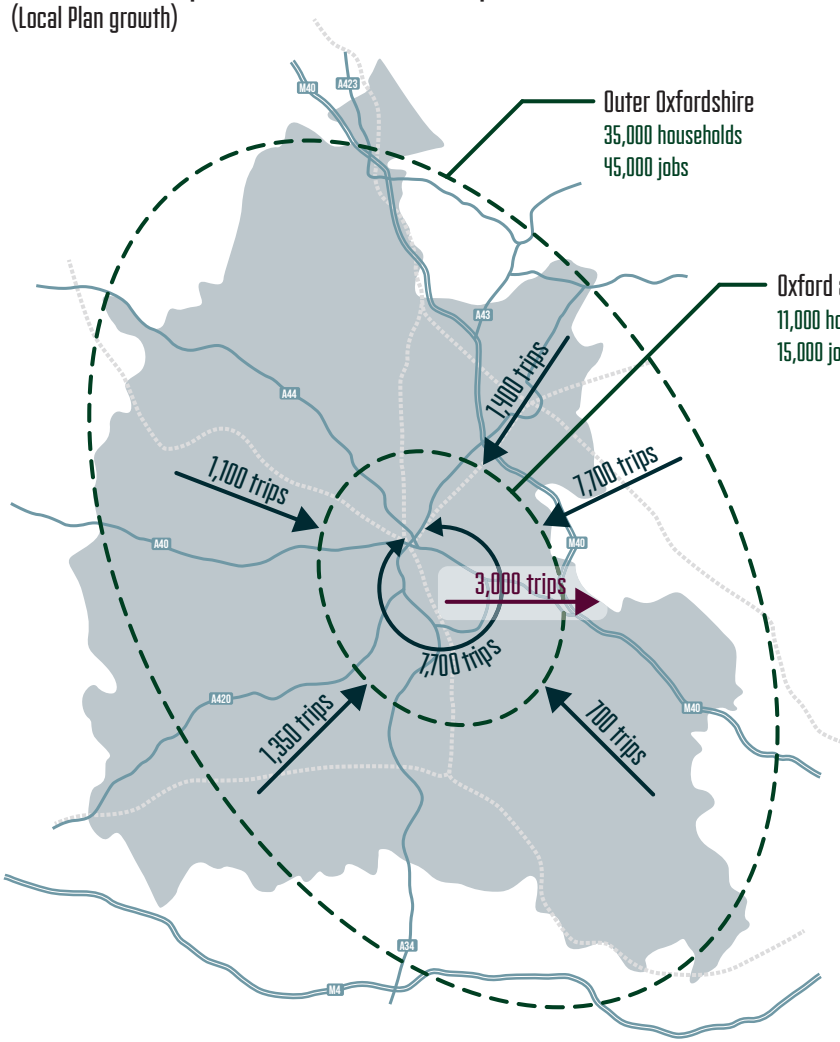
2.3 Oxfordshire is currently one of the fastest growing, and most dynamic, areas in the UK. The City Deal, and Oxfordshire Local Enterprise Partnership's (LEP) Strategic Economic Plan (SEP), both set out a vision for accelerating economic growth to meet the needs of the area's science and knowledge-rich economy. Per Oxfordshire County Council's overarching growth plan, the aim is to place the county at the forefront of the UK's global growth ambitions to 2031 and beyond, through the delivery of:



Oxfordshire growth plans to 2031

2.4 To date the various local planning authorities have progressed their Local Plans to different stages. The following diagrams summarise the main locations currently being envisaged as the focal points for future growth across Oxfordshire according to the Local Plans and the Strategic Housing Market Assessment (SHMA[1]):

Scale of development and commuter trips to, from and within Oxfordshire 2031
(Local Plan growth)

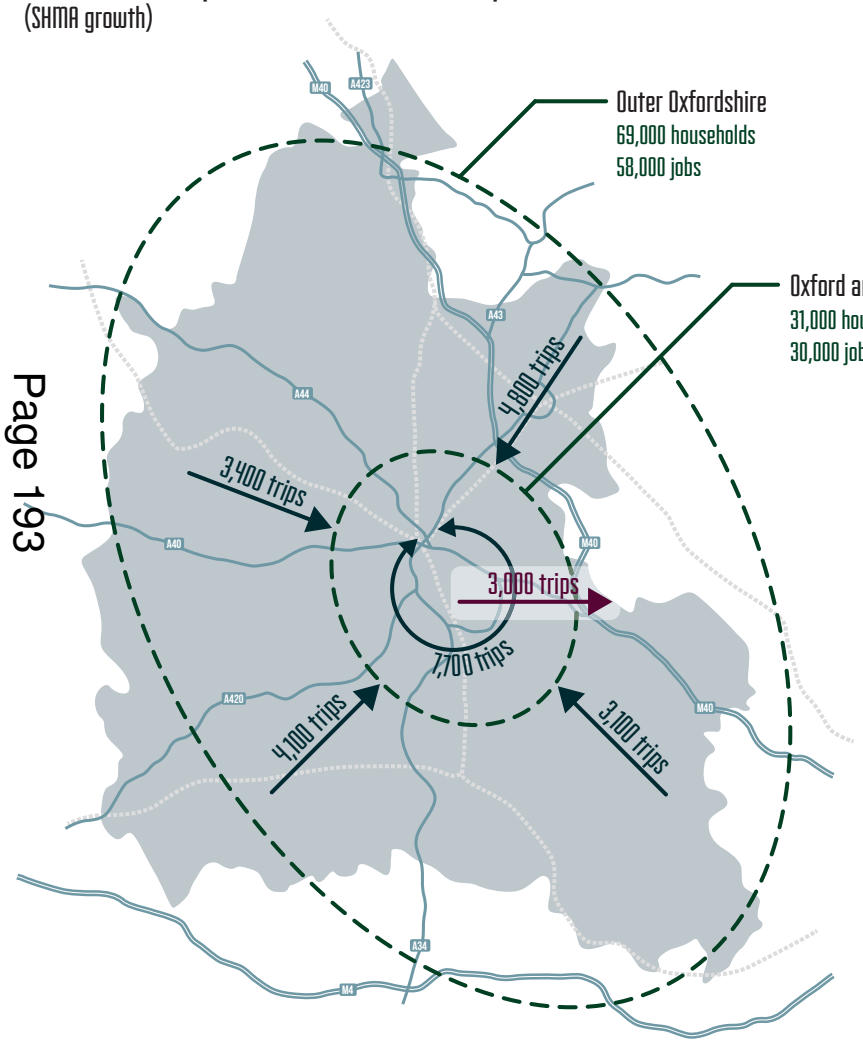


Additional demand

Where existing patterns of commuting trip generation, distribution and mode share applied to the anticipated Local Plan housing growth throughout the county, the city will see the following additional level of commuting:

- 6,800 car trips
- 2,450 bus trips
- 2,300 cycle trips
- 5,500 rail trips
- 2,200 walking trips
- 950 other modes

Scale of development and commuter trips to, from and within Oxfordshire 2031
(SHMA growth)



Additional demand

Where existing patterns of commuting trip generation, distribution and mode share applied to the anticipated Local Plan housing growth throughout the county, the city will see the following additional level of commuting:

- 13,600 car trips
- 4,300 bus trips
- 2,900 cycle trips
- 900 rail trips
- 2,400 walking trips
- 2,000 other modes

2.5 Government funding secured through the City Deal and SEP will be controlled locally to boost innovation and business growth, and create jobs in the technology and knowledge sectors in which Oxfordshire is already strong. This funding will also be used to unlock private sector investment, focusing on the following thematic objectives:

Innovative Enterprise	Growth led by innovation, R&D and business collaboration
Innovative People	Specialised and flexibly skilled people across all sectors
Innovative Place	Quality of urban and rural environments and choice of homes
Innovative Connectivity	Freedom of movement and interconnectivity for people and things

[1] Household growth levels taken from the SHMA and jobs forecast from Cambridge Econometrics study for Oxfordshire LEP. The SHMA is a technical study intended to help the Oxfordshire local planning authorities understand how many homes will be needed in the period 2011 – 2031. The Oxfordshire SHMA was commissioned jointly by all the Oxfordshire district councils supported by Oxfordshire County Council in 2013.

The Knowledge Spine and Innovation Hubs

2.6 The creation of high value science-related jobs within the area defined as Oxfordshire's **Knowledge Spine** represents a cornerstone of the economic growth strategy enshrined in our City Deal and SEP. The Knowledge Spine cross-cuts the county; running from Harwell and Culham in the south, to the life science Bio Escalator in Oxford, on to the advanced engineering hub at Begbroke, and through to Bicester in the north.

2.7 Key innovation areas within the Knowledge Spine include those shown in the table.

2.8 Other parts of Oxfordshire will also be key contributors to the success of the county's growth strategy. Witney and Carterton are key commuter areas for the Knowledge Spine. Banbury, while a hub for employment in its own right, also provides housing for significant numbers of people who work in the Knowledge Spine. This emphasises the critical need for effective mobility links that connect locations situated within the Knowledge Spine to each other, as well as key residential and locations outside the Knowledge Spine into the area.

Science Vale Oxford	▪ World class free-standing research establishments – at Harwell Enterprise Zone, Milton Park and Culham Science Centre. ▪ Growing settlements of, Didcot and Wantage / Grove and Abingdon-on-Thames provide a very attractive "town and country" lifestyle. ▪ Great Western Main Line, East-West Rail, A34 and M4 motorway also provide excellent links to Thames Valley, London and West of England.
Oxford	▪ Thriving city of 150,000 people – combining a historic city centre, a wide range of cultural activities with world famous research-based universities. ▪ The area boasts major blue chip companies, business incubators and an existing industrial base around the Cowley motor manufacturing facility. ▪ The city is home to 40,000 students and attracts nine million visitors per year. ▪ Its dense urban bus / Park & Ride network and strong culture of cycling is the envy of many larger UK cities.
Bicester	▪ A growing market town that is rapidly becoming one of the best connected places in the UK – thanks to excellent bus / coach services, expanding rail links to London / the Midlands and motorway connections. ▪ The availability of land for further housing and employment development will see the town grow in importance – especially for low carbon, sustainable living.

Challenges of accommodating future growth

2.9 A key challenge moving forward is that our future growth plans are threatened by our current success. Existing patterns of development and high income levels have created an environment defined by high car ownership and high levels of car use – particularly outside of Oxford.

2.10 If our growth plans are to be achieved, we recognise the need to provide an effective mobility system that provides real alternatives to the private car and helps to reduce traffic congestion. This is a key aim of both this Science Transit vision, and Connecting Oxfordshire (LTP4). Importantly, the growth plans themselves provide an opportunity for changing travel patterns and making public transport more attractive and viable.

Increasing demand for mobility

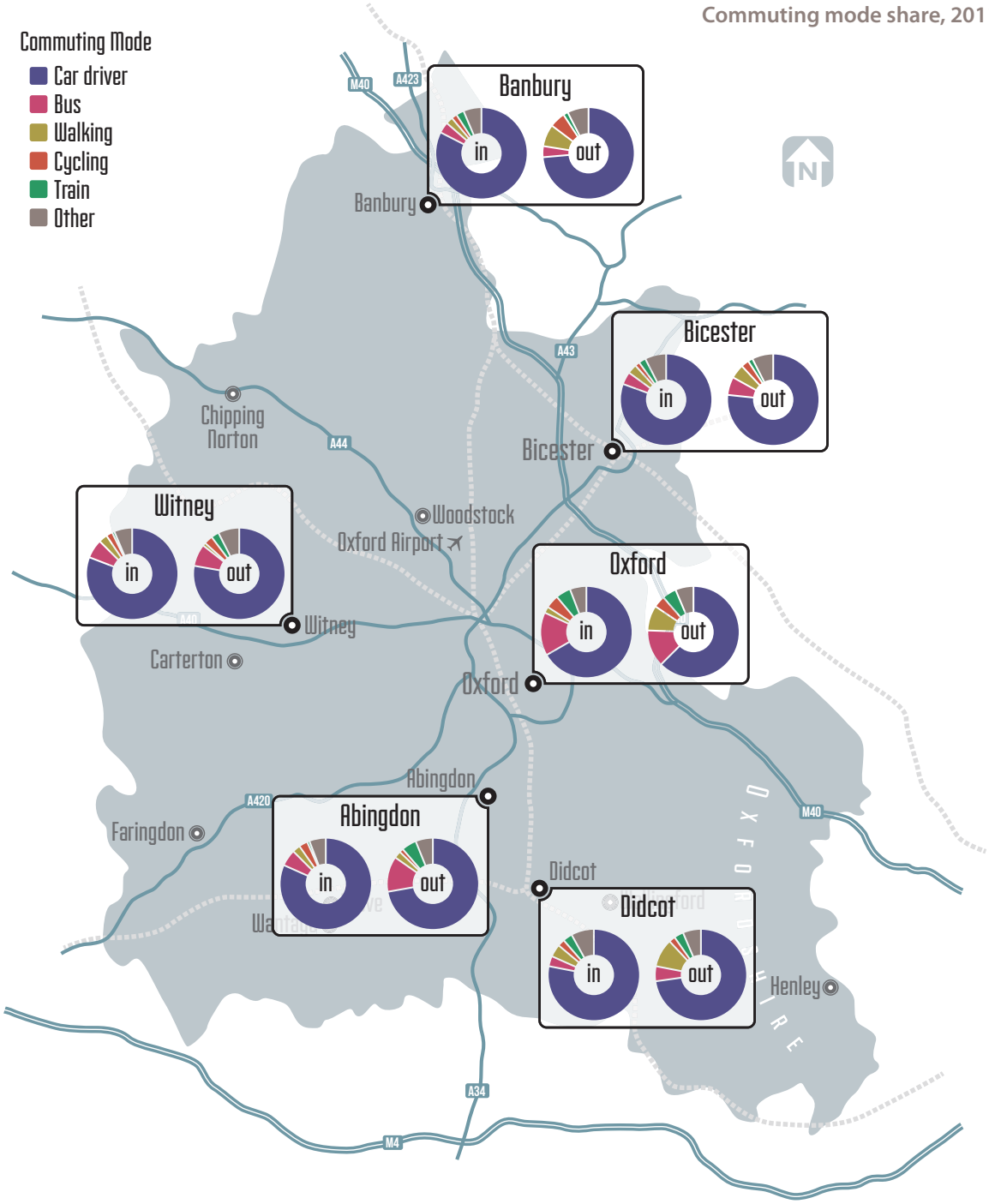
2.11 Unless public transport, walking and cycling can provide an equally or more attractive alternative, the predicted economic and housing growth will result in greater demand for private motor vehicle travel in the future – thereby increasing current levels of congestion and pollution.

2.12 Car ownership in areas outside of Oxford is high, with, for example, 88% of households in South Oxfordshire owning a car, compared to the national average of 74%. Forecasts based on projected growth and residential development across the county predict the total number of cars owned will increase by approximately 70,000 vehicles (+19%) between 2013 and 2031 in Oxfordshire. This is higher than the growth of the number of households in Oxfordshire (16% between 2013 and 2031).

2.13 This high car ownership translates into high levels of car usage, including for commuting trips. Census data from 2011 reveals that around 80% of commuter trips to work from Banbury, Bicester, Witney, Abingdon and Didcot are made by car. Travel into Oxford is also predominantly by car, but 15% of trips into the city are by bus and 10% by bike and train.

2.14 All of the major settlements in Oxfordshire, and in particular Didcot and Oxford, see a greater proportion of people leaving by train each day to travel to work than the proportion arriving from nearby towns and villages. The higher proportions of commuter bus trips into Oxford, and emanating from Abingdon, demonstrate that where good public transport is provided, it can offer an attractive travel choice.

Commuting mode share, 2011 Census



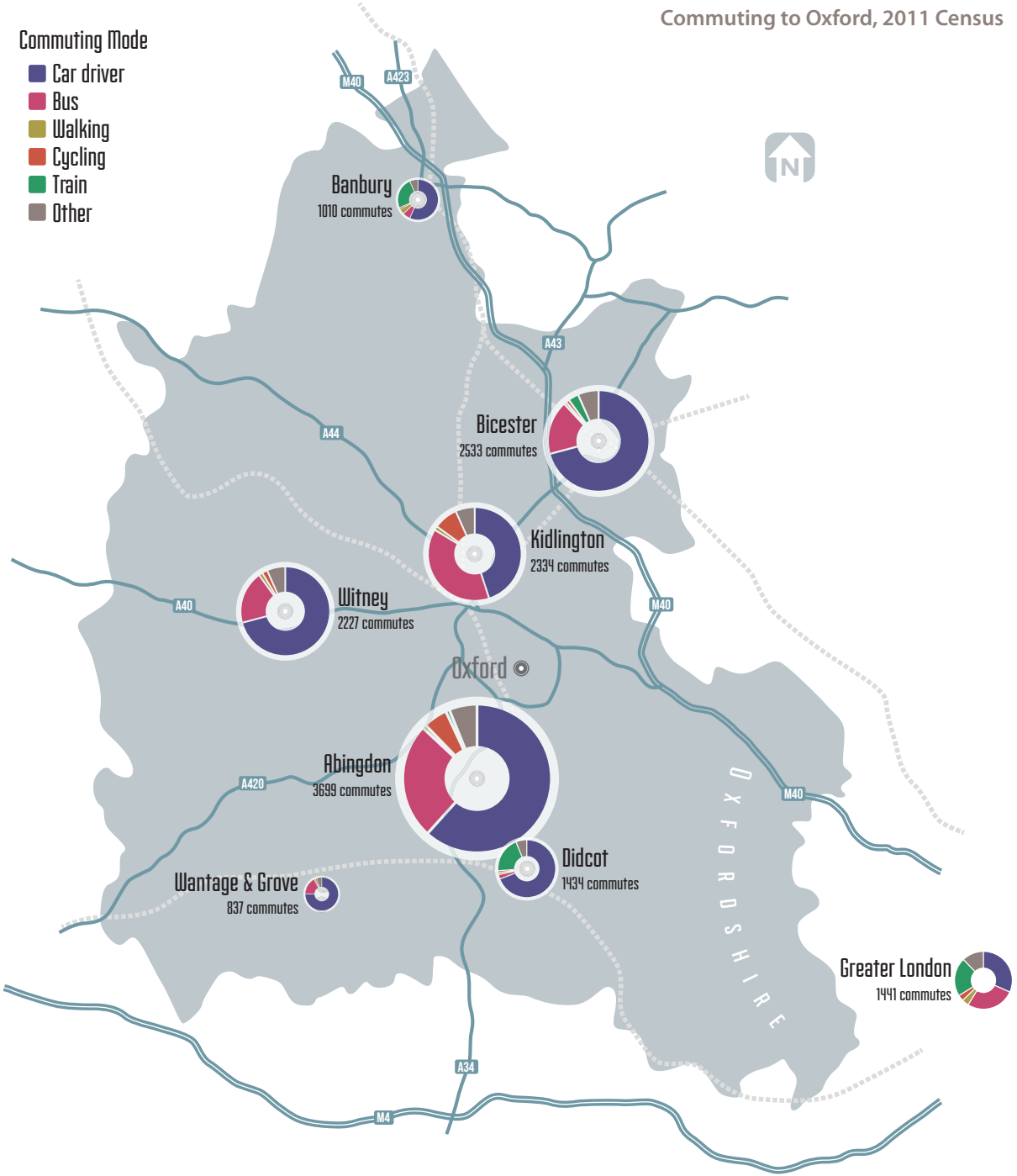
2.15 It is considered that high incomes and poor public transport accessibility are key reasons behind this trend, and improvements to public transport are essential if the growth in car use is to be reduced.

Complex travel patterns

2.16 Although Oxford city centre is the largest urban area in the county, Oxfordshire presents a challenge to serve dispersed "polycentric" employment sites and housing development that have traditionally resulted in high levels of private car use because of difficulties in providing commercially viable public transport.

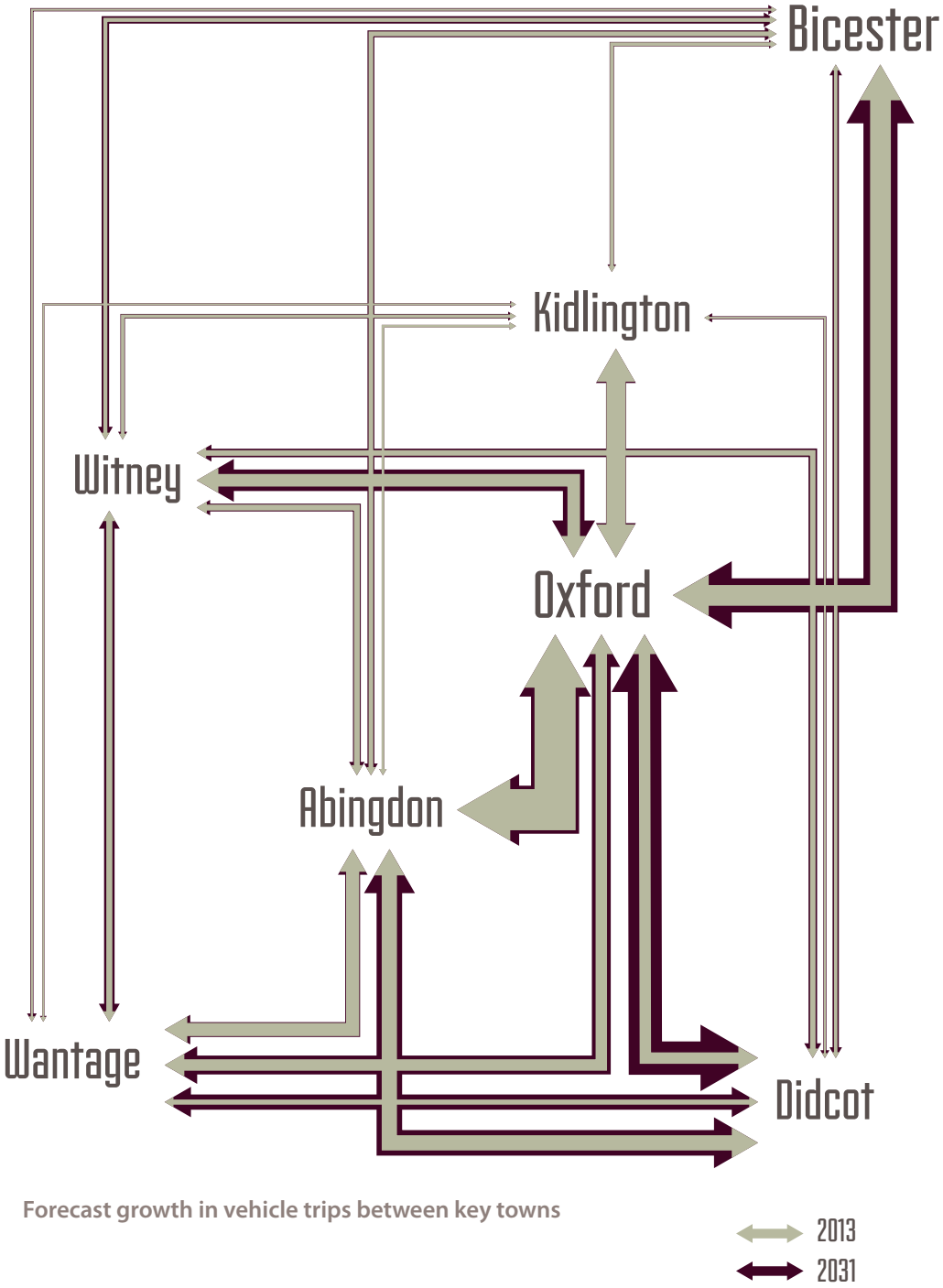
2.17 Reflecting its size, geographically central position in the county, and the range of employment opportunities available in the city, Oxford itself attracts workers from a wide geographic area. It is the main commuter trip attractor in the county, accounting for around 13,000 passenger car movements each weekday peak hour morning. As well as commuters, Oxford attracts tourists from all over the world. It was the seventh most visited town or city in Britain in 2013; attracting around nine million visitors per annum in total.

Commuting to Oxford, 2011 Census



2.18 The Oxfordshire Strategic Transport Model reveals that a large number of trips are currently made in the morning peak period on weekdays between key towns and Oxford. Although movements between these locations are greatest in the direction of Oxford; Bicester, Abingdon, Wantage, and Didcot are also significant trip attractors in their own right.

2.19 The projected future growth of local settlements is forecast to result in a strengthening of these movements during peak hours - particularly those emanating from Didcot, Abingdon, and Bicester.



Forecast growth in vehicle trips between key towns

Traffic congestion and its impacts

2.20 Perhaps unsurprisingly, the key characteristics of Oxfordshire's dispersed population and employment centres, complex movement patterns, and high levels of car ownership and usage have resulted in a highly congested road network.

2.21 The A34 and A40 already experience high levels of traffic congestion and delay. Most notably, sections along the western boundary of Oxford and towards Didcot frequently operate over capacity during extended morning peak hours and near to capacity for much of the day. As a result the A34 and A40 are not resilient to minor incidents and disruptions, which often result in major congestion events. Elsewhere in the county key junctions serving strategic routes like the A34, A40, and A44 operate at or beyond capacity during the morning peak hours. Stretches of the A420, A4074, A417, and A415 that link key residential areas and employment locations all experience high volumes of vehicles in relation to available highway capacity.

2.22 Future growth in jobs, population and car ownership levels will have a significant impact on the highway network's ability to cope with rising traffic volumes. During the morning peak hours there are projected to be more areas of stress on the network, particularly on the A34 between Oxford and Bicester, on sections of the Bicester ring road; and between Abingdon, Kidlington, and Didcot.

2.23 These levels of congestion on strategic and supporting road networks also create challenging operating conditions for local bus services. Buses rely on the same roads to operate, and only tend to benefit from bus lane segregation and signal priority on approach to/within Oxford. As a result, journey times can be slow from key towns to Oxford - up to 50 minutes to travel nine miles.

2013 and 2031 Forecast congestion

Transport opportunities arising from projected growth

2.24 Although the challenges presented by Oxfordshire's projected growth over the next 20 years may seem overwhelming, many of the new residential and employment developments being envisaged will unlock funding and create opportunities to deliver improvements to the county's transport system.

Intelligent Mobility for Oxfordshire

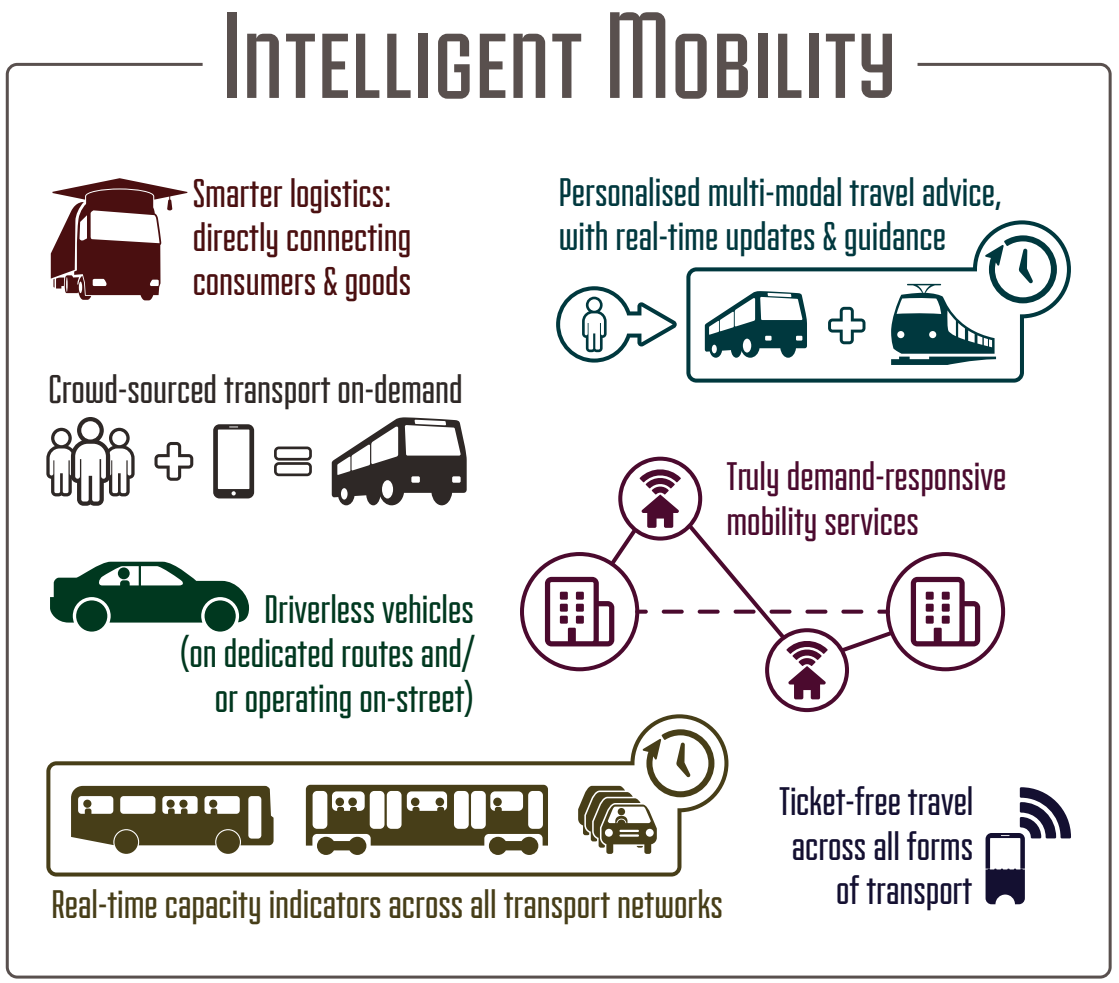
2.25 The emerging concept of Intelligent Mobility refers to significantly more responsive and predictive 'data-driven' transport systems that:

- More efficiently and sustainably connect goods, services, events, and people.
- Optimise available infrastructure capacity to maximise the time, energy and resource efficiency of travel and transportation.
- Are more readily connectable and flexible - promoting seamless journeys across all transport modes that can flex according to disruptions, changes in schedule or priority, and competing demands for other seemingly unrelated services.
- Generate lesser environmental and social impacts than current transport systems.

2.26 Intelligent Mobility services are not currently very well defined, since many are yet to come to market. Those already in development, or are technologically feasible, are shown in the diagram.

2.27 The international market for Intelligent Mobility services is estimated to be worth £900bn[2] by the Transport Systems Catapult[3]. As a global centre for research and development, the Innovation Hubs that make-up the Oxfordshire Knowledge Spine are perfectly positioned to capture a share of this market.

2.28 Science Transit seeks to develop the concept of Intelligent Mobility and apply it to real world transport systems within Oxfordshire – with particular emphasis on influencing and changing the way people think about mobility. We envisage the planned transport improvements to the Knowledge Spine area will act as a live test-bed and proving ground for Intelligent Mobility systems, techniques, and services. In doing so we will work in partnership with local research industries and commercial providers to develop and integrate this expertise.



[2] Transport Systems Catapult (2013) Five-Year Delivery Plan to March 2018. Available online here, last accessed on 28/04/14.

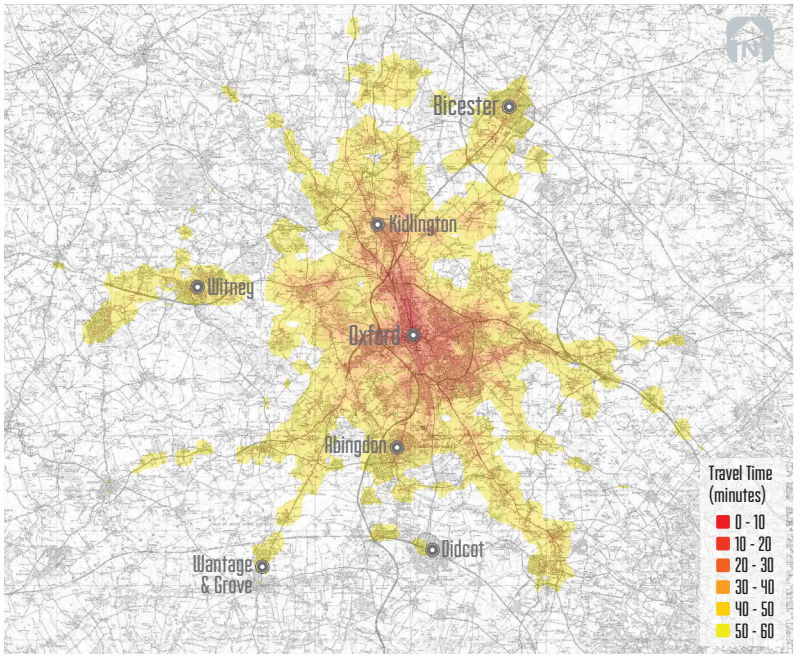
[3] The Transport Systems Catapult (TSC) is the UK's technology and innovation centre for Intelligent Mobility, harnessing emerging technologies to improve the movement of people and goods around the world. The TSC forms part of an elite network of seven technology and innovation centres established and overseen by the UK's innovation agency, Innovate UK. Together, they represent a £1bn public and private sector investment up to 2018.

Attractive public transport alternatives

2.29 The consolidation of people in the main existing settlements like Oxford, Banbury, Carterton, Bicester, Witney, Didcot[4] and Abingdon will help to strengthen the viability of enhanced public transport investment linking these towns to employment hubs. Anticipated investment to create new jobs across the county's Knowledge Spine, focused on the county's Innovation Hubs, will also help to define principal employment locations that can feasibly be connected to each other, and to local towns, by public transport.

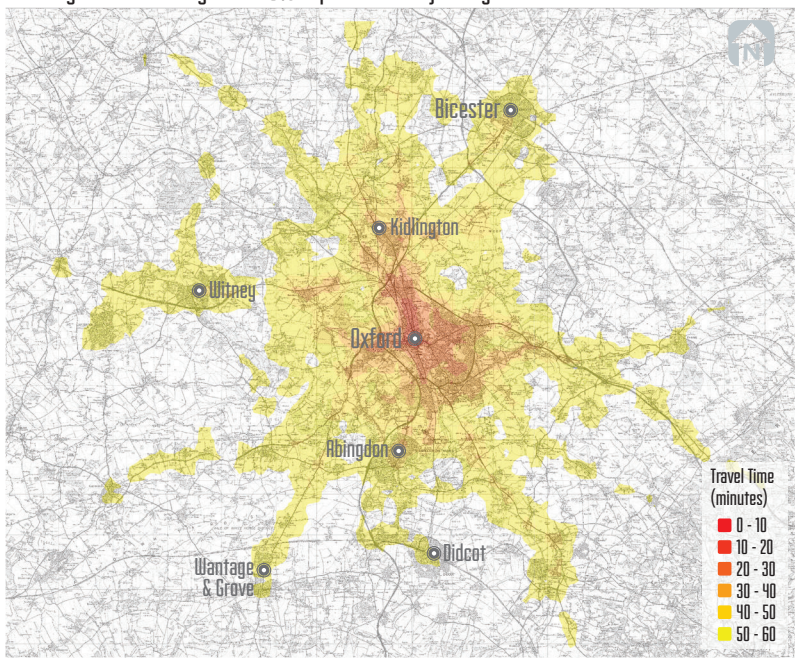
2.30 Projects highlighted in the Science Transit Strategy aim to achieve improved connectivity to new and existing development locations by public transport alongside service quality, passenger experience, and journey time/reliability improvements. For example, achieving a 10% reduction in door-to-door public transport journey times alone would increase by around 20% the proportion of Oxfordshire's current population that could access key employment areas in the Knowledge Spine within 20 minutes by public transport:

Existing situation



Journey times by public transport to Oxford City Centre

Existing situation with general 10% improvement in journey times



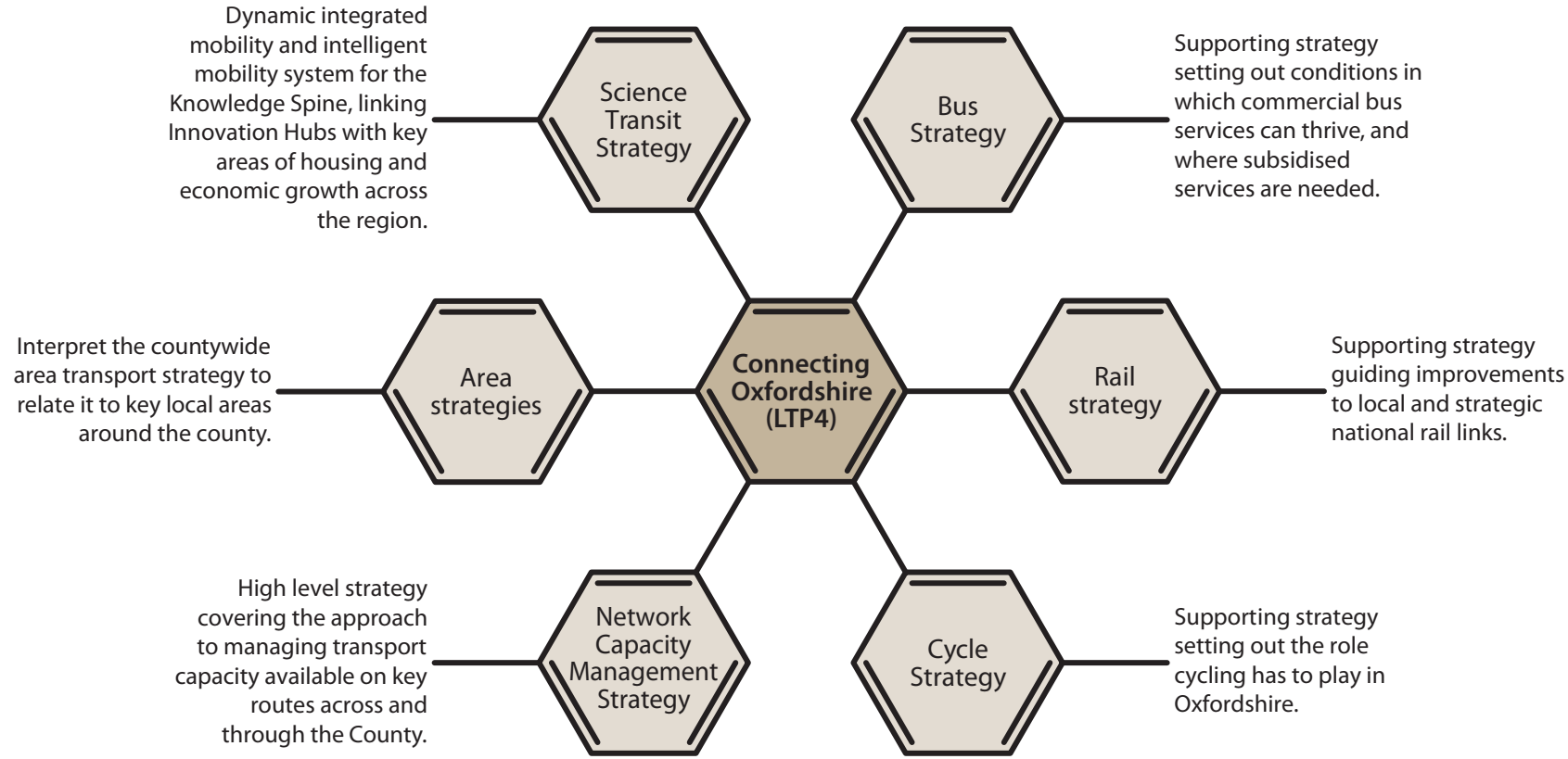
[4] Populations with > 20,000 inhabitants

Unlocking pinch-points on the highway network

2.31 Employment and residential growth will generate contributions from property developers and additional public revenues that can be invested in highway network improvements. Planned improvements to junctions on the A34 (at Hinskey, Kennington, Milton, Chilton, and around Harwell), on the A40 (Shores Green and Downs Road), within Oxford city centre; and new link roads at Grove, Wantage, and South West Bicester will help to improve traffic flows and public transport journey times alike.

Strategic fit with existing transport policies and strategies

2.32 Science Transit is part of a suite of local transport plans and strategies that will combine to address existing and future traffic congestion challenges in Oxfordshire:



3 SCIENCE TRANSIT VISION & OBJECTIVES

Our vision

3.1 **Science Transit** will realise a next-generation mobility and information system for the Oxfordshire Knowledge Spine across all modes of travel. It will link together our Innovation Hubs, and connect them to locations of identified housing and economic growth across the county. New developments will support Science Transit's delivery through strategic land-use planning to prioritise non car-based mobility, and create bi-directional demand for public transport services wherever possible. Science Transit will represent a credible and viable alternative to private car use by meeting people's basic mobility needs, as well as their expectations of speed, comfort, reliability, environmental sustainability, affordability, and journey experience.

3.2 This is about more than just improving bus services. The Science Transit vision is to ensure local transport links are deeply integrated with mainline rail and strategic highway connections to neighbouring towns, London, and Heathrow. New interchange locations will connect new and existing public transport services with walk, cycle, car-based, and air travel modes. Smart uses of real-time data generated through our effective coordination of mobility networks, and system users' movements, will increasingly enable people to seamlessly combine multiple travel modes to complete their door-to-door journeys.

3.3 To achieve this, Science Transit will actively seek to exploit:

- New and emerging technologies that improve the environmental efficiency and sustainability of conventional transport systems.
- Ticketless and cashless payment systems that are expected to enable seamless interchange across travel modes in the future.
- New and innovative uses of data that are being collected from local transport networks and vehicles in real-time.
- Entirely new modes of travel (e.g. autonomous vehicles) that are emerging from the intersection of technology, data, and transport system research & development.
- Partnerships with local transport operators, developers, and businesses to improve timetable coordination, service frequencies, and existing interchange and cycling infrastructure.

3.4 This ambition was outlined in Oxfordshire's feasibility bid to Innovate UK in 2014 to develop integrated transport solutions with Science Transit enabling the Knowledge Spine Area to be treated as a 'living laboratory' for the development and demonstration of 'Mobility as a Service'[5]. Its legacy will be a set of integrated mobility products that are end-user focused, seamlessly integrated with each other, and highly valued by time and money-conscious consumers.

Strategic objectives

3.5 Five interrelated and interdependent objectives will underpin the development of the Science Transit system. They are to:

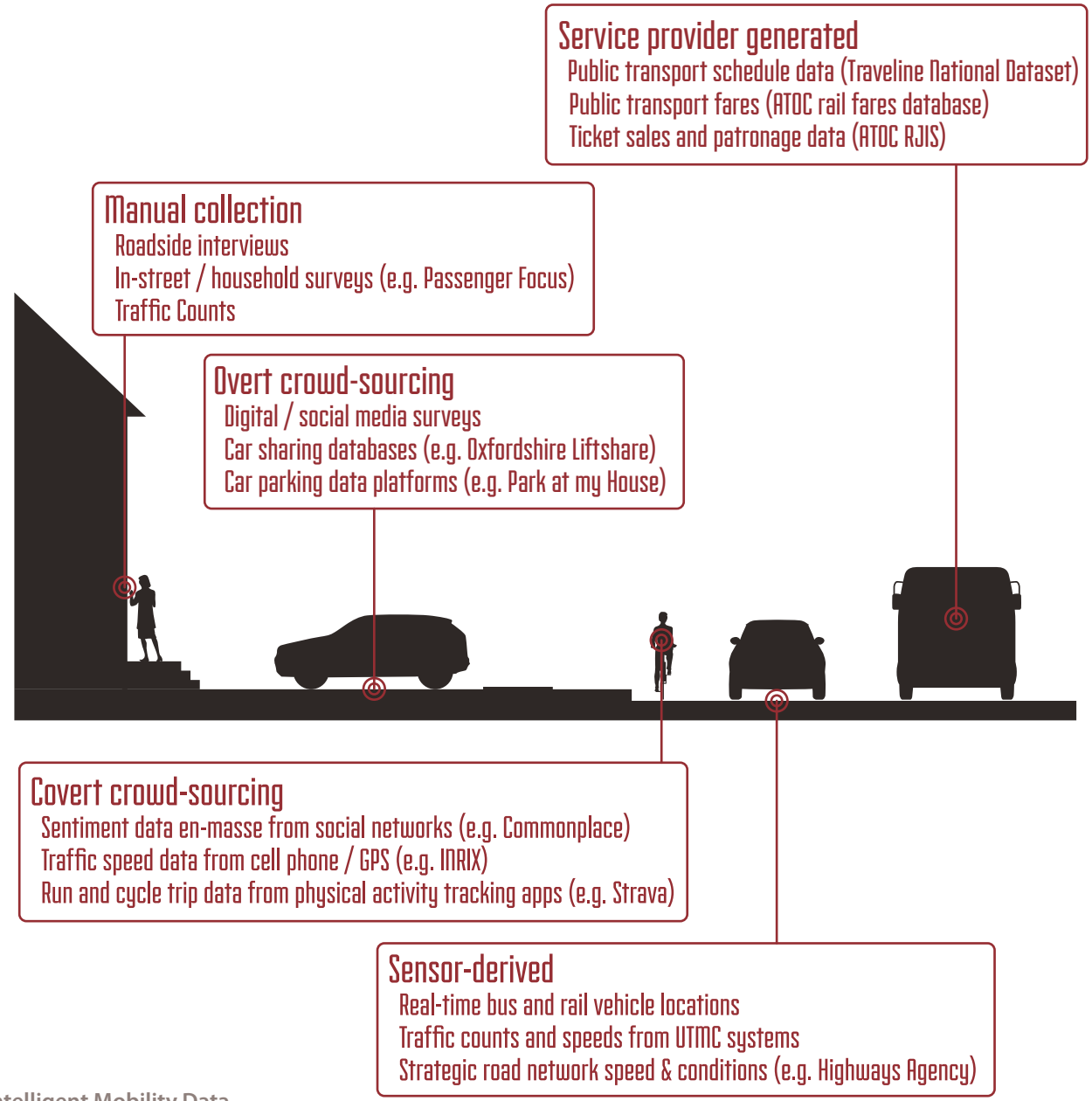
- **Embrace new technologies and data innovation to unlock intelligent mobility**
- **Accelerate local growth through innovative R&D**
- **Improve connectivity between places people live, work and spend their leisure time**
- **Integrate transport and land-use planning to improve non-car-based mobility**
- **Deepen public & private sector partnership**

3.6 The remainder of this section is structured around these objectives to explain each in more detail.

[5] ITS Europe defines Mobility as a Service (MaaS) as a mobility distribution model in which a customer's major transportation needs are met over one interface and are offered by a service provider

1) Embrace technology and data innovation to unlock intelligent mobility

3.7 Intelligent mobility services will be primarily, but not exclusively, driven by technological innovations and new analytical possibilities being created by accelerating flows of so-called 'digital exhaust' data. Such digital exhausts are a by-product of the online activities of Internet users and are created when people move around, purchase goods and services, or post updates to social networks. Such data is increasingly becoming available in real time:



Intelligent Mobility Data

3.8 Although it is impossible to be certain, given the emerging nature of many data processing and autonomous control systems at the time of preparing this strategy, we envisage the following possibilities will be unlocked by adopting a data-driven and proactive technology approach through Science Transit:

- **More timely, accurate, and insightful intelligence** for transport system managers in respect of what is happening across the county's transport and movement at any given time. This more proactive network management will draw on data from both public and private sector data owners, and Oxfordshire County Council's role will likely involve acting as an independent broker for this data.
- **Scope for autonomous mobility network** control and management systems that require less human intervention. These are likely to operate based on intelligent responses to data that are being collected and analysed in real-time, and simultaneously compared against historically collected and pattern-analysed datasets.
- **Deeper insight and intelligence for strategic transport planners**, enabling more efficient design and implementation of new mobility systems.
- **Personalised and context-specific multi-modal travel information** that can be delivered to individuals across multiple platforms. This will power digital tools that enable individuals to make more intelligent, data-driven, decisions about their personal mobility options in a range of scenarios – optimising their use of time, money, CO_2 and calories when moving around.

3.9 In line with Oxford's emerging Smart City Strategy, Science Transit will be both a key contributor to, and consumer of, data from Oxford's envisaged Open Data hub.

Successful delivery against this objective will involve embedding the latest mobility technologies and data analytics so that digital exhaust data collected from operational transit systems and the region's road networks bind the county's disparate transport network components into an integrated system.

2) Accelerate local growth through innovative R&D

3.10 Driving economic growth through innovation is a key future theme for the county, and our delivery of the Science Transit Strategy will create opportunities for precisely this. Its commitment to embracing emerging environmental sustainability and intelligent mobility technologies in transport and other areas deliberately seeks to create significant research and development opportunity for local industries. Our aim is for the following business segments to benefit from future investment in the local transport system through innovative Research & Development (R&D) in:

- Vehicle manufacturing
- Communications technologies
- Electronic sensors and controls
- Logistics and distribution
- Traveller information systems
- Predictive modelling
- Infrastructure management
- Real-time data exploitation

3.11 Each of these are fast-moving, independent business sectors that have historically operated with little formal connection to each other. As such, existing intelligent mobility initiatives often appear fragmented, with the concept's full potential yet to be realised.

3.12 Science Transit will help overcome this lack of integration by establishing R&D projects that enable all forms of transport to participate in continuous, intelligent vehicle-to-infrastructure and vehicle-to-vehicle interactions. These offer unexplored potential to tackle global problems of congestion, poor traveller experience, fuel consumption, environmental pollution, and road safety.

If successful, working in coalition with businesses and University partners, Oxfordshire's transport system will become a 'living-lab' for internationally significant, bleeding edge[6] mobility technologies that benefit our county whilst also being scalable for export to other regions around the world.

[6] Bleeding edge technologies are considered so new that they could have a high risk of being unreliable and require considerable investment in order to make use of them. A proportion of bleeding-edge technology will find its way into the mainstream (e.g. email).

3) Improve connectivity between places people live and work

3.13 Science Transit's ultimate objective is to provide mobility as a consumer service that people in Oxfordshire can purchase easily, as and when they need it, for their trips to/from, and within the county. In this context the system will aim to be:

- **User-focused** – It will integrate with modern lifestyles, and align with evolving demands and expectations for personalised mobility options (both for people and goods). It will allow for informed decisions, be simple to use, and allow people to combine whatever modes of travel they want to use in order to get where they are going. Information and communication will be the key interface between the user and transport service.
- **Seamless** – Physical and virtual integration will ensure coordinated transfer between modes and create a 'zero wait state', whereby delay to users of the transport system is minimised before/during/after their journeys. Science Transit Hubs Interchanges and services will make space for people to work or relax whilst they are in-transit, and will be inclusive and accessible to all by design. Cashless payment and ticketless travel will aid seamless transfer between travel modes and ensure the system is easy to use.
- **Valued** – Trusted services, in which users perceive value for themselves, will be delivered. A transparent value proposition will be accompanied by simple and flexible payment systems. Science Transit will be recognised by its users as safe, reliable, comfortable, fast, environmentally sustainable, and good value. The clear use of Science Transit branding will create a common identity across integrated travel modes.

3.14 We foresee a combination of tangible improvements to existing public transport routes (as set out in the Bus and Area Strategies), the construction of new mass rapid transit capacity, and the creation of Science Transit Interchanges (described in more detail in section 4) for seamless interchange between modes of travel, as the basis for achieving this objective. The illustration provides an example of how Science Transit journeys between home and work are likely to take place in 2035, once the vision for the system has been fully realised.

The closer we are in 2031 to providing mobility services that are as seamless as the example above, the more successful we will consider our delivery of Science Transit to have been.

A future journey to work

07:00
Molly wakes up, and receives an alert about an incident affecting driving times and (to a lesser extent) her usual BRT line.

07:20
Molly checks her journey options via Digital TV while eating breakfast. Local traffic congestion is worsening, so she's advised her fastest option today will be via a different route.

07:30
Molly uses the Science Transit app on her phone to confirm her alternative route and starts her trip by booking a driverless small vehicle transfer from just outside her front door to today's best Science Transit Hub for her destination.

07:35
Molly heads outside in time to board a small vehicle with some neighbours heading in a similar direction.
On-board she reads the news using the free WiFi and gets an update on her onward connections.

07:40
Molly pre-orders and pays for a fresh coffee from the kiosk at the approaching Science Transit Hub using loyalty credits she has earned on previous trips. Her preference is remembered for future trips through this Hub.

07:45
Molly exits the small vehicle and picks up her coffee as she interchanges. While waiting for the next BRT bus she quickly reschedules her 8am meeting with colleagues using the free WiFi at the Hub.

07:50
Molly boards the next BRT vehicle heading to her workplace, bumping into colleagues. After chatting with them she clears through some emails using the fast, free WiFi on-board.

08:10
Arriving 10 mins later than usual, but already having started work en-route, Molly heads straight to her office on foot. Her Science Transit app has figured out the route she took to get here and billed her E-purse appropriately.

08:15
In the lift en-route to her desk Molly shares a quick 4 out of 5 rating for her journey today (her coffee was missing sugar) in return for additional Science Transit loyalty credits. Her feedback is stored for future service improvement and personalisation.

4) Integrate transport and land-use planning

3.15 Another key objective for our successful delivery of Science Transit is for the strategy to become fully embedded within the future growth aspirations, development proposals, and urban design features of the areas it serves.

3.16 The National Planning Policy Framework (NPPF) provides the policy requirement to locate major developments where the need to travel can be minimised and the use of sustainable travel modes can be maximised. However, there is also scope through future Local Plans and Reviews to deepen the integration between development proposals and the Science Transit system. For example, encouraging developers and local planning authorities to focus growth in locations adjacent to high frequency transport corridors can help to further boost demand for services, and reduce forecast future growth of private car trips. New developments can be designed with 'nudge' factors to make people more likely to choose sustainable transport, for example by providing parking in secure garaging areas a short distance away from homes or offices rather than directly outside and in view. This reduces the likelihood that a traveller will consider a private car journey as the default option when they begin their trip.

3.17 Through Science Transit our aim is for transport and personal mobility planning considerations to become significant factors in local planning decisions for residential, commercial, and employment developments.

If successful we will create a virtuous cycle that enables growth and development to both support, and be supported by, commercially viable sustainable connectivity.

5) Deepen public and private sector partnerships

3.18 The aims of the Science Transit Strategy cannot be achieved through Oxfordshire County Council working in isolation. Instead the success of the strategy will critically depend on effective partnership working, and joined-up project delivery, with:

- Private sector mobility providers - bus and rail companies, bike hire providers.
- Secondary service providers - car parks, public WiFi, ticket sellers.
- Research and development partners - Universities, technology providers.
- The local business community and our Local Enterprise Partnership.
- Local Planning Authorities
- Central government departments.

3.19 To this end our aim is to use the Science Transit brand and funding allocated for Science Transit projects to unlock involvement, in-kind support, and investment from private sector and research delivery partners.

3.20 An example already in development, is the OXybeles concept[7] being established in partnership between Oxfordshire County Council and local Universities. It will act as a vector for intelligent mobility research and live-testing. Innovative SME business development, new Intellectual Property for both local businesses and the OXybeles partnership, and wider economic benefits through efficiency savings are anticipated outcomes. The partnership will build on existing work being led by Oxfordshire County Council around digital traffic monitoring, responsive journey planning tools, traffic management and smart transaction hackathons[8].

Successful achievement of this objective will involve the majority of Science Transit projects being delivered in collaboration with private sector and/or other research partners, and include shared investment, by 2035.

[7] Oxfordshire LEP (2014) Strategic Economic Plan: Driving Economic Growth Through Innovation, pg 68, Available online at: http://www.oxfordshirelep.org.uk/cms/sites/lep/files/folders/Strategic%20Economic%20Plan/Oxford_Strategic_Economic_Plan.pdf, last accessed 28/10/14.

[8] A hackathon (also known as a hack day, hackfest or codefest) is an event, typically lasting between a day and a week, in which computer programmers and others involved in software development come together to create usable software. Transport hackthons can focus on building exciting transport-related apps, visualisations, or conduct insightful data analysis.

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4 OUR APPROACH TO DELIVERING SCIENCE TRANSIT

General approach

4.1 The ultimate vision for Science Transit is of establishing an integrated mobility system that is very different to existing ways of providing public transport. The approach we adopt to achieve this will need to recognise the strengths of the networks we have today and evolve each different component of the system appropriately.

4.2 The Science Transit Strategy will evolve over the next 20 years as funding, growth, development, investment, partnering, and intelligent mobility opportunities arise. Our long-term vision means the foundations on which Science Transit will be built are unlikely to fall into place overnight. Instead individual components of the Strategy are expected to materialise at different times, and in different locations, across the county.

4.3 For example, widely anticipated advances in technology and data-analytics are expected to dramatically change the landscape within which mobility services are delivered. Greater personalisation of services, and fluidity in response to changing patterns of travel demand, are expected to become common features of both urban and rural mobility systems. We don't know what some of these technologies will be but the Science Transit Strategy needs to be flexible enough to take them on board and exploit their benefits. As such our approach to delivering Science Transit will draw on four over-riding principles:

Flexibility	To respond to rapidly changing technologies and analytical possibilities that emerge through the maturation of the current 'digital revolution'
Quality	Throughout our approach to planning, designing, and delivering Science Transit services, supporting infrastructure, and policies.
User-centred	Ensuring the infrastructure and services we plan truly meet the mobility needs and aspirations of local commuters, business and leisure travellers alike.
Intelligent	To purposively and patiently create a mobility system that is data-driven, truly multi-modal, and resilient to changing mobility patterns.

Key features and principles of the future system

4.4 It will be vital for Science Transit to get the basics of mobility right to satisfy the demands of both users and non-users. Science Transit must be accessible, affordable, reliable, and frequent. It must offer a rapid journey time, with seamless interchange, and serve desired origins and destinations. To additionally attract non-users to the system, and therefore generate modal shift, other aspects of the system also need to be high quality and appeal to people that would not usually consider using non car-based forms of mobility.

4.5 In designing and developing the system we will use the following hierarchical series of questions that users, or potential users, might ask themselves when considering whether Science Transit's mobility options are relevant to them:

- Does it do the job I need?
- If it suits my travel needs, is it usable?
- Does it diminish me as a person to use it?
- Am I willing to pay for this service quality?
- Do I consider this a quality product, and is it ethical?

4.6 Critically therefore, Science Transit must do a core job of meeting individuals' mobility requirements, and everything else is secondary. To achieve this, the main effort behind Science Transit will involve:

- Investing in sound product design for linkages, frequency, speed, and reliability.
- Holistic system design based on an accurate understanding of actual travel needs.
- Recognising no amount of added value or marketing can overcome core product deficiencies, but that they are a key part of the mix - particularly for generating mode-shift.

4.7 On this basis, the key design features of our fully-realised Science Transit vision are shown in the table to the right.

4.8 Deeply embedded intelligent, and data-driven, mobility technologies will cut across all four of these key design features; and is considered a critical enabler to achieving our long-term vision for Science Transit.

Smooth interchange

- Transport interchanges and vehicles that are truly accessible for all
- High quality audio-visual information
- Free WiFi at Transport interchanges
- Linked to local walk and cycle networks
- Seamless transition between different modes of travel
- Retail and service activities to enable productive use of time

High quality services

- Fast and efficient bus, rail, and autonomous small vehicle connections.
- Reliable journey times achieved via priority use of road networks.
- Safety and security paramount
- Free WiFi connectivity on-board.
- Easy to access vehicles for all users
- Responsive to demand based on data-driven operational management and adaptive learning from user's feedback.

An easy to use mobility system

- Cashless payment systems using smartcards, bank cards and smartphones.
- Identifiable branding across multiple modes of travel.
- Rewards and incentives for repeated use of the Science Transit network and off-peak travel[9].

Joined-up smart mobility information

- Relevant to different user contexts and journey purposes at all journey stages.
- Available via multiple digital sources (web, smartphone app, digital TV).
- Updated in real-time, to provide the latest insights and intelligence.
- Comparative travel time and cost information for an individual's options.

[9] Incentives such as those provided in Singapore might be considered: http://www.lta.gov.sg/content/ltaweb/en/public-transport/mrt-and-lrt-trains/travel-smart/for-commuters.html

Evolving Oxfordshire's existing transport networks

4.9 Our starting point for the delivery of Science Transit is the county's existing transport networks. The following assets provide the basis on which our strategy will be implemented:

- **Park and Ride** sites that are already well-used, and have potential to act as strategic multimodal interchange facilities for trips through and within the Knowledge Spine.
- **Modern hybrid or emission-free buses with high levels of service** between key residential areas and Oxford city centre, and recently introduced services between Knowledge Spine Innovation Hubs and local residential areas.
- **Strategic rail connections** direct to London, Birmingham, Manchester, Newcastle, and Reading, with planned improvements through East-West rail.
- **Direct, high quality coach services** to Heathrow, Gatwick and Luton airports, and central London with free WiFi on-board.
- **Smart cards** that enable cashless payments, faster loading at stops, and create an integrated ticketing zone within Oxford and surrounding residential areas.
- **Real Time Information** systems covering most buses operating in and around Oxford city centre, with satellite tracking of bus vehicles powering underlying operational data systems and countdown departure displays at stops in the city.

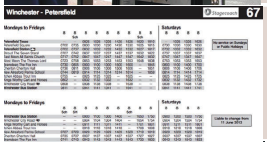
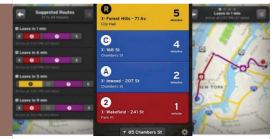
4.10 These assets are currently focused around Oxford, as the county's largest urban area and primary generator and attractor of trips.

4.11 In practical delivery terms, Science Transit, alongside other related transport strategies and policies, will bring these disparate transport network components together over time and mould them into a cohesive system. It will deliberately broaden the range of mobility options beyond the main corridors into Oxford, to better connect residential areas across the county with the Knowledge Spine and its key employment locations. In doing so we will seek to address the following weaknesses currently present in local transport networks:

- **Comparatively long bus journey times** to Innovation Hubs across the Knowledge Spine, and service frequencies that do not allow for spontaneous travel.
- **Regular traffic congestion** on a highway network that is vulnerable to disruptions and extreme weather, and on which local public transport services also critically rely.
- **Fragmented and occasionally inaccurate local travel information** across multiple formats, making it hard for people to intelligently plan local trips.
- **Little multi-operator ticketing outside of Oxford city**, and disjointed rail and parking payment systems.
- **Lack of fast, direct rail connections to Heathrow and Gatwick**; and infrequent buses to London Oxford airport.
- **High carbon footprint of transport in Oxfordshire**, with air quality in Oxford exceeding EU and World Health Organisation limits.

4.12 At the heart of Science Transit is the recognition it needs to be conceived, developed and implemented as an integrated system. It needs to allow users to make seamless door-to-door journeys more productively than if they were made by car, and within comparable journey times.

4.13 By taking the strengths and weaknesses listed above into account, and mapping them against the key components that will make up Science Transit, we can indicate where Oxfordshire's transport networks currently sit in relation to our desired level of development for each one. Each component can be developed at different rates across different areas of the network. The figure below illustrates the various stages of evolution that might be considered, and identifies where today's system sits within that framework:

		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	
Relevant to all	Intelligent data-driven mobility		Limited automatic data collection	Increased data collection and use by individual organisations	Some sharing of schedules and pricing data between different stakeholders	Open data sharing platform for real-time traffic and local public transport data	Data shared by all mobility services. Real-time & historic feeds power predictive models and autonomous systems	
High Quality Services	Priority		Shared lanes in mixed traffic no priority	Shared lanes but with some preferential treatment	Designated lanes, heightened priority	Dedicated lanes and segregated facilities	Exclusive alignment with full grade separation	
	Vehicles		Functional	Exterior aesthetic and ride/comfort features	Improved boarding accessibility and information features	Diversified vehicle sizes, materials, capacities, alternative fuels	Guidance, propulsion and demand responsive routing	
	Stops/ interchanges		Basic flag, some shelters	Improved shelters, signage and amenities	Additional passenger information, safety and security amenities	Enhanced station services and fare collection	Enhanced berthing, loading and land use features	
Page 211	Route structure		Basic regular service	Improved service frequency with transfer connections	Extended stop distances with skip-stop and express services	Regional coordination, high frequency and reliability	Flexible route options to increase one seat rides, on/off alignment operations and convenient transfers	
Easy to use mobility system	Publicity/ branding		Limited	Marketing with minimal differentiation from other routes	Wider use of branding to differentiate services	Marketed and branded as a separate tier of service	Full branding and marketing as single service system	
	Fare collection		On-board only	Increase pre paid fare sales	Proof of payment fare systems	Electronic fare collection using smart card systems	Multi modal multi operator ticketless travel and e-payment	
Smart mobility information	Information		Basic timetable information at stops and public locations	Web-based information, improved distribution, some real time information	Wider roll out of real time information	Real time information at all key stops and public places	Personalised, context-aware information and alerts through multiple digital devices.	
	Handling small demands		Car and taxi based	Car, bike, and taxi sharing schemes, bike hire service	Semi-flexible bus services, Car Club	Demand responsive small vehicles. E-bike hire system	Intelligent demand responsive transport	

4.14 The remainder of this section outlines how we will approach the implementation of the components which make-up the four key design features of Science Transit.

Creating an easy to use mobility system

Smarter fare collection

4.15 Alongside traveller information, fare collection is a business-critical support system that will respond to, and facilitate, the broader Science Transit system's operational design and business model.

4.16 Fare collection is considerably more than just a background technical system. It represents the 'front-end' of the most fundamental business and pricing decisions for local transport operators. Similarly the price being charged, and the mechanism for making payment, is a key point of interaction between system users and the mobility service.

4.17 Through our delivery of Science Transit we intend to evolve fare collection systems across all mobility services in the county. In the not-so-distant future we envisage county-wide cashless and ticketless travel, with integration into national rail, coach, and park and ride parking payment systems. To make this a reality the focus of our work will be on:

- Developing technical and data interoperability frame-works with transport operators to allow for multi-mode and multi-operator ticketing and cashless payments.
- Establishing branded Science Transit fare products that extend to connecting services, and allow for revenue sharing between different service operators.
- Simplifying pricing mechanisms so users can easily identify their best fares via Science Transit publicity materials and digital information channels.
- Developing online and interactive services via the web and smartphone apps that including on-the-fly payment for travel (while in motion or progress).
- Exploring and testing the potential for location-aware fare collection to facilitate automated payments.
- Opening-up anonymised fare revenue and patronage data to allow for predictive and pattern-analyses that could inform more intelligent transit route investment decision-making in the future.

4.18 Several of these activities present scope for collaborative R&D with local innovation partners in order to accelerate routes to market for locally-developed fare collection and payment systems.

Consistent branding

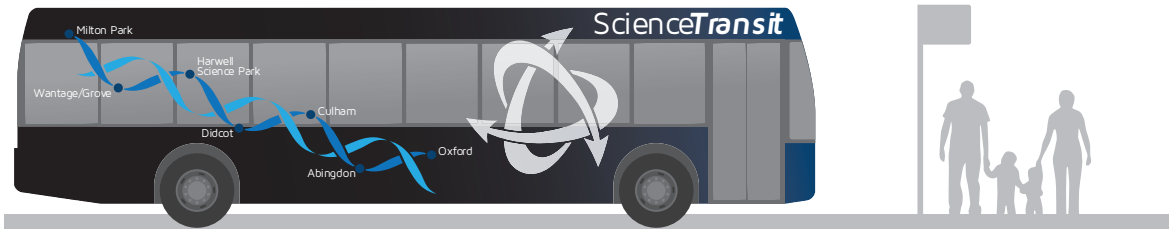
4.19 Developing a strong, coherent brand and identity for the Science Transit system is an important consideration of overall system design. Whether a sign, symbol, slogan or word, branding the system will ensure a constant message to the audience, aiding recognition and building awareness amongst the population. An engaging brand will help us to reach the general public and assist with achieving support and buy-in.

4.20 Our work to brand the system will consider concepts tapping into what people want, need, and require; as well as - ultimately - what they desire. The brand needs to create an image in the minds of users and non-users so as to clearly communicate a positive and accurate perception of the services on offer through Science Transit.

4.21 Through our development of this Science Transit Strategy document, we have created the following outline concepts which can be tested and developed with potential system users as we progress this component of the strategy.

4.22 There are already some very strong branded images for Oxfordshire and it is important that any new brand is minded of this to enhance customer experience rather than add uncertainty. We need to consider how the Science Transit Brand integrates with other brands while remaining inclusive.

Possible Science Transit Branding



ScienceTransit

ScienceTransit

ScienceTransit

Joining-up smart mobility information

More intelligent information for system users

4.23 Travel Information, like fare collection, has traditionally been a supporting system that should ideally be carefully tailored to the customer service and operational objectives and features of Science Transit. Reliable and accurate mobility information is central to empowering public transport users and non-users into making more intelligent decisions about their choice of travel modes. The world's most successful transit systems can be negotiated in relative comfort without the need to interact with anyone. These are often urban light rail and metro systems where every effort is made to reassure the user along the course of their journey. The same principles have been successfully applied to local bus-based systems (e.g. Trans-val-de-Marne busway in Paris and Zuidtangent in Holland).

4.24 Outside of London, Oxford has one of the most comprehensive real-time passenger information systems in the UK. This information has to date been delivered at-stop, via digital displays, but is increasingly becoming available through web-based feeds so that it can be embedded into various forms of digital media.

4.25 The growing availability of real-time transport data feeds (particularly in major cities) is rapidly changing our historic reliance on timetables and paper-based information distribution approaches. Personalised travel information is increasingly available from queryable online sources that allow prospective travellers to provide details of the origin, destination, and timing of their trip to receive relevant information in return. Widely used smartphone apps like CityMapper and MyCityWay are driving-up the quality and relevance of multi-modal travel information in large global cities. Their users are gaining deeper insight into the travel options available to them, enabling enhanced decision-making about the optimal route and mode combinations for the combinations of trips they need to make.

4.26 Our expectation is that similar personalised, context-specific, journey planning tools will trickle-down to smaller cities like Oxford as the multiple open real time data feeds they depend on become reliably available. Science Transit aims not to overlook user groups that will continue to need clear and concise paper-based and at-stop information, but provides a growing alternative. We envisage the bulk of work we do to deliver this strategy will involve:

- Working with local transport operators, highway network managers, and other mobility service providers (on and off-street car parking, bike hire systems, car clubs, and car share providers) to broker real-time open data feeds that can be shared publicly and used to power next generation information tools.
- Exploring the possibility of crowd-sourcing user feedback and sentiment in relation to their experiences of using the Science Transit system, to inform future service planning and identify which system components work well / require attention.
- Enhancing the quality of information on board Science Transit system vehicles, with better insights into the performance of connecting services and mobility options.
- Fully opening-up and exploiting all of the mobility-related data owned by local authorities in the region, including Urban Traffic Management Control centre datasets.
- Collaborating with local R&D partners to develop innovative, locally-relevant, mobility information tools that improve the efficiency with which people use the Science Transit system alongside the rest of the county's transport networks.
- Working with local property developers to ensure intelligent mobility information services are 'designed-in' to new residential developments and dwellings constructed over the course of the next 20 years.
- Engaging with other UK cities and transport groups to play an active role in the development of open global standards for sharing mobility-related data.

4.27 By implementing these initiatives, Oxfordshire's mobility data feeds will come to act as the glue that binds together disparate transport networks into a truly multi-modal, integrated Science Transit system. The mobility information products described above will likely become central to the way people choose how to travel, as well as providing the means to procure and pay for mobility 'as a service'.

Handling small demands

4.28 The process of accommodating small demands (both short trips, and longer trips from locations where there is limited demand) is increasingly thought of as a data problem. 'Inefficient', and operationally inconvenient, taxi and car passenger trips are traditionally accommodated at major interchanges with limited provision elsewhere. Data-driven, location-aware mobility services like Uber, and automated bike sharing/car club services, mean it is becoming easier than ever before for people to plan and make multimodal trips with minimal interchange penalty. In the most densely populated urban areas these lifestyle oriented services are enabling growing numbers of people to reduce their dependency on the private car – and in some cases live totally car-free.

4.29 Our delivery of Science Transit will recognise that the semi-rural and rural nature of many of the county's residential areas currently places limitations on the viability of these kinds of 'next generation' services. In doing so our work to accommodate small travel demands across the system will combine the following activities:

- Working with local taxi and private hire companies to explore ways we can enhance integration and interchange at Strategic Science Transit Interchanges.
- Improving the provision of physical interchange facilities at Transit and Strategic Interchanges for private and hired vehicles, allowing for both pre-planned and on-the-fly connectivity with scheduled/high frequency public transport services.
- Working with local R&D partners to scope, design, test, and implement a family of scalable, and replicable location-aware vehicle hire and ride sharing technologies focused on bike hire, car share, car clubs and other on-demand vehicle services. By developing new products and technologies that are both relevant and financially viable for smaller cities like Oxford, we envisage scope for innovation-led growth and re-sale to other similarly sized cities around the world.
- Partnering with local Universities and automotive companies to create and test intelligent, driverless, demand-responsive mobility services. We envisage this scaling from existing local work to develop and trial the Robotcar vehicle into a viable product.

4.30 Implementing many of these initiatives will be a long-term undertaking that necessitates significant collaborations with industry and academic partners. We believe the long-term gain from investing time and resources – and being receptive to opening-up the county's highway networks to provide the living lab needed to test their real-world viability – presents genuine scope for us to establish new forms of mobility that are globally relevant and exportable.

Embracing intelligent data-driven mobility

4.31 Our desire to embrace intelligent, data-driven, mobility is guided by our observation they are already disrupting[10] existing transport networks, and look set to pervade new forms of mobility for the foreseeable future. Our expectation is that intelligent mobility techniques and practices will cross-cut all of the Science Transit system's components. The Strategy sets out a plan that ensures Oxfordshire is at the forefront of influencing and embracing the new disrupting technologies.

4.32 While this is a long-term aspiration and is not something we can expect to achieve overnight, the intelligent mobility sector is gathering pace rapidly. To set the 20 year Science Transit time-horizon in context, technologies that were pure science fiction just 20-25 years ago are increasingly commonplace. As such it is very difficult to predict with any precision where our pursuit of Science Transit will take us, or how quickly current public transport providers will respond to the disruptive innovations on the horizon.

4.33 As a practical first step towards achieving more intelligent mobility, the collection and storage of transport-related data from a range of local and national data sources will underpin the development and design of Science Transit. Oxfordshire County Council will play a central role in coordinating this automated data collection effort, working in partnership with local transport providers (e.g. bus and rail companies, bike hire providers) and secondary service providers (parking providers, free public WiFi, ticket sellers). The diagram below shows how data generated through the process of providing these services can feed back in to the design and delivery of the better optimised Science Transit system.

Data at the heart of Science Transit

[10] A disruptive innovation is an innovation that helps create a new market and value network, and eventually disrupts an existing market and value network (over a few years or decades), displacing an earlier technology. The term is used in business and technology literature to describe innovations that improve a product or service in ways that the market does not expect, typically first by designing for a different set of consumers in a new market and later by lowering prices in the existing market.

4.34 Not all of the datasets required for intelligent mobility are currently freely and openly available, and some are unlikely to ever be made available in this way, but when collected and combined in real-time they offer scope for deeper understanding of the way transport systems interact with the world around them. Further integration with data flows from social media, restaurants, venues, shops and other trip-generating destinations is ultimately envisaged as critical to the development of mobility systems that are responsive to the changing aggregated travel demands of people.

4.35 Resolving the technical problems associated with collating and combining the data flows from the multiple sources described above is a common challenge across the established transport industry as a whole. From the perspective of the financial business case for Science Transit, any data costs associated with procuring or collecting missing datasets will need to be considered. Long-term, these costs may be integrated within the price of travelling in and around the Oxfordshire Knowledge Spine, or borne by new commercial models (e.g. through sales of seemingly unrelated products).

4.36 The table to the right summarises the key drivers and opportunities for Oxfordshire businesses and research industries in respect of the five strands for Intelligent Mobility identified by the Transport Systems Catapult.

4.37 Projects that could be delivered in partnership with local R&D centres to exploit these opportunities include:

- Dynamic traffic and transport modelling.
- Fully interoperable payments systems across all locally present forms of transport.
- Next generation electric vehicle charging infrastructure.
- Ultra low emission vehicle propulsion technologies.
- Exploitation of free public WiFi connectivity for pedestrian footfall and vehicle tracking.
- Electric vehicle driver information.
- Intelligent two-way feedback between driver and vehicle, including crowd sourcing feedback on journey satisfaction and performance.
- Autonomous passenger and freight vehicle design, implementation and service delivery.

Intelligent mobility strand	Drivers & opportunities for exploitation through Science Transit
Autonomous systems	▪ Optimised performance and control of existing transport services ▪ Reduced operating costs and staffing requirements ▪ Better use of existing transport network capacity ▪ Reductions in fuel costs and transport emissions ▪ Driverless technologies and control systems
End-to-end journeys	▪ Greater convenience for transport users ▪ Inclusive access for people with limited mobility ▪ Mobility as a service procured on-demand ▪ Reduce time and costs associated with moving people
Information exploitation and customer experience	▪ Easier to use, more navigable transport networks ▪ Tailored, contextual assistance for travellers with particular needs ▪ Reduce time and costs associated with moving people and goods ▪ Add value by leading consumers to relevant goods and services
Resilience	▪ Faster response to emergencies and incidents ▪ Better-informed strategic plans for winter readiness ▪ Dynamic switching between transport networks ▪ Reduced costs associated with service delays and cancellations
Smart infrastructure	▪ Adaptive capacity to accommodate primary movement flows ▪ New sources of data from connected infrastructure ▪ Reduce/delay need for additional road/rail/air infrastructure ▪ Optimise maintenance and repair activities based on sensor data

- Data mining, predictive analyses using historic datasets, and autonomous control systems for individual mobility services and system managers.
- Partnering with local mobility service operators to ensure real-time information feeds are converted into actionable real-time intelligence for system coordinators (and autonomous control systems), as well as being made available retrospectively for pattern analyses and predictive modelling.
- Exploitation of GNSS[11] and Internet of Things data flows from increasingly connected vehicles and infrastructure.

[11] GNSS - Global Navigation Satellite System (GNSS) receivers commonly-used for surveying and navigation.

Delivering smooth interchange

4.38 All journeys involve some form of interchange, whether it is walking to the bus stop to get on a bus, transferring from bus to train, or parking the car and walking to the office. In the context of Science Transit, the ambition is to make all interchanges as smooth and seamless as possible.

4.39 To this end through the Science Transit, public transport and Area Strategies we will establish a network of stops and interchanges that serve key destinations across the Knowledge Spine, and act as interchange points between multiple modes of transport. These will differ in scale from one location to another, but as a general rule will:

- Accommodate high frequency services, and large flows of people, at peak times.
- Facilitate seamless, stress-free transfer across multiple modes of travel.
- Be situated in locations that are close to the strategic highway network, providing maximum opportunity for park and ride and mode-shift from private car use.
- Maintain safe walk and cycle access by keeping people segregated from public transport and vehicle movements.
- Become an integral part of the land-use mix to create vibrant centres of activity that reduce 'dead-time' commonly associated with interchange between travel modes.

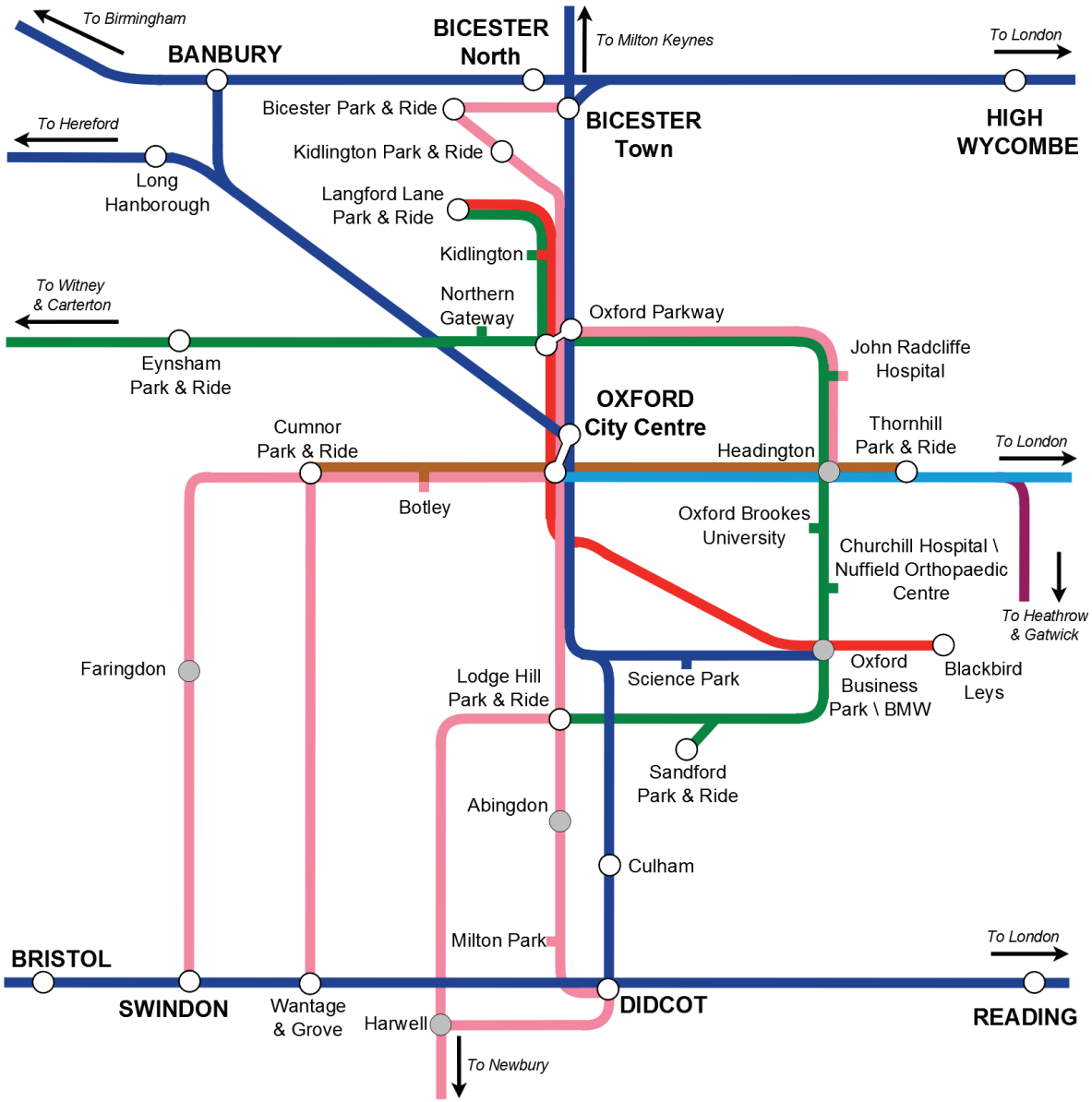
4.40 The following hierarchy is envisaged for the future Interchanges:

- **Local** - a simple stop serving a limited number of routes, with safe and convenient access by walking and cycling, and perhaps some cycle parking
- **Transit** - an interchange served by a range of different services, perhaps with a number of stops/shelters, at the convergence of walking and cycling routes, with pick up/drop off facilities, and possibly some parking to facilitate park and ride
- **Strategic** - a major interchange potentially served by national and regional rail or bus services, many local bus services, and including existing and proposed Park and Ride sites.

4.41 We envisage that many Strategic Interchanges will, over time, become connected to each other by rapid transit services designed to move large volumes of people at regular frequencies. Where passenger volumes do not support mass rapid transit, buses with high levels of service will operate at peak hour frequencies that are sufficient for users not to need a timetable (e.g. every 15 minutes). Key residential areas and smaller destinations, such as satellite campuses at each of the county's various science parks, will be connected by feeder bus or small vehicle services as well as secondary walk/cycle and demand responsive mobility services.

Intercange type	Potential locations	Facilities	Transit Modes
Local	Less accessible parts of residential and employment areas	RTPI, information, shelter	Local bus, small vehicles, DRT, driverless "Pods"
Transit	Major residential developments, innovation areas, town centres	RTPI, information, improved shelters, plus some retail and service activities	As above plus higher capacity/frequency services
Strategic	Railway stations, park and ride interchanges	RTPI, information, interchange building offering wide range of retail and service opportunities	As above plus rail, regional and national coach, park and ride

4.42 The existing network already has the benefit of some good quality stops and interchanges, particularly in and around Oxford. Moving forward, it will be necessary to identify the location of local, transit and strategic interchanges in conjunction with the connections between them. An impression of how Science Transit Interchanges could be connected to form a system is set out on the following page (indicative plan).


To Birmingham
BANBURY
BICESTER North
To Milton Keynes
To London
HIGH WYCOMBE
Bicester Park & Ride
BICESTER Town
To Hereford
Kidlington Park & Ride
Long Hanborough
Langford Lane Park & Ride
Kidlington
To Witney & Carterton
Northern Gateway
Oxford Parkway
John Radcliffe Hospital
Eynsham Park & Ride
OXFORD City Centre
Cumnor Park & Ride
Thornhill Park & Ride
To London
Headington
Botley
Oxford Brookes University
Churchill Hospital \ Nuffield Orthopaedic Centre
To Heathrow & Gatwick
Faringdon
Lodge Hill Park & Ride
Science Park
Oxford Business Park \ BMW
Blackbird Leys
Sandford Park & Ride
Abingdon
Culham
Milton Park
To London
BRISTOL
SWINDON
Wantage & Grove
Harwell
DIDCOT
READING
To Newbury
Key
Rail
Bus Rapid Transit 1
Bus Rapid Transit 2
Bus Rapid Transit 3
Premium Bus Route
Strategic Interchange
Transit Interchange
Coach Route
Airport Link Route

4.43 The aim of the Science Transit system will be to provide the majority of people who work in Oxfordshire with journey options that involve no more than a single, logical, inter-change through a Science Transit Interchange and minimise the need for private car use. In developing and improving the quality of local interchanges, some of the features that will need to be implemented include:

- Further roll out of Real Time Passenger Information.
- Relocation and increase in the number of Park and Ride sites, as proposed in the Oxford Transport Strategy; to serve more routes, increase interchange potential, and enhance facilities on-site (retail and other services).
- Improvements to existing/creation of new national rail stations to serve as Strategic Interchanges with a wide range of retail and other services to ensure productive interchange.
- Creation of Transit Interchanges in new developments and existing Innovation Areas, with improvements to existing town centre interchange facilities.
- Design for a wider range of vehicle-types to serve gradu-ated demand across routes.

Achieving high quality services

Deploying appropriate transit vehicles

4.44 Travel demand between, within, to, and from the Knowledge Spine is highly varied. As such, an important consideration in the design of Science Transit system will be to provide for a range of movement patterns along different corridors. Using vehicles of appropriate capacity levels will allow for service frequencies that are attractive to users, and deliverable at an affordable price.

4.45 The Science Transit system will integrate a combination of walk/cycle, demand responsive small vehicles, conventional bus services with high levels of service, dedicated Bus Rapid Transit, and Heavy Rail connections into a cohesive mobility network. The key service types, and the roles they are envisaged to play, are outlined to the right.

Service type	Role in Science Transit
National Rail links	▪ Fast connection between Banbury, Bicester, Didcot, and Oxford Strategic Interchanges. ▪ Fast connection to London, Heathrow and key destinations in neighbouring counties. ▪ High volume people movements at regular intervals.
Bus Rapid Transit (BRT)	▪ High frequency links between Strategic Interchanges ▪ High degree of segregation and priority from road traffic delivering reliable journey times. ▪ High quality vehicles offering mass-transit system capacity, where needed. ▪ Deployed on high-demand corridors.
Premium Transit Routes - Buses with high levels of service	▪ Regular services linking larger residential areas' Transit Interchanges with nearby Strategic Interchanges ▪ Act as a feeder service to BRT and National Rail links.
Connector Transit - Smaller vehicles operating on sched-uled and flexible demand-responsive routes	▪ Minibus shuttle services operating at peak hours. ▪ Feeder services to connect Local Interchanges in residential / destination locations with lower levels of travel demand. ▪ Demand responsive services on semi-fixed routes to connect smaller residential areas with nearby Strategic Interchanges and destinations.
Premium/Super cycle routes & walking	▪ Direct, segregated active travel links that connect destinations and residential areas to their nearest Science Transit Interchange (set out in Oxford Transport Strategy).
Private car travel	▪ Frequent interchange opportunities with high quality public transport and demand-responsive services. ▪ Essential connection into Science Transit network for people living and working in rural parts of the county. ▪ Scope for driverless vehicle technologies to dramatically change demand for private car use.

4.46 The service types described above represent a continuum. Lower cost services that are more flexible and can be implemented with little lead-time are ideal for areas where limited demand for non-car based travel exists. If through their introduction, or local development, the scale of passenger demand changes over time, these services can be scaled-up gradually through the provision of larger vehicles and improved network infrastructure.

4.47 An important feature of the Science Transit system will be its flexibility. Some aspects of network infrastructure (bus priority at junctions, BRT running lane segregation, walk/cycle paths connecting Interchanges to places), and the services that use them, will be permanent fixtures. However, other components will be designed to operate on a flexible basis – reducing the need for expensive infrastructure that is only used for part of the day. Flexible components of the Science Transit network are anticipated to evolve over the 20 year delivery horizon to include:

- Small vehicle services operating on scheduled routes, which can be amended with minimal lead-time to respond to travel demand from new housing development or specific scenarios (e.g. University term start and end, annual festivals and cultural events). Data collected from the Science Transit system, and combined with local road traffic/event data feeds, will inform the scheduling of these services.
- Demand responsive mobility services that do not operate on a scheduled basis, but instead use computer algorithms to match requests for short distance travel from multiple users. Several such systems are currently in development in the UK (Simply Connect) and internationally (Bridj), and are anticipated to become increasingly common as intelligent mobility services become more commonplace. The Science Transit system roadmap will plan for the integration of these kinds of data-driven transport services alongside existing forms of mass rapid transit and public transport.

4.48 Over the timescale being considered by Science Transit, greater volumes of services will come directly to people - rather than necessarily requiring people to move to them. Early signs of these kinds of system are evident in the form of services like Click & Collect, which are changing people's movement patterns and mobility demands. The Science Transit Strategy will need to adapt to these technology-driven changes in order to ensure it remains relevant over the life of its 20 year delivery horizon.

Improved priority and segregation

4.49 Science Transit's aim is for more rapid services to deliver travel time savings and more reliable journey times, particularly between Strategic Interchanges. Only high levels of segregation and priority will deliver this. Bus gates, bus lanes, grade separated lanes, or exclusive transit ways - such as disused rail corridors - will be implemented, as appropriate, across the Knowledge Spine and on interconnecting routes from neighbouring residential areas. These will all be explored as part of individual Area Strategies.

4.50 Just as railway tracks indicate where a train travels, treatments or markings to differentiate a running way can effectively convey where a dedicated bus service operates. Differentiating the appearance of bus running ways can be accommodated through a number of techniques including pavement markings, lane delineators, alternative pavement texture, alternative pavement colour, and separate rights-of-way. These are likely to be features of routes that connect Transit and Strategic Interchanges.

4.51 We anticipate investment in a guided system will also help promote a stronger image, and generate greater modal shift. However, this needs to be balanced against the lower costs and greater flexibility offered by high quality conventional bus-based systems. The lead-time, cost, and permanent nature of any form of segregated running way means they are only likely to be appropriate for high-demand links between Strategic Interchanges that also serve major employment sites (e.g. Innovation Hubs) and residential areas.

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5 DELIVERY ROADMAP

Context

5.1 As a long-term vision for improving mobility options and connectivity into, and within, the Oxfordshire Knowledge Spine, we envisage Science Transit will be delivered gradually over a 20 year timeframe.

5.2 This 'future-focused' time-horizon, and desire to proactively integrate intelligent mobility into the Science Transit system, means anticipated technological innovations and research-led development will introduce considerable variability over when specific components can feasibly be delivered. As identified in the previous section, future levels of public funding available, the actual scale and location of demand for movement created through settlement growth in Oxfordshire, and relative transport priorities all impact upon the accuracy with which we can plan and deliver our vision.

5.3 Our roadmap for delivering Science Transit needs to account for this inherent uncertainty, and to allow different components of the Science Transit system described in the previous section to move forward at different speeds – whenever demand, funding and private sector opportunities emerge. The timeline on the following page therefore constitutes an outline plan, with the near-term activities grounded in current and planned projects. The kinds of projects considered necessary to fully achieving all of the Science Transit objectives, but which may currently appear aspirational, are shown as medium and longer-term activities. We note these projects may not be delivered in the precise order they are described overleaf, but envisage they are likely to come to fruition over time in a manner that ensures the components of Science Transit are gradually assembled as part of an integrated system.

The Roadmap

5.4 On this basis our indicative Science Transit delivery roadmap is set out overleaf. For each potential Science Transit project we have estimated the amount of time related to the three key stages of:

- **Aspiration**: Pre-feasibility work to appraise and prioritise new project ideas.
- **Feasibility**: Detailed appraisal to determine each idea's viability and deliverability.
- **Implementation**: Technical delivery of the project, resulting in improved mobility.

5.5 In the Table, each Science Transit project is mapped against the vision objectives previously set out in Chapter 3:

a) Improved connectivity

b) Integrated transport and land-use planning

c) Embrace new technology and data

d) Accelerate local growth through innovative R&D

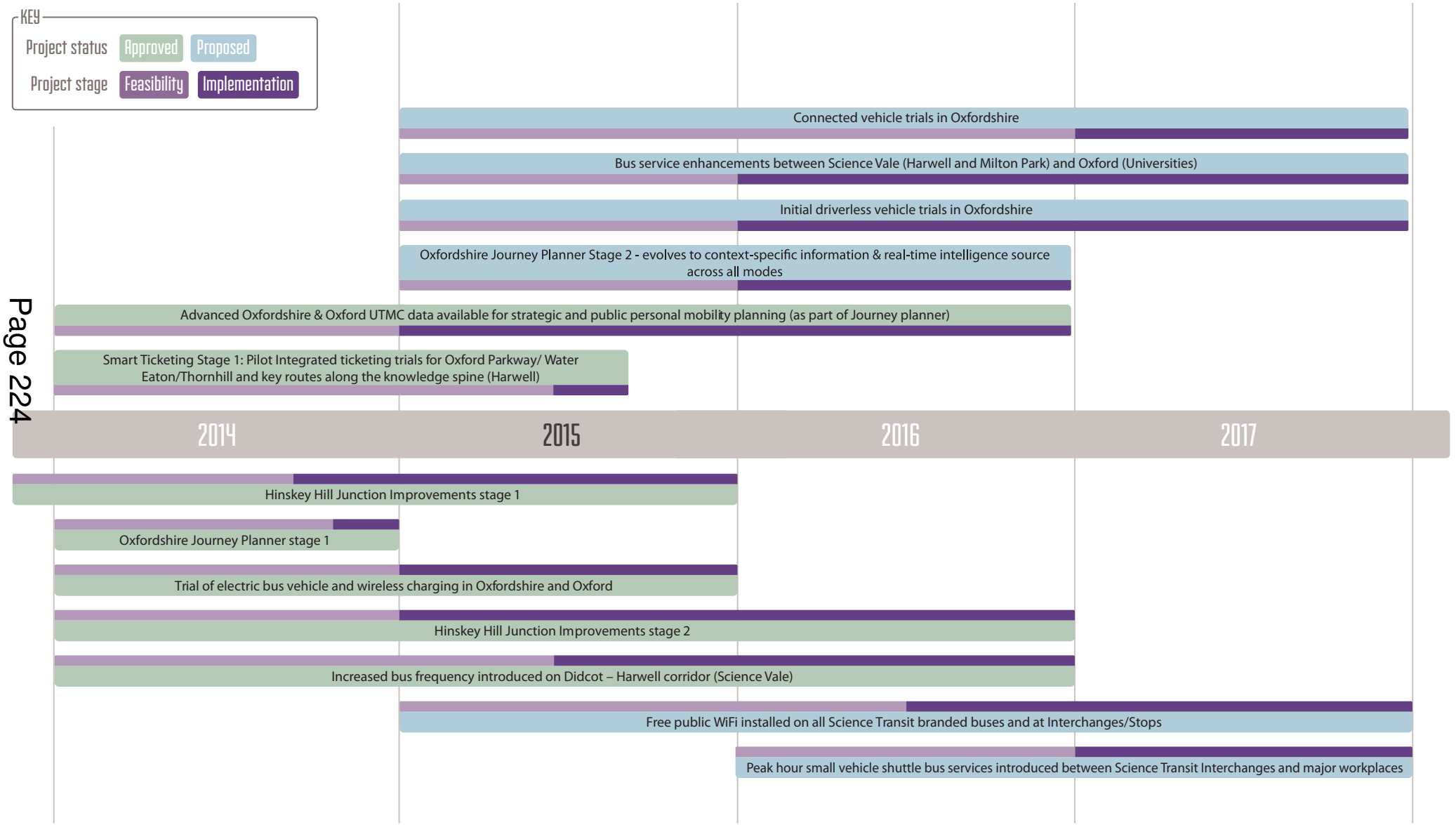
e) Partnership delivery

5.6 An integrated list of projects from the Science Transit and other LTP4 strategies is included at Appendix A.

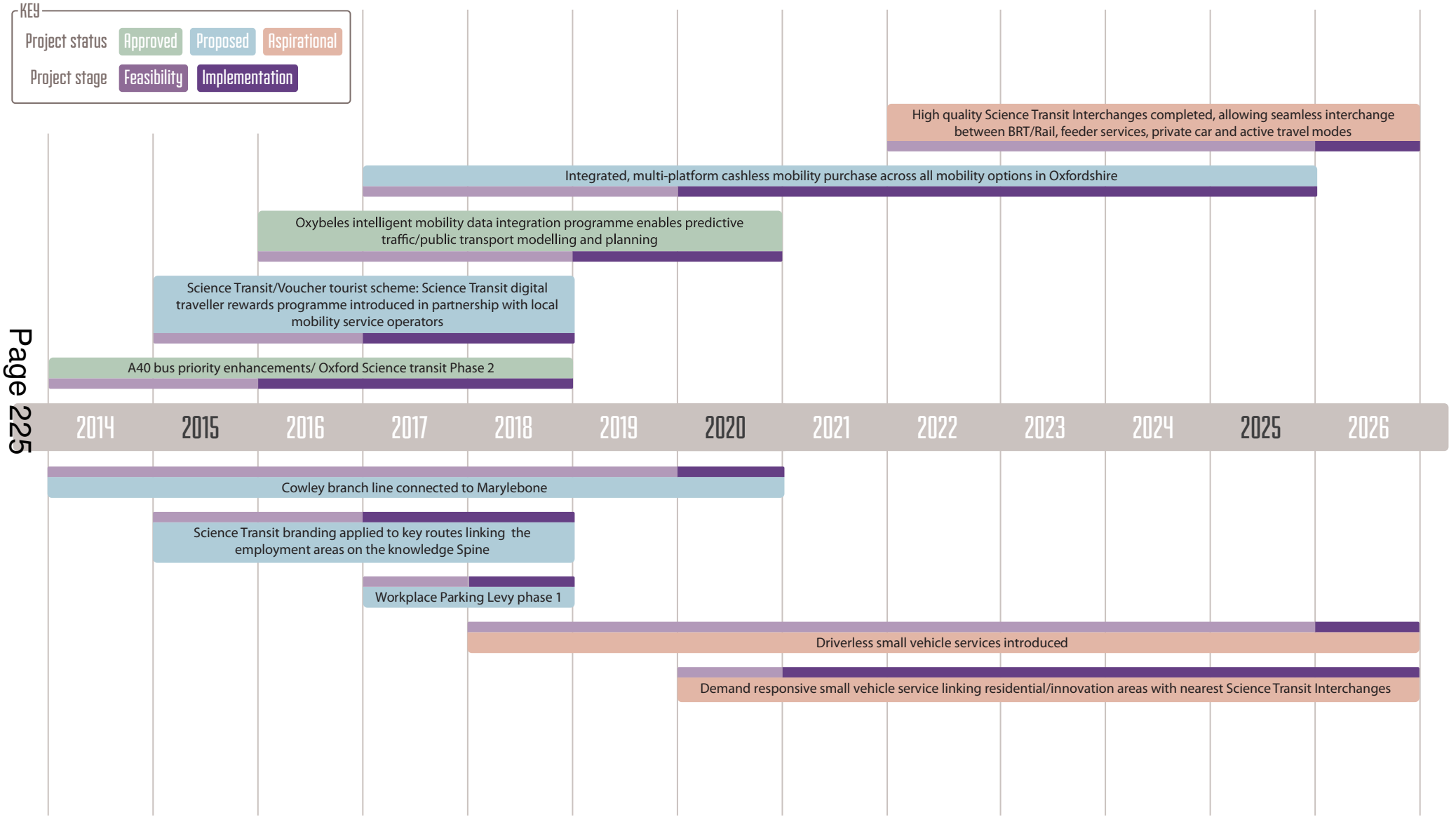
Timescale (start work)	Project description	Status	Feasibility	Implementation	Funding identified	Associated Strategies	Lead Deliverer	Objectives				
								A	B	C	D	E
2013 - 14	Hinskey Hill Junction Improvements stage 1	Approved City Deal	2013	2014/15	City Deal agreed		Oxfordshire County Council	✓				
	Hinskey Hill Junction Improvements stage 2	Approved City Deal	2014	2014/ 2016	City Deal agreed		Oxfordshire County Council	✓				
	Oxfordshire Journey Planner stage 1	Approved (Local Sustainable Transport Fund)	2014	December 2014	Local Sustainable Transport Fund 2013/14		Oxfordshire County Council			✓		✓
2015-16	Smart Ticketing Stage 1: Pilot Integrated ticketing trials for Oxford Parkway/ Water Eaton/Thornhill and key routes along the knowledge spine (Harwell)	Approved - County Council Transport Programme Board	2014	September 2015 (TBC)	Oxfordshire County Council and operators		Oxfordshire County Council and bus operators			✓	✓	✓
	Advanced Oxfordshire & Oxford UTMC data available for strategic and public personal mobility planning (as part of Journey planner)	Approved – County Council Transport Programme Board	2014	2014-2016	Oxfordshire County Council	Network Management Strategy	Oxfordshire County Council			✓	✓	✓
	Trial of electric bus vehicle and wireless charging in Oxfordshire and Oxford	Approved – County Council Transport Programme Board	2014	2015	Private and ULEV (Ultra Low Emission Vehicle funding)	Science Transit Strategy	Private - Mitsui Arup Partnership Oxfordshire County Council facilitate			✓	✓	✓
	Increased bus frequency introduced on Didcot – Harwell corridor (Science Vale)	Approved – Local Sustainable Transport Fund	2014/15	2015-16 (this is the LSTF timeframe but the proposition is it goes beyond)	LSTF/ developer funding	Science Vale Area Strategy/ Bus Strategy	Oxfordshire County Council/ Operators	✓	✓			✓
	Oxfordshire Journey Planner Stage 2 - evolves to context-specific information & real-time intelligence source across all modes	Proposed	2015	2016	TBC/Innovate UK?		Oxfordshire County Council and MoBox consortium			✓	✓	✓
	Initial driverless vehicle trials in Oxfordshire	Proposed	2015	2016-17	University/ Private		University/ private/ Oxfordshire County Council facilitate			✓	✓	✓
	Bus service enhancements between Science Vale (Harwell and Milton park) and Oxford (Universities)	Proposed	2015	2016-17	TBC/LSTF	Science Vale Area Strategy/ Bus Strategy	TBC Operators/ Universities	✓	✓			✓

Timescale (start work)	Project description	Status	Feasibility	Implementation	Funding identified	Associated Strategies	Lead Deliverer	Objectives				
								A	B	C	D	E
2017-18	A40 bus priority enhancements/ Oxford Science transit Phase 2	Approved SEP LGF	2014/15	2017-18	LGF	A40 Strategy	Oxfordshire County Council	✓				
	Free public WiFi installed on all Science Transit branded buses and at Interchanges/Stops	Proposed	2015	2017	TBC		Bus Operators			✓		✓
	Connected vehicle trials in Oxfordshire	Proposed	2015/16	2017	TBC/ satellite catapult and bus operators		Satellite catapult/ bus operators/ Oxfordshire County Council facilitating			✓	✓	✓
	Peak hour small vehicle shuttle bus services introduced between Science Transit Interchanges and major workplaces	Proposed	2016	2017	Private - TBC		Science Park/Bus Operator led (County Council facilitate)	✓	✓	✓	✓	✓
	Science Transit branding applied to key routes linking the employment areas on the knowledge Spine	Proposed	2015/6	2017/18	TBC (integrated with LSTF SV branding)		Bus Operators/ Oxfordshire County Council		✓			✓
	Science Transit/Voucher tourist scheme: Science Transit digital traveller rewards programme introduced in partnership with local mobility service operators	Proposed	2015-16	2017-18	TBC		Operator/ Industry/ University/ Council partnership		✓	✓		✓
2019-20	Integrated, multi-platform cashless mobility purchase across all mobility options in Oxfordshire	Proposed	2017-18	2019-25	TBC		Operator/ Industry/ County Council facilitating			✓		✓
	Oxybeles intelligent mobility data integration programme enables predictive traffic/public transport modelling and planning	Proposed – Strategic Economic Plan	2016-18	2019-20	TBC	Smart Cities Strategy	University/ LEP/ businesses/ County Council		✓	✓	✓	✓
	Cowley branch line connected to Marylebone	Proposed	2014-15	2019-24	TBC	Chiltern Rail	Chiltern/ Network Rail	✓				✓
2026–30	Demand responsive small vehicle service linking residential/innovation areas with nearest Science Transit Interchanges	Aspirational	2020	2021-26	Private		Industry led	✓	✓	✓	✓	✓
	High quality Science Transit Interchanges completed, allowing seamless interchange between BRT/Rail, feeder services, private car and active travel modes	Aspirational	2022-24	2026	TBC		Operators/ County Council	✓	✓			✓
	Driverless small vehicle services introduced	Aspirational	2018	2026	TBC		University/ Industry lead	✓	✓	✓	✓	✓

Science Transit Roadmap - projects implemented by 2017



Science Transit Roadmap - projects implemented beyond 2017



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6 KEY SUCCESS FACTORS

6.1 The Science Transit Strategy cannot be delivered successfully in isolation. It needs to be supported by supportive transport and land use planning policies, by a robust funding strategy, by clear governance, and involve both the public and private sectors.

6.2 The figure below provides insight into how we envisage these different aspects will be delivered through Science Transit in order to ensure the necessary supporting policies and conditions are in place for the strategy to be a success.

Supporting policies

Managing car-based demand for travel

6.3 Successful transport strategies typically combine "carrots" to encourage a particular behaviour and "sticks" that discourage choices that have significant environmental, economic, or social impacts. Science Transit will offer a high quality door-to-door service to encourage passengers to use the system, but will require supportive measures to reduce growth in car use and lock-in the benefits of modal shift. This is not about being anti-car, it is about making the best possible use of existing and future infrastructure and services for the benefit of all residents, businesses and visitors to Oxfordshire.

6.4 Controlling the supply, pricing, and location of car parking is an established policy that has been used to manage car-based demands in Oxfordshire, and in Oxford particularly, for many years. By restricting demand in the city centre and encouraging park and ride through supply measures and differential parking charges, the number of vehicles entering Oxford city centre has been strongly managed.

6.5 It is important that this continues and is extended in a way that is complementary and supportive to the Science Transit Strategy. Whilst existing policies influence the demand for public parking, a considerable proportion of spaces in Oxford city centre and virtually all of the spaces at the Innovation Area, are privately owned. Where appropriate, the potential for workplace parking charging should be explored in order to manage demand at these locations. Alternatively, congestion charging could be used in areas where there is high travel demand and very limited road space, as a way to influence behaviour and choice.

6.6 With the intelligent real time data available on congestion, parking availability, and public transport capacity, it is possible to envisage a dynamic approach to pricing for road usage, car parking and transit services that optimises the use of available parking and highway capacity. We envisage this will become technologically feasible in both urban centres and in more remote locations. It offers scope to simultaneously maximise revenue for further re-investment in Science Transit by encouraging the use of vacant spaces or seats that would otherwise remain empty. So, for example, during the parts of the day when travel demand is at its highest and pressure on the road network is at its most severe, the differential between the pricing of Science Transit services and driving/parking would be at its greatest. During quieter periods of the day, where spare road and parking capacity existed, the differential could be smaller. Re-investing revenue from any such user charges to develop improved public transport infrastructure and services would be essential from an acceptability perspective.

Spatial Planning

6.7 There is a need for 100,000 homes or 5000 per annum to be built in Oxfordshire between 2011-2031. There is currently a large shortfall in provision with only 5,360 homes having been built in the three years 2011-2014. While there are many reasons for this shortfall, a clear commitment to delivering Science Transit, together with its integration within the spatial plans for the county, will help address concerns over the impact of growth on transport networks and infrastructure. To achieve this, Science Transit must become embedded within the future growth, development and urban design of the areas it serves.

	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	
Land use integration		No integration	Ad hoc policies to encourage integration	Integrated transport and land use planning becoming embedded within Planning Policy	Policies on uses, densities and parking standards related directly to public transport accessibility	Hard and fast rules requiring transit oriented development	
Demand management		No parking or other fiscal measures	Parking charges and some supply limitations	Differential charging according to location and purpose	Congestion charging/ workplace parking levy	Dynamic pricing of parking, road use and public transport	
Funding		Government grants	Increased private sector funding, eg from developers	Private sector becomes responsible for the majority of investment	Innovative mechanisms to capture land value increases to allow borrowing and reinvestment in system	Self-sustaining system	

6.8 NPPF provides the policy requirement to locate major developments where the need to travel can be minimised and the use of sustainable modes of travel can be maximised, there is the opportunity through future Local Plans and to better integrate future development with Science Transit. Transit Oriented Development (TOD), which lies at the interface of land use planning, transport planning and urban design, will become part of future land use plans in Oxfordshire. In land use planning terms, TOD means clustering mixed use development around existing or proposed public transport interchanges and stops, with the highest density development closest to the public transport node. The short walk/cycle distances create a high demand for public transport services, with the mixed use characteristics helping to reduce motorised trips and generate the bi-directional demands that facilitate efficient public transport operation.

6.9 To support funding of Science Transit, the potential level of developer financial contribution to new infrastructure and services should be clearly based on proximity to the Science Transit network. Development sites located closer to stops or interchanges should pay a lower level of contribution (or in some cases nothing at all) compared with locations which are more remote and likely to be more car-dependent in nature.

Land for parking

6.10 Over the time horizon for delivering Science Transit, there are likely to be many changes to the way in which we choose to travel, either because of global issues such as climate change and peak oil, national or local issues driven by political decisions, or behaviour change stimulated by Science Transit itself. One of the impacts of this might be that ownership and use of private vehicles is very different to today, with greater focus on the use of public vehicles (be they mass transit, demand responsive or autonomous) and therefore less demand for parking in city and town centres, and at innovation and business parks. This would create an opportunity for using land currently taken up by parking for more productive and valuable use, thereby increasing density, with positive impacts on the commerciality of transit services, and land values, creating additional revenue for re-investment in Science Transit.

Funding

6.11 Science Transit will be developed and delivered over the next 20 years and whilst immediate funding from the Local Growth and City Deals is available for initial projects, a flexible and scalable strategy is required for the longer term. Both capital and revenue funding will be required and it is the very nature of political and economic cycles that the availability of grant funding from Government is unpredictable. Staying ahead of the game, and being able to demonstrate economic, environmental and social benefit from investment will, however, always remain the best approach to securing investment. The following sections set out some of the key principles of the funding strategy and discuss the potential sources of funding that will facilitate the delivery of Science Transit.

Principles

6.12 **Self-sustaining**. The overriding aspiration is that over the long term, Science Transit should be self-sustaining, with a commercial network of services and the financial ability to invest in upgraded and new infrastructure and services. This will require all stakeholders to play and pay their part; and for new funding mechanisms to be developed, tested and employed.

6.13 **Advance preparation**. Oxfordshire has a strong recent track record in securing significant grant funding. To continue this success it is vital that new ideas are developed, appraised, and designed so they are "oven ready" for funding submissions; and powered by clear, positive business cases. Increasing involvement of private sector industry partners is envisaged.

Sources of funding

6.14 **Government**. In the short term, Government is likely to continue to make the largest contributions to the funding of Science Transit. This might come through Government Departments, for example, DfT, DCLG and BIS, or through research and innovation bodies such as Innovate UK and similar EU funding such as Horizon 2020. Such funding, however, is unpredictable, and with current policies aimed at reducing national debt, competition for funding for transport-related schemes will only increase, therefore reinforcing the need for robust and positive businesses cases and the ability to leverage funds from other sources, including the private sector.

6.15 **Operators**. Oxfordshire's Growth strategy will attract close to a quarter of a million new residents and create 85,000 new jobs - effectively the size of a new city. This will generate significant demand for travel, and massive potential for mobility service operators to increase ridership and revenue. Existing and new operators must be encouraged to invest in new services and, potentially, infrastructure.

6.16 **Developers**. Contributions towards delivery of the Science Transit Strategy can be expected from developers through Section 106 agreements and the Community Infrastructure Levy. This will require a clear strategy that needs to be grounded in transparent and accessible planning policies so it is clear what is expected in respect of different types and sizes of development.

6.17 **Industry**. Oxfordshire's research, innovation and academic communities will have the opportunity to pilot and trial new technologies and systems in a "living lab" environment. With the scale of the global intelligent mobility market put at around £900bn, there is significant incentive for local industry partners to invest in Science Transit to test and prove their technology solutions with the longer term aim of securing reward through international sales. Close working with industry, and developing the living laboratory, will put Oxfordshire in a stronger position to successfully attract R&D investment and funding through channels such as Innovate UK and Horizon 2020.

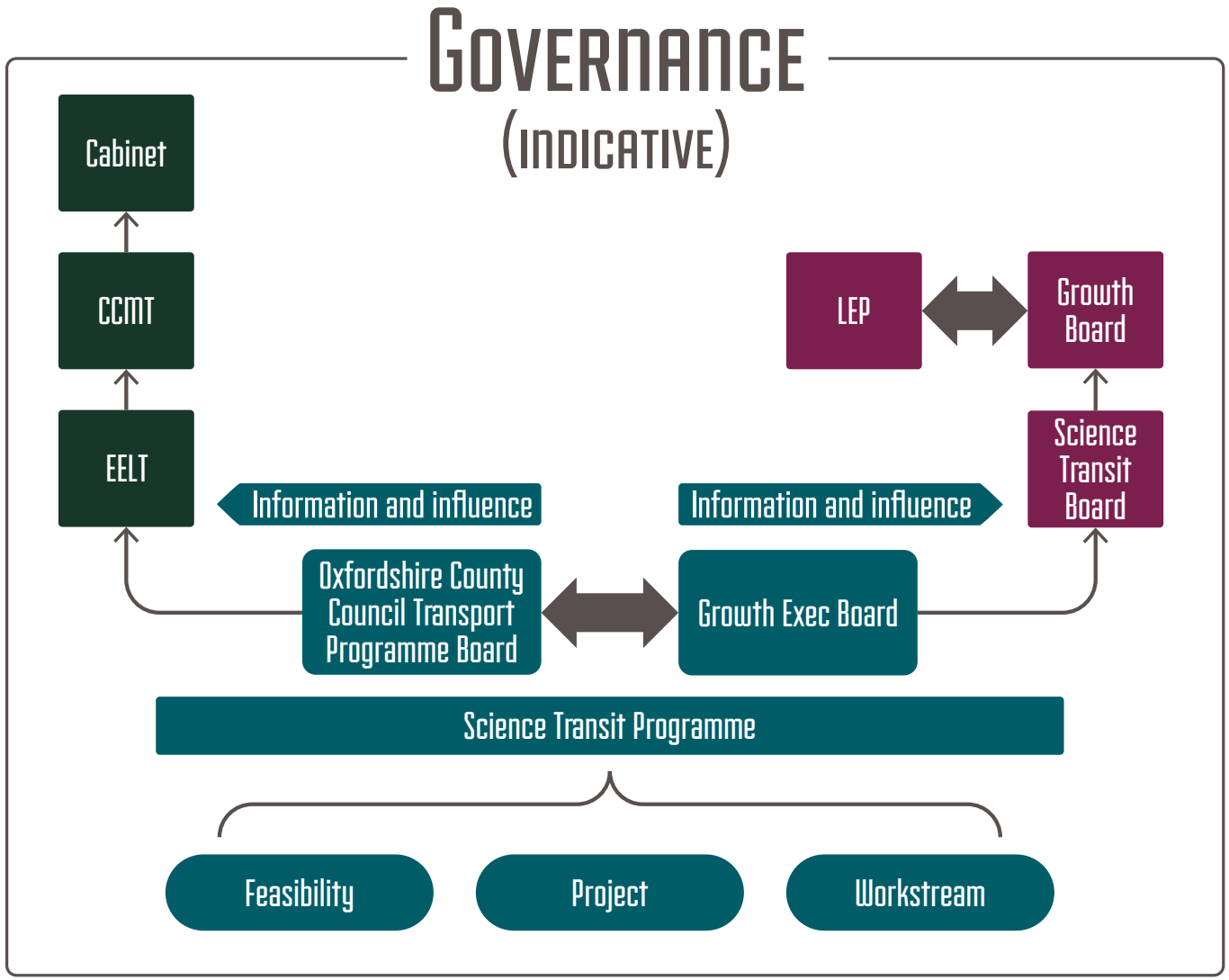
6.18 **Users**. Science Transit users will pay for their use of the system through fares. Successful delivery of this strategy is expected to drive-up revenues from local mobility services over time, attracting trips that would usually be made by private car. Effective branding and promotion of new high quality services will help users from around the county to recognise the value of Science Transit services, and begin switching modes to benefit from it.

6.19 **Land value capture**. A potentially significant contribution to funding could be made through mechanisms such as land taxes, business rates and Tax Increment Financing (TIF) to capture increases in land value generated by new and improved transit services. Such mechanisms require investigation, detailing and buy-in from relevant stakeholders.

Governance

6.20 A clear governance structure has been established to manage the development and delivery of the Science Transit Programme, as shown in the figure to the right.

6.21 The Science Transport programme will report to the Transport Programme Board and Growth Board Exec Group which will form the primary governance and decision making point for the project.



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Appendix A

Integrated List of Projects across all Strategies

Timescale (start work)	Project description	Status	Feasibility	Implementation	Funding identified	Lead Strategy	Lead Deliverer
2013-14	Hinskey Hill Junction Improvements stage 1	Approved City Deal	2013	2014/15	City Deal agreed	Science Transit Strategy	Oxfordshire County Council
	Hinskey Hill Junction Improvements stage 2	Approved City Deal	2014	2014/ 2016	City Deal agreed	Science Transit Strategy	Oxfordshire County Council
	Oxfordshire Journey Planner stage 1	Approved (Local Sustainable Transport Fund)	2014	December 2014	Local Sustainable Transport Fund 2013/14	Science Transit Strategy	Oxfordshire County Council
2015-16	Oxford Parkway connected to London via Bicester (EWR Phase 1a)	Approved – Network Rail	2014	September 2015	Chiltern railway forward funded by network rail	Chiltern Rail	Network Rail
	Oxford Parkway to Oxford (EWR Phase 1 b)	Approved - Network Rail	2014	Spring 2016	Chiltern railway forward funded by network rail	Chiltern Rail	Network Rail
	Smart Ticketing Stage 1: Pilot Integrated ticketing trials for Oxford Parkway/ Water Eaton/Thornhill and key routes along the knowledge spine (Harwell)	Approved - County Council Transport Programme Board	2014	September 2015 (TBC)	Oxfordshire County Council and operators	Science Transit Strategy	Oxfordshire County Council and bus operators
	Advanced Oxfordshire & Oxford UTMC data available for strategic and public personal mobility planning (as part of Journey planner)	Approved – County Council Transport Programme Board	2014	2014-2016	Oxfordshire County Council	Science Transit Strategy/Network Management Strategy	Oxfordshire County Council
	Trial of electric bus vehicle and wireless charging in Oxfordshire and Oxford	Approved – County Council Transport Programme Board	2014	2015	Private and ULEV (Ultra Low Emission Vehicle funding)	Science Transit Strategy	Private - Mitsui Arup Partnership Oxfordshire County Council facilitate
	Northern Gateway Package - Cutteslowe and Wolvercote junction upgrades.	Approved	2014/2015	2015/16	City Deal	A40 Strategy/ Oxford Transport Strategy	Oxfordshire County Council
	Northern Gateway Package : A40 – A44 Link Road	Proposed	2014/15	2017/18	City Deal	Oxford Transport Strategy	Oxfordshire County Council
	Access to Headington Phase 1	Approved	2014/15	2015/16 – 2017/18	LGF-SEP/Held 106	Oxford Transport Strategy	Oxfordshire County Council
	Science Vale Cycle Infrastructure Improvements	Approved – Local Sustainable Transport fund	2014/15	2016-17	LSTF/LGF	Science Vale Area Strategy/ Science Transit	Oxfordshire County Council
	Increased bus frequency introduced on Didcot – Harwell corridor (Science Vale)	Approved – Local Sustainable Transport Fund	2014/15	2015-16 (this is the LSTF timeframe but the proposition is it goes beyond)	LSTF/ developer funding	Science Vale Area Strategy/Bus Strategy/ Science Transit	Oxfordshire County Council/ Operators
	Oxfordshire Journey Planner Stage 2 - evolves to context-specific information & real-time intelligence source across all modes	Proposed	2015	2016	TBC/Innovate UK?	Science Transit Strategy	Oxfordshire County Council and MoBox consortium

Timescale (start work)	Project description	Status	Feasibility	Implementation	Funding identified	Lead Strategy	Lead Deliverer
2015-16	Initial driverless vehicle trials in Oxfordshire	Proposed	2015	2016-17	University/ Private	Science Transit Strategy	University/ private/ Oxfordshire County Council facilitate
	Bus service enhancements between Science Vale (Harwell and Milton park) and Oxford (Universities)	Proposed	2015	2016-17	TBC/LSTF	Science Vale Area Strategy/ Bus Strategy/ Science Transit	TBC Operators/ Universities
	Access only through Science Area through bus gate on St Cross Road.	Proposed	2015	2016	TBC	Oxford Transport Strategy	Oxfordshire County Council
2017-18	A40 bus priority enhancements/ Oxford Science transit Phase 2	Approved SEP LGF	2014/15	2017-18	LGF	A40 Strategy/Science Transit Strategy	Oxfordshire County Council
	Cycle parking hubs at major employment sites	Proposed	2017	2017	TBC	Area Strategy/Cycle Strategy	District/ County/ operators
	Free public WiFi installed on all Science Transit branded buses and at Interchanges/Stops	Proposed	2015	2017	TBC	Science Transit Strategy	Bus Operators
	Connected vehicle trials in Oxfordshire	Proposed	2015/16	2017	TBC/satellite catapult and bus operators	Science Transit Strategy	Satellite catapult/ bus operators/ Oxfordshire County Council facilitating
	Peak hour small vehicle shuttle bus services introduced between Science Transit Interchanges and major workplaces	Proposed	2016	2017	Private - TBC	Science Transit Strategy	Science Park/Bus Operator led (County Council facilitate)
	Science Transit branding applied to key routes linking the employment areas on the knowledge Spine	Proposed	2015/6	2017/18	TBC (integrated with LSTF SV branding)	Science Transit Strategy	Bus Operators/ Oxfordshire County Council
	Science Transit/Voucher tourist scheme: Science Transit digital traveller rewards programme introduced in partnership with local mobility service operators	Proposed	2015-16	2017-18	TBC	Science Transit Strategy	Operator/ Industry/ University/ Council partnership
	A34 technology and junction improvements	Proposed	2015-2016	2016-2020	Highways Agency	Network Management	Highways Agency
	Road space management (on radials and inner ring-road) - reduce conflict points and congestion and to facilitate Bus Rapid Transit Routes and Super Premium Cycle Routes	Proposed	2015-2016	2017-2020	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Traffic signal infrastructure upgrade and renewal – provide congestion relief and bus priority.	Proposed	2015	2017-2020	NA	Network Management / Oxford Transport Strategy	Oxfordshire County Council
	Out-of-hour delivery ban introduced on corridors and city centre	Aspirational	2015	2017-2020	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Freight management plans introduced to control routing into city.	Aspirational	2015	2017-2020	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Implementation of cycle strategy (Phase 1 – City to ring road and existing settlement + Quiet routes)	Proposed	2014/2015	2018-2025	TBC	Oxford Transport Strategy	Oxfordshire County Council

Timescale (start work)	Project description	Status	Feasibility	Implementation	Funding identified	Lead Strategy	Lead Deliverer
	Active Traffic Management (e.g. ramp metering) to make best use of strategic roads	Proposed	2018-19	2019	TBC	Network Management Strategy	Oxfordshire County Council
	Integrated, multi-platform cashless mobility purchase across all mobility options in Oxfordshire	Proposed	2017-18	2019-25	TBC	Science Transit Strategy	Operator/ Industry/ County Council facilitating
	East-West Rail Phase 2: direct trains from Reading/Didcot via Oxford/Bicester/Aylesbury to Bedford/Milton Keynes	Approved	2015-16	2019	DfT and Local Contributions	EWR Consortium	Network Rail
	Oxybeles intelligent mobility data integration programme enables predictive traffic/public transport modelling and planning	Proposed – Strategic Economic Plan	2016-18	2019-20	TBC	Science Transit Strategy/Smart Cities Strategy	University/ LEP/ businesses/ County Council
	Heathrow western rail access from Oxford without needing to enter central London	Approved	2016-18	2018-20	Network Rail	WrATH consortium	Network Rail
	Transit terminals opened at three locations on periphery of city centre.	Proposed	2015	2019-2020		Oxford Transport Strategy	Oxfordshire County Council
	Signage and VMS technology used to control routing of motorised trips from the ring road.	Proposed	2018	2019		Network management/ Oxford Transport Strategy	Oxfordshire County Council
	Bus Rapid Transit Route Mini- Interchanges – Cowley/ Headington/Northern Gateway	Proposed	2016	2019		Oxford Transport Strategy	Oxfordshire County Council
2019-20	Access to Headington Phase 2	Proposed	2018	2020	LGF-SEP	Oxford Transport Strategy	Oxfordshire County Council
	City centre to be zero emission zone by 2020. All bus operators using hybrid services with full electric power in centre.	Proposed	2015	2020	N/A	Oxford Transport Strategy	Bus Operators
	Consolidation of parking in local centres	Proposed	2016	2019-20		Oxford Transport Strategy	Oxfordshire County Council
	Bus terminals established on periphery and consolidation of services begun.	Proposed	2015	2020-2025	TBC	Oxford Transport Strategy	Oxfordshire County Council
	City centre access controls	Proposed	2016	2020-2025	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Delivery of reversible bus lanes on sections of radials.	Proposed	2018	2020-2025	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Reorganisation of Park & Ride – closure of some ring-road sites and opening new sites in Cumnor/Eynsham/ Begbroke/Lodge Hill/Sandford	Proposed	2015-2016	2020-2030	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Cowley branch line connected to Marylebone	Proposed	2014-15	2019-24	TBC	Chiltern Rail/Science Transit Strategy	Chiltern Network Rail
	Park & Ride Access improvements – A34 junctions	Proposed	2015-2016	2020-2030	TBC	Oxford Transport Strategy	Oxfordshire County Council

Timescale (start work)	Project description	Status	Feasibility	Implementation	Funding identified	Lead Strategy	Lead Deliverer
2021-25	Expansion of cycle hire scheme to whole city	Aspirational	2020	2020-2030	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Four Trains per hour between Didcot and Oxford	Proposed - SEP	2018	2020-24	TBC	SEP / Corridor Rail Partnership	Network Rail
	Workplace Parking Levy phase 1	Proposed	2017	2020-25	N/A	Oxford Transport Strategy	Oxfordshire County Council
	BRT on high-demand corridors, linking growth areas and expanding innovation areas within Knowledge Spine and Oxford	Proposed	2016-2017	2022-25	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Rapid Transit Routes – Full electrification of Lines 1 and 2 established	Proposed	2016-2017	2022-2025	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Electric shuttles linking city centre transit terminal to aid mobility impaired.	Proposed	2020	2021	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Freight consolidation centre reduces HGV movements in city centre.	Proposed	2020	2021	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Partial route consolidation achieved through bus strategy – P&R as interchange hubs	Proposed	2022-24	2025	TBC	Oxford Transport Strategy	Oxfordshire County Council
2026-30	Demand responsive small vehicle service linking residential/innovation areas with nearest Science Transit Interchanges	Aspirational	2020	2021-26	Private	Science Transit Strategy	Industry led
	Local Plan reviews allow for tighter focus on Science Transit oriented development and higher density land-use designation	Aspirational	2016	2017-26	NA	Districts	District and County Council
	High quality Science Transit Interchanges completed, allowing seamless interchange between BRT/Rail, feeder services, private car and active travel modes	Aspirational	2022-24	2026	TBC	Science Transit Strategy	Operators/ County Council
	Driverless small vehicle services introduced	Aspirational	2018	2026	TBC	Science Transit Strategy	University/ Industry lead
	Implementation of cycle strategy (Phase 2 – Ring road to future growth)	Aspirational	2025	2026-	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Rapid Transit Routes – Full electrification of Line 3 established	Aspirational	2025	2026-2030	TBC	Oxford Transport Strategy	Oxfordshire County Council
	Bus network consolidation	Aspirational	2025	2030	TBC	Oxford Transport Strategy	Oxfordshire County Council
	City centre bus tunnels	Aspirational	2015-2020	2031 - 2035	TBC	Oxford Transport Strategy	Oxfordshire County Council

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integrated transport planning

Connecting Oxfordshire: Local Transport Plan 2015-2031

Cycle, Freight and Bus Strategies

DRAFT

Oxfordshire Cycling Strategy

1. Introduction

We aim to create the foundation for cycling to become a major mode of travel in Oxfordshire. It is a sustainable, inexpensive, reliable and pollution-free way of getting around. It comes with the fantastic bonus of improving our health, happiness and well-being. As we look for ways to solve the problem of congestion on our roads, cycling is an obvious and growing part of the solution. Cycling is a popular recreational activity too - most people enjoy cycling if they have the right equipment, confidence and access to quality cycling networks.

We want to make cycling a safe, simple and accessible option for people of all ages. We will be radical, and we will work with stakeholders to develop cutting-edge projects to meet our health and transport challenges. Our vision is for Oxfordshire to be a place where as many people as possible will consider cycling as a safe and feasible transport option – particularly for short trips. We want this to be a county where people will be able to cycle to work, to the shops, to rail stations or bus hubs on safe, attractive routes with secure cycle parking at the other end. Over time, our network of cycle routes will connect people to main employment and retail destinations. We will create a network of cycle routes that will enable as many people as possible to choose cycling rather than driving, with all the health benefits, quality of life benefits and financial savings that go with it.

Encouraging and enabling more people to choose cycling is not simply about providing cycle routes – although that is important. We are aware of the need to enable non-users to become confident about travelling by bike. In collaboration with the Oxfordshire Cycle Network, we will provide a comprehensive toolkit of cycling support – training for new users or people returning to cycling after a long lay-off. We will promote cycling using social media, workplace travel plans and personalised travel planning. While money will still be tight, more of it will go towards cycling with the consequent benefits for all.

Visionary cities such as Copenhagen and Amsterdam have led the way by showing that cycling is not a 19th century relic, but the solution to many of our 21st century travel problems. We aim to go further and demonstrate that cycling can transform travel problems throughout a county and not just in and around a city.

We are not starting from a low baseline. Four of our five districts – Oxford, South Oxfordshire, West Oxfordshire and Vale of White Horse are above the figure of 2.8% for cycling as a percentage of journeys to work in England and Wales in the 2011 Census. Oxford is, of course unique in the county with a 17% mode share of journeys to work. But this is not enough. Our ambition is to treble the share of journeys to work made by bike in our county by the end of this strategy.

Our strategy has been developed in collaboration with the Oxfordshire Cycling Network (OCN), which represents most of the cycling campaigning groups and clubs

in the county. We have benefitted greatly from this partnership and will continue to work with OCN to achieve the aims of the Strategy. We also want to involve people who are not members of cycling organisations and only cycle occasionally, if at all.

2. Key outcomes

The 2011 census data on travel to work in Oxfordshire found that 54% of people usually drive to work while just 7% of people cycle to work. The number of people who usually drive short journeys to work in Oxfordshire is increasing and our roads are becoming more and more congested. We will provide an alternative sustainable way to travel so we minimise the increasing levels of congestion by reducing the number of journeys made by motor vehicles, contribute to cutting pollution and improve our health.

2.1 Increasing Cycle Use

Our target is to treble the level of cycling to work in Oxfordshire by the end of this strategy. Cycling will be something that is a part of everyday life, which people are used to from an early age. We want and need to see demonstrable increases in levels of cycling for journeys to school, work and access to services like health and shopping. To achieve this, we will work with partner organisations, businesses, local councils, schools and communities to promote, enable and increase understanding of cycling throughout the county. We will investigate measures to encourage people to try cycling: for example we will look to build on our OXONBIKE pilot cycle hire scheme, identifying other locations that may be feasible.

2.2 A Quality Infrastructure

We will identify a series of strategic routes in collaboration with users where we will Cycle Premium Routes and Cycle Super Routes, which will become the focus of our future investment. The greatest investment potential lies in connecting the areas of employment growth to transport hubs and areas of housing growth. Many of these routes may already have good levels of cycling or have the potential for more cycling if made safer.

Over time, local route networks will also be upgraded to Connector Routes in order to enable safe, signed cycle journeys throughout the county, as well as providing links with Cycle Premium Routes and Cycle Super Routes. We have already

developed cycle strategies and networks for Oxford and Science Vale, and propos to adopt this approach for other main towns in Oxfordshire, working with the OCN and other partners to improve the choice of safe, attractive, high-quality cycling routes in the county. We will promote these to residents and visitors, for example through mapping, and provide cycle parking at key destinations.

2.3 Cycling as part of a Journey

Cycling alone cannot replace the car for long journeys, but a combination of cycling and public transport can create more door-to-door sustainable trips. Bike-rail or bike-bus can provide a seamless journey to almost anywhere – and one of the outcomes of our Strategy will be to make it easier for people to this. We will improve routes from residential areas to transport hubs, improve cycle parking and promote door-to-door travel using cycle and public transport. We will provide more and better links between our cycle network and popular public transport hubs and ensure that safe and secure cycle parking is available at the interchange point – not just at obvious places like rail stations but also at main stops on key bus routes. We will work with rail operators to provide more space for cycles on trains.

2.4 A Safe Form of Transport

We know that one of the main reasons people do not cycle regularly is for fear of an accident. A recent study found that, per hour spent cycling, cyclists in England are around four times more likely to be killed than they would be if they cycled in the Netherlands. This is not something that can be resolved in the short term, but we are committing to provide space and segregation for cycling and improving provision for cyclists at known danger points, such as junctions and roundabouts, as elements of the new Cycle Premium Routes.

2.5 More Funding for and Investment in Cycling

The All Party Parliamentary Group report 'Get Britain Cycling' recommended a £10 per head of population investment in cycling. In the draft Cycle Delivery Plan published by the Department for Transport in October 2014, the Government stated that it would work with local government and businesses to explore how a minimum funding package equivalent to £10 per person per year could be achieved by 2020-21 or sooner if possible. We cannot achieve this alone, but will work with government and other local authorities to make this a reality.

2.6 More user involvement in decisions affecting cyclists

Cycling needs to be considered and incorporated into the design of new roads at the earliest stage, and users or potential users consulted as part of this process. Oxfordshire County Council will commit to undertaking cyclability audits with users as standard practice and require developers to fund cyclability audits of new developments, so that local people can have a direct input into what cycling infrastructure would benefit users.

2.7 Cycling and health

Cycling is more than a mode of transport – it boosts our health too by providing the opportunity to build exercise into everyday life and improve health and well-being. There is a wide range of evidence to show that regular physical activity reduces the risk of major diseases and the growing problems of diabetes and dementia. However, as people get older, there is evidence that only a small minority cycle.

Transport - particularly single occupancy vehicle trips - is widely recognized to be a significant and increasing source of air pollution in the UK and elsewhere. This is a serious risk to health for all of us, as air pollution, leads to an estimated 35,000 premature deaths in the UK each year

3. Our strategy

3.1 Develop a High Quality Cycle Network

We have varying quality cycle routes in Oxfordshire, like the rest of the UK. To support our growth, transport and health objectives, we need to improve our cycle network and the supporting infrastructure, such as cycle parking.

For routes and areas where our analysis indicates the biggest potential growth in cycling, we will create safer and connected routes for cyclists, which will comprise safer, direct routes. Our aim is that the routes will be of a quality to convince more people to consider cycling. We will enhance the routes with branded signage, displaying details of destinations and the estimated time to reach these, while providing additional cycle parking where it is needed. We will identify funding from all available sources to ensure that the network continues to grow. We will also involve users in auditing the potential routes, using the cyclability audit tool.

Cycle route category	Common features
Cycle Super Route	Safe, direct, well-signposted routes in and around Oxford's areas of major current and potential cycling demand
Cycle Premium Route	Safe, direct, well-signposted routes in areas across the county where our analysis indicates substantial potential growth in cycling, particularly in the Knowledge Spine area
Connector/Local Routes	Safe, well-signposted routes attractive for both leisure and commuter journeys, providing links around the county

We will also work to increase the number of residents and visitors to Oxfordshire choosing to cycle for recreation and leisure through our improvements to cycle networks. As part of prioritising our maintenance programme, cycle tracks, roads and public rights of way that form part of our high priority cycling networks will be maintained to a high standard and promoted.

We will work with our partners in the county to ensure technology helps us maximise cycle uptake, for example by developing or linking to free smartphone apps, to enable cyclists to find a suitable cycle route, or to plan their own, and to locate cycle parking facilities at their destination.

3.2 Provide a Safe and Well Maintained Network

Sharing narrow carriageway space with fast-moving vehicles – particularly HGVs – is intimidating for even the most confident, experienced cyclists. All available evidence shows that this is why most people will not cycle on the carriageway. We will provide more segregated cycle lanes and other measures like advance stop lines at junctions. We will consider 20 mph speed limits and other traffic calming measures in locations where cyclists share space with other vehicles, where these can be justified. There will be more fully-segregated cycle lanes on existing routes.

A safe cycle network is also a well maintained cycle network. Given limited resources, we will identify a list of priorities for maintenance on key cycle routes. Where space is not available, we will seek to sign cyclists along safer route options, to minimise the need for cyclists to ride on roads that have no cycle facilities. We will also consider reallocating space to cyclists where feasible, considering the needs of pedestrians where space is shared.

3.3 Encouraging People to Cycle

We need to make people feel that cycling is something for them and give them confidence in using a bike. To make this happen, we will:

- Provide detailed information about travelling by cycle in the county as part of the Journey Planner currently in development.

- In collaboration with the OCN, develop a cycle buddy system, where an experienced cyclist will work with a new or returning cyclist on a one-to-one basis, to build confidence and advise on all aspects of cycling.

- Work with the OCN and partner organisations to communicate with businesses, schools and communities to promote, enable and increase understanding of cycling throughout the county. We will develop an information pack to promote and increase understanding of cycling throughout Oxfordshire.

- Increase the level of and improve cycle parking facilities in the city, in towns, at transport hubs (including bus stops) and in new residential developments

- Promote cycling to people who are concerned about their health or fitness, for example by working with our partners to make a cycle route planning app, to give estimates of the calories burned by cycling a route.

3.4 Cycling to Schools

Cycling should be something that is a part of everyday life, which children are used to from an early age. The school run is a major contributor of traffic congestion, especially in residential and suburban areas, but encouraging cycling to school can reduce traffic in the morning peak, while introducing children to cycling. We will raise awareness of cycling as a transport option for young people, working with schools to provide cycle training programmes and engage pupils in cycling. Cycling to school can also offer a healthy and cost effective alternative to school bus travel on some secondary school routes. We will look to invest in these routes where there is a clear case for promoting cycle trips for students.

3.5 Improve Our Journeys and Places

We will work with District and local Councils across Oxfordshire to develop cycling strategies for towns and journey to work areas, either as stand-alone documents or as part of wider area transport strategies. These will enable people to cycle into towns, park bikes securely, and access shops, offices, stations and priority bus routes. We will build-in user involvement, via cycleability audits, to develop coherent user-friendly plans and ensure all designers of schemes fully understand and take into account the needs of cyclists.

Science Vale

A stand-alone cycling strategy has been developed for Science Vale UK (see annex 1). This commits to cycle route upgrades and maintenance, initially through the 2015/16 Local Sustainable Transport Fund project. By 2020, we will provide new routes, branded signs, a trial cycle hire scheme and marketing measures to provide a high quality, safe and attractive network.

Oxford

Oxford already has an enviable cycling record with an estimated 75,000 cycle journeys made each day by Oxford's residents and monitoring of trips has shown a consistently high proportion of journeys made by bicycle into the city centre. But there is an ambition to go further: for Oxford to become a World-Class Cycle City where cycling is accessible to everyone regardless of age, background or cycling experience.

By 2020, the Oxford Cycle Strategy therefore commits to providing higher quality routes on the B4995, improving route continuity across other parts of the main road cycle network and an expanded network of quieter off-road routes. Furthermore, in the city centre there will be an increase in secure and conveniently located cycle parking, and city-wide there will be comprehensive destination signage throughout. This will be funded through existing money already secured such as developer contributions and the Local Growth Fund, as well as extra funding available from the Cycle City Ambition Programme recently announced by central government.

Longer term, the ambition is for a fully joined–up, coherent and safe network for all types of cyclist. This will mean a network of higher quality routes throughout the city that are continuous and direct, enabling cyclists to travel more quickly across the city. It will also mean overcoming major road and river barriers and providing cycle hubs at key public transport interchanges and major employment destinations. In the city centre it also means more innovative cycle parking solutions to deal with future demand and a range of cycle types.

3.6 New Developments

In September 2013, Oxfordshire councillors approved a motion that included requiring cycle-friendly measures to be incorporated into all new road schemes and new housing developments. It is essential that new developments are planned with cycling in mind and with facilities to make cycling both convenient and safe. Designing new developments so that cycling is the most convenient transport method for the majority of trips will naturally increase the proportion of journeys made in this way.

For large new housing development sites, we propose establishing the following principles:

- Developers must demonstrate through masterplanning how their site has been planned to make cycling convenient and safe, for cyclists travelling to, from within and through the site
- Site road network and junctions must be constructed with cycling in mind, including providing space for cycling on main/spine roads through the provision of, as a minimum, advisory cycle lanes

- We will ask developers to fund cyclability audits, so that the local user view is incorporated into new cycle facilities.

For large new commercial developments, developers should demonstrate how their development has been planned for users cycling to the site. This should be 'to the door' and as a result should show how cycle parking will be located in the most convenient position.

3.7 Provide for People without a Bicycle

We have developed a successful pilot OXONBIKE cycle hire scheme, funded by the Government via the Local Sustainable Transport Fund, in the Headington area of Oxford. During 2015/16, a similar project will provide cycle hire between Didcot Parkway station, Harwell, Oxford and Milton Park Oxfordshire. We have set up a stakeholder group to identify a strategic approach to cycle hire in Oxfordshire and how this could be funded in the longer-term, such as through sponsorship.

3.8 Encourage Cycling for Recreation

Cycling is the third most popular recreational activity in the UK - it is estimated over 3 million people cycle each month. Recreational and leisure cycling is often about taking the less direct route, using quiet roads, dedicated cycle tracks and public rights of way in addition to the roads network.

However, less-experienced or confident cyclists can be put off by traffic volumes driver behaviour, or road condition. The public rights of way network is also mainly unsurfaced and subject to seasonal variations as well as other problems such as vegetation growth so its quality and availability cannot be guaranteed. All these factors mean that choices can be limited, and can mean that people choose to drive to a place that can offer a safe cycling experience. As well as generating additional vehicle journeys this may reduce the number of new cyclists using the public network and mean they are less likely to choose to cycle for transport as well as recreation.

We will work to increase levels of cycling for recreation in Oxfordshire by improving the available Connector/Local cycle network where feasible. We will work with partners to improve the quality and resilience of the public rights of way network where possible and where there is potential for increasing usage. We will work with the OCN and other partners to improve the choice of safe, attractive, high-quality recreational cycling routes in the county. We will promote these to residents and visitors and provide cycle parking at destinations along the routes. Where the network has breaks in continuity that affect levels of use we will work with local communities and other stakeholders to find solutions. We will also look to reduce traffic speeds and influence driver behaviour where space is shared with vehicles.

3.9 Funding

Where there is a clear justification and outcome, we will commit to applying for grant and other funding opportunities announced for cycling and related schemes.
We will ensure that developer funding is used to fund infrastructure improvements that people will want to use. We will engage with developers to ensure that high quality cycle infrastructure is designed-in to their own development plans and secure Section 106 money to improve cycle facilities in and around the site, to encourage people to cycle as soon as they move in to the development. Where appropriate, Community Infrastructure Levy (CIL) funding will be used to provide cycle schemes or create sections of the overall county cycling network, with cyclability audits providing a user perspective.

We will improve links between our cycle network and popular public transport hubs and ensure that safe and secure cycle parking is available at the interchange point. We will work with rail operators to provide more space for cycles on trains.

3.10 Cycle Scheme Assessment and Prioritisation

As schemes and projects and funding opportunities come forward, we will need to ensure there is a robust means of assessing projects against the outcomes of this Plan and any bid criteria, to maximise our chances of success in securing funds and meeting Strategy cycling targets. For more significant and costly schemes,

especially those which require Local Growth Fund funding from the Oxfordshire Local Economic Partnership, schemes will be prioritised against their contribution to meeting the LEP objectives of Innovative Place, Innovative People, Innovative Enterprise, and Innovative Connectivity. Where schemes require Major Scheme funding (generally those costing over £5 million) then they will also need to be justified through a Business Case based upon the government's five-case model – economic, strategic, financial, management and commercial before funding becomes available.

4 Implementation Plan

This sets out what we will do during the first three years of the new strategy. We will inevitably need to make changes as we proceed – for example, if we receive more funding for our plans - and we have developed our strategy to make it easy to adapt.

2015/6

Identify a dedicated cycle resource to promote cycling internally and externally, develop a vision of an integrated cycle network, lead on high quality bids for funding opportunities and act as a point of contact for Stakeholders.
Development of assessment process in selecting Cycle Premium Routes and Cycle Super Routes (CPR), branding and marketing strategy for CPRs and development of plans for a comprehensive toolkit of support for cyclists
Identification and completion of first CPR route, including at least one audit of the route with users and subsequent detailed design work.
Research and analysis of options for three more CPRs to be delivered in 2016/17.
Completion of a document outlining the new strategy for utilising developer funding to support the developing cycling network within the county, including funding for cycleability audits
Communicate with businesses, parish councils, schools and communities to promote, enable and increase understanding of cycling throughout the county
Develop a cycling promotion and publicity plan (with Oxfordshire Cycling Network)
Discussions with rail and bus companies about the potential of improving bike/rail and bike/bus door to door journeys.
Identification (in collaboration with users via Oxfordshire Cycling Network) of maintenance priorities for cyclists in the county. This will be an on-going annual task**.**
Training for all planners and designers in facilitating cycleability audits including on-cycle audit of routes.

2016/17 to 2017/18

Completion of three further CPRs in 2016/17. Costed plan for implementation of three more CPRs to be delivered in 2017/18, including community street audits and detailed plans, prior to construction.
Publication of an annual report on progress to management councillors and Stakeholders outlining, achievements and lessons learned during the first year.
Taking every opportunity to promote Oxfordshire as a centre of cycling excellence, via press releases, articles in transport, health and other publications.
In 2018, produce a public report to show how the Strategy is working, covering 2015/16 and 2016/17. It will include comprehensive quantitative data on user numbers and views, particularly on CPR routes, evaluate the health benefits of the developing cycling network, measure progress to date and cover lessons learned.
Development of an implementation plan for 2018/19 onwards

5 How cycling addresses the objectives of our Local Transport Plan

Increasing the number of people cycling in Oxfordshire is a key element of our Local Transport Plan. Our strategy addresses the objectives of the Plan as follows:

Objective	Cycling impact
Make most effective use of all available transport capacity	A bicycle takes up just one-fifth of the road space of a car. Shifting car journeys to bicycle is one of the most efficient ways of increasing road space. However, we will look to provide segregated space for cyclists on roads with fast moving traffic.
Reduce the proportion of journeys made by private car	Cycling investment benefits everyone, whether or not they cycle. More people cycling means fewer people driving, which will reduce congestion.
Maintain and improve transport connections to support economic growth and vitality	Cycling improves transport links between homes and centres of employment, increasing access to work and options for jobs, especially for poorly connected people across the county. We will also promote and enable door-to-door journeys combining cycling and public transport as an alternative to driving to transport hubs.
Influence the location and layout of development	Cycling should be at the centre of the design of new developments, making it easy and attractive to walk or cycle the area. We will aim to influence the location of development to ensure that journeys are cyclable and not just accessible by vehicle.
Increase journey time reliability	Journey times are much more reliable for cyclists

	during peak times, but we recognise that many people will not consider switching to cycling if they perceive it as being too dangerous.
Develop a high quality, resilient integrated transport system that is attractive to customers	Enabling and improving door-to-door journeys combining cycling and train or bus is something that we will be prioritising as part of this Strategy.
Reduce per capita carbon emissions from transport in Oxfordshire	Cycling is a largely carbon-free form of transport. By increasing the proportion of journeys made by cycle rather than vehicles, we will make a contribution to reducing emissions.
Mitigate and wherever possible enhance the impacts of transport on the local built and natural environment	Cycling requires relatively small infrastructure changes to the environment, many of which will bring improvements for the wider community, for example street calming measures.
Improve public health and wellbeing	Cycling is an excellent form of exercise. A successful policy to increase the level of cycling will have substantial public health benefits and lead to long-term savings for the NHS. We have developed this strategy in collaboration with our colleagues in Public Health. This Strategy aims to support Priorities 1, 8 and 9 from 'Oxfordshire's Joint Health & Wellbeing Strategy 2012 – 2016'. Priority 1 aims to ensure that: 'all children have a healthy start in life and stay healthy into adulthood'. (DE)

Our vision for cycling in Science Vale

SCIENCE VALE

CYCLING STRATEGY

Version 1 – Autumn 2014

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PART ONE: Our vision

"Our vision is for a world-class cycle network enabling users to make safe, efficient, connected journeys by bike."

"Our ambition is to raise the status of cycling in the Science Vale area through the provision of innovative and high quality cycling facilities comparable with those found in the cycling countries of continental Europe, supporting the growth and investment being made in Science Vale"

Introduction

Science Vale is receiving unprecedented levels of economic investment and associated growth. This investment is creating new jobs, and these new jobs are being supported through new housing in the nearby towns. In the order of 20,000 new jobs and 16,000 new homes by 2031 are being planned for.

Science Vale is an economic growth area that includes three nationally and inter-nationally recognised science and research centres at Harwell Oxford Campus, Milton Park and Culham Science Centre. It also includes the settlements of Wantage & Grove and Didcot. Science Vale is home to Oxfordshire's Enterprise Zone and the focus for significant growth and infrastructure investment.

The transport network needs to be upgraded and strengthened to facilitate the investment by ensuring people can move efficiently around the area and easily reach jobs and services. Significant investment is needed to achieve this in the road network together with cycling and public transport. A multimodal approach is needed to provide choice and ensure resilience, sustainability and efficiency. The first schemes are already in progress. This document sets out our vision for cycling in Science Vale and details where investment in cycling will be directed.

With European companies investing and desire to provide good usable alternatives to car travel cycling is enjoying a renaissance: The profile of cycling is continually being raised at both national and local levels and more people are choosing to cycle. In Oxfordshire, we now have a new Cycling Strategy. The Oxfordshire Cycling Strategy, part of the new Local Transport Plan (LTP4), sets out our policies and targets for cycling in Oxfordshire. The Science Vale Cycling Strategy sets out how we will

implement these policies in the Science Vale area and help to deliver the transport strategy set out in the Science Vale Area Strategy.

The government has announced hundreds of millions of pounds of investment in science based industries in Science Vale, which is attracting multi-national companies to consider locating in the area. These companies are looking to locate where infrastructure is good, and this includes cycling infrastructure. It's essential we take the opportunity to ensure our cycling infrastructure meets the expectations of these companies so that they choose to locate in Science Vale, this will in turn support our aims to significantly increase levels of cycling in Oxfordshire.

There are significant challenges; the dispersed nature of the Science Vale area does not naturally encourage high levels of cycling, unlike cities such as Oxford where short distances between destinations make cycling an attractive option. The greater distances involved also means larger investment is required.

Cycling investment benefits everyone, whether or not they cycle. More people cycling means fewer people driving, which will reduce congestion. No one form of transport alone can provide the means to ensure the transport network remains functional. Cycling will be a central part of the transport system for Science Vale, supporting our aims set out in the Oxfordshire Cycling Strategy, the Science Transit Strategy and the new Local Transport Plan.

We have already started. Cycling schemes are in progress and we have secured a further £5million from the Oxfordshire Local Growth Fund to implement the highest priority schemes as the first phase of realising our vision. Future phases will follow once funding has been secured and this strategy will be an important tool in securing that funding.

There are already above average levels of cycling in Science Vale. For example, at the last census (2011), 4.1% of journeys to work were made by bike in Science Vale. This is higher than the average across England and Wales of 2.8%, or within Oxfordshire (excluding Oxford), where the average rate is 3.2%.

We aim to increase the overall proportion of journeys made by cycling in Science Vale by 50% by 2021.

Science Vale cycling network:

The Premium Routes approach

The Oxfordshire Cycling Strategy introduces our concept of Cycle Premium Routes. This will focus investment on those routes already popular, building upon their success to raise levels of cycling in the most efficient manner.

The premium routes concept has been successfully applied to bus routes in Oxfordshire over the past decade. The foundation of a successful route and proven demand can be nurtured through investment into an even more successful route. By focussing on these routes – the core links – investment is concentrated to where is can be used most efficiently, and this has allowed a step change in service delivery for bus passengers on these routes. These routes form the backbone of the commercial bus network in Oxfordshire and are used by the majority of bus passengers.

Cycle Premium Routes takes this concept and applies it to cycling. We have identified a series of strategic corridors across Science Vale where we will establish the Cycle Premium Routes which will become the focus of our future investment. The greatest investment potential lies in those corridors which connect together the areas of growth, and so our corridors are based around connecting the areas of employment growth to transport hubs and areas of housing growth. Many of these corridors already have good levels of cycling. We will build on this to create the Science Vale cycle network.

Our chosen corridors are defined and discussed in detail in part two. A system of prioritisation for investment is also included based on current demand and current route conditions.

A series of discrete schemes will be programmed for each Cycle Premium Route, once defined for each corridor, which when complete will form a continuous direct route providing a high quality cycling experience.

Feeder routes

Whilst investment will be focussed on the premium routes, a network of short feeder routes to the premium routes will also be developed and promoted. These routes will provide important links into the network to ensure the premium routes network is as easy to access as possible. Further details of these routes are discussed in part two.

National Cycle Network

The National Cycle Network is a network of routes largely established by cycling charity Sustrans, using millennium funding in the late 1990s and early 2000s. The routes consist of a mix of traffic-free paths and quiet roads linking together large towns. Continued investment since 2000 has established complimentary regional routes of a similar standard feeding into the national routes.

There are two National Cycle Network routes in the Science Vale area. National route 5 runs through the area from Oxford, via Abingdon, Didcot and onwards towards Reading via Long Wittenham. Regional route 544 feeds into this route at Didcot from Wantage via the Harwell Oxford campus.

These routes will continue to form an integral part of the cycling network and we will work closely with Sustrans to build on this.

Complementary measures

Investment in cycling is not just about infrastructure. In Science Vale we will actively promote and raise awareness of the cycling network. We have initially secured funding for this through the Department for Transport's Local Sustainable Transport Fund. We will make available a series of maps covering the area in both printed and electronic form. The maps will be supported by new, clear signage to destinations and map display boards at key locations and junctions.

Didcot Interchange

Didcot Parkway railway station is at the heart of the Science Vale transport network. It is the gateway into the area for many journeys and recently has had an £8million upgrade for this purpose. It is a significant destination for cycling journeys, and cycle facilities have been substantially improved as part of the upgrade work. We shall continue to look for opportunities for further development of the cycling facilities at the station to reflect its key role in the network. This could take the form of upgraded information points, secure cycle parking, improved local cycle routes, a bicycle repair service or even a fully featured cycle hub. We shall work with others to achieve this while recognising the station's space constraints and other future development.

Cycle Hire

Cycle hire schemes are currently enjoying significant popularity across the country, with new schemes coming online in different locations each month. In Oxfordshire we have the OxonBike cycle hire scheme in Headington and Brompton Dock points at Oxford and Didcot complementing traditional cycle hire companies operating in Oxford.

The OxonBike scheme has been introduced in Headington with funding from the DfT's Local Sustainable Transport Fund (LSTF). The type of hire scheme is similar to the popular Barclays Cycle Hire scheme in London, which is designed to maximise use of the hire bikes through short hires between hire points. Oxonbike has proved popular and its expansion to other areas is being investigated, including the Science Vale area.

Science Vale is substantially more rural and dispersed than most other areas operating Oxonbike type hire schemes; these tend to be urban areas. This will present challenges to operating a scheme in Science Vale. We have secured funding from the DfT's LSTF to set up a pilot scheme covering Didcot, Milton Park and Harwell Campus.

Our long term vision is for a commercially sustainable, innovative cycle hire scheme covering all of Science Vale, fully integrated into the Science Transit network. This could see the availability of e-bikes to assist with the longer journeys required in Science Vale.

Publicity

Getting the message out about good cycle routes is a key part of encouraging more people to cycle. This will become more important as the network is upgraded. We will communicate through a series of measures including:

- A set of cycling maps covering the Science Vale area in detail and highlighting quieter roads and off-road paths. These will be available both online and in printed form from local information points
- Map boards at key locations and junction points showing the local routes and points of interest. These will be similar to the boards that exist at some points on the National Cycle Network routes 5 and 544, which will be updated where needed
- An occasional cycling newsletter covering the latest route upgrades and events

- Promotion of cycling through the Oxfordshire Travel Choices brand including at events organised as part of the Access to Science Vale Enterprise Zone programme
- Close relationships with large employment sites and cycling user groups

Funding to start some of this work has been secured from the DfT's LSTF.

Signage

Good consistent route signage is important as it helps to ensure the cycling network is easy to use. The National Cycle Network routes within Science Vale are well signed, but other routes are often lacking good clear cycling specific signage. Good signage, particularly when including journey times, is also a good way of raising awareness of the network.

We have secured funding from the DfT's LSTF to create a set of signage guidelines which will be applied to routes in Science Vale to ensure quality and consistency.

Network identity

To complement our work on signage and publicity, we propose to give the Cycle Premium Routes in Science Vale a name or theme that will help to raise awareness of the network. We will then name each of the routes within the theme to help users understand the network better and to find out route destinations.

Our thinking is based on work elsewhere such as in Aylesbury, where cycle routes have been colour coded and named after gemstones.

New Developments

The significant amount of planned development in Science Vale offers the opportunity to make a real difference for cycling. It is essential that new developments are planned with cycling in mind and with facilities to make cycling both convenient and safe. Designing new developments so that cycling or walking is the most convenient transport method for the majority of trips will naturally increase the proportion of journeys made in this way.

For large new housing development sites, we propose establishing the following principles:

- Developers to demonstrate through masterplanning how their site has been planned to make cycling convenient and safe, for cyclists travelling to, from, within and through the site
- Sites to be connected to at least one of the Cycle Premium Routes defined in this strategy, including creating feeder routes where needed
- Site road network and junctions to be constructed with cycling in mind, including providing space for cycling on main/spine roads through the provision of, as a minimum, advisory cycle lanes

For large new commercial developments, developers should demonstrate how their development has been planned for users cycling to the site. This should be 'to the door' and as a result should show how cycle parking will be located in the most convenient position.

For new highway improvement schemes, we will outline where we propose to make improvements for cyclists and engage with cycling user groups, shortly after project inception, so that schemes are developed with improvements built in from the outset.

Where are we now?

The latest census, 2011, shows there are already above average levels of cycling in Science Vale for journeys to work. For 4.1% of journeys to work across Science Vale, the majority of the journey was made by bike. This is higher than the average across England and Wales of 2.8%, or within Oxfordshire (excluding Oxford), where the average rate is 3.2%.

It is difficult to reliably and consistently measure the proportion of journeys overall made by bike. The census only covers journeys to work, and this data is only records the main mode of travel used. A journey by train that involves cycling to the station is most likely to be recorded as a train journey, for example.

Where do people cycle to work?

Cyclists from…

Wantage

…work in	**% of cyclists**
Wantage	46
Harwell	22
Watchfield	14
Grove	13
Milton	6

Grove

…work in	**% of cyclists**
Wantage	46
Grove	31
Watchfield	14
Harwell	9

Didcot

…work in	**% of cyclists**
Didcot	63
Harwell	20
Milton	14
Abingdon	1
Wallingford	1

How do people get to work in Harwell?

Mode	%
Car - drive	77
Bus/Coach	5
Car - passenger	5
Bicycle	3
Foot	2
Train	1

How do people get to work in Milton Park?

Mode	%
Car - drive	76
Car - passenger	5
Bicycle	5
Bus/Coach	3
Foot	3

Monitoring our progress

We aim to increase the proportion of journeys for all purposes made by bike, where the journey is of a length suited to cycling. This is very difficult to accurately measure and monitor without conducting costly surveys. We therefore aim to monitor and analyse existing sources of data in addition to the census to identify trends. These additional sources will include:

- Travel to work surveys conducted by the main employment sites
- Automatic cycle counters (these already exist on a number of routes)
- General traffic surveys

We will set up a monitoring programme to assess our impact and report on this annually.

The central part of our monitoring will utilising information from travel to work surveys that will be regularly completed on the three main employment sites: Milton Park, Harwell Campus and Culham Science Park.

This will be complemented by analysis of automatic cycle counters positioned at strategic points on the network. These counters are permanent and count all bicycles that pass over them. We will review the current locations and supplement where necessary to ensure there is good coverage.

PART TWO: Routes and schemes

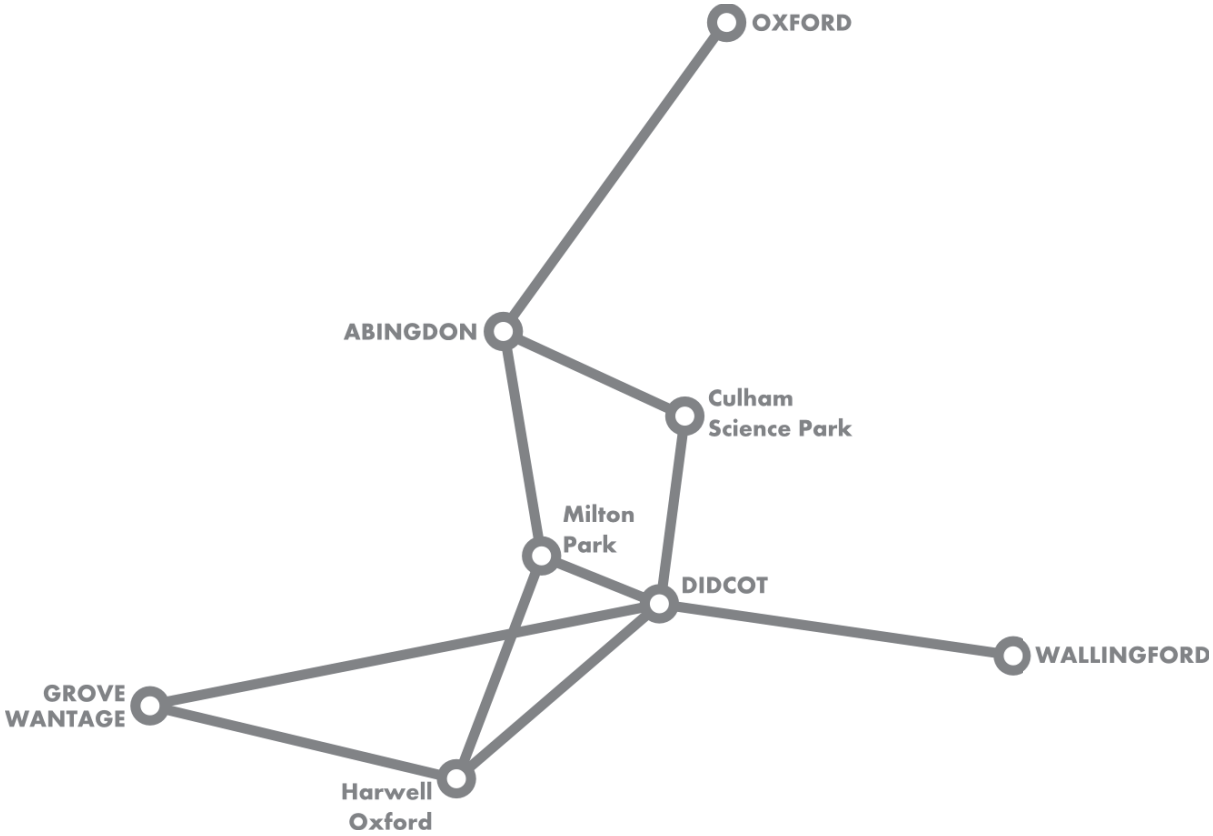
The network of Cycle Premium Routes in Science Vale will be based on connecting the large employment sites: Milton Park, Harwell Campus and Culham Science Park to the towns; Didcot, Abingdon, Wantage and Grove. This enables us to maximise our opportunities for funding and investment by focussing the network on the employment and housing growth areas. There are already good cycling levels in and between these points, which will help us to build on existing success and achieve our vision in the most efficient way.

We have identified a series of corridors for which a future study will determine where best to direct investment to create one Cycle Premium Route along each corridor. The study will review existing routes and previous studies, and recommend a series of schemes required to provide a continuous Cycle Premium Route along each corridor.

The resulting route along each corridor will be high quality, direct, well signed and is likely to be a mix of predominantly segregated and off-road paths. The study for each corridor will assess the possible individual scheme options and consider the benefits and feasibility for each. We will consult on the choice of schemes that are to make up each route.

Our aim for each of these routes is to achieve a quality of infrastructure comparable to that found in the European cycling countries. We may have to be pragmatic about how to achieve this and a staged approach may be required in places if full funding is not immediately available.

The map below shows the corridors that will make up the Cycle Premium Routes in Science Vale. Forthcoming studies will determine the exact routes and required schemes for each corridor. The routes of some corridors may overlap one another.



The corridors

Wantage to Harwell Campus

National Cycle Network route 544 currently connects Wantage to Harwell Campus via an indirect route. A shorter route will make cycling more attractive on this corridor. This promoted premium route will most likely make use of the existing route 544 at either end where the route is of a high standard already or is about to be upgraded. The strategy is to upgrade several sections of existing rights of way to create a more direct route. The longer-term aspiration is to also have a route alongside the A417.

Wantage to Milton Park

This strategy for this route is to create a connecting route between the Wantage to Harwell and Abingdon to Harwell corridors. Longer term, a separate route possibly running in the shadow of the railway line between Grove and Steventon could be created.

Abingdon to Milton Park

National Cycle Network route 5 already connects Abingdon to Milton Park via Sutton Courtenay. Our strategy is to supplement this route and create a shorter distance route from Abingdon to the central and western parts of Milton Park, and to also upgrade the Peep-o-Day Lane section of route 5.

The shorter distance route could be created by upgrading and converting footpaths running north from Milton Park, or use Milton Road and the rights of way east of Drayton to connect with the Drayton to Abingdon roadside shared use path.

Abingdon to Harwell Campus

Our strategy for this corridor will be to either utilise the Abingdon to Milton Park route or make improvements to the B4017 road route through Steventon. Continuing towards the Harwell Campus our strategy will be to either make upgrades for cyclists to the A4130 or to the Hungerford Road restricted byway.

Didcot to Harwell Campus

A substantial investment is being made to upgrade a footpath currently used by cyclists between the north end of the Harwell Oxford campus and Harwell village. This path, The Winnaway, is to be converted to a bridleway, widened and resurfaced by summer 2015. Our strategy is for this to form the southern section of the Didcot to Harwell Cycle Premium Route, which will then continue through Harwell village and utilise the B4493 into Didcot.

Longer term, our strategy will be to utilise Grove Road A34 bridge and then define a direct and convenient route through the proposed Valley Park development, leading into Great Western Park.

Didcot to Milton Park

Our strategy for this corridor will focus on upgrades to the existing routes. To the south of the power station site a shared use path runs along the south side of Milton Road. This path is very popular but suffers from seasonal vegetation incursion and conflict between cyclists and pedestrians, exacerbated by a lack of lighting which is a particular issue during the winter months. We will investigate enhancements to this route including lighting and, as the existing path is constrained between the carriageway and adjacent railway line, either constructing another path on the other side of the carriageway, or moving the carriageway to allow widening of the existing path.

To the north of the power station site is National Cycle Network route 5, which provides an alternative but less direct route to Milton Park. We will look at making this route more attractive by providing lighting, together with new sections of path at either end to create a more direct route.

Abingdon to Culham Science Park

Our strategy will be to create a new northerly route from Culham Science Centre, possibly crossing the Thames and connecting with route 5 into Abingdon and Oxford or staying south of the Thames and entering Abingdon at Bridge Street.

In addition, an existing shared use roadside path follows the A415 but stops at Culham Village turn where the pavement becomes raised into Abingdon; the path known as The Causeway. We will investigate the feasibility of continuing the cycle route along or behind The Causeway.

Feeder routes

Steventon to Milton Park

This scheme will provide a link between Steventon and Milton Park avoiding Milton Interchange. The scheme is likely to consist of a new cycle path running alongside the existing footpath which runs next to the railway line, passing under the A34 and connecting Steventon, probably at Pugsden Lane, to Milton Park at the Milton Village High Street junction.

Chilton to West Ilsley A34 junction

This scheme will provide a link between the West Ilsley A34 junction and the Chilton A34 junction. Currently cyclists heading north/south have to make use of a section of A34 dual carriageway. Alternative roads add several miles to a journey.

This scheme would create a path between these points suitable for all weather cycling and helping to make cycling a more attractive option between West Berkshire and Harwell Oxford campus and beyond.

Backhill Lane tunnel

This scheme will see a currently disused underpass under the railway at Milton Park reopened for cyclists and pedestrians. It will be of particular benefit for cyclists travelling from Didcot Great Western Park to the west of Milton Park. The £1.4million scheme is being delivered by Milton Park as part of a larger scheme including a new junction of the A4130, and is funded from the Oxfordshire LEP's Growing Places Fund.

Other schemes

Cow Lane underpass, Didcot

The Cow Lane underpass at Didcot represents a major barrier for cyclists. The underpass, which carries Cow Lane under the railway, lies on National Cycle Network route 5 and is a key link between the north and south of Didcot. It was built prior to the expansion of Didcot to the north, but has not been upgraded. It currently consists of a narrow southbound vehicle carriageway and a narrow pavement, separated from the carriageway with a barrier. Cyclists heading southbound can use the carriageway but heading north have no choice but to dismount and use the narrow pavement.

Several options have been looked at in the past to address the problem, including widening the existing underpass or constructing a new underpass, and funding has been sought unsuccessfully. The age of the underpass, its length and having an operational main line railway running over it contribute to any solution having a very substantial price tag of several million pounds, making it difficult to justify in terms of value for money.

A decision to spend several million pounds on one very small part of the network would need to be carefully considered in terms of value for money and compared to what that funding could achieve for the rest of the network if spent elsewhere.

A potentially less costly solution would be to remove the vehicle traffic lane and make the underpass for the exclusive use of pedestrians and cyclists. However, this solution would require widespread support locally and politically among all concerned before it could be considered.

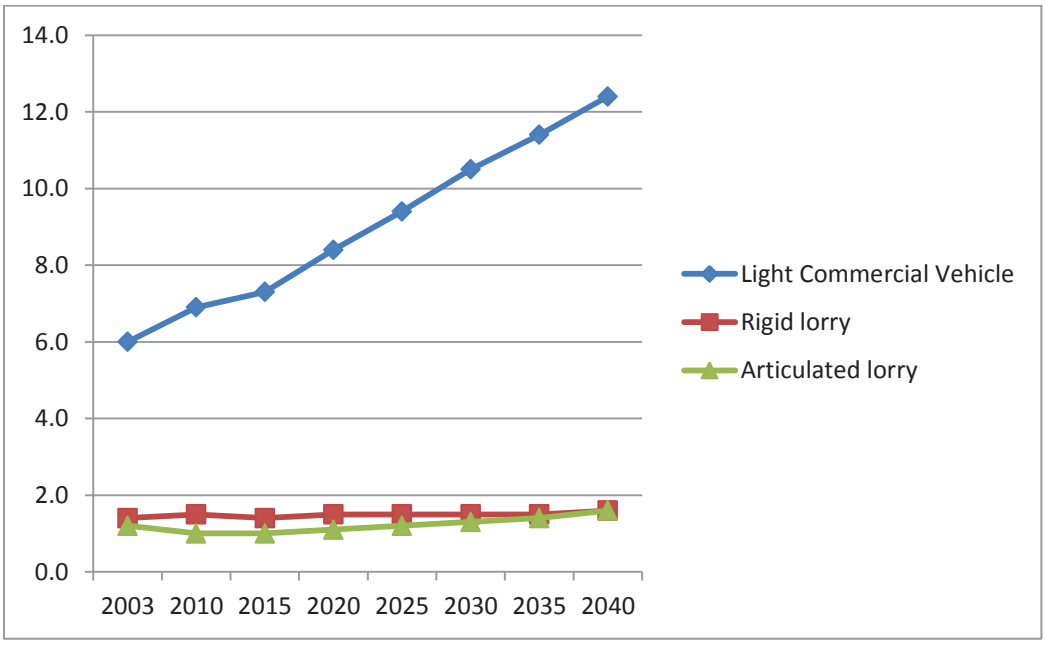
Longer term, a solution may be found through the possible creation of a northern entrance to Didcot station, utilising its associated subway or footbridge.

Oxfordshire Freight Strategy

Introduction

We rely on an efficient and reliable freight network for our daily lives. The freight network brings food to our supermarkets and parcels to our doors. It links our manufacturers with their suppliers and their customers and brings the aggregates to our roads. We need to enable reliable freight transport between businesses, their supply chains and their customers and so make Oxfordshire an attractive location for business and employment.

The nature and volume of freight traffic is likely to change substantially over the period of this strategy. The Department for Transport's central prediction for south-east England is that from 2015 to 2040, we shall see a substantial road traffic increase of 70% for light commercial vehicles; the level of articulated lorries on our roads will grow by 60% and the level of rigid lorries will grow by 14%. Freight traffic growth from our Strategic Economic Plan, with its aim to promote high tech industry, is likely to reflect and even exceed this pattern of growth in light commercial vehicles.



Freight Strategy Figure 1: Forecast growth in freight on all types of roads in south-east England excluding London, billion miles per year (source: Department for Transport Road Traffic Forecasts 2013 – central forecast)

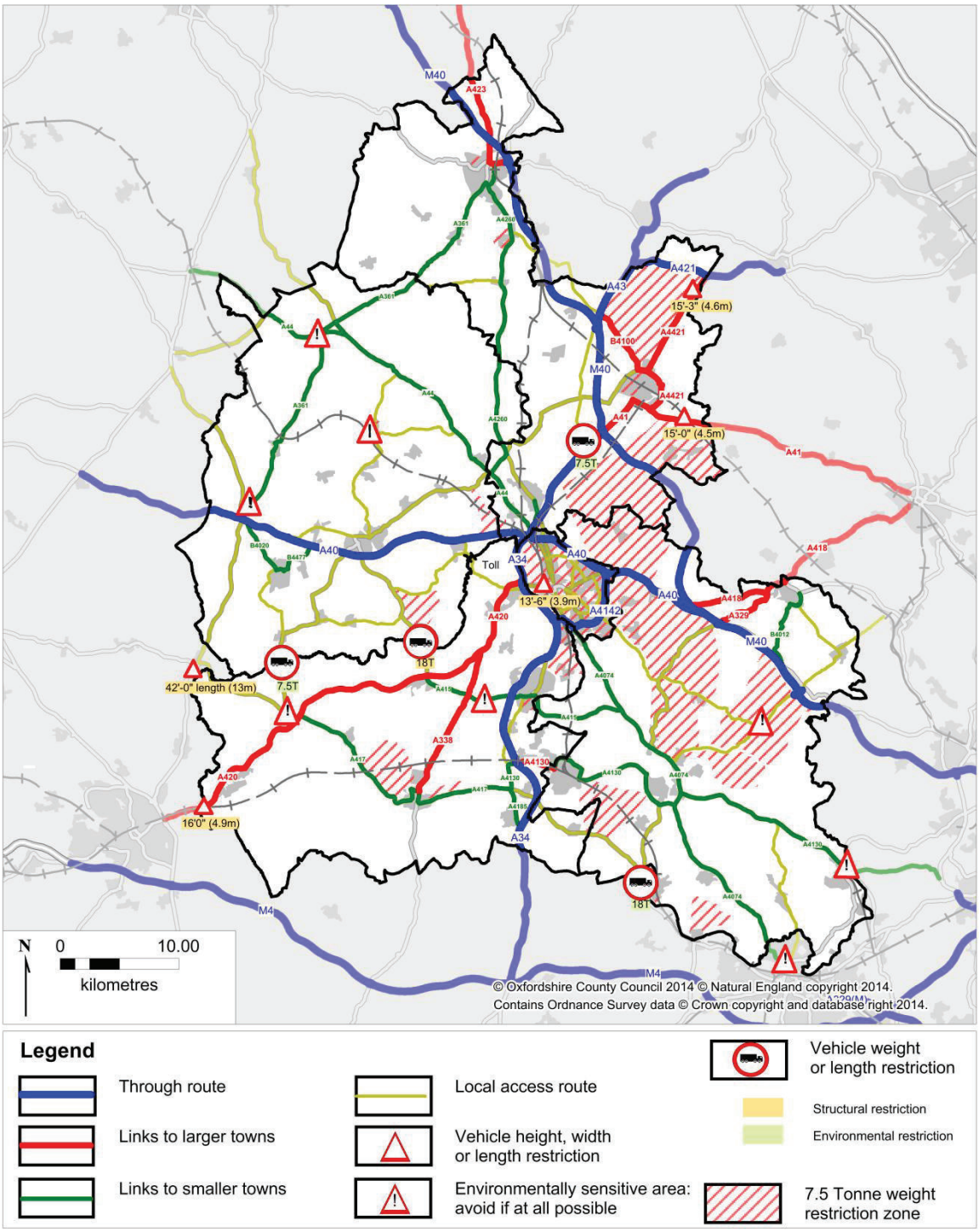
To provide for this we need to make more efficient use of transport networks and systems across all modes of transport, including use of the rail network. However, the majority of freight movements in our predominantly rural county will continue to

be by road. It is essential that we make use of our road network as efficient as possible, with larger goods vehicles using the strategic road network in preference to minor roads, encouraged by measures to reduce journey times and increase journey time reliability on these important major routes.

Freight vehicles can have negative effects on congestion, road safety, air quality and the wider environment. These depend very much on time and particularly place, with lorries negotiating narrow streets through villages and market towns generating numerous complaints from local residents. This can also impact on other modes of transport that LTP4 is seeking to encourage, for example delays to buses particularly from on-street loading and the risks to cyclists and pedestrians from large lorries which can deter use of these active modes of transport.
However, it is not a simple trade-off between economic benefits and environmental costs. A safe and attractive environment where people and goods can move around freely is a vital component of the county's economic offer as a place to live, work and visit. This is what our freight strategy aims to deliver for Oxfordshire.

The Department for Transport has published the estimated external cost per lorry mile of using different categories of road.[1] These vary from 82 pence for A roads to 235 pence for other (lower classification) roads. This reflects various environmental costs but the critical factor is infrastructure, where the costs are 7 pence for motorways, 24 pence for A roads and 171 pence for other roads. This illustrates the economic and environmental benefits of keeping lorries on the strategic road network as far as possible.

[1] *Freight mode shift benefit values technical report: an update,* DfT, 2014



Freight Strategy Figure 2: Oxfordshire lorry route map

Key Principles

We will base our freight strategy on the following six principles:

Understand patterns of freight movements including time and origin/destination as well as any problems encountered by operators and their customers as well as problems experienced by local communities and other road users. Surveys will be required to improve our knowledge base in an area where data is currently limited.

Inform freight operators of the best routes to use and those other routes and locations which should be avoided where possible. As funding and priorities allow, we will take advantage of new technology and best practice to help manage freight movements, particularly where this would help meet other Plan objectives.

Encourage use of the strategic road network by traffic management measures. This could include better provision of high quality rest facilities, coupled with the removal of sub-standard laybys where these can adversely affect road safety and congestion on strategic routes. This also means using the opportunity presented by investment in strategic rail in Oxfordshire to shift freight from road to rail in support of our Route Based Strategies in the county.

Deter use of inappropriate minor roads and movements through towns and villages and other environmentally sensitive areas except where this is essential for local access. This also helps to minimise damage by lorries to road surfaces and bridges. Our strategy will set out a policy on the introduction of further environmental weight limits across Oxfordshire and on their enforcement.

Manage freight and logistics in partnership with public sector organisations and businesses to achieve maximum efficiency and reduce waste by eliminating unnecessary trips. This might involve consolidation of items from diverse origins, combining them for onward delivery to the same destination, possibly including the use of smaller or low emission vehicles in sensitive environments such as urban centres with poor air quality.

Plan the location of new employment sites and any related transport infrastructure so that these can function well, with efficient freight access to and from the strategic transport network without adverse impacts on local communities, road users and the environment.

These principles are developed further below.

i. Understand patterns of freight movements

We will improve our knowledge and understanding of freight transport, the needs of freight operators and their customers as well as the negative impacts on local

communities. This will involve traffic surveys but also knowledge gained from the use of the national freight journey planner and from the development of Construction Logistics Plans and Delivery and Servicing Plans.

ii. Inform freight operators of the best routes to use and those to avoid

There has been growing public and political concern in recent years about the number of lorries making journeys (other than for local access) through towns and villages in Oxfordshire. This is why we will take advantage of new technology and best practice to help manage freight movements. Our aim would be to influence how hauliers and logistics companies plan their activities so that route planning takes account of our weight limits and environmentally sensitive areas. Another objective would be to enable local residents to report suspected breaches of weight limits.

iii. Encourage use of the strategic road network and of rail freight

The rationale for our Route Based Strategies for the A34, A40 and A420 is to encourage lorries and through traffic to stay on the strategic route network as much as possible. There are various traffic management measures that can help to achieve this objective. For example, removing some laybys from main roads can help because large vehicles pulling out slowly onto a road with fast traffic can be a safety hazard as well as a significant cause of congestion. Another approach would involve prioritising lorry traffic – for example, one option for the A40 is a combined bus and lorry lane which if implemented could reinforce the attractiveness of this recommended lorry route which avoids important market towns.

It is important to note that, while major development is concentrated in areas well served by the strategic route network, this does lead to increased congestion forecast on the very routes we want lorries to use. This will be a major challenge for the Network Capacity and Management Strategy which is currently under development.

Rest areas for lorry drivers are an important element in an efficient freight network. Proper facilities with security, refreshments, washing and toilets also cater better for drivers in terms of health and safety. They also help to avoid inappropriate use of laybys and parking on-road, which can cause obstruction and serious environmental problems to local residents. Unfortunately, in recent years the smaller service stations have withdrawn from catering for HGVs, leaving only motorway service areas and a few lorry parks. Motorways and trunk roads are better served including Oxford services at M40 junction 8, Cherwell Valley services at M40/A43 junction 10 and Chieveley services (outside Oxfordshire) at M4/A34 junction 13.

However, the Road Haulage Association (RHA) and Freight Transport Association (FTA) have identified a need for additional capacity at a site or sites close to the Oxford ring road. One potential location could be adjacent to the A34 at Lodge Hill (north Abingdon) if this is expanded to a full all-movements junction, subject to

planning constraints in relation to the Oxford Green Belt. Such a facility could fit with plans for a park and ride at the same location.

Significant volumes of rail freight pass through Oxfordshire, particularly between the port of Southampton and the Midlands and North of England. A recent project to increase the loading gauge, enabling larger containers, has removed thousands of HGVs from the A34. Other rail freight includes aggregates, waste, MOD supplies and finished mini cars. It is heavy and bulky items like these for which rail is most competitive, and we will support the provision of appropriately sited rail freight facilities, subject to funding being available and having regard to the impacts on local communities and on the road and passenger rail networks.

iv. Deter use of inappropriate minor roads through towns and villages

We will conduct a review of the environmental weight restrictions across the County paying particular attention to those areas which are subject to high and significant levels of HGV traffic. This will focus on places which currently do not have any restrictions in force such as:

- Burford
- Chipping Norton
- Woodstock
- Henley-on-Thames

and also those areas, such as Watlington, which do have them in force but where consistent incursions by HGV traffic are exacerbating problems of air quality, economic function and environmental amenity.

Our policy on new environmental weight limits is that we will first need to establish that a particular location has a problem in terms of environmental and economic impacts as reflected in congestion, air quality, road danger and public concern. We will then need to identify the share of HGV traffic that does not constitute local access based on origin and destination surveys and other data, as well as analysis of alternative routes. Consideration of weight limits will also need to have reference to the road hierarchy set out earlier in this Local Transport Plan.

In Oxford we will review signing on the ring road to ensure that lorries are directed to their destinations within the city by the most appropriate routes. It is sensible to co-ordinate this with work to develop the cycle network to try to reduce the danger that lorries pose to cyclists.

Neighbourhood Weight Watch is an existing scheme using volunteers, often in partnership with parish and town councils, to report lorries contravening weight and other restrictions. It can supplement the limited resources available for enforcement (Thames Valley Police and OCC Trading Standards). Trading Standards have a separate policy for prioritising the enforcement of the various weight limits in Oxfordshire in the most appropriate and effective way.

v. Manage freight and logistics to achieve maximum efficiency

We will set up a freight quality partnership which is a good way in which to engage with freight and logistics operators and other stakeholders. However, we will do this in a considered way, reflecting our resource levels and prioritising action over discussion. This could involve ad hoc working with particular partners on particular issues, for example with the National Farmers Union on agricultural and rural freight issues and with district councils to rearrange refuse collection outside peak periods.

In recent years Oxfordshire County Council and Oxford City Council have discussed with a number of other local stakeholders the possibility of freight consolidation and trans-shipment to reduce the negative impacts of goods vehicles in the city. These negative impacts include congestion, poor air quality resulting from diesel emissions and accidents, particularly those involving cyclists and pedestrians.

Freight consolidation means combining loads from various sources to one or a number of closely located destinations. It is a technique already practised by large retailers with sophisticated logistics operations and it reduces the number of separate goods vehicle journeys and total goods vehicle mileage. Trans-shipment means switching to smaller, sometimes electric delivery vehicles for the “final mile”. In Oxford there are two areas that could benefit from freight consolidation - the city centre and the Headington area including the hospitals and Oxford Brookes University.

Other options include Construction Logistics Plans (for major developments while under construction) and Delivery & Servicing Plans (for existing and newly completed developments). These are like travel plans and help businesses to organise their deliveries and collections to reduce lorry trips but also to bring efficiency savings. They can be linked to the use of approved operators under a Freight Operator Recognition Scheme (FORS) with standards for safe and environmentally friendly operation.

vi. Plan the location of new employment sites and any related transport infrastructure

We will influence the location and design of new employment sites and any related transport infrastructure so that these can function well, with efficient freight access to and from the strategic transport network without adverse impacts on local communities, other road users and the environment. We will work closely with local

planning authorities within the constraints of the National Planning Policy Framework.

We will ask developers of major sites to prepare Construction Logistics Plans to minimise the impact of the large scale residential and business development planned for Oxfordshire, as well as Delivery and Servicing Plans to ensure that businesses make ongoing arrangements for sustainable freight and logistics.

We will take careful account of the need for an efficient and sustainable freight network as we look to refine Infrastructure Development Plans as part of emerging Local Plans. We will seek developer contributions to mitigate the impact of freight traffic on the local and strategic network.

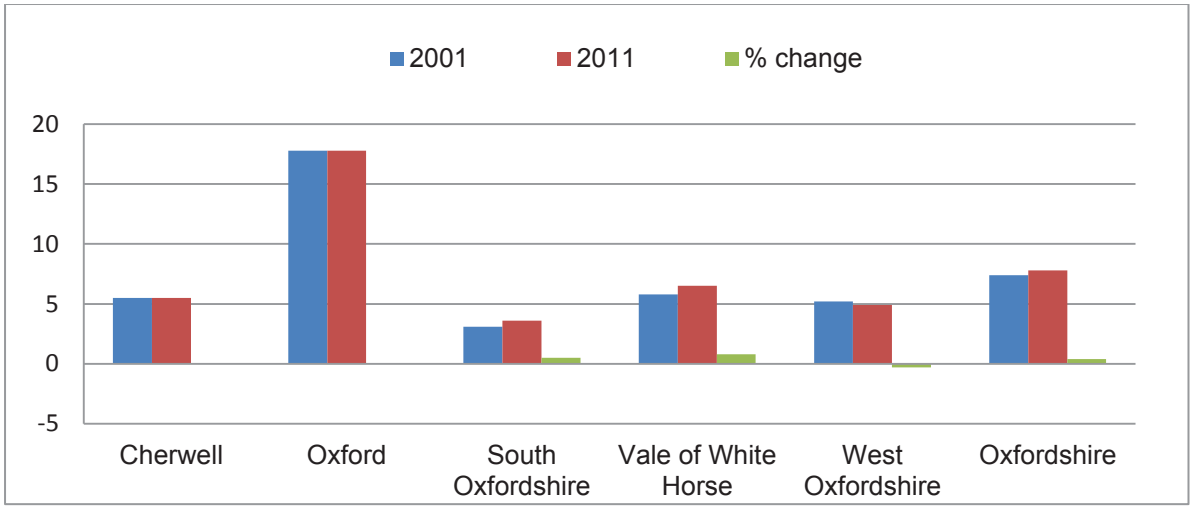
Oxfordshire Bus Strategy

Introduction

Oxfordshire County Council has a long and consistent track record of promoting bus travel working in close partnership with the bus industry. Our forward-looking pro-bus policies over the last four decades have been a key factor in the continual growth of bus patronage and development of a 'bus user culture', especially in and around the Oxford urban area. Oxford has developed one of the most highly-developed and successful commercial bus networks in the country.

Because of the relative strength of the local bus system – and health of the local economy – Oxfordshire has managed to avoid the widespread decline in bus passenger numbers across many parts of the country since 2008 and post one of the highest rates of growth of any local authority area in England and the South-East region. During this time we have also helped introduce major improvements on some inter-urban bus routes in central Oxford and its local area, including an integrated ticketing scheme.

As a result, in the past four years alone the total number of bus passenger journeys in Oxfordshire rose by almost 21% and the number of journeys per head of population rose by almost 17%. In 2013/14, there were over 43 million bus journeys in Oxfordshire, an increase of seven and a half million trips in just five years. In the predominantly rural districts the bus network is however currently much less developed and bus patronage substantially lower as a consequence, as figure 1 shows. In 2011 over 70% of all bus commuting trips in the County originated and/or ended took in, Oxford.



Bus Strategy Figure 1: Commuting to work by bus & coach in Oxfordshire - 2001 and 2011 - mode share by district [Source: Census]

Despite impressive and sustained bus growth Oxfordshire as a whole however continues to have very high levels of car congestion, especially at peak hours, which makes journeys unreliable, limits capacity for growth and damages health through pollution. Transforming the bus network is a key contributor to limiting congestion in the future, establishing sustainable travelling habits among those new to the county, by encouraging existing car users to switch to this more efficient means of transport and by making jobs, shops and local centres more accessible to those who cannot drive.

The development of this strategy has drawn on evidence, public consultation, and engagement with stakeholders, including transport operators, user groups and transport experts at county and local levels. A number of data sources have been used to identify the challenges facing the transport network in Oxfordshire including the national census, Local Plan work, and the Oxfordshire Transport Model. This evidence has informed the development of strategies and plans that are aligned with LTP4 objectives and integrated with other parts of the overall Transport Plan.

Key outcomes

We have developed a new bus strategy to complement the new Oxfordshire Local Transport Plan. The bus network is an essential contributor to sustainable transport and addresses the Plan's high-level goals in a number of ways. The table below identifies the key outcomes from this bus strategy in the light of *Connecting Oxfordshire*'s goals and objectives.

Bus Strategy Table 1: Key Outcomes

Connecting Oxfordshire high-level goals	To support jobs and housing growth and economic vitality	To support the transition to a low-carbon future	To support social inclusion and equality of opportunity	To protect, and where possible enhance, Oxfordshire's environment and improve quality of life	To improve public health, safety and individual wellbeing
Bus strategy key outcomes	More people will be able to travel to more destinations by bus, improving access to work, shops and local centres	Sustainable, energy-efficient bus transport will reduce sole-occupancy car usage and help manage car emission levels	Accessible bus connections will enable disabled people, elderly people and those unable to drive will travel more	More public transport journeys mean fewer car journeys: fewer roads need to be built and harmful vehicle air pollution is lower	Regular walking and cycling to and from bus stops and interchanges can be an important contributor to keeping fit

In addressing these goals and objectives from our new Local Transport Plan through the key outcomes, this bus strategy realises the Council's vision for bus services in Oxfordshire:

… 'a modern bus and coach system which is fully integrated with rail and other modes of transport, provides an attractive, viable, and socially inclusive alternative to the private car for most local and medium-distance journeys, and has (a) supported growth and economic vitality across the whole of the County, (b) achieved a substantial shift to sustainable, low carbon modes of travel, (c) helped reduce traffic congestion, and (d) generally improved the quality of life and local environments in Oxfordshire.

The Bus Strategy

OVERVIEW

The bus will remain the sole or main alternative to the private car for most medium-distance inter-urban journeys, and an important mode within the larger towns and their surrounding hinterlands, and therefore one of the main means of tackling congestion and facilitating social inclusion.

The main elements of our strategy are:

- **Integrated transport planning** building on Oxford's successful policy of land use planning, traffic management, parking management and restraint, and bus promotion, and adaptation of this approach to the rest of the County.

- **A cohesive and integrated bus network and provision of accessible, high quality infrastructure** with clear policies and design standards to guide the development and improvement of route infrastructure.

- **Tackling congestion and delays** by implementing bus priority or other traffic management measures at specific points along the major bus routes to ensure that buses can operate reliably and at commercially attractive speeds.

- **Adapting the bus network** to cater for more complex and dispersed journey patterns and new major development. We will encourage and support the development of more

cross-town and cross-area bus routes where these are practically feasible and there is sufficient potential demand.

- The development of **mass rapid transit systems and routes** between Oxford and a proposed **new outer ring of Park & ride sites**.

- The **development or upgrading of new high quality Premium urban and inter-urban services** where new development makes it feasible including bus priority measures and enhanced passenger and interchange facilities in:
  - Oxford, especially within and linking to the growing Eastern Arc
  - The Science Vale area,
  - larger towns outside Oxford,
  - locations along some strategically important inter-urban routes.

- **Enabling good onwards access on foot to major destinations** facilitating the penetration of bus services as close as possible to the heart of destinations such as town centres, employment areas and hospitals, with conveniently located bus stops.

- **A strategy for public transport in rural areas** to deal with further funding cuts to the Supported Bus Services Programme.

- The further development and extension of **multi-operator and multi-modal smart payment** which will enable the network to offer a greater range of journey choices than at present.

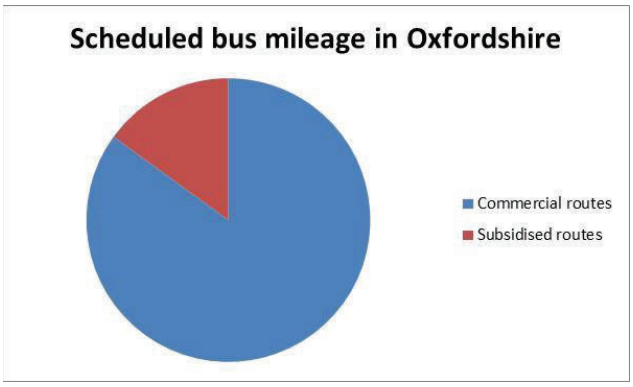
- **The further development of the Quality Bus Partnership approach** to focus on improving service punctuality/reliability, information and integration

- **Improvements to the securing and use of developer contributions for bus development,** by revising our approach to securing and utilising Section 106 developer contributions, and making preparations to achieve optimal use of the Community Infrastructure Levy.

- **Enhanced partnership working with local planning authorities** and use of the planning system to achieve better coordination between land use planning and future bus service provision.

OXFORDSHIRE'S BUS NETWORK

The private sector operates around 85% of scheduled bus mileage within Oxfordshire on a commercial basis. We subsidise the remaining services in order to fill gaps in the local bus network, especially in rural areas and smaller towns.



Oxford and its immediate surrounding area have a highly developed and generally high quality bus network, including a well-established park & ride system. Within Oxford there are already fairly extensive bus priority measures (although a few important gaps or 'pinch points' remain). Outside Oxford bus priority is currently almost non-existent on inter-urban routes and is generally under-developed in most of the larger urban areas. We need to identify the most important routes or corridors outside Oxfordshire where bus priority (or new services) may be needed to improve journey time reliability and reduce traffic congestion.

On a larger geographical scale the 'premium routes' bus network in Oxfordshire tends to follow a strongly radial, 'hub and spoke' pattern centred on Oxford, particularly the city centre. Outside these radial corridors – both within Oxford and Oxfordshire as a whole – there currently is fairly limited public transport connectivity.

The existing strategic inter-urban bus network is well connected to some major towns outside Oxfordshire but there are other strategically important links where services are less developed and a few where we may expect traffic demand to grow substantially as a result of major planned development in and outside Oxfordshire e.g. links to Northamptonshire and the Oxford-Cambridge arc.

Bus networks in and around Oxfordshire's larger towns have become increasingly limited and bus patronage generally has not grown significantly. Our current strategy is to use developer funding where available to 'pump prime' increased service frequency on routes serving the new developments. The defined bus network and hierarchy is used in negotiations with developers to determine the improved standard of service to be achieved and appropriate level of contribution required.

We have a duty to provide 'socially necessary' transport where commercial bus services have not proved viable. This is mostly in rural areas but also in some of the smaller towns. We have attempted to provide and maintain a basic network consisting of supported bus services and other statutory, voluntary or community transport services. Revenue funding to support these services has been declining for many years and the network has subsequently been shrinking. Further budget cuts mean that the supported bus services programme is due to be cut by over half over the course of the next four years. Without substitution in one form or other such extensive cuts to subsidised services may have adverse consequences for a small minority of the population and may serve to reinforce the culture of car dependency in large parts of the County, further undermining the growth of local bus services. There is a need to develop a new approach to rural public transport for this, as well as local economic reasons.

Changing demand for the bus network

Travel demand within Oxfordshire is becoming highly dispersed and complex and it is difficult and often impossible to serve with single-stage bus and rail services. With substantial employment and urban growth planned in Oxfordshire over the next 20 years, most of which will be concentrated within the 'Knowledge Spine' area, it is likely that travel demand patterns will become increasingly complex and decentralised. The County's strategic public transport network needs to be redesigned to cater for this more complex pattern of internal journeys, and public transport and multi-modal interchange will be an increasingly important issue in providing good access and achieving modal shift.

We have therefore reviewed and revised our bus strategy to ensure that the network is a key component of the overall public transport network in the County. By enhancing both routes and hubs and other interchanges simultaneously this facilitates better public transport connectivity and access leading to passenger growth and a reduction in car travel for unnecessary journeys. Supporting this with more efficient payment and ticketing systems helps create a more 'seamless' and easy to use, integrated public transport system.

Bus Network Strategy

The bus strategy is largely based on enhancing the role of the bus as a key component of the overall public transport network in the County, including the Science Transit Network. By enhancing both routes and hubs and other interchanges simultaneously this facilitates better public transport connectivity and access leading to passenger growth and a reduction in car

travel for unnecessary journeys. Supporting this with more efficient payment and ticketing systems helps create a more 'seamless' and easy to use, integrated public transport system.

Bus Strategy Table 2: Oxfordshire Bus & Coach Network Hierarchy

SERVICE LEVEL	DESCRIPTION	PRIMARY FUNCTION
THE STRATEGIC BUS AND COACH NETWORK		
BUS RAPID TRANSIT	• Bus Rapid Transit (or other form of Mass Rapid Transit) - direct and fast • Very high passenger volumes • Very high frequency (ideally a minimum of 6-8 buses per hour) • Extensive hours of operation • High level of bus priority/segregation • High quality vehicles and passenger and interchange facilities • Fully commercial services	• Connect places of strategic importance and busiest demand on main transport corridors in and approaching the largest settlements e.g. A40 corridor, • Cater for all journey purposes
PREMIUM TRANSIT	• High frequency (ideally a minimum of 4 buses per hour) • Early and late evening services • Direct, with some express services esp. at peak-time • High level of bus priority/segregation Moderate level of bus priority on inter-urban corridors but may utilise high level super-premium infrastructure to Oxford) • High quality vehicles and passenger and interchange facilities • Different standards for urban/extra-urban and inter-urban routes • Fully commercial services	• Connect places on main inter-urban corridors between Oxford, market towns and major urban centres in region • Links to main line railway stations at Oxford, Oxford Parkway, Didcot, Bicester (Town & North) and Banbury • Cater for all journey purposes

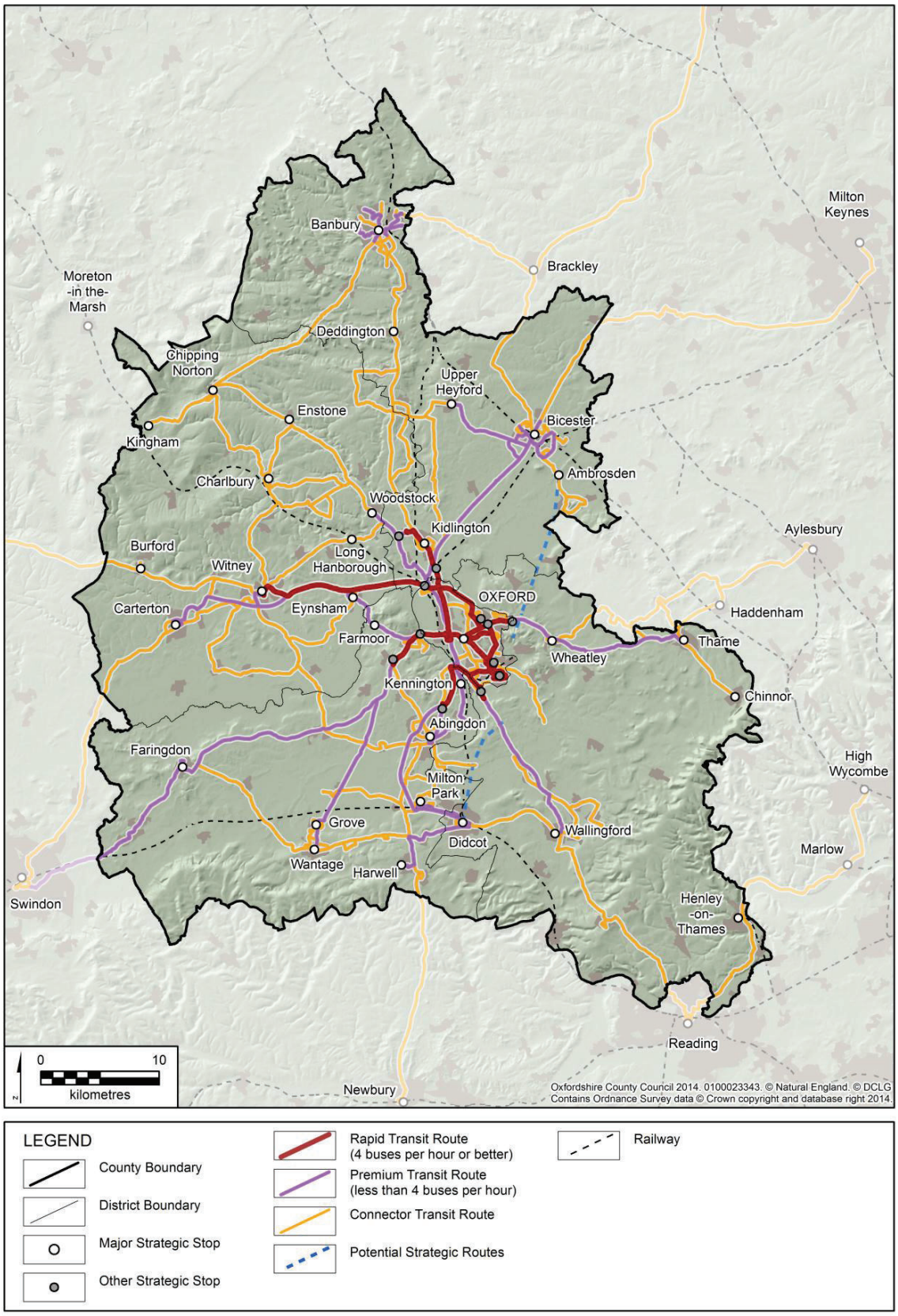
CONNECTOR TRANSIT	• Moderate frequency (ideally a minimum of two buses per hour) • Less extensive hours of operation and Saturday/Sunday services • Fixed route • Generally direct (but some services may be indirect) • High quality vehicles and passenger and interchange facilities • Fully commercial services or services with strong prospects to become so • May have a moderate level of bus priority /segregation on main urban and inter-urban roads (but may use high level super-premium infrastructure into Oxford)	• Local town services • Utility journeys to key trip generators (including railway stations) • Main corridors between market towns and larger villages • Secondary corridors into Oxford • Cater for all journey purposes
THE NON-STRATEGIC BUS NETWORK		
COMMUNITY OR LOCAL TRANSIT	• Fixed and flexible routes • Less direct/ indirect • Relatively low frequency (ideally one per hour - or demand responsive) • May use bus priority for higher-level services but no specific priority • Good standard of vehicles and some interchange facilities • Primarily subsidised (but may be close to commercial)	• Operates in areas of low and dispersed demand • 'Feeder services' to strategic transport interchanges and higher frequency services, town centres, main employment sites • Only cater to limited extent for commuting to work and post-school education • Link smaller rural villages to nearest market town • Off-peak services in smaller towns

The Strategic Bus Network

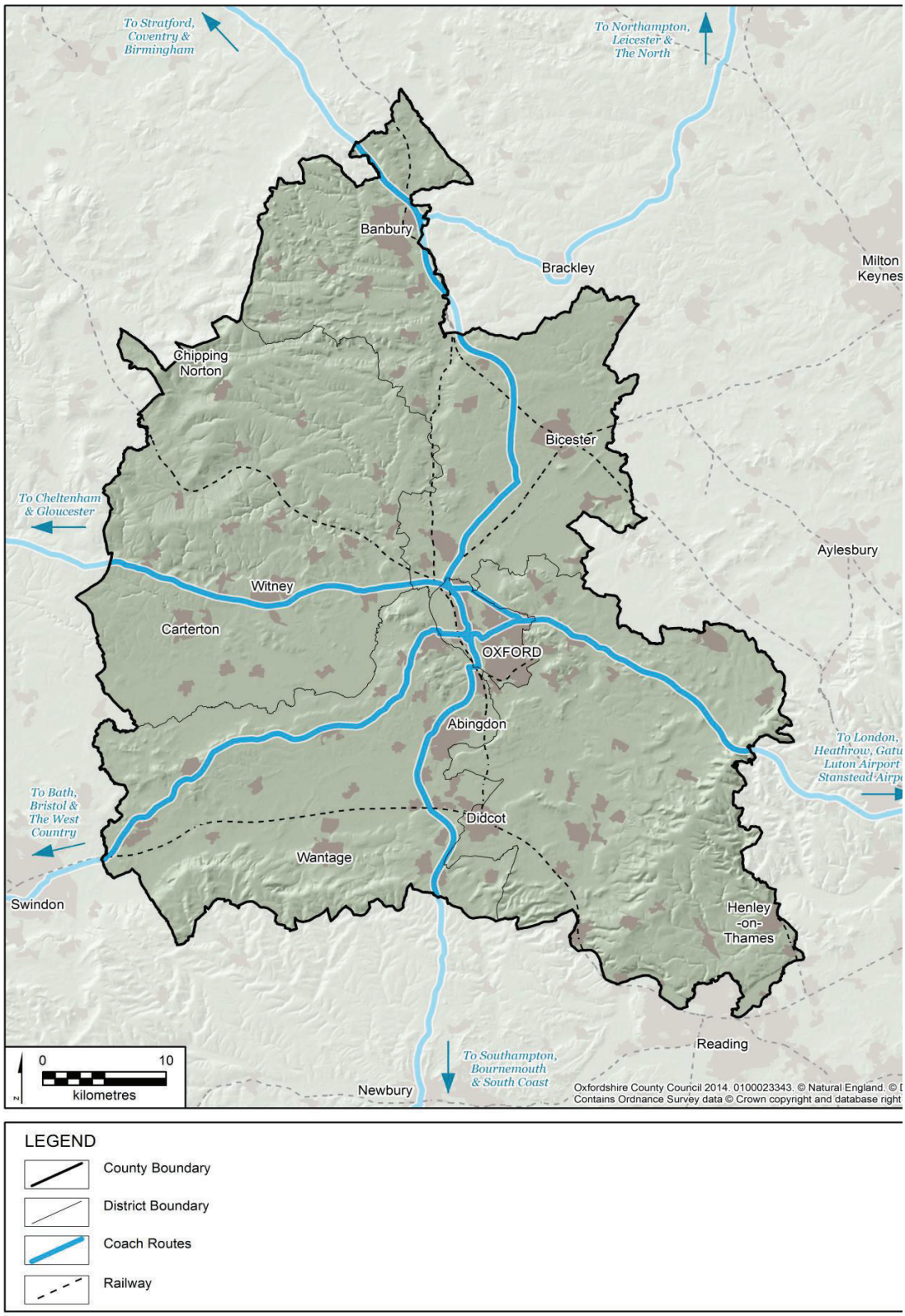
Introduction

Bus Strategy Figure 2 shows a map of the strategic inter-urban bus and coach network identifying the Bus Rapid Transit (BRT), Premium and Connector Transit routes to optimise the use of existing strategic transport infrastructure and minimise the growth in vehicle traffic.

Bus Strategy Figure 2: Oxfordshire's strategic bus network



Bus Strategy Figure 3: Oxfordshire's Strategic Coach Network



Our policy is to support bus development such that as much of the bus network as possible becomes wholly commercially viable, especially services on the strategic network. Commercial viability is based on the achieving the right combination of:

- **Potential demand -** matching desired travel patterns between residential origins and a range of potential destinations, across the day and not just in peak hours.

- **Critical mass** – ensuring that services provide the optimum level of capacity for the size of development.

- **Frequency and reliability –** providing a service that is attractive in terms of frequency and journey time reliability for work trips and other types of journey.

- **Fares –** ensuring that fares are affordable but optimising potential revenue which will sustain further growth and improvement.

- **Seat capacity** – buses that are well matched in terms of size to the level of passenger demand so as to maximise vehicle efficiency and keep the number of bus movements in urban centres to an acceptable level.

More specifically, where funding allows, our policy on the strategic network is to make services as attractive as possible for bus passengers and potential users through:

(i) 'Pump priming' increased service frequency and operating hours and where there is a reasonable prospect of the higher level of service being self-sustaining in the longer-term once funding support is removed.

(ii) Improving on-road conditions for strategic bus services to achieve better journey time reliability and faster journey times.

(iii) Improving passenger facilities and access to bus stops and other interchange points particularly on foot and by bicycle.

(iv) Supporting commercial bus operators through the Bus Quality Partnership framework in delivering well-targeted and designed marketing and promotion.

(v) In addition, where service improvements are associated with new residential or business developments and developer contributions there is a significant role for travel planning

and other smarter choice initiatives to contribute to the achievement of bus mode split targets.

Bus Rapid Transit Routes/Services

We aim to develop three Bus Rapid Transit routes centred on Oxford that will achieve an exceptionally high level and quality of service. These routes will require substantial investment in bus priority measures, or possibly purpose-built infrastructure, as well as on passenger facilities and high quality pedestrian and cycling links to access the services. We expect to attract high occupancy developments around the routes in order to take maximum advantage of the investment and the potential or encouraging sustainable travel behaviour. Our strategy for developing these routes is set out in the section on the Oxford area bus strategy in Annex 1 and in the Oxford Transport Strategy.

Premium Transit Routes/Services

Premium Routes generally serve the most heavily trafficked road corridors and larger settlements and employment areas in the County. Improving bus journey times and service punctuality is therefore a high priority for all Premium Routes.

A major challenge is therefore to provide protection against worsening traffic congestion in order to ensure that buses remain attractive alternatives to the private car for work, education and shopping. Premium bus routes will therefore generally require infrastructure investment on bus priority measures where there is congestion and circumstances permit in order to improve journey time reliability and speed.

OCC therefore wishes to see future land use development proposals located on or near Premium Route corridors, where appropriate sites can be identified. Such an approach would be more financially sustainable than designation of entirely new routes; and is also likely to reduce levels of traffic generated by new developments.

The Premium Route brand has traditionally focused on service frequency; but operators have demonstrated already that there are many other aspects of the service that help to deliver a quality product. For example both Stagecoach and Oxford Bus Company have introduced high quality and low environmental impact vehicles on their bus and coach services in and around Oxford.

BUS RAPID TRANSIT

What is it?

High quality passenger facilities and environments are part of the typical BRT package to achieve a step change in service quality and image.

Bus rapid transit (BRT) systems are found in cities throughout the world. Although they vary in form, their key characteristic is that, compared to conventional bus services - even good ones - they are faster and higher quality operating on routes ranging from an above average level of on-road bus priority up to complete 'grade segregation'.

They are more than this however. BRT is an integrated system of facilities, services, and amenities that collectively improves the speed, reliability, and identity of bus transport. Their other typical features include: use of 'rubber-tyred' vehicles and roads (rather than rail track), faster methods of passenger boarding, faster fare collection, and a unique and identifiable identity and public image. The best systems tend to include a combination of Intelligent Transportation System (ITS) elements in a fully integrated system.

BRT's flexibility and ability to be built quickly, incrementally, and economically accounts for their growing popularity in these times. In many respects BRT is similar to a light-rail rapid transit system, but with greater operating flexibility and potentially significantly lower capital and operating costs.

BRT Vehicles

As an example of leading edge BRT vehicle design, Cologne recently commissioned a fleet of new electric articulated buses based on the existing 'Citea' version. The articulated Citea (see above) with its completely flat floor is ideal for the transport of large numbers of passengers. The low floor construction makes it extremely easy to enter the bus and offers optimal access for travellers with wheelchairs or baby pushchairs. The internal design makes the flow of passengers from entry to exit doors easy, and seat design gives plenty of passenger space and a high standard of comfort.

These buses will run entirely on electricity without any aids such as diesel hybrid engines and overhead pantographs for power supply. Electric buses are an important development in public transport as they contribute to a cleaner environment, lower energy consumption, and a quieter and healthier environment.

Why do we need BRT in Oxford and the surrounding area?

Huge population growth is proposed in Oxford and its surrounding catchment area over the next 20 years. There are acute and increasing levels of traffic congestion in and around the City, and we are faced with virtually insurmountable physical constraints on further significant improvements and expansion of conventional public transport solutions. Together these create the need for new mass transportation solutions. BRT represents an innovative, relatively low cost public transport solution to many of Oxford's mobility and accessibility problems.

BRT is a way to improve mobility in Oxford and the sub-region at relatively low cost through incremental investment in a combination of bus infrastructure, vehicles, operational improvements, and technology.

An example of a BRT system in the UK: Cambridgeshire

The Cambridgeshire Guided Busway connects Cambridge, Huntingdon and St Ives and the route consists of two long sections of guided operatio n (together covering 16 miles), a bus-only road, and other places with on-street operation using conventional bus lanes. New park and ride sites have been built at Longstanton and at St Ives, with a cycle track/bridleway alongside some sections of the route. The scheme includes bus priority and real-time passenger information system displays at special busway bus stops, and better links are being created to bus stops for pedestrians and cyclists.

The busway between Oakington and Longstanton. The cycle path is visible on the left of the image.

Most buses are fully accessible, have leather seats and air conditioning for greater comfort, free wifi connection for convenience, and use the latest technology for greater environmental sustainability. Two bus operators have been given exclusive use of the route for five years in exchange for providing a minimum service frequency. Specially adapted buses are used on the guided sections.

A total of 2,500,000 trips were made in the first year of operation - 40% higher than predicted. Bus ridership along the corridor was estimated to have increased by 33% over the same period.

The scheme was predicted to cause some reduction in traffic on the busy parallel A14 road and complement other planned measures, but its main intended effect on congestion was to have an overall benefit across the local road network.

Connector Transit Routes/Services

Connector bus services often play an important role in providing "feeder" links to the Premium Route services, as well as rail services, as well as origin to destination journeys. Most services are commercially provided and except where new development significantly increases or alters the level or pattern of potential demand are generally unlikely to increase to a higher level of frequency that would make them more attractive to new users in the foreseeable future. Some Connector routes are however commercially marginal, and in some cases we currently supplement the fully commercial services by subsidising specific services at certain times of the day or week. These journeys are particularly vulnerable to budget cuts.

Our main is to assist with protecting and improving commercial viability through incremental infrastructure and service enhancements such as:

- Targeted measures to address problems such as on-street parking or inefficient traffic signal operation;
- Improved bus stops and hubs;
- Integration with more frequent bus and rail services (potentially facilitated by through ticketing).
- In return, through the mechanism of the Quality Bus Partnerships, bus operators will be encouraged to provide high quality, low emission vehicles and well trained drivers and higher quality and consistently available information.

Developing and upgrading bus services and routes

We and bus operators wish to take advantage of travel demand from proposed future development – in particular housing, employment and urban retail. The aim is to increase the frequency of existing bus routes where these exist, potentially to Premium or higher standard if sufficient potential demand exists, and introduce new routes where different travel patterns are created. "Pump priming" funding from section 106 developer contributions may therefore be used to provide incremental enhancements to higher standards, particularly in terms of service frequency, for an initial period of time. After the end of the pump priming, the service frequency would need to be provided on a commercial basis with additional demand primarily coming from the most recent land use development. The priority for service enhancements will therefore be on work and other utility journeys (education, shopping and access to essential services) which can be financially sustainable.

Bus routes that run within new developments must be planned and designed in a way which minimises vehicle journey time, whilst aiming for a maximum walking distance from a bus stop of around 400 metres. Longer maximum walking distances are tolerable if this results in a much faster bus service being delivered (which results in a faster overall journey time). Time consuming and circuitous bus routes must be avoided, as they will not be attractive to people with a higher value of time.

Bus priority measures play a major role in attracting additional patronage by ensuring that bus routes under development provide fast and reliable links between where people live and where they need to get to. Up untill now there has been little investment in bus priority measures in the larger urban areas other than Oxford, or on the main inter-urban routes. However, with increasing congestion on many of these routes, with increasing urban growth, and the higher priority assigned to achieving bus growth outside Oxford, our policy is to increase the amount and proportion of developer funding that is used for bus priority infrastructure (see section 2.7). We must co-ordinate the timing of bus infrastructure and introducing new services – which tend to come from different funding streams - to optimise the potential for attracting and retaining new passengers. Where we have a reasonable expectation of sufficient demand and where it is practically feasible we will encourage and practically support bus operators to develop new routes, for example cross-town and inter-urban services/routes in and to Oxford to the Eastern Arc, to avoid unnecessary interchange.

The non-strategic bus network

Community or Local Bus Routes/Services

Community or local bus and community transport services operate in places of low transport demand such as rural areas and small towns. They primarily provide 'socially necessary' transport for people who do not have access to a private car and therefore rely on the bus for access to essential services such as shops and health care and currently tend to require a high level of financial subsidy.

As with other routes in the hierarchy, bus priority, service information and stop improvements will be particularly important for enhancing knowledge and usage of local routes. The provision of conventional buses and bus stops, that are accessible to people with mobility impairments, is also an important priority so as to prioritise specially adapted vehicles for people with the most chronic disabilities.

The budget for supported bus services is proposed to be cut by over 50% over the next 4 years, which will clearly have a major impact on the Local/Community bus network. We will need to carefully consider how this change is managed to ensure that essential services are protected and best value for money achieved, while developing a new approach to supporting local transport services.

Other types of bus service

In addition to the hierarchy of scheduled bus and community transport services there are a number of specialised services designed to meet the needs of specific groups. The most numerous of these are school bus services, which we provide for those living over three miles from their nearest state-maintained secondary school (two miles for primary schools). These are run largely as an independent network not available to the general public. Some independent schools also provide services. Higher and further education establishments provide a range of services; some of these – notably the *Brookes Bus* network provided by Oxford Brookes University and the bus service funded by Abingdon & Witney College to link its two sites – also run as scheduled local bus services which contribute to the local network.

Some major employment sites fund bus services to serve their sites, notably Harwell Science & Innovation Campus and Oxford Science Park. These are generally combined with local bus services. Some retail sites also fund shoppers' services to their sites; these generally run free to users, are not registered as local bus services and completely separate from the local bus network. We expect the operators of such sites to ensure that they are accessible by public transport without funding from the council but, where they might be conveniently combined with a local bus service which is also useful for other journeys, will consider joint funding arrangements.

Public transport interchange strategy

High-quality infrastructure and integration with other services and types of transport is crucial to the successful operation of bus and coach services in Oxfordshire. Reliable and attractive public transport services can only operate where vehicles arrive at high-quality stops that users can easily access and where they can wait in safety and comfort, knowing their service will arrive on time. Interchanges provide the link which binds different public transport services into a network. If transfers between bus and other public transport services can be made easier, quicker, and more convenient, travel opportunities for existing and new passengers will emerge that are better, more frequent and wider ranging.

The main challenges we face in improving interchange facilities and interchange in Oxfordshire include:

- Overcrowded and inadequate interchange facilities and limited available space in Oxford city centre
- Park & Ride sites close to capacity at certain times
- Inadequate interchange facilities in many of Oxfordshire's other main urban centres and along main inter-urban bus routes.
- A need to protect and enhance the built environment, heritage, and ambience in all town or city centres, with Oxford presenting a particular challenge.
- An increasing demand for travel
- Increasing passenger expectations of safety, security and comfort
- Differing needs of passengers and other users
- Working with many partners who often have differing objectives and priorities.
- Limited financial resources

Bus Strategy Table 2 below outlines our Bus Interchange hierarchy and the level of passenger facilities required at each. The different types and standard of facilities is a function of a number of factors including:

- the level of bus route,
- the number and types of public transport service utilising the facility,
- location, and
- current and projected passenger demand.

We propose to increase connectivity and access and improve the passenger experience by

- working with operators and other partners to develop and improve the public transport hubs and other interchanges facilities so that they appropriate to the size of urban area and demand along the corridor;

- improving access to these facilities by feeder modes (both access routes and co-ordination of services); and

- making payment and ticketing systems easier and speedier to use.

Criteria which will be considered in planning and designing appropriate interchange facilities include facilities for disabled passengers, opportunities to connect by walking and cycling,

Bus Strategy Table 2 – Bus Interchange Hierarchy

LEVEL	MAIN TYPES OF HUB	MINIMUM HUB FACILITIES	MINIMUM BUS STOP FACILITIES
RAPID TRANSIT INTERCHANGE	• Main Park & Ride sites • Intermediate hubs on main routes (e.g. where orbital and radial services meet) • Main rail, bus or coach station	• Bus layover facilities • Pre-payment ticket machines • High quality passenger facilities (restrooms, waiting rooms, retail outlets, etc) • High disability access standards throughout • Real time service information • High quality cycle and walking links • Secure covered cycle parking	• Very high quality bus shelters • Pre-payment ticket machines • Real time service information • High quality cycle/walking links • Secure cycle parking • Good lighting at shelters and on main access routes • High disability access standards
PREMIUM INTERCHANGE	• Park & Ride Sites • Other rail/bus/coach stations	• Bus layover facilities • High quality passenger facilities (restrooms, waiting rooms, retail outlets, etc) • Real time service information • Secure cycle parking	• High quality bus shelters or larger structures with real time and printed service information • Good cycle and walking access • Good lighting at stops and on main access routes • Secure cycle parking • High disability access standards
CONNECTOR INTERCHANGE	• Small, local Park & Ride sites • Large or medium sized town bus / rail stations or interchange	• Central bus / coach station with adequate layover or multiple bus stops clustered on the same section of road in the centre • Bus / rail interchange in one location or less than a 5 minute walk between bus and rail stations	• High quality bus shelters with real time and printed service information in main centres and other places where feasible • Secure cycle parking • Good lighting at shelters and on main access routes • Bus stops meeting disability access standards

COMMUNITY OR LOCAL INTERCHANGE	• Local parking sites close to bus stops • Smaller town bus or rail interchange • Bus stops on higher frequency services	• Bus stop adjacent to railway stations or less than a 5 minute walk between bus and rail stations	• High quality bus shelters with printed service information • Safe access on foot • Bus stops meeting disability access standards

improving personal safety and security, and enhancing the public realm. We will further develop public transport hubs in conjunction with work on implementing the Rail Strategy.

There are a number of major hub locations where the potential for new or improved interchange will be assessed and possibly developed (these are discussed in greater detail in section 2.3 and/or in the respective area transport strategies):

- **Oxford** – station re-development as part of wider master plan with enhanced bus / rail interchange; a revised Park & Ride system involving the creation of a ring of new sites further out of Oxford on key radial corridors.
- **Banbury** – reviewing bus interchange facilities in and near the town centre and making improvements accordingly.
- **Bicester** - a new Park & Ride site at South West Bicester.
- **Didcot railway station** – further development of the multi-modal interchange creating a high quality gateway leading to the town centre.
- **Proposed new opportunities** e.g. potential new railway station at Grove or on the Cowley branch line.

There will also be enhancements of facilities at smaller interchange locations, for example in Abingdon, Didcot, Wantage and Witney. With the recent development of high frequency Premium inter-urban bus routes in the County there is a growing demand for better access to these services by residents in towns and villages along the routes and surrounding villages so better interchange facilities in smaller urban centres on the Premium inter-urban bus network will need to be considered at locations like Thame, Faringdon and Shrivenham.

A growing issue is access by car to the inter-urban bus network and whether there is benefit in developing small rural Park & Ride facilities close to stops and other interchange facilities at some locations. For example in Shrivenham there is already an issue with inter-urban bus passengers parking their cars close to the bus stop for large parts of the day leading to complaints from local stakeholders about this using up scarce on-road parking spaces that could be used by shoppers with greater benefit to sustaining local centre vitality.
In general we will encourage and facilitate access to higher level bus services by walking, cycling and local bus services. Improving foot and cycle access to bus stops and other interchange facilities will also be given a high priority when new bus routes are developed and existing routes are being upgraded or altered. Access by these modes will be considered when investigating the siting of new bus stops and cycle parking facilities will be provided where appropriate. Many local bus stops do not have suitable waiting facilities,

especially for those passengers who are disabled, frail and elderly. Opportunities will be taken to introduce low-cost improvements, if possible on a whole-route basis.

We recognise however that there may be situations where small formal car parking arrangements may be desirable and necessary in order to facilitate access, encourage patronage growth, and avoid undermining access by car to local centres. In partnership with the appropriate local authorities we will therefore consider parking provision and management at locations along strategic inter-urban bus routes as part of a comprehensive access strategy. Where development funding might permit small scale car parking, a needs and impact assessment which takes account of all the above mentioned considerations will be carried out prior to reaching a decision.

Co-ordinating bus and rail services to reduce waiting times and facilitate easy connection is a particular challenge given the large number of private operators and their sometimes conflicting priorities. Operators however recognise the importance of making public transport services more attractive, particularly to those that have the option of private car use. We will continue to work with bus and rail operators through partnership arrangements to improve service co-ordination and integration.

Developing more efficient payment and ticketing systems is a particularly important in improving public transport interchange. This is a highly complex and challenging issue organisationally but substantial progress has already been made in Oxfordshire with the introduction in 2011 of the *Smartzone* integrated, multi-operator ticketing system centred on Oxford. Using smartcard technology this has enabled bus passengers to make trips on any operators' service within the zone and was the main reason for the large growth in passenger numbers following its introduction. The next stage is to extend the system to include parking charges at County Council owned Park & Ride sites in the near future.

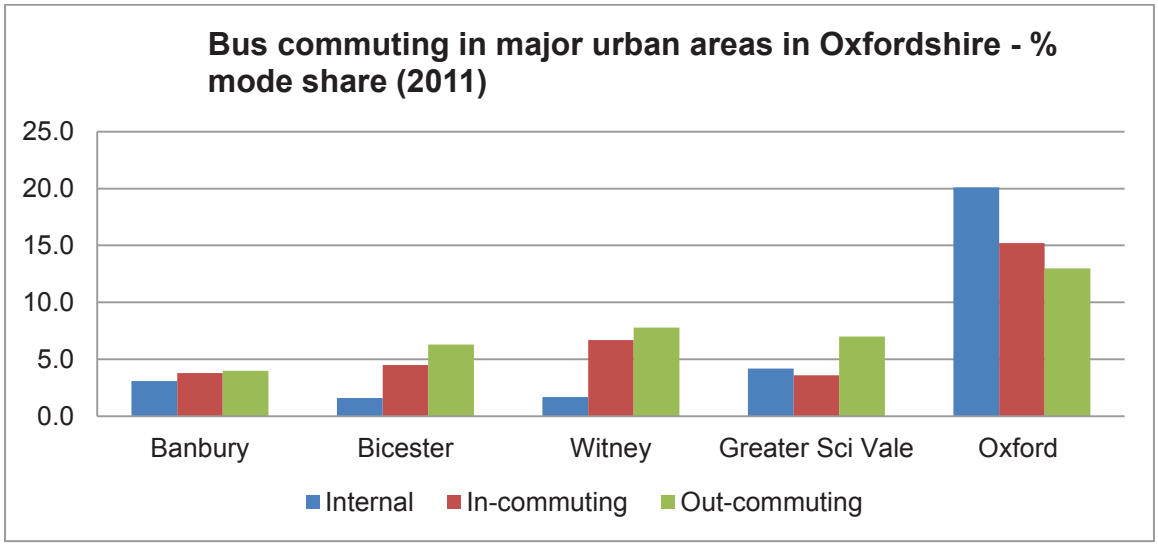
Outside the Oxford *Smartzone* there is less advantage in having integrated ticketing as there is seldom more than one operator on any particular route and most journeys do not involve more than one operator. In such areas the ability to use smartcard payments systems - particularly when these are associated with more economical regular user tickets for certain periods – tends to be more beneficial for both passengers and operators. For the former they can make payment easier (and cheaper) and for the latter they help speed up boarding and journey times.

However, with increased bus network development and greater bus and rail network connectivity, demand for an extension of the Smartzone integrated ticketing system to other parts of the County is likely to grow. We will look for opportunities to extend the integrated ticketing system as well as support the further development of smartcard and other off-board payment and ticketing systems.

Outside Oxfordshire some neighbouring authorities plan to develop public transport hubs that will have an impact on the Oxfordshire bus network and travel opportunities for Oxfordshire residents. The most significant of these new hubs is a new major park & ride site on the A420 on the approach to Swindon.

2.2 DEVELOPING & ENHANCING BUS NETWORKS IN THE MAIN URBAN AREAS

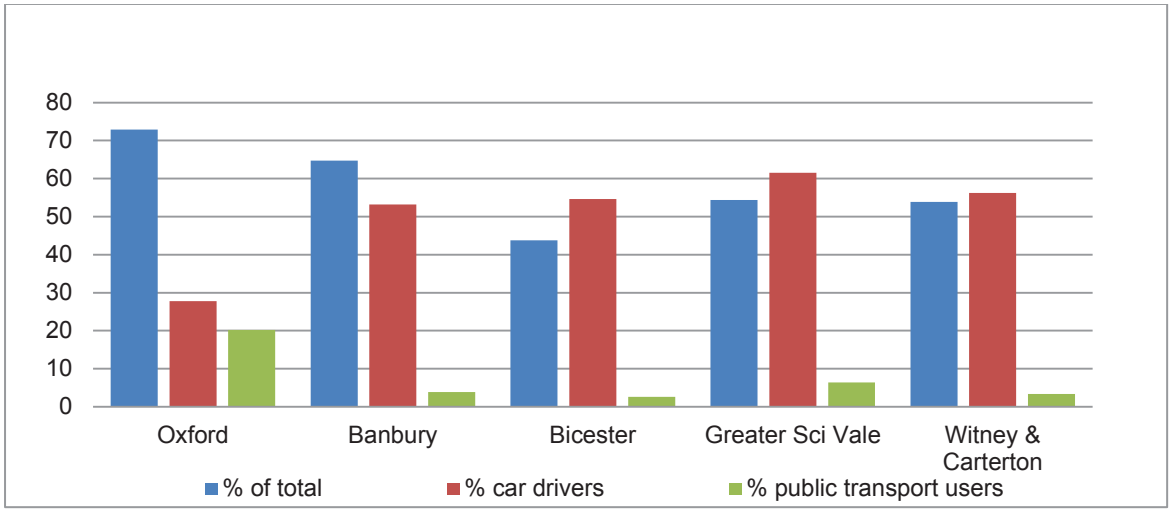
For the purposes of this bus strategy the main urban areas of Oxfordshire have been defined as Oxford, Banbury, Bicester, Witney and Carterton, and the Greater Science Vale area which includes Abingdon and Wallingford. Figure 5 shows the proportion of people that were commuting to work by bus in 2011 within, to and from these settlements or areas (i.e. for the longest part of their journeys) and clearly shows the currently very low levels of bus commuting in outside Oxford.



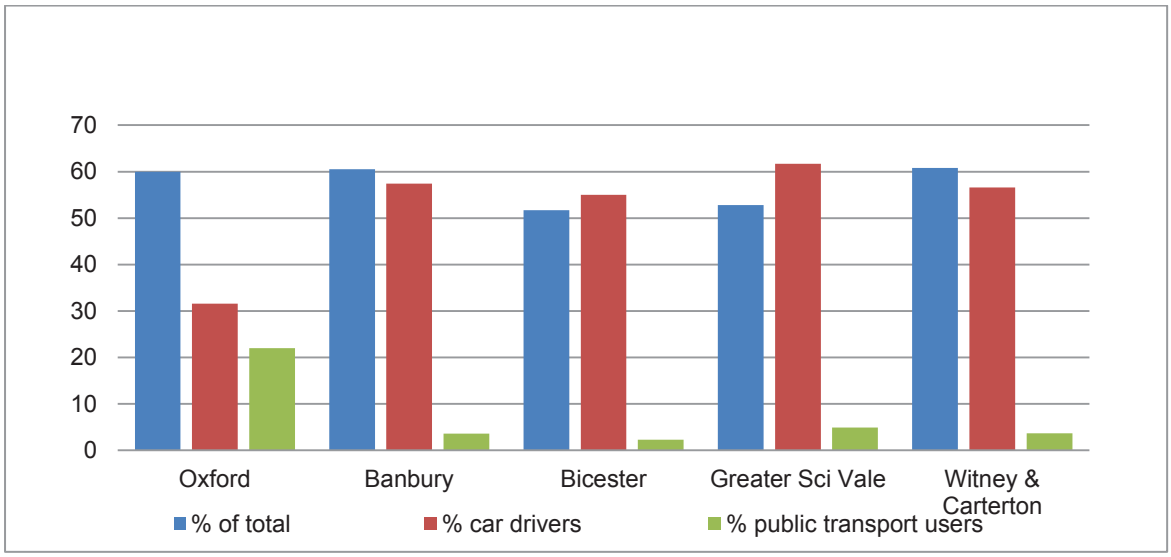
Bus Strategy Figure 4: Bus commuting in major urban areas in Oxfordshire

These settlements and localities display a very wide variation in the proportion of local employees who live within the surrounding area (defined here as being up to 10km of their workplace) and the proportion of residents whose workplace is within this range. This, and the comparative level of access by bus and other modes, has a profound influence on mode

choice and mode split within these settlements and surrounding catchment areas (see figures 4, 5 and 6).



Bus Strategy Figure 5: Main urban areas: Means of transport and percentage of residents working within 10km of home (source: 2011 Census)



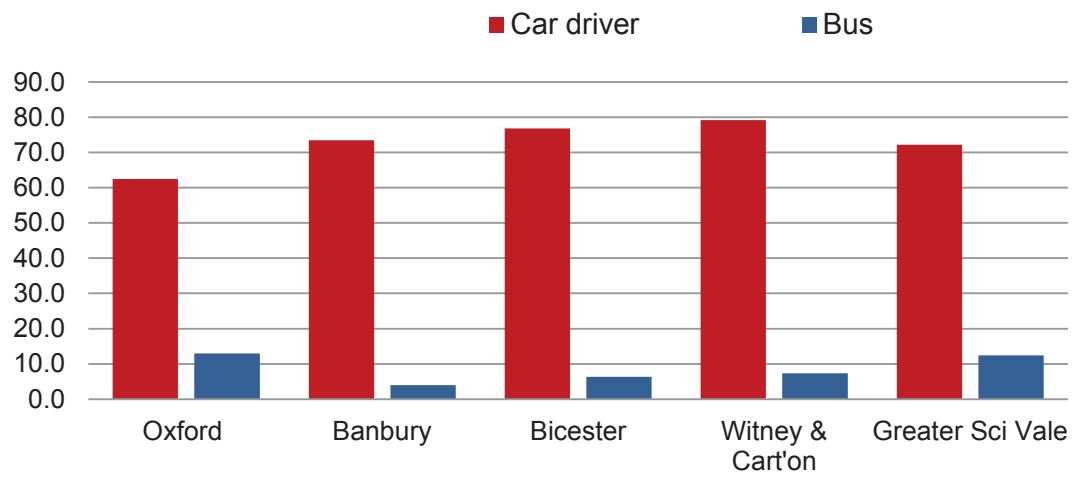
Bus Strategy Figure 6: Means of transport and percentage of employees residing within 10km of workplace (source: 2011 Census)

We have developed plans for bus network improvements to 2031 for each of these areas and these are included in the Annex to this document.

2.3 DEVELOPING AND ENHANCING THE INTER-URBAN BUS NETWORK

A large proportion of journeys in Oxfordshire, particularly commuting to work, involves travel outside residents' home settlements and the vast majority of these journeys are still carried out by car and very few by bus (see figure 7 below). These longer-distance, mostly car-borne journeys produce the majority of road based carbon emissions, vehicle miles, and traffic congestion on busy inter-urban routes and within urban areas.

Bus Strategy Figure 7: Out-commuting by bus & car: main Oxfordshire urban areas (2011) [Source: Census data]



For most people's journeys, bus is the only viable alternative to car travel - at least to destinations on the strategic transport network. A relatively good, high frequency, but limited, inter-urban bus (and coach) network has developed in Oxfordshire in recent years linking some of the larger towns in the County, and also Oxfordshire to the wider region and beyond. Figure 2 shows the map of the Oxfordshire strategic inter-urban bus and coach network. In partnership with the main bus operators the County Council has supported the development of the inter-urban bus network which has helped facilitate a significant and rapid growth in passenger numbers on several of these routes. For example, bus patronage on the route between Swindon and Oxford has more than doubled in the last five years and, as a result, the fully commercial service frequency is increased to three buses per hour.

The current Oxfordshire strategic bus network has a strongly radial pattern centred on Oxford and there are few good bus (or rail) connections between neighbouring towns. To some extent this reflects the centralisation of employment and services in Oxford and subsequent weaker patterns of demand between other urban centres. Analysis shows that the inter-urban routes with the highest proportion of bus/coach commuters generally start or finish in Oxford. Generally the proportion of commuters travelling by bus to other centres

outside their home towns is *significantly* lower than to/from Oxford. As travel patterns are likely to become even *more* complex (and decentralised) in the future. The strategic inter-urban bus network will need to adapt to cater much better for complex, non-radial patterns of travel demand.

Given that bus patronage growth in Oxford seems, for now, to have more or less levelled off in terms of market share, the majority of passenger growth in the County is occurring on these routes and for operators it seems likely that this where many of the best commercial opportunities lie.

This section of the bus strategy outlines our approach to increasing growth even more on the strategic inter-urban routes in the County. To this end the strategy is divided into three main elements:

(1) The key role that a revised Oxford Park & Ride strategy will play in contributing to a step change in interurban bus development and passenger growth.
(2) Our strategy for increasing inter-urban bus connectivity within (and to) the Knowledge Spine.
(3) Our strategy for improving inter-urban bus connectivity within Oxfordshire more generally, and in connecting Oxfordshire to the wider region.

PARK & RIDE AND THE BUS STRATEGY

Introduction

The Oxford Park & Ride strategy has evolved, in conjunction with parking management and on-road bus prioritisation and service improvements primarily as a means of tackling traffic congestion on the main radial routes within the City and on the Oxford ring road by facilitating access to Oxford city centre – and later other destinations within Oxford. Its main function and purpose has been to enable transfer to bus for the last leg of the journey into Oxford.

Park & Ride has become hugely successful commercial operation. Most of the existing P&R sites are now however often close to capacity - and for most of them - especially those within the ring road – the congestion has spread to engulf the approaches to the sites. This not only increases car journey times to reach the sites but suggests that the current park and ride strategy has limited potential in dealing with any further expansion in travel demand along these routes.

Oxford's Park & Ride system is one of the key elements affecting the City and County's bus system and has a wide geographical influence on travel behaviour. Changes to the County's Park & Ride strategy and system will therefore have a considerable impact on the planning, operation, and attractiveness of the Oxfordshire public transport network.

Strategy

A new approach to Oxford's Park and Ride system has been proposed as part of an updated Oxford Transport Strategy. The following section outlines these proposals, which will require further development to assess their probable impacts on the bus network and bus offer before a final approach is agreed.

(a) Short/medium term Park & Ride strategy

The main element of the new approach to Park & Ride is the development of a network of larger sites located further out of Oxford adjacent to the main inter-urban radial routes. These sites would intercept trips closer to their point of origin and before they cross the ring road. The first of these new sites, to be opened in 2015 adjoins the new residential development at south-west Bicester (A41).

Other proposed locations are: Eynsham (A40), Langford Lane (A44), Lodge Hill (A34 south of Oxford), Kidlington (A34 north of Oxford), Cumnor (A420 west of Oxford), and Sandford (A4074), and Garsington Road (B480).

The development of this 'outer ring' of sites may mean that some or all of the existing sites within the Ring Road i.e. at Peartree, Redbridge and Seacourt could be closed if no longer required and could be redeveloped for other purposes, which may include public transport-related functions.

The current proposals for an outer ring of sites have been developed with the aim of meeting the following objectives:

- maximising the potential for intercepting trips,
- reducing congestion on the inter-urban network,
- increasing bus modal share to Oxford (and onward connections), and
- site availability and financial feasibility.

Opportunities will also be created from new Park & Ride developments planned outside Oxfordshire. In particular, we recognise that the proposed P&R site on the A420 approaching Swindon (in the Borough of Swindon) will potentially have an impact on traffic along the A420 corridor in both directions, and on inter-urban and local bus services in the area. In partnership with Swindon Borough Council and bus operators we will seek to maximise the public transport benefits for Oxfordshire.

(b) Impacts on the County's inter-urban and local bus networks

Although it is too soon to predict the full impacts of proposed changes to the Oxford Park & Ride system on the bus network and travel behaviour, the following changes are planned or expected:

- The proposed outer Park & Ride sites at Cumnor, Eynsham, Langford Lane and Sandford – and the existing site at Thornhill – would constitute the termini of three Bus Rapid Transit routes centred on Oxford.

- Outer Park & Ride sites are expected to develop into significant bus hubs connect Bus Rapid Transit or Premium Transit services into/from Oxford with services to/from neighbouring urban and rural areas and longer-distance bus and coach services, thus greatly enhancing public transport connectivity and access across Oxfordshire.

- Bus journey times and reliability for all services using the Bus Rapid Transit routes will be greatly enhanced. In combination with other measures this should help facilitate substantial growth in bus ridership on inter-urban routes in and out of Oxford.

- Proving feeder bus services to sites may give a significant boost to local bus services and networks, and help facilitate a reduction in car dependency outside Oxford.

- The interchanges planned on the BRT routes within Oxford (where they intersect with radial or orbital bus or rail routes and at new city centre bus termini), and the Park & Ride sites close to built-up areas, would not only greatly enhance public transport connectivity within and out of the City, but also facilitates increased pedestrian and cycling access to the strategic public transport network and final destinations. There will therefore be a strong emphasis on providing good links to/from interchange facilities and neighbouring employment sites, residential areas, and other trip attractors and cycle parking at interchanges and destinations.

c) Longer term Park & Ride strategy

Longer term, there may be the need and opportunity to develop additional Park & Ride sites to serve Oxford and other towns in Oxfordshire. In order to optimise the transport and non-transport impacts of different locations and sites consideration will be given to developing and utilising an appraisal methodology that would include the following objectives:

- reducing the total amount of car travel (and therefore carbon emissions),
- maximising *non-car* access to/from the site and integration with connecting bus services,
- encouraging *outward- as well as inward-bound* commuting,
- supporting local bus services as well as inter-urban ones,
- their potential for supporting local economies and town centres.

CONNECTING THE OXFORDSHIRE 'KNOWLEDGE SPINE'

Introduction

The primary focus of employment and housing growth in Oxfordshire up to 2031 is likely to take place along the 'Knowledge Spine' which runs through the centre of the County (see figure xx). Growth in the Knowledge Spine is to be targeted in three broad areas i.e. in and around Bicester, Oxford City, and Science Vale as discussed in Oxfordshire County Council's Science Transit project.

The Knowledge Spine lies along the north-south strategic transport corridor consisting of the A34 road and the Didcot-Oxford-Bicester railway line. The A34 is already severely congested in many places in Oxfordshire and prone to severe unplanned disruptions, particularly at peak times. There are very few suitable alternative north-south roads capable of providing adequate connectivity within the Knowledge Spine.

Table xx shows the level of commuting flows between the major urban centres and some of the major employment areas within the Spine in 2011. It shows Oxford City and the employment clusters at Milton Park and Harwell as being the two largest inter-urban commuting destinations for residents within the Spine, and also shows the significant scale of out-commuting from Abingdon. With large amounts of growth planned in all three parts of the Spine initial modelling suggest that this pattern to continue, although Bicester and Didcot in particular are likely to grow in importance both as the destination and origin of inter-urban commuting trips.

Table XX: Commuters flows between key towns and selected employment areas within the Knowledge Spine in 2011 [Source: Census data]

		DESTINATION						
		Bicester	Kidlington[1]	Oxford	Abingdon	Didcot	Business Parks[2]	**TOTAL**
ORIGIN	Bicester	-	640	2,530	130	50	80	3,430
	Kidlington	280	-	3,575	130	30	50	4,065
	Oxford	400	980	-	960	250	900	3,490
	Abingdon	70	240	3,700	-	370	1,100	5,480
	Didcot	<50	140	1,430	780	-	1,560	3,960
	TOTAL	800	2,000	11,235	2,000	700	3,690	20,425

1. *Kidlington including mid-layer super output area containing Kidlington airport*

2. *The mid-layer super output area containing Milton Park and Harwell*

The difficulty of accommodating more movements on the existing north-south road network, particularly the A34, highlights the need to significantly enhance the strategic public transport network between strategic locations and growth areas along the Knowledge Spine (and beyond), and also strengthen east-west public transport connections to places along the Spine. This section focuses on the former aspect, and the latter will be dealt with in the next.

The main rail line through the centre of the Spine linking Didcot, Oxford, and Bicester is an extremely valuable strategic asset and component of the public transport strategy for Oxfordshire and the Knowledge Spine. Rail has the potential to move very high volumes of people (and freight) between a limited number of fixed points quickly and efficiently, especially for medium and longer-distance journeys. With new infrastructure and services being developed and planned, for example East West Rail, the new Oxford Parkway station and proposed development of the Cowley branch line, rail is likely to provide a much greater proportion of journeys within and to the area in the future, especially for commuter trips.

The majority of travel demands within the Knowledge Spine - including to main business / employment clusters – however tend to be dispersed and complex and this is likely to continue. For many of these journeys, bus services will be more flexible and accessible than rail. Services can potentially operate at very high frequencies and move high volumes of passengers on main strategic corridors, with certain services deviating from the main route to serve more dispersed demand in residential or employment areas nearby. Multi-stage bus journeys can be made easier by providing more and better bus integration and service co-ordination. Investment in bus priority measures on specific routes can also demonstrate

very good value for money, especially when coupled with investment by operators in new vehicles and additional services.

The relative importance of the bus for commuting to work between parts of the Knowledge Spine is demonstrated in table xx which shows the shares for bus and rail commuting for the trips mentioned in the previous table. The data also shows the much lower levels of bus commuting to the locations mentioned outside Oxford, and the very high level of bus use between Kidlington and Oxford is notable. It is also notable that bus commuting between places on the opposite side of Oxford is currently very limited given the lack of direct services or easy ability to interchange.

More detailed analysis shows that the majority of inter-urban bus commuters along the Spine tend to work - or live - in the central part of Oxford City, given the relatively poor access by bus to the eastern side of Oxford.

Table XX: Commuting between key towns and employment areas within the Knowledge Spine in 2011: rail and bus mode shares[3] [Source: Census data]

Rail commuters		**DESTINATION**						
		Bicester	Kidlington[1]	Oxford	Abingdon	Didcot	Business Parks[2]	**TOTAL**
ORIGIN	Bicester	-	0.3	3.3	0.0	4.0	1.3	2.6
	Kidlington	0.0	-	0.0	0.0	0.0	0.0	0.1
	Oxford	3.2	0.0	-	0.4	6.7	6.8	2.7
	Abingdon	0.0	0.0	0.7	-	0.3	0.0	0.5
	Didcot	8.9	3.0	19.9	0.6	-	0.0	7.6
	TOTAL	2.1	0.3	3.5	0.5	2.9	1.7	2.5
Bus commuters		**DESTINATION**						
		Bicester	Kidlington[1]	Oxford	Abingdon	Didcot	Business Parks[2]	**TOTAL**
ORIGIN	Bicester	-	2.8	17.3	2.3	0.0	0.0	13.4
	Kidlington	12.5	-	36.6	5.3	3.3	2.0	33.3
	Oxford	18.8	20.7	-	14.5	5.9	7.6	14.4
	Abingdon	10.4	4.1	25.4	-	7.0	8.5	19.7
	Didcot	0.0	3.0	2.5	6.2	-	13.9	7.7
	TOTAL	14.8	11.8	24.2	9.9	6.0	10.4	18.1

1. The mode used for the longest stage of the journey.

Strategy

Given the pattern of transport demand in the area, the flexibility of bus transport and its much lower infrastructural costs, the bus and Bus Rapid Transit (BRT) in places where there is a particularly high volume of demand) will continue to provide the main public transport alternative to the car for most inter-urban journeys within the Knowledge Spine. Buses will also play a vital role as feeder services between railway stations and main business sites, town centres and residential areas.

Our strategy for improving bus connectivity within the Knowledge spine includes the following key elements:

New Park & Ride strategy:

- The proposed new 'outer' Park & Ride sites adjacent to the strategic highway network at Bicester South-West (A41), Lodge Hill (A34 just north of Abingdon), Kidlington (A34 south of Islip), Sandford (A4074), and Garsington Road (B480) - linked to the development of three Bus Rapid Transit Routes centred on Oxford, will improve bus connectivity between Oxford and other parts of the Knowledge Spine.

Increased and improved public transport interchange capacity:

- The improvement in capacity for interchange and greater connectivity within Oxford, with the planned interchanges between BRT and other bus and rail services, is likely to significantly improve access by bus to/from the Eastern Arc in Oxford, and also increase bus connectivity through the City for people travelling to destinations on the opposite side of Oxford.

- We expect the Park & Ride sites to develop as significant bus and coach hubs facilitating the growth in more dispersed patterns of local bus services improving access and connectivity.

A major new north-south highway corridor linking Didcot and the eastern side of Science Vale with east Oxford:

- A potential new road link and Thames River crossing with bus priority where required running between north Didcot, past Culham Science Centre (connecting to the B4015 and the east side of Oxford).

Innovative strategic bus routes:

- Where possible, and in pursuit of our strategic objectives, we will encourage and support bus operators proposals to develop innovative bus services and alternative routes, especially more direct and express services. An example of this that will be considereda is a strategic bus link from south-east of Bicester to the Oxford Eastern Arc. The main advantages of this proposal is that a large part of growth in Bicester is focused on the south-east of the town and access to the Eastern Arc from Bicester is currently poor.

- South of Oxford we will explore the feasibility of developing a Busway 'spine' running north-south through central Science Vale – possibly terminating at the proposed Park & ride site at Lodge Hill in the north and at Harwell Business Park in the south. Such a busway would be a high frequency BRT route allowing services to branch off and serve strategic employment and residential developments.

- With the Highways Agency we will continue to explore the possibility of bus (or 'no car') priority measures at junctions and on specific links on the A34.

CONNECTING OXFORDSHIRE AND THE WIDER REGION

Introduction

While most of Oxfordshire's housing and employment growth up to 2031 is likely to be within the Knowledge Spine we acknowledge – as does the Oxfordshire strategic Economic Plan - the importance of strengthening the bus network in the rest of Oxfordshire, including the rural parts of the County, and increasing bus connectivity to the wider region. This is an important priority for the following main reasons:

- reducing traffic growth and congestion in the Knowledge Spine area,
- reducing transport carbon emissions,
- supporting local economies in Oxfordshire, including the rural economy, outside the Knowledge Spine,
- providing opportunities for people without access to private motor vehicles living or working in these areas to access employment and services.

The focus of this section is on the inter-urban bus and coach network outside the Knowledge Spine, and the following section addresses the rural bus network.

Strategy

Figures 2 and 3 (above) show the Oxfordshire strategic bus and coach network map, which is based on an analysis of current and predicted peak hour and commuting general and bus passenger flows, patterns of major growth in Oxfordshire and adjoining areas, and the strategic urban hierarchy. Given the above factors we have changed the designated strategic inter-urban bus network from LTP3. The major changes and reasons for them are listed in table 3 below:

Bus Strategy Table 6: Changes in the Strategic Bus & Coach Network

ROUTE/LINK	CHANGE	RATIONALE
Didcot - Harwell link	Upgraded to Premium	Strategic importance, housing and economic growth, high volume of demand
Witney – Eynsham P&R – Northern Gateway – Headington – Cowley – Lodge Hill P&R / Sandford P&R	New Bus Rapid Transit	Strategic importance, high volume of demand. Intercept trips on A40, B4449, A4074, and A34 corridors at P&R sites and provide high speed, high frequency service to/from Oxford
Langford Lane P&R (Begbroke) – City Centre - Blackbird Leys	New Bus Rapid Transit route	Intercept trips on A44 and A4260 corridors at P&R and provide high speed, high frequency service to/from Oxford
Cumnor P&R – City Centre – Thornhill P&R	New Bus Rapid Transit route	Intercept trips on A420 and A40 corridor east of Oxford at P&R sites and provide high speed, high frequency service to/from Oxford
A44 – A4260	Designated a potential strategic link	Potential connection for Banbury – Oxford and/or Witney – Woodstock – Kidlington airport bus routes

Kidlington – Upper Heyford	New strategic route – connector level	New development at Upper Heyford
Banbury - Upper Heyford - Bicester	New route – connector level	Major growth at Banbury, Upper Heyford and Bicester
Bicester - Milton Keynes	Designated a strategic route – connector level	Major growth at Bicester and along Cambridge Arc
Bicester & Banbury - Brackley – Northampton (A43 corridor)	Designated a strategic route – connector level	Major growth at Bicester, Banbury and Northants
Grove – Faringdon	Designated a strategic route – connector level	Strategic importance of access to employment in Science Vale from west part of Vale of White Horse (and Swindon); moderate volume of demand
Harwell - Newbury	Designated a strategic route – connector level	Strategic importance of access to employment in Science Vale from Newbury area
Thame - Aylesbury	Upgraded to Premium route	Strategic importance, mod/high level of demand
Oxford – Swindon	Upgraded to Premium route	Strategic importance, mod/high level of demand

Where inter-urban bus routes are designated as Premium we will, where applicable, review the conditions for bus operations and passenger access, as part of developing major route strategies. The route strategies being developed for the A420, A34, and the A40 will give a high level of consideration to facilitating quicker bus journeys, and better access and bus interchange facilities along the routes. Review of bus conditions and facilities on other strategic inter-urban routes will take place according to need and development funding-related opportunity, especially related to major development on or near the route.

Where we have designated strategic bus routes that extend into neighbouring local authority areas we will work with the relevant authorities to ensure that the priority they attach to these routes is similar to ours, and that our respective plans for bus-related infrastructure and service development match and are fully co-ordinated.

2.5 PUBLIC TRANSPORT FOR RURAL AREAS

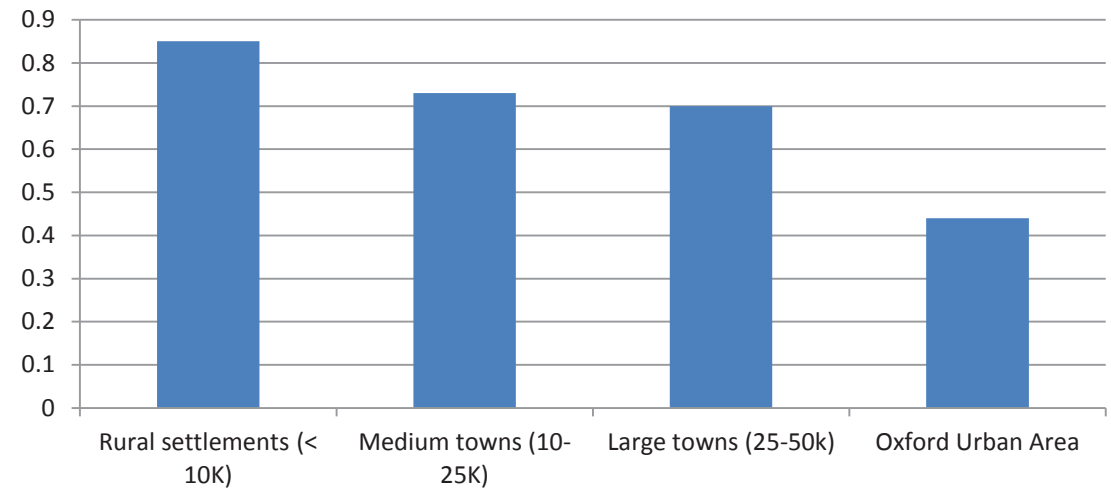
Rural bus and community transport services provide a lifeline for many people. For those living in rural areas without easy access to a car, having accessible and affordable public or community transport is vital to leading an active and independent life. Good rural public transport can also have important wider economic, environmental and social benefits and will therefore be a vital element in a successful comprehensive public transport system in Oxfordshire.

Introduction

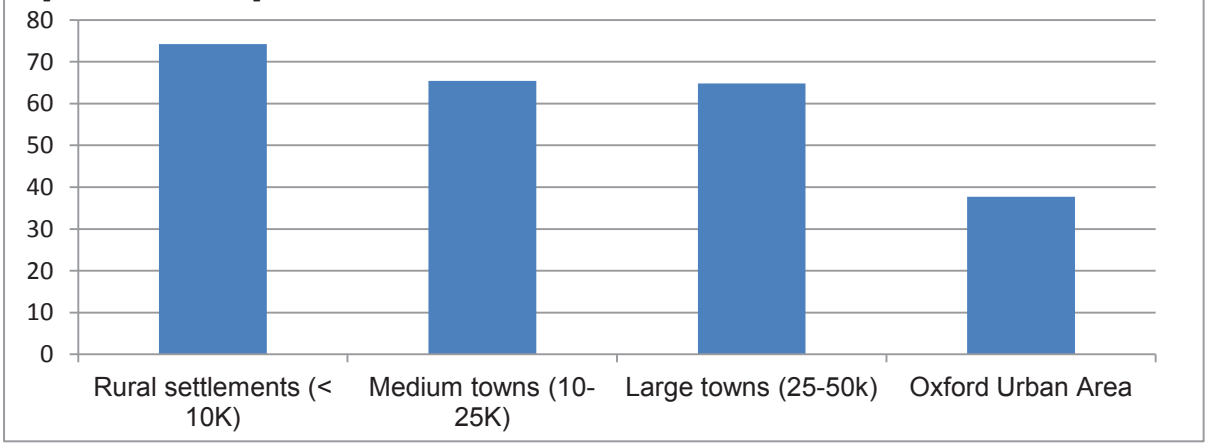
Oxfordshire is one of the most rural counties in the South East region. In 2011 37% of the population was living in settlements of less than 10,000 residents (the most common definition of rural areas), while 27% was living in settlements with less than 3,000 inhabitants. The state of public transport in the more rural parts of Oxfordshire is therefore a major concern not only for rural communities, but also local policy-makers and various other interest groups.

Most rural settlements in Oxfordshire do not lie on main inter-urban bus routes providing satisfactory levels of access to basic services and essential activities, particularly work and education. The dispersed and low level of transport demand in many rural areas makes the provision of affordable commercial public transport services unfeasible and publicly supported or subsidised services costly. Also, increased prosperity has encouraged the growth of car ownership and the development of highly car dependent lifestyles further weakening demand (see figures xx and xx). Consequently by 2011 only 2.1% of employed residents (about 3,600 people) living in rural settlements (i.e. less than10,000 residents) travelled to work by bus – a rate over 60% lower than in urban areas.

Bus Strategy Figure 8: Oxfordshire: cars per adult by settlement size (Source: 2011 Census)



Bus Strategy Figure 9: Oxfordshire: mode share for travel to work by settlement size (2011); [Source: Census]



Poor public transport undoubtedly causes significant hardship for many people without easy access to a motor vehicle who are predominantly concentrated amongst the elderly, the young, those with disabilities, and those on low incomes. There is also evidence to suggest that many low-income households living or working in rural areas are forced into buying and running a car when they cannot really afford to do so. Although to some extent community transport services have helped meet some of the need arising from a reduced level of bus services there are significant constraints on the further expansion of this sector. However it is far more than an individual or personal problem for a minority of people living in these areas. Important adverse economic, social and environmental impacts include:

- Consequences for the demand for other public services e.g. health, education and social care that can lead to significant direct and hidden long-term costs for these services.

- Undermining the economies of small and medium-sized towns leading to greater economic and social inequality.

- Undermining the rural economy worsens economic and social inequality. With increased urbanisation in the County and expansion in home-working the demand for access to the countryside for work, leisure, recreation, and tourism is expected to increase even more in scale and importance. Without adequate public transport, access to the countryside would to some extent be suppressed and be more inequitable and rural economic growth stifled.

- Increased levels of car use in - and to - rural areas leading to higher transport carbon emissions and further reductions in the quality of life in villages.

Despite efforts to reduce costs and maintain a public transport 'safety net' that fulfils basic social needs, rural bus services in Oxfordshire (as in England generally) have been gradually contracting for many years against a backdrop of declining central government funding and this situation is likely to continue.

County Council duties and responsibilities

National legislation lays down what we may and may not do in relation to subsidy for bus services. Bus operators are free to decide what commercial (unsubsidised) services to provide; we have no direct control over these services. Timetables for all bus services must be registered with the Traffic Commissioner – a Government appointee – who can ensure that services run to their registered timetable but cannot influence the timetable in the first place. Operators must give the Traffic Commissioner and the local transport authority at least eight weeks' notice of service introductions, withdrawals and timetable changes.

The Council has a duty to arrange "such services as they consider it appropriate to secure" to meet public transport needs which are not met by commercially run services. We can subsidise these extra public transport services, but for at least three quarters of all subsidised bus services must invite competitive tenders and decide which tender to accept solely on the basis of securing "best value" for public funds. A bus service can be arranged without tendering to meet an unexpected and urgent requirement (such as withdrawal of a

commercial service which can be with only eight weeks' notice), but tenders must subsequently be invited.

The amount of support for non-commercial services is limited by the funding that is available to us. In the short term we will be looking to see how the funding available can be used most effectively to provide for people's minimum access requirements within very tight financial limits. This raises some difficult and fundamental questions about how public transport services are to be delivered in the future.

Community Transport

We will continue to work with our district partners and local communities to support community transport to improve accessibility of services for rural communities. Oxfordshire has a large number of community transport schemes in operation. These range from car schemes whereby volunteers provide transport using their own cars, through to schemes providing shared minibuses to local groups, to schemes providing regular timetabled transport services similar to a conventional bus. Most community transport schemes in Oxfordshire are self-financing, but rising costs and legislative requirements are becoming a burden for some. The rising age profile of the volunteers themselves is also of concern when contemplating some schemes" sustainability. Where funding is available Oxfordshire County Council is currently able to offer support for community transport schemes in the form of grants.

Future strategy

This draft plan does not currently include any specific policies or proposals for how the rural transport network or transport for particular groups will be supported. This will be added to the Bus Strategy and the Local Transport Plan once further needs assessment has been completed.

2.6 INTEGRATED TICKETING, INFORMATION AND MARKETING

Bus service information and marketing

Bus service information tells users or potential users about services available and provides assurance that buses will provide a certain level of service to enable them to get to where they need to go. Marketing goes a stage further and aims to provide compelling reasons and sometimes inscentives for people to choose bus travel.

This strategy clarifies responsibility for the provision of information and who should meet the costs. Oxfordshire County Council generally provides bus stop infrastructure, including the pole, bus stop flag and timetable case. Operators are expected to meet the cost of providing and maintaining information relating to their own services.

Oxfordshire's Real Time Information service is amongst the best-performing systems in the UK primarily because the partners have focused on achieving quality in terms of the proportion of buses accurately predicted at stops and bus operators have invested in the on-board technology and so have a vested interest in the performance of the system. The issues faced by the system include whether the geographic coverage should be extended and whether the functionality of the system should be further developed.

There is a wide range of printed and web-based bus service information available for services across the county. However limited funding means that information provision needs to be both targeted at evidence of real need / usage, and delivered efficiently by OCC and operators. There are other challenges to be addressed in this strategy including:

- Differing responsibilities for providing information
- Consistency of presentation
- The future of real time information
- The move to increasing provision of electronic information

To address these challenges and achieve a step change in bus patronage will require a major improvement in the quality and availability of bus service information and increased and better marketing. OCC aims to plan and implement these measures with the co-operation of bus operators through the mechanism of the existing and future Quality Bus Partnerships (QBPs) which will need to consider:

- Evidence of the benefits and what people want from printed and web-based information.
- The benefits and costs of more consistent formats and house styles for information.
- The potential to make best use of OCC and operator information / marketing budgets (to avoid any possible duplication).
- The means of ensuring that information is regularly and consistently updated and then effectively implemented.
- An assessment of who does what; and whether there are more efficient and effective ways of working.

- A focus on key target groups who either don't get the information they need or who are most likely to change their travel behaviour as a result of marketing initiatives. These groups include people with sensory disabilities or impairments.

This work will be done in partnership with operators and representatives of bus users and other target groups, ensuring a greater focus on the "end customer".

Integrated Ticketing and Payment

We support the development of off-bus and integrated 'smart' payment, as a means of facilitating multi-stage and multi-operator public transport journeys, and reducing bus journey times by speeding up boarding. In 2011 a limited integrated smart ticketing system was introduced in bus services based in Oxford. In combination with some other measures – including routeing changes – this immediately had the effect of significantly increasing bus patronage on urban and some inter-urban services by making multi-operator journeys easier and more affordable.

We will continue to work in partnership with operators to develop improved ticketing schemes including further development and roll out of smartcards to potentially include other services like parking at park and ride sites and rail services. This work is one of the key elements of the Science Transit strategy and programme.

2.7 PARTNERSHIP WORKING

Quality Bus Partnership

The County Council and bus operators have worked in partnership since the 1970s. In 2011 OCC and the two major bus operators - Oxford Bus Company and Stagecoach Oxfordshire - launched a network of co-ordinated timetables and smarter ticketing on Oxford's main bus routes so that passengers are able to use one ticket for services from either bus company. The agreement resulted in far fewer buses on Oxford's central streets helping to reduce congestion and improve the ambience in the city centre. At the same time, the number of seats was maintained for passengers through the use of larger vehicles, which are among the greenest buses in the country, benefiting the environment. The challenge is now to expand the scope of the QBP in Oxford and across Oxfordshire.

With Oxford and Central Oxfordshire being given the opportunity to assume devolved powers under the City Deals initiative, there is an opportunity to work in partnership with bus operators to develop strategies for serving new development and making existing urban

areas function more effectively in transport terms. Understanding the future demand for bus services and the critical success factors for passengers will be important in order to develop a financially sustainable strategic public transport network.

This strategy proposes to develop a further quality bus partnership working covering the commercial network across the whole County. The primary focus would be on the major urban areas and inter-urban corridors (especially where new land use development is planned) and location specific objectives would include:

- Greater time-based and geographic coverage of bus services based on evidence of when and where people want to travel.
- Reduction in delays to bus services as a result of traffic congestion.
- Reduction in service cancellations.
- Increases in passenger satisfaction with the "end to end" journey experience.
- Increase in numbers of bus passengers.

Future Oxfordshire QBPs will concentrate on three major strands of activity:

(a) **Punctuality and reliability improvement**: to identify the source of delays to bus services and to jointly develop evidence-based solutions.

One of the several ways that OCC may achieve improvements in bus punctuality is using the New Roads and Street Works Act 1991. This legislation gives OCC responsibility for the planning, approval and (in some cases) undertaking of highway works, which can adversely affect bus punctuality and ability to run services to the timetable. OCC can designate any street with over eight buses per hour as "traffic sensitive", which can potentially restrict disruptive highway works especially at peak times. The Traffic Management Act 2004 also requires the implementation of bus punctuality improvement plans as part of the duty to secure the "expeditious movement of traffic".

Depending on evidence of the cause of punctuality and reliability problems the partners will need to jointly draw up and implement remedial action plans. There is also a need for all partners to consider solutions to the medium and longer term risks to bus punctuality and reliability – for example additional traffic congestion from planned land use development and general economic growth.

(b) **Information and Marketing**: to provide information in such a way that it break down perceived barriers and make people aware of the transport services and options

available, and furthermore provides compelling reasons for using the bus (or rail). Our strategy for this area of work is described in section 3.XX.

(c) Improving door-to-door integration and the overall passenger experience:

If buses are to attract and retain existing and future users and provide satisfaction there needs to be a greater focus on increasing integration between different stages of passengers door-to-door journey and improving the whole passenger experience. The QBP would identify the underlying causes of poor integration and low user satisfaction and develop financially sustainable solutions. The most important issues that will need to be addressed include:

- Wider availability of inter-operator (and multi-modal) smart payment systems.
- Service frequencies and daily coverage.
- Access to bus routes by foot and cycle at both ends of the journey. See the Cycling Strategy for more details of how we will aim to achieve sustainable Door to Door journeys (DE)
- Access to vehicles at stops for people with mobility impairments.
- Quality and environmental performance of vehicles (especially on lower level bus routes).
- Standards of driving / customer care.
- Integration with rail services.

QBPs have worked very successfully in Oxfordshire, however should voluntary agreements not prove effective in future in dealing with the scale and nature of the challenges faced OCC may look at the option of utilising powers contained within the Transport Act to assist policy delivery, through the development of Statutory Quality Partnerships or Quality Contracts.

Equality-related partnership working

Oxfordshire County Council will follow two important principles on all schemes. The first of these is that consultation with disabled people and their representatives should take place from the earliest stage in the development of schemes and initiatives before any details have been determined. The second principle is that the Council should secure high level disability awareness training for all appropriate staff in order that scheme designers can have greater awareness of the needs of disabled people.

When planning new schemes and improvements to existing facilities, we will consult local access groups, with Transport for All (the independent but council-funded body representing disabled and mobility-impaired people throughout Oxfordshire in relation to transport issues) and with the Oxfordshire disability organisation Unlimited. We will also, when necessary, seek expert advice to ensure that the final outcome is a satisfactory and useable facility for everyone.

2.8 PROMOTING BUS USE THROUGH THE PLANNING PROCESS

Strategy

Our strategy to enhance the bus network and achieve a substantial increase in bus patronage through the planning process consists of the following main elements. Success in achieving this goal and the other bus strategy objectives hinges on effective integration and co-ordination between each of these elements.

Integrated land use-transport planning

To support bus development and optimise the use of strategic transport investment we will:

- Encourage appropriate types of new development to be located, planned and designed with good access to the strategic bus network, especially designated Bus Rapid Transit and Premium bus routes.
- Encourage master planning to gives bus and rail a central place in the transport hierarchy.
- Support increased urban densification, especially near major strategic public transport infrastructure
- Encourage growth to be concentrated in existing larger urban areas or, with the development, to reach a threshold of greater potential self-containment and transport sustainability.
- Seek developer funding to support the development of existing or new bus services to achieve a higher and more attractive standard of service as required and where there is a reasonable expectation of longer-term commercial sustainability.
- Where significant new developments are planned, we will seek developer funding to pay for the necessary bus stop infrastructure to upgrade it to the desired standard.

- Ensure that new developments are planned to ensure optimal movement of buses along future routes in accordance with national and Oxfordshire County Council design guidance best practice. Bus routes must provide very high levels of penetration of - and pedestrian access – to and within sites.

- With the relevant District Council partners explore the possibility of introducing tighter parking standards at new major employment sites and residential developments, and restraint measures at existing major employment sites.

- Explore opportunities with the relevant District and Town Councils and local businesses to gradually introduce parking controls/regimes in town centres that could encourage the greater use of buses and other non-car modes of transport while taking account of town centre vitality.

- Support residential and workplace sustainable travel planning.

Transport development control and travel planning

To support bus development and optimise the use of strategic transport investment we will ensure the development of:

- Planning agreements that support bus development in terms of both hard infrastructure and 'soft' travel planning measures.

- Ambitious sustainable travel plans and targets which are monitored, managed and enforced.

Increased consideration will have to be given in future to of the most appropriate developer funding source for infrastructure schemes and bus service development and the most appropriate and best use of developer funds in particular cases. The options include Section 106 contributions, the Community Infrastructure Levy (CIL) and devolved major scheme funding.

Section 106 agreements

The identification, negotiation and securing of section 106 financial developer contributions to bus services and infrastructure is currently undertaken on a site by site basis. OCC (and partners such as the bus operators and District Councils) consider a number of factors when proposing bus service and infrastructure improvements – as shown in Table 7 below.

There isn't a strict formulaic approach which calculates a financial contribution to transport measures. The size and phasing of any specific developer contribution is currently a matter of negotiation and agreement between the relevant local authorities and the developers.

Bus Strategy Table 7 – Factors in Identification of Service and Infrastructure Improvements

Improvement	Key Factors
New bus service or improvement in existing frequency / daily coverage	• Size of development (e.g. number of houses, number of new jobs, floor area of retail development etc.)
	• Time taken to construct and occupy development (phasing)
	• Location of development (i.e. distance from existing frequent public transport corridor)
	• Frequency / commercial viability of existing bus services
	• Proximity to existing urban centres and travel generating destinations
	• Potential links to other proposed developments
Bus priority measures	• Evidence of current problems and / or future congestion resulting from development-related travel demand
	• Requirement to minimise journey times to adjacent settlements / developments
Bus stops and support accessibility improvements (walking routes and road crossings)	• Size and geographic extent of development
	• Minimising the required walking time from the development
	• Proximity of existing or proposed bus routes
Travel Plans	• Size of development and travel demand generation potential
	• Projected travel patterns (origins and destinations)
	• Socio demographic profile of development

The current approach allows flexibility based on the specific circumstances of development(s) based on experience of what has worked (or not worked) elsewhere. Local knowledge of the bus operating conditions and potential passenger demand means that the service and infrastructure measures can be tailored to circumstances, based on available local evidence and professional judgement.

Our policy to date has been to concentrate on promoting the development of local bus services by using developer contributions to increase service frequencies, particularly for employment and utility trips, attract more passengers and therefore improve commercial viability. The developer funding to support these services is time-limited therefore it is critical that these improved services become commercially sustainable in the longer term. There is a significant role for travel planning and other initiatives to support these developing bus services.

A drawback of the current approach is the potential for a lack of transparency and consistency in the way developer contributions are secured and apportioned, especially where more than one development is required to make a contribution to bus service and infrastructure improvements in an area or corridor. Individual developers may challenge the financial contribution expected if they believe that they are paying more than their "fair share". This all makes for a time-consuming and inefficient system. There is also a need to plan a future integrated network that links different developments rather than simply introducing a series of isolated routes.

We therefore believe there is a case for defining a more consistent and transparent policy and process for developer contributions towards transport improvements, including bus services and infrastructure. With the much higher level of population and employment growth anticipated outside Oxford in the future and our ambition to achieve a major step change in the bus system and patronage it has become a priority to review our strategy and policy in this area. This will imply adopting a formulaic approach for calculating contributions from developments to public transport, based on the anticipated transport impact (including the key factors outlined above).

The key principles of this formulaic approach could include:

- Provision of a multi-modal trip rate for the different classifications of development (e.g. residential, B1 office, retail etc.).

- Calculation of a financial value per trip based on the estimated cost of transport services (including buses) and infrastructure that would be necessary to make the development work in transport terms.
- Provision of local weighting factors to reflect specific circumstances (potentially including local economic conditions, sustainability of the development site, proximity of existing Premium Routes etc.).
- Agreement of binding targets for bus use from specific developments – with additional investment being triggered if targets are not met.

There are challenges in developing such an approach. There will need to be a clear local vision for a future bus network which would link each development to an appropriate range of trip attractors and generators. Individual section 106 agreements will need to build up the wider public transport system rather than simply providing isolated routes, which would then disappear once funding ended. There would also need to be a means of ensuring that operators who provide services as part of sections 106 contributions (by winning a contract from the OCC or developer) subscribe to the principles set out in QBPs (see section xx above).

Community Infrastructure Levy (CIL)

OCC is aware of the need to improve conditions for buses and facilities for passengers in towns and villages outside Oxford and on inter-urban routes. Bus priority is currently under-developed outside Oxford. In some areas bus operators have indicated that they would find investment in infrastructure, particularly bus priority and other traffic management measures that would improve bus reliability more beneficial and attractive for them in the longer run than subsidisation of higher service frequencies. It is suggested that this might make them more willing to take the commercial risk of introducing new or additional services. As CIL is only applicable to capital infrastructure schemes, enhancements to bus services would still need to be secured through section 106 contributions.

The basis of CIL is a charging rate per residential dwelling or square metre of development, which generates an overall sum for funding strategic infrastructure required to facilitate both individual and multiple developments. There is no size limit to CIL and the money can be pooled to address transport problems that are wider than any specific development. The potential advantages of CIL include:

- Improving predictability and certainty for developers as to what they will be asked to contribute;
- Increasing fairness by broadening the range of developments asked to contribute;
- Allowing the cumulative impact of small developments to be better addressed; and
- Enabling important sub-regional infrastructure to be funded.

This strategy makes the case that bus services and infrastructure are a vital part of the solution for additional travel demand and congestion that could be generated by planned development in the county. Therefore CIL policies and schedules being developed by the District Councils should include provision for bus priority and transport hub strategic priorities.

Bus Service Operators Grant (BSOG)

Bus Service Operators Grant (BSOG) enables bus operators to reduce their costs and can charge a lower fare and / or operate a larger network than they otherwise would do. BSOG is currently paid directly to operators by the Department for Transport (DfT) based on the amount of fuel they use on both commercial and council-supported services. The DfT is proposing to devolve BSOG paid for non-commercial routes to local transport authorities (i.e. OCC) with the aim of enabling the money to be spent according to local circumstances. OCC and the operators have concerns that devolved BSOG payments would not reflect the relatively high proportion of commercial service mileage in the county. OCC will work with bus operators to decide how the devolved BSOG could best be invested based on the policy for Local Routes outlined below.

3 ACTION PLAN AND PERFORMANCE MONITORING

A detailed forward programme for the whole LTP, including the Bus Strategy, will be developed prior to the final version of the plan. In the interim the table below (see table xx) gives a broad indication of the phasing of the implementation of the bus strategy during the plan period.

The most important transport outcome the bus strategy aims to achieve is to increase bus patronage and modal shift from cars across the County and especially in - and to/from - major urban and employment areas at peak times in order to mitigate traffic congestion. Our key performance indicators (see below) have been designed to reflect these aims.

Although transport outcomes such as the above are influenced by a huge range of variables, including many over which local authorities have little or no control or influence, performance monitoring and ongoing policy assessment is all a vital part of effective strategic management and planning, and will therefore be accorded a very high priority. In particular we will use it to inform partnership working with District Councils, bus operators through the Quality Bus Partnership, and other stakeholders and regular reviews of our bus strategy and overall transport strategy.

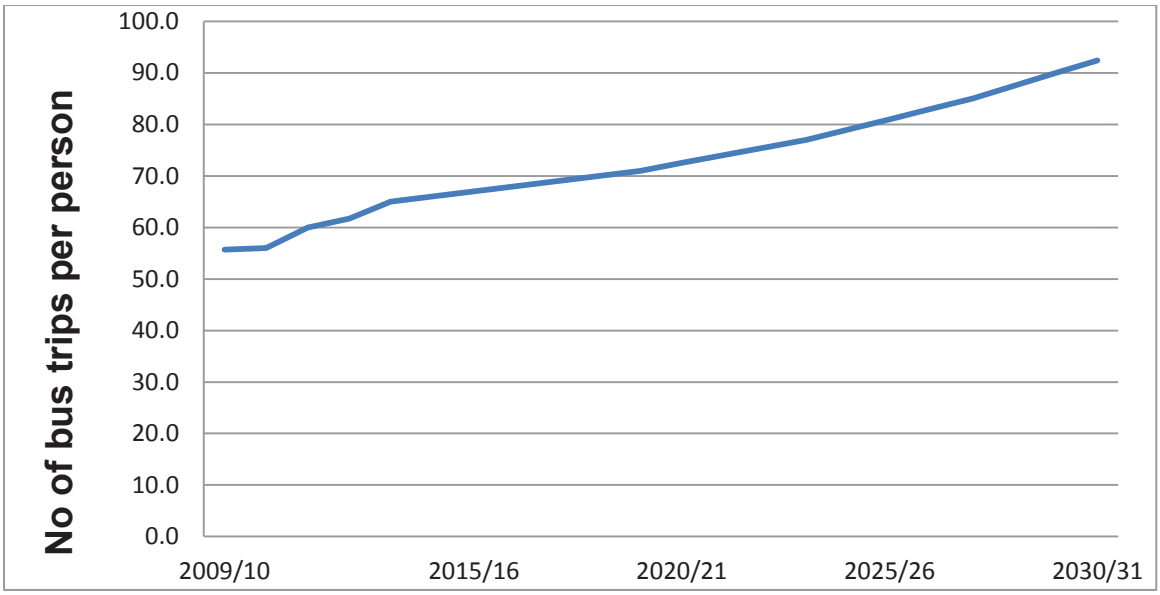
Bus Strategy Table 8: Indicative broad outline of the phasing of the Oxfordshire bus strategy 2015-

ACTION	SHORT-TERM (2015-2020)	MEDIUM-TERM (2021-2025)	LONGER-TERM (2026-2031)

2031

LTP4 Bus strategy 2015 – 2031: Suggested Key performance indicators and targets

INDICATOR	NO. OF ANNUAL BUS JOURNEYS PER HEAD OF POPULATION		
Data source	DfT statistics (Table: Bus 0110a)		
Area	Oxfordshire		
BASELINE	**SHORT-TERM TARGET**	**MID-TERM TARGET**	**LONGER-TERM TARGET**
2013/14: 65.0	2020/21: 72.5	2025/6: 81.0	2030/31: 92.4



INDICATOR	WORKPLACE MODE SHARE: % OF EMPLOYEES COMMUTING TO WORK BY BUS [or alternatively - % of employed residents commuting to work by bus]		
Data source	National Census		
Area	Major urban areas in Oxfordshire		
AREA	**BASELINE**	**SHORT-TERM TARGET**	**LONGER-TERM TARGET**
	2011	2021	2031
Oxford City			
Banbury			
Bicester			
Science Vale & environ			
Witney & Carterton			

Annex: Bus strategies for selected urban areas

OXFORD & SURROUNDING AREA

Introduction

Oxford is the largest urban area in the County and in functional and transport terms exerts a strong centralising influence over a large part of central Oxfordshire. In 2011 it had a resident population of almost 152,000 and was home to approximately 96,000 jobs and about 32,000 full-time students. It is also a major regional centre for retail activity and other services - particularly health care.

Oxford enjoys a very high level of employment self-containment which is conducive to sustainable travel behaviour. Currently only a very small proportion of employed Oxford residents work outside the City - a mere 13% - and 52% of jobs based in Oxford were filled by local residents in 2011. In addition, there are a very large number of student commuting movements, which are predominantly internal, relatively short-distance, and mostly performed using sustainable modes of transport.

Oxford benefits from the fact that the bus (along with walking and cycling) has become a key part of the local transport system and is testament to a long history of successful integrated sustainable transport strategies. In 2011 over 10,500 employed residents of Oxford (about 18% of the total) regularly commuted to work by bus or coach, and of these 8,500 travelled to workplaces inside Oxford (representing over 20% of internal commuters).

Levels of bus commuting from outside Oxford are also relatively high: in 2011 almost 7,000 commuters (over 15% of *in-commuters*) travelled to work by bus/coach. It is noteworthy however that the levels of *out-commuting* by bus/coach (with the exception of journeys to London) are significantly lower than the levels of internal and in-commuting by bus: slightly over 2,000 residents commuted out of Oxford by bus in 2011 of which almost 600 travelled to London (see section 2.3).

The following factors present challenges to the further growth of bus use in - and to - Oxford:

Traffic congestion: There is acute traffic congestion on several of the main radial roads in and approaching Oxford City, the A34 and A40, the Oxford Ring Road, and at a number of locations in the 'Eastern Arc' during the morning and afternoon/ evening peaks. Despite extensive on-road bus priority measures conditions for buses have tended to become worse

in many places leading to deterioration in bus journey time reliability. A few major 'pinch points' still exist on some of the main radial and the few orbital routes.

Constraints on the continued effectiveness of the current Park & Ride system: Most of the existing P&R sites on or near the edge of the City are now often operating close to capacity and congestion now affects the approaches to most sites at peak times.

Restricted bus movement around/through the city centre: The constrained central area road network creates difficulty in traversing or going around the city centre impeding the development of cross-town services.

Limited capacity for further bus growth in the city centre: 'Transform Oxford' improved the city centre ambience and conditions for pedestrians and cyclists partly by restricting the number of buses entering the area while slightly increasing the capacity by moving to double-decker buses. With the limited road space available there is now limited scope for further increasing bus capacity without once again worsening the ambience and conditions for pedestrians and cyclists.

Limited public transport interchange and inadequate passenger facilities: There is generally a poor level of interchange between different bus routes and between bus and rail in the city centre and very little outside the centre. This makes passenger interchange costly in terms of the time and distance penalty involved and discourages bus use for some journeys within Oxford and also some outbound journeys. In addition, there are insufficient conveniently located, high quality facilities for bus passengers and space for buses and coaches to wait and offload.

Limited bus connectivity to and within the 'Eastern Arc': The main commuting flows to Oxford are from north, west and south-west directions but a large proportion of employment is located in the east and south-east parts of the city (the so-called 'Eastern Arc'), accessible by only a few river crossings. Consequently within the city, and Eastern Arc in particular, there is currently insufficient orbital connectivity, leading to poor access by all transport modes and worsening congestion on the Ring Road and within the built up area. At the moment, most travel to the Eastern Arc from West Oxfordshire and Cherwell necessitates a difficult interchange in the city centre, although there are a few direct services which lack good bus priority. Both direct and multi-stage bus travel from these areas are therefore considered unattractive options.

Acute sensitivity of bus services to disruptions on the road network: Unplanned and planned events both inside and on the edge of the City often lead to virtual gridlock for extended periods affecting bus services as well as general traffic.

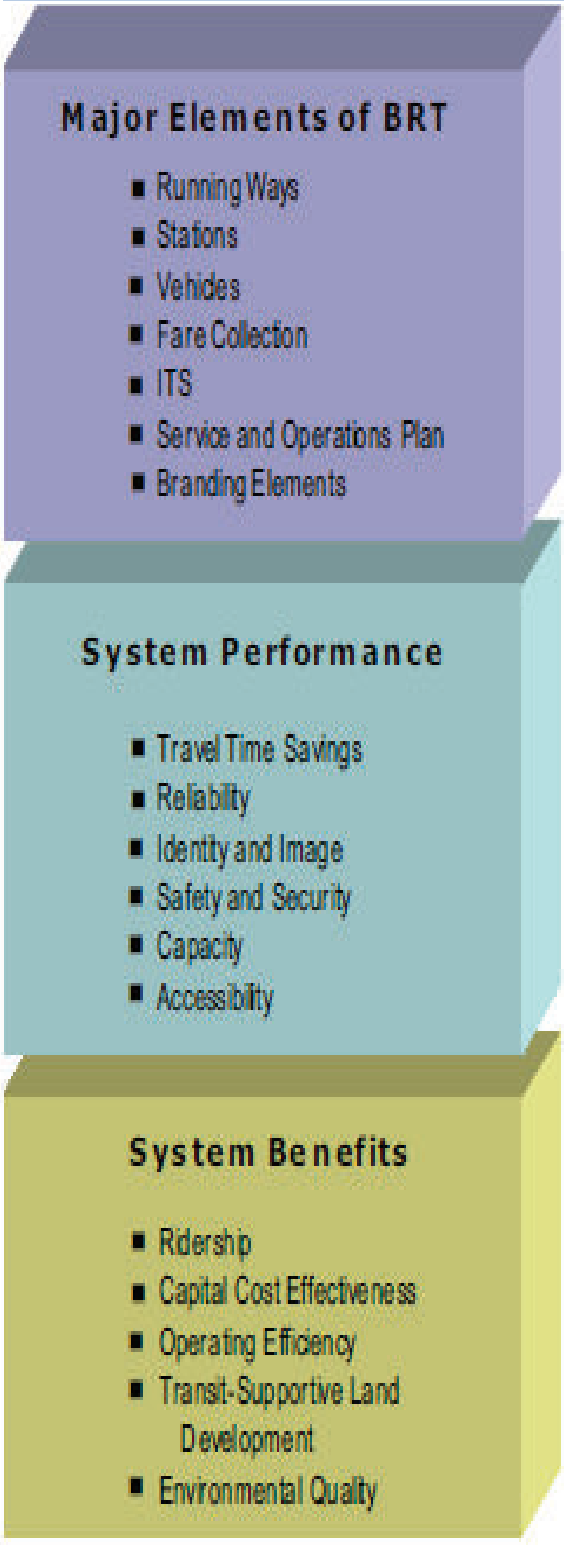
Although it has not yet been possible to carry out detailed transport modeling, with the scale of housing and employment growth expected in the City and surrounding area the City's existing public transport system faces major challenges in the future. Without decisive action to further transform public transport infrastructure and improve sustainable travel options, traffic conditions, particularly at peak hour, would be likely to deteriorate significantly. The bus strategy which follows is an important component of our overall, integrated approach to develop a sustainable transport system and travel choices.

Strategy

Oxfordshire County Council's vision of the strategic bus network in Oxford and the surrounding area in the short to medium term is shown in figure xx. The strategic network and the categorisation of routes/services will be kept under constant review as circumstances change and new opportunities arise.

The Oxford Transport Strategy will continue to support the development of local and longer-distance bus services through a combination of *integrated transport strategies and policies*. Proposals are likely to evolve over time in response to changing circumstances and opportunities however by 2031 they are likely to include the following elements (described in greater detail in the Oxford Transport Strategy – Connecting Oxfordshire Volume 2):

Enhanced bus network connectivity, integration, and access:



- New outer-ring of Park & Ride sites further away from Oxford on main radial routes to intercept trips closer to their point of origin, prior to reaching the Ring Road / A34
- Redevelopment of existing Park & Ride sites inside the ring road / A34
- Development of bus hubs/interchanges within the City linking services and catering more for non-car journeys (walking and cycling). Link with cycling strategy by referring to it here (DE)
- Better transport interchanges at railway stations including Oxford and Oxford Parkway stations and proposed new station sites on the Cowley Branch Line.
- New city centre bus terminals.
- Expanded and improved integrated smart payment systems.

Development of Bus Rapid Transit routes and services:

- Three routes have been designated as future 'Bus Rapid Transit' (BRT) routes traversing the City and terminating at the new 'outer' Park & Ride sites.
- BRT services in Oxford are likely to have the following general features: higher levels of frequency; enhanced on-route bus

priority or (where circumstances require) grade segregation; off-board ticketing; separate passenger entrance and exit doors for speeded up loading/off-loading; overall faster journey times; higher capacity and high quality vehicles; zero emission technology (i.e. at point of use); comprehensive use of intelligent transport systems; good cycling and walking links to interchange points, high quality passenger facilities at stops, termini and other interchanges, and a strong, unique public image.

Traffic management:

- Various priority measures e.g. reallocating road space, improving junction, and access restrictions to improve flow conditions and access for conventional buses, especially on designated premium bus routes.
- Enhanced contingency planning to deal with traffic disruptions, in time utilising the potential of intelligent transport systems.

Other measures to enhance and promote bus travel:

- Extension of the smart payment system
- Enhanced real-time bus information, including innovative advanced journey planning systems.
- Work with local bus operators through a Quality Bus Partnership (see section 2.7)
- Strong marketing/branding campaigns carried out with local bus operators.
- Improved passenger facilities in accordance with standards set out in the bus network hierarchy.
- Further Improvements in the quality and comfort of bus vehicles and vehicle emission standards.

BANBURY & SURROUNDING AREA

Introduction

Banbury is the second largest town in Oxfordshire, with a residential population of nearly 47,000 and over 28,700 jobs, accounting for 42% of the total jobs in Cherwell District.[2] In addition to Oxford, Banbury is currently the only settlement in Oxfordshire to have more jobs than employed residents. Located in north Oxfordshire, close to the M40 motorway and several 'A' roads and with good long-distance rail connections, Banbury acts as a Primary Regional Centre in its own right with an extensive catchment area.

[2] Source: *Cherwell Economic Analysis Study*, 2014 (presented as evidence at the Cherwell Local Plan hearing)

The *Cherwell Local Plan* anticipates that Banbury will continue to grow significantly. It proposes that by 2031 there will be an additional 7,000 houses and 7,000 jobs based in the town. Key residential sites are proposed in the south, west and north-west of Banbury. Proposed employment sites are located on the east side of Banbury, close to M40 Junction 11.

Given its prime location in relation to the wider region, its excellent strategic transport links, and the size and diversity of its economy, Banbury employment sites generate a sizeable minority of very long distance car commuting journeys: in 2011 its employees had the longest average commuting trip of all the main Oxfordshire settlements (see Bus Strategy Figure X below).

Bus Strategy Figure 10: Employees' average travel to work distances (straight-line distance between postcodes) in major Oxfordshire settlements (km) (source: 2011 Census)

Banbury	Bicester	Witney	Abingdon	Didcot	Oxford
16.1	14.9	11.5	14.6	10.6	14.9

Banbury *residents* enjoy a high level of employment self-containment, with associated shorter commuting distances: 60% of journey-to-work trips are currently undertaken within the town, with a home origin and work destination in Banbury. However, despite the local pattern of work trips, whilst 32% of these trips are undertaken on foot, 57% of these local trips are undertaken by car and only 3% by bus. The levels of in-commuting and out-commuting by bus are only slightly better than this at about 4%.

Collectively these statistics suggest that there is considerable potential for encouraging sustainable travel both within the town and the immediately surrounding area. Banbury's Bus Strategy forms a key strand of the town's Sustainable Transport Strategy.

The Bus Strategy will focus on addressing the following key issues and challenges that have been identified in Banbury:

- **Improving journey time reliability: Traffic congestion,** particularly at key town centre junctions during the peak hour, and a **lack of bus priority measures**, impact significantly on bus service viability and the ability for operators to run frequent and reliable commercial services.

- **Improving the town centre bus, and bus-rail interchange experience for passengers:** The existing bus station is unwelcoming and under-used. In addition, although Banbury railway station, the central bus station, and the Bridge Street bus 'hub', are all located relatively close to the town centre there is significant severance between them.
- **Providing *direct and frequent* services between key residential and employment sites** to ensure that the bus is a genuinely viable alternative to the car.
- **Reversing the existing culture of car dependency and the correspondingly weak culture of bus use,** as indicated by the relatively low numbers of bus passengers in the town

With the scale of planned growth in jobs and housing in the town, an ***effective*** Bus Strategy will be a key element to the sustainable growth of Banbury.

Strategy

Our vision of the strategic bus network in Banbury and the surrounding area in the longer term (2031), based on existing and future patterns of growth is shown in Figure xx. The strategic network and categorisation of routes/services will be kept under review as circumstances change and new opportunities arise.

Strategy

Our vision of the strategic local bus network in Banbury and the surrounding area in the short to medium term based on existing and future patterns of growth is shown in Figure xx. The strategic network and categorisation of routes/services will be kept under constant review as circumstances change and new opportunities arise.

The primary aim of the bus strategy is to increase bus patronage in the area, particularly for peak hour journeys. The Banbury Sustainable Transport Strategy will support the development of local and longer-distance bus services through a combination of the following integrated transport strategies and policies:

Bus Strategy Figure 11: Banbury area's strategic bus network

Enhancement of the town's bus network:

- A comprehensive review of town bus operations will identify short, medium and long term infrastructure and service requirements.
- There will be a focus on improving direct links between residential areas and key employment, leisure and retail destinations, and the rail station. There will be a particular emphasis on improving bus links between west Banbury and employment sites on the east side of town.
- Improvements will be prioritised at key congestion pinch points within Banbury, especially on designated 'Premium' bus routes. Junction improvements and bus priority

on Bloxham Road, and minor highway and signalling changes in the town centre, are high short-term priorities for existing bus operations to support quicker and more reliable bus journeys.

- The Cherwell Street 'Eastern Corridor' will be the preferred north-south route for traffic through the town and improvements will be made to the Bridge Street / Cherwell Street junction, and additional capacity provided at the Bloxham Road (A361) / South Bar Street junction which will facilitate improved bus movements.
- Bus routes and services will be reviewed and enhanced where necessary with the aim of increasing patronage and commercial viability. Where possible, enhancements will be funded through developer contributions.

Review and enhancement of bus interchange facilities in the town centre

- A comprehensive review of bus interchange facilities in and close to the town centre will be carried out taking into account bus-layover requirements, passenger access to the town centre, facilitating bus and rail interchange, and the relationship of these factors to town centre regeneration proposals.
- A new bus station facility on the George Street car park, with strong, high quality pedestrian links to the town centre, has been identified as one option to be explored.

Other measures to enhance and promote bus travel:

- Working with public transport operators in the town to ensure access to high quality passenger information, including enhanced real-time bus information on strategic routes and innovative advanced journey planning systems.
- Extension of integrated multi-modal, multi-operator smart payment to area.
- Work with local bus operators through a Quality Bus Partnership (see section 2.7)
- Improving passenger facilities in accordance with standards set out in the bus network and interchange hierarchy.
- Improving connections to bus stops, e.g. walking/cycle links
- Improvements in the quality and comfort of buses and vehicle emission standards.

Other changes that would benefit bus travel:

- Explore opportunities with the relevant District and Town Councils and local businesses to gradually introduce parking controls/regimes in town centres that could encourage the greater use of buses and other non-car modes of transport, while taking account of town centre vitality.
- Review of parking provision, management and information

- Potential new link roads to enable new routes/services (e.g. A361 to A4260)

Integrated land-use planning measures (see section 2.8)

BICESTER & SURROUNDING AREA

Introduction

Bicester had a population of almost 33,000 people and over 13,000 jobs in 2011 and is the fastest growing town in Oxfordshire. It has an increasingly diverse and strong economy that includes Bicester Village shopping outlet which has become a major UK tourist attraction, drawing in nearly six million visitors a year.

The town possesses excellent road links via the A34 and the M40, and rail links to Oxford, London Marylebone, High Wycombe and Birmingham (and in the near future, also Milton Keynes), and has a highly advantageous location in relation to major areas of economic growth in Oxford and Science Vale, the Oxford-Cambridge Arc, and the Northamptonshire Arc. Bicester has been identified as the northern end of the Oxfordshire Knowledge Spine.

Bicester has major ambitions for growth. The Cherwell Local Plan seeks to exploit Bicester's potential to deliver jobs-led growth, supported by housing, with approximately 10,000 new homes and up to 9,000 additional jobs planned up to 2031. The Plan also seeks to strengthen the town centre economy. In December 2014 the Government confirmed plans for the town to become a new 'Garden City' with up to 13,000 new homes.

Given the compactness and current size of the town a relatively high proportion of residents that work in the town currently walk and cycle to work. The level of bus commuting is however extremely low – less than 2% in 2011. Residents that work locally however represent only a minority of the town's commuters: because of a shortfall in the number of local jobs and the town's location, the level of out-commuting is relatively high, and of these 77% were car drivers. Similarly 80% of in-commuters were car drivers. The levels of in- and out-commuting by bus were 4.5% and 6.3% respectively.

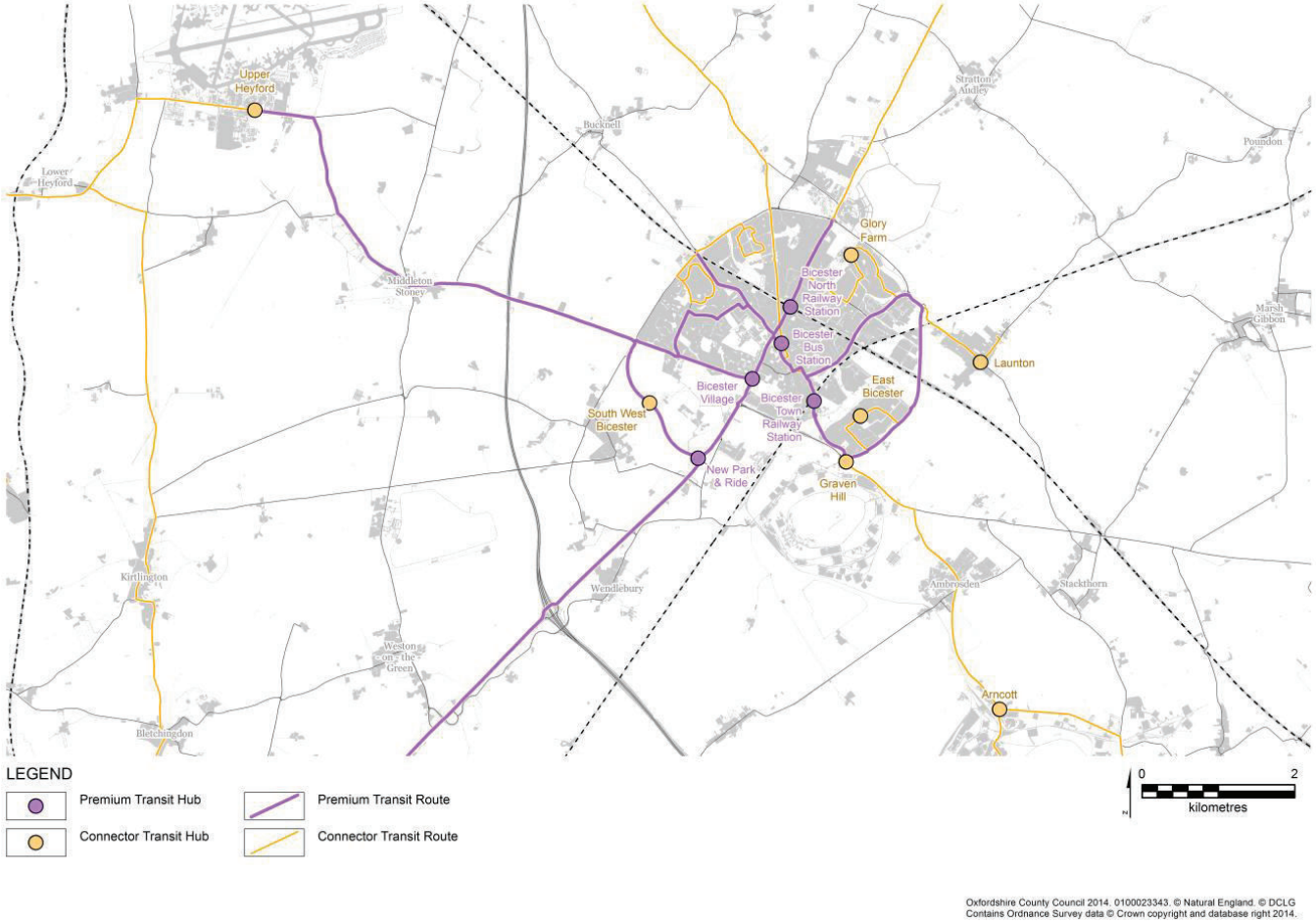
The following factors present challenges to the further growth of bus use in - and to - the Bicester area:

An inadequate existing local bus network: There is currently a low level of bus frequency and poor coverage of many residential and employment areas in the town and to settlements in its immediately surrounding travel to work and shopping/service catchment area.

Traffic congestion: There is acute traffic congestion on key main routes through and in the town, and at specific locations at certain times e.g. the junctions in the vicinity of Bicester Village. There are currently virtually no significant bus priority measures within the town.

Car dependent local attitudes: According to the *Bicester Movement Study* there is currently a lack of popular support for demand management measures e.g. road space reallocation and parking restraint that would constrain car use and support increased bus use.

With the scale of planned growth in jobs and housing in the town, it is clear that decisive action to further transform public transport infrastructure and travel options, as well as increase existing overall transport capacity, will be necessary to avoid a further deterioration in traffic and environmental conditions in Banbury. The bus strategy which follows is an important component of our overall, integrated approach to develop a sustainable transport system and travel choices.



Bus Strategy Figure 12: Bicester area's strategic bus network

Strategy

Oxfordshire County Council's vision of the strategic bus network in Bicester and the surrounding area in the short to medium term is shown in figure xx. The strategic network and the categorisation of routes/services will be kept under constant review as circumstances change and new opportunities arise.

The Bicester Transport Strategy will support the development of local and inter-urban bus services through a combination of *integrated transport strategies and policies*. Proposals are likely to evolve over time in response to changing circumstances and opportunities however they are likely to consist of the following elements: **Enhancement of the town's bus network:**

- Improving bus services along key routes to connect residential areas with existing and future employment centres, particularly Graven Hill, North West Bicester, the Launton Road Industrial estate, Bicester Business Park, South-East Bicester and North-East Bicester Business Parks, as well as the town railway stations, the town centre, Bicester Village and the Park & Ride site. This will be achieved by using funding from development to enhance the quality and frequency of existing services, with the aim of services reaching full commercial viability.

- Proposed network improvements are shown in Figure xx (see attached).

- Growth at Upper Heyford will need to be considered in terms of improved public transport frequency and connectivity with Bicester.

- Prioritise highway improvements and bus priority measures at key congestion pinch points on designated 'Premium' bus routes and other places where there are identified needs arising from strategic development sites. For example, a bus priority scheme on Bucknell Road-St Johns Street-Manorsfield Road is vital to deliver an improved bus service to service the major North West Bicester development.

- A comprehensive review of town bus operations will identify other short, medium and long term infrastructure and service improvements required.

Enhancement of bus interchange facilities:

- use the opportunities offered by the redevelopment of Bicester Town Railway Station to create a 'state-of-the-art' multi-modal interchange offering high quality facilities for pedestrians, bus users and cyclists.

- Fully utilise the potential of the new Park & Ride site at South West Bicester to promote bus use to as wide a possible range of destinations inside and outside the town, especially to promote both in and out-commuting by bus. Within Bicester the P&R should be directly linked to Bicester town centre, key employment centres, and Bicester Village.

Other measures to enhance and promote bus travel:

- Extension of integrated multi-modal, multi-operator smart payment to the area
- Enhance real-time bus information, including innovative advanced journey planning systems, working with Bicester Town Council.

- Work with local bus operators through a Quality Bus Partnership (see section 2.7). In particular co-operate with local bus operators and key local stakeholders to carry out a strong marketing/branding campaign promoting the Bicester P&R and bus connections to EW Rail and the Garden City vision

- Improved passenger facilities in accordance with standards set out in the bus network hierarchy.

- Improvements in the quality and comfort of buses and vehicle emission standards.

Other changes that would benefit bus travel:

- The announcement that Bicester is to be developed as a 'Garden Town' is likely to give a significant boost to the development of sustainable transport and travel.

- Expand capacity on new and existing peripheral routes to encourage their greater use for employment purposes and longer distance traffic. This would help reduce congestion in the town centre and central corridor, and thus help facilitate improved conditions for bus movement on these routes and in these areas.

- New link roads to enable new routes/services (e.g. through the SE Bicester development area?) Peripheral developments should enable attractive inter-urban bus travel along new links.

- Review of parking provision, management and information

- Better connections to bus stops, e.g. walking/cycle links

Integrated land use-transport planning measures (see section 2.8)

SCIENCE VALE AND SURROUNDING AREA

Introduction

LTP4 contains an area transport strategy for Science Vale, however for the purposes of strategic bus planning we have defined a slightly larger area south of Oxford consisting of not only the Science Vale area (including Grove, Wantage, Didcot and the high-tech business parks at Harwell Oxford, Milton Park and Culham Science Centre) but also Abingdon and Wallingford.

In 2011 this area had a population of approximately 117,000 residents and over 54,000 jobs. The Oxfordshire Strategic Economic Plan has however recommended that approximately 20,000 new homes and 20,000 additional jobs be concentrated in the Science Vale area between 2011 and 2031 – the majority are likely to be located around Didcot and Grove/ Wantage. This translate into an increase of approximately 55,000 residents – almost a 50% growth in population.

The major business parks in Science Vale possess a very high concentration of employment in high-tech industries and therefore attract employees from a very wide catchment area as well as generating a large number of national and international business trips. In 2011 the jobs located in the area generated about 47,000 commuter journeys of which 57% were internal, and about 52% of employed residents of the area worked locally.

Although a relatively high proportion of residents work in the area, the level of bus commuting to workplaces within the area is currently extremely low: only about 4% of employees in the area commuted to work by bus in 2011, whereas over 62% of internal commuters and 82% of commuters from outside the area were car drivers. The level of bus commuting to *workplaces outside the area* was slightly better: about 7% travelled by work by bus (and 73% were car drivers).

The following factors present challenges to the further growth of bus use in - and to – Science Vale and the surrounding area:

Limited bus connectivity between major settlements in the area and employment areas: many services between important destinations are currently relatively infrequent and slow, and in some cases do not exist at all. Connections to the centre of Oxford are more frequent, however those to other areas, especially major employment areas in the Oxford Eastern Arc are relatively poor.

Traffic congestion and lack of bus priority measures on busy, main connecting routes e.g.

Weak car demand management policies and measures: little or no strategic use of parking policies to manage demand and encourage sustainable modes of transport.

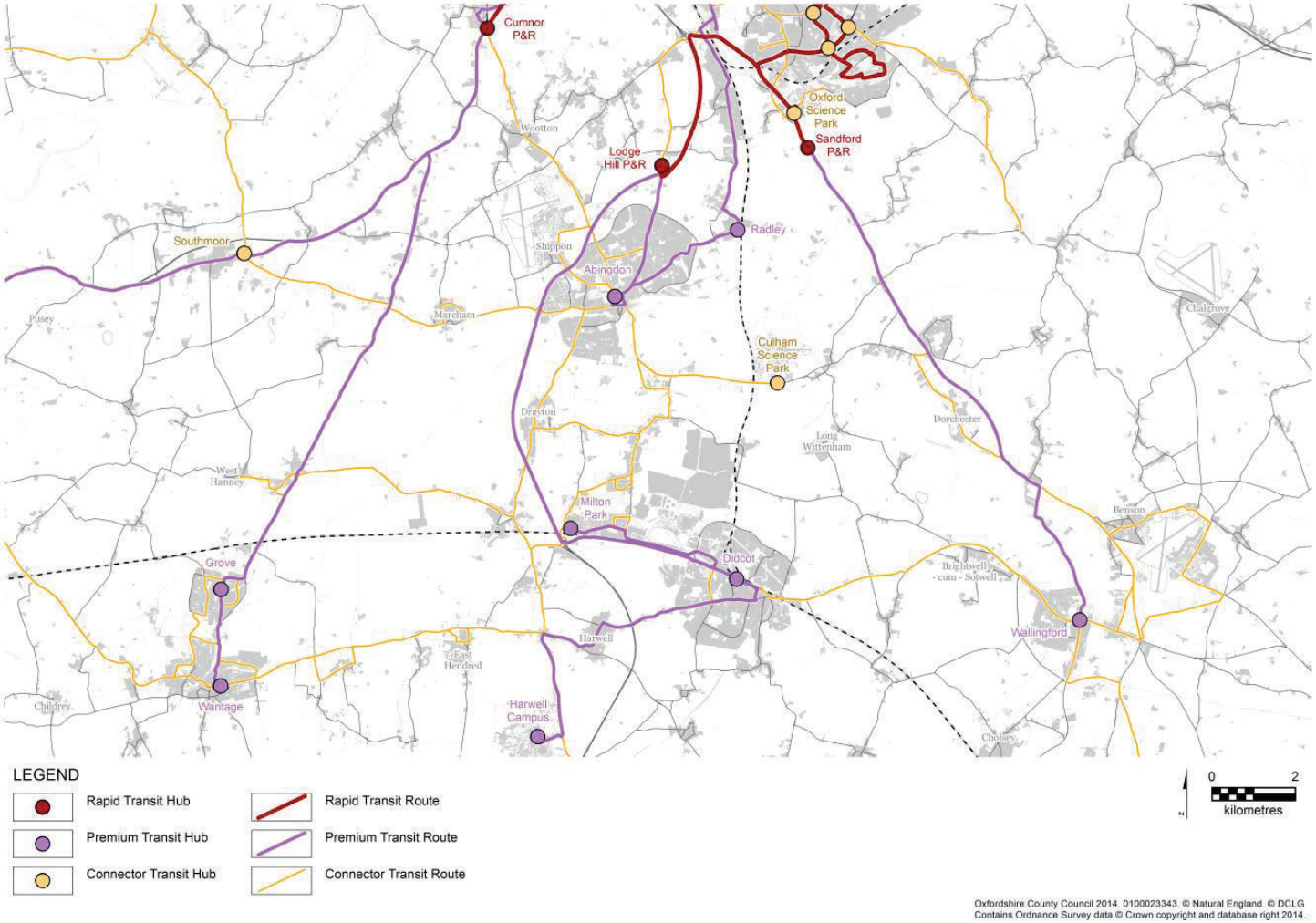
Limited public transport interchange and inadequate passenger facilities: With the exception of Didcot railway station there are currently few high quality interchange facilities enabling transfer between different bus services, between bus and rail, and park & ride.

Lack of integrated ticketing: There is currently no system of multi-operator and multi-modal ticketing for public transport services within the area.

Although it has not yet been possible to carry out detailed transport modeling, with the scale of housing and employment growth planned in the area it is clear that without decisive action to further transform public transport infrastructure and improve sustainable travel options, traffic conditions, particularly at peak hour, would be likely to deteriorate significantly. The bus strategy which follows is an important component of our overall, integrated approach to develop a sustainable transport system and travel choices.

Strategy

Oxfordshire County Council's vision of the strategic bus network in Science Vale and the surrounding area in the short to medium term is shown in figure xx. The strategic network and the categorisation of routes/services will be kept under constant review as circumstances change and new opportunities arise.



Bus Strategy Figure 13: Science Vale Bus Strategy

To support planned growth and cope with the predicted growth in travel demand it is vital to develop a much improved bus network within the area and, together with the railway network, connect it (through the 'Science Transit network') to other parts of Oxfordshire, especially the 'Knowledge Spine' and wider region. Other complementary measures to encourage and facilitate sustainable travel will also be important.

Improved rail services and travel opportunities, although an important part of the strategy, will only be able to cater for a small proportion of all transport needs generated within the area given the complex and dispersed nature of internal and external travel patterns. The bus network will therefore need to provide the backbone of the public transport system in the area and needs to be accorded a much higher priority in integrated land use-transport planning.

The Science Vale Transport Strategy will support the development of local and longer-distance bus services through a combination of *integrated transport strategies and policies*. Proposals are likely to evolve over time in response to changing circumstances and opportunities however by 2031 may consist of the following key elements:

A major new north-south transport corridor linking Didcot and the eastern side of Science Vale with east Oxford:

- A potential new road link and Thames River crossing with bus priority where required running between north Didcot t, past Culham Science Centre (connecting to the B4015 and the east side of Oxford).

Traffic management:

- Various measures to improve traffic flow and give greater priority to buses on strategically important local routes and at junctions (esp. on 'Premium bus routes' – see map and below)
- Bus priority measures where required on the Harwell - Didcot - Milton Park - Abingdon – Lodge Hill P&R – Oxford route linking the two main towns and most of the major employment sites in the area; this routes is seen as the 'spine' of the bus network in the area.

Development of new and enhanced commercial bus services, focusing on high quality, high frequency 'Premium' bus services on the following core north-south routes (see map):

- Harwell - Didcot - Milton Park - Abingdon – Lodge Hill P&R - Oxford
- Harwell - Lodge Hill P&R - Oxford
- Wantage - Grove - Oxford

Development of high quality commercial services on the following 'Connector' Bus Routes (with the following routes our initial priority - see map):

- Wantage - Grove - Abingdon
- Wantage - Grove - Milton Park
- Grove - Wantage - Harwell
- Wallingford – Didcot

New and better quality bus interchange facilities:

- Improved and expanded bus-rail interchange as part of a redeveloped Culham railway station.
- Potential development of a Park & Ride site and bus 'hub' at the Lodge Hill junction on the A34.
- Provision of a bus-rail interchange at the potential new railway station at Grove.
- Enhancement of bus and passenger waiting facilities in Didcot, Abingdon, Wantage, and Wallingford town centres to meet projected demand by 2031 (in accordance with bus interchange policy standards in section XX).
- Better facilities for integration between bus and cycling and walking including safe, accessible routes, street lighting, and cycle parking at key bus stops.

Other measures to enhance and promote bus travel:

- Extension of integrated multi-modal, multi-operator smart payment to area
- Enhanced real-time bus information, including innovative high-tech journey planning systems.
- Work with local bus operators through a Quality Bus Partnership (see section 2.7)
- Strong marketing/branding campaigns carried with our partners at major employment sites and local bus operators.
- Improvements in quality and comfort of buses and vehicle emission standards.

Integrated land use-transport planning measures (see section 2.8)

The present bus strategy emphasises and gives priority to north-south 'Premium' routes and services as this is where the greatest demand and modal potential currently lies. While we would also like to see Premium level bus services on key east-west routes within the area there is currently insufficient actual and potential demand for increased/improved services. Realistically our goal given present circumstances is to develop and maintain services at a 'Connector' standard (i.e. at least 2 buses per hour) on the priority routes mentioned. The key factor that might enable the achievement of Premium standard east-west bus routes would be additional residential and/or employment development on a sufficiently large scale in the Grove/Wantage area (perhaps linked with the development of a new railway station at Grove).

WITNEY & CARTERTON

Introduction

This Local Transport Plan contains separate area transport strategies for Witney and Carterton. In terms of strategic bus planning however it makes sense to look at the two largest towns in West Oxfordshire District together given their close proximity and the strong travel and bus connections between them.

Witney is the largest town in West Oxfordshire with a population in 2011 of about 27,500. It is the main commercial and service centre for the predominantly rural district of West Oxfordshire and possesses a relatively strong and diverse economy. In 2011 Witney was home to about 12,300 jobs.

Carterton, the second largest settlement with a population of just under 15,800 residents is a relatively modern town which has grown, in the main, to serve RAF Brize Norton. It has a small but varied economy, largely focused around the provision of local services, and has been identified as a growth area by West Oxfordshire District Council and Carterton Town Council with opportunities for both residential and employment growth. The two towns enjoy a frequent, high quality 'Premium' bus service to Oxford, however the range of other destinations in West Oxfordshire and in adjacent local authority areas that are served by bus is very limited and the services generally infrequent.

For Witney, current development proposals contained in the WODC Housing Consultation paper (July 2014) include 3,550 new homes by 2029, and provision for further economic

development. The draft Local Plan (2012) contains policies to maintain and enhance Witney's town centre shopping, leisure and cultural attractions. Current development proposals for Carterton include 2,450 new homes by 2029, strengthening the employment offer in the town and local area, and developing a more attractive and vibrant town centre. In combination these initiatives will present greater opportunities to work and live in the Carterton area, thus potentially reducing out-commuting and the need to travel. The Witney and Carterton Area Transport Strategies will be revised following the adoption, by West Oxfordshire District Council, of the Local Plan and Carterton Master Plan.

Both Witney and Carterton currently experience fairly high levels of out-commuting: in 2011 some 58% of Witney's and 62% of Carterton's employed residents worked outside their respective home towns. In- and out-commuting in Witney is strongly car based: about 81% of in-commuters and 78% of out-commuters travelled to work by car; the proportions commuting by bus were respectively 6.7% and 7.8%. Internally though, given the compactness and size of Witney a relatively high proportion of residents that work in the town currently walk and cycle to work. The level of bus commuting is however extremely low – less than 2% in 2011. The picture of commuting in Carterton is very similar to Witney's.

Despite the high rate of out-commuting, Witney has the greatest proportion of employees (i.e. 72%) living within 10km of their workplace of all the main Oxfordshire settlements. Many of these employees live in Carterton and a smaller proportion in surrounding villages. This suggests that there is strong latent potential for increased bus commuting between the two towns and to Witney in general, which is likely to increase significantly with the housing and employment growth planned.

The following factors present challenges to the further growth of bus use in - and to – Witney and Carterton and the surrounding area:

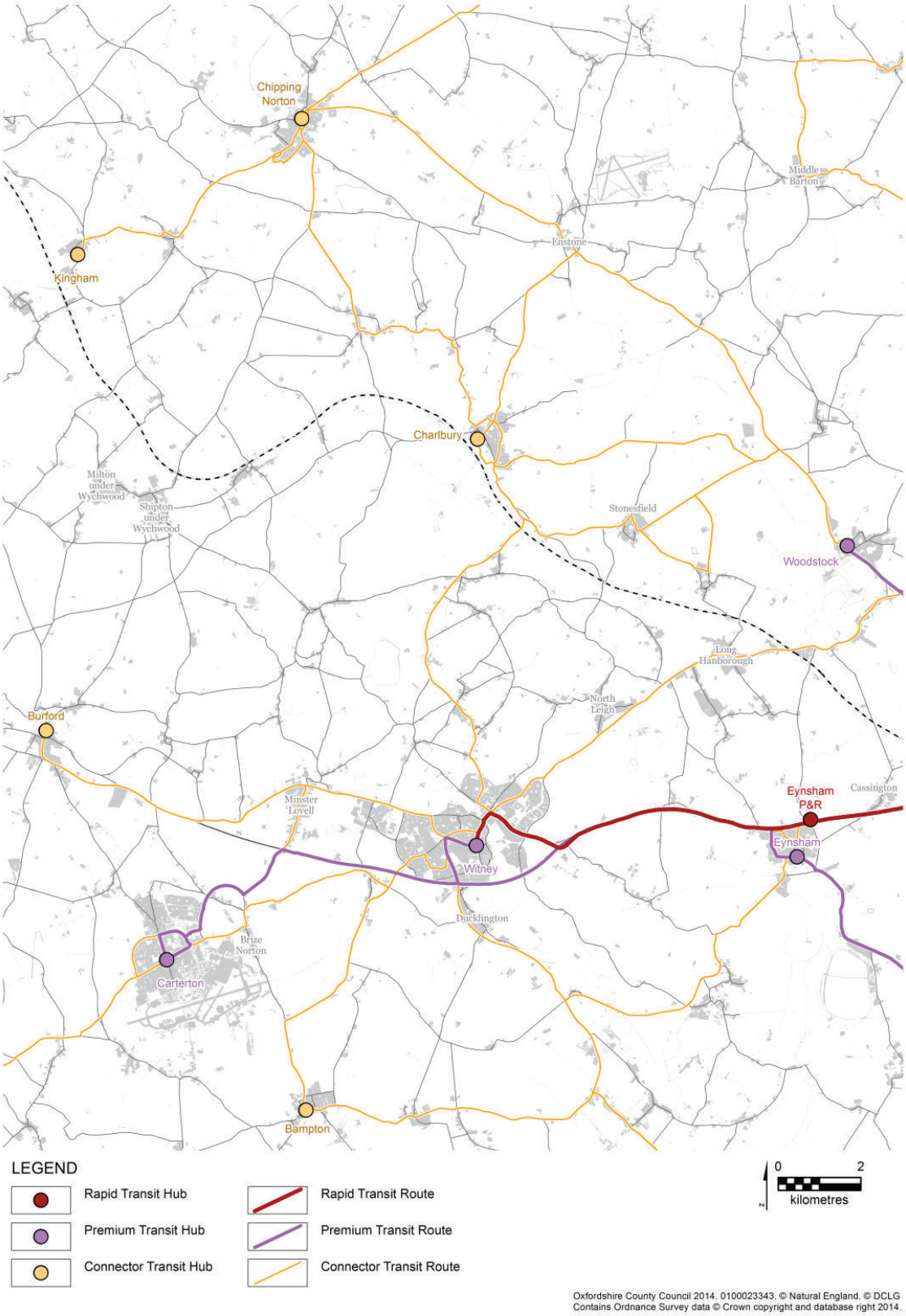
- The attractiveness of using the bus is restricted by bus frequency, journey time and journey time reliability.
- Acute traffic congestion and bus delays at Bridge Street in Witney, the only main route through the town, a major bottleneck for local journeys and through traffic from the northeast.
- A lack of bus priority measures at appropriate places within and on the edges of the towns.
- Chronic congestion on the A40 east of Witney.
- An inadequate existing local bus network linking residential areas to employment areas

- Away from the main bus routes, there are low levels of frequency and poor coverage of some residential and employment areas in the towns and settlements in the surrounding rural hinterland (to be addressed in the rural bus strategy – see section 2.5).

The following bus strategy is an important component of our overall, integrated approach to develop a sustainable transport system and travel choices for those people living and working in this area.

Strategy

Oxfordshire County Council's vision of the strategic bus network in Witney and Carterton and the surrounding area in the short to medium term is shown in figure xx. The strategic network and the categorisation of routes/services will be kept under constant review as circumstances change and new opportunities arise.



Bus Strategy Figure 14: Witney and Carterton area strategic bus network

The Witney and Carterton Area Transport Strategies will support the development of local and inter-urban bus services in these towns through a combination of integrated transport strategies and policies. Proposals are likely to evolve over time in response to changing circumstances and opportunities is likely to consist of the following elements:

Use developer funding to improve the frequency of bus services on the following routes including where necessary pump-prime funding to produce commercially viable bus services:

- Between Carterton, Witney and Oxford; including City Centre, Oxford rail station, hospitals and Oxford Brookes University;
- Between Woodstock and Burford via Hanborough rail station and Witney;
- Between Witney's main residential and employment areas;
- Between Carterton and Swindon.

Use developer funding to ensure that new and, where possible, existing residential areas are connected by adequate levels of bus service to the main employment areas/sites in the Witney and Carterton area.

Implement measures to reduce delays to bus services, including considering bus priority on the Premium Routes:

- through Witney particularly along Corn Street, Market Place, Bridge Street and Newland;
- joining the A40 eastbound at B4044 Shores Green;
- along the A40 corridor, east of Witney to Oxford;
- at any other identified congestion pinch points on designated 'Premium' bus routes;
- where there are identified needs arising from strategic development.

In the short term, make public transport from Carterton, and Witney to Oxford more attractive by using Oxfordshire's Local Growth fund allocation to develop and implement a scheme to provide a step change in public transport provision on the A40 Witney-Eynsham-Oxford corridor, by providing significant bus priority measures on the A40 between Eynsham and Wolvercote. This scheme would be complemented by enhanced bus services.

Other measures to enhance and promote bus travel:

- Enhance town centre bus interchange facilities
- Provide new bus stops to better serve employment sites such as RAF Brize Norton.
- Extension of integrated multi-modal, multi-operator smart payment to the area
- Enhance real-time bus information, including innovative advanced journey planning systems, working with Witney and Carterton Town Councils.
- Work with local bus operators through a Quality Bus Partnership (see section 2.7)
- Improved passenger facilities at bus stops, and access to these on foot and by bicycle, in accordance with standards set out in the bus interchange hierarchy.
- Improvements in the quality and comfort of buses and vehicle emission standards.

Integrated land use-transport planning measures (see section 2.8)

Connecting Oxfordshire 'Local Transport Plan 4' (LTP4): Strategic Environmental Assessment

Prepared for

Oxfordshire County Council

January 2015

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Figures

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Acronyms and Abbreviations

ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
BAP	Biodiversity Action Plan
CO_2	Carbon dioxide
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EA	Environment Agency
EIA	Environmental Impact Assessment
EU	European Union
HAMP	Highways Asset Management Plan
HER	Historic Environment Register
HRA	Habitat Regulations Assessment
LNR	Local Nature Reserve
LTP3	Local Transport Plan 3
NO_2	Nitrogen dioxide
NOx	Oxides of nitrogen
OCC	Oxfordshire County Council
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SPA	Special Protection Area
SFRA	Strategic Flood Risk Assessment
SSSI	Site of Special Scientific Interest
WFD	Water Framework Directive

Glossary

Area of Outstanding Natural Beauty	AONBs were formally designated under the National Parks and Access to the Countryside Act of 1949 to protect areas of the countryside of scenic quality that cannot be selected for National Park status.
Baseline Environment	The state of the environment against which to measure change from the plan
Biodiversity Action Plan	An agreed plan for a habitat or species, which forms part of the UK's commitment to biodiversity.
Conservation Area	These are areas, usually in towns and villages, where the character of buildings and other public spaces is of 'special architectural or historical interest'. Such areas are defined by the Local Planning Authorities and are afforded different development controls to open countryside and built up areas not under this definition.
Countryside Quality Counts	A project sponsored by Natural England in partnership with Defra and English Heritage to develop a national indicator on how the countryside is changing.
Ecosystem services	Benefits to people from resources and processes that are supplied by natural ecosystems. For example clean drinking water and processes such as the decomposition of waste.
Flood Risk	Flood risk is the product of the likelihood (or frequency) of flood events and their consequences (such as property loss or damage, physical harm or distress and social and economic disruption).

Green Infrastructure Local Nature Reserve	Areas set aside for multi-functional purposes of leisure, exercise, drainage, wildlife corridors, green space and play areas. Designated under the National Parks and Access to the Countryside Act 1949 by local authorities, for their locally important wildlife or geological features.
National Nature Reserve	Designated under the National Parks and Access to the Countryside Act 1949 or the Wildlife and Countryside Act 1981 (as amended) primarily for nature conservation.
Water Framework Directive	European Community Directive (2000/60/EC) on integrated river basin management. The WFD sets out environmental objectives for water status based on ecological and chemical measures, common monitoring and assessment strategies, arrangements for river basin administration and planning, and a programme of measures to meet the objectives.

1 Introduction

1.1 Background

CH2M HILL was commissioned by Oxfordshire County Council (OCC) to undertake a Strategic Environmental Assessment (SEA) of their emerging and fourth Local Transport Plan (LTP) - 'Connecting Oxfordshire: LTP4 2015 - 2031'. As a Local Transport Provider, OCC is required to produce a LTP under the Transport Act 2000 (as amended by the Local Transport Act 2008) in which are set out objectives and plans for developing transport in the county.

This Environmental Report sets out the results of a SEA carried out for the LTP4 in accordance with the requirements of the SEA Directive, which is transposed into English legislation by the Environmental Assessment of Plans and Programmes Regulations 2004 (the 'SEA Regulations'). The purpose of the SEA is to identify, evaluate and describe the likely significant effects on the environment of implementing the plan. The SEA is an iterative process, which informs the decision-making in plan development. It provides opportunities for the public to get involved in developing a plan that will meet important objectives for people and the environment.

This report is available for consultation, together with the draft LTP4, to download from https://www.oxfordshire.gov.uk/cms/content/local-transport-plan-ltp4 [to be confirmed] and in hard copy at the following office: -

Oxfordshire County Council
Speedwell House
Speedwell Street
Oxford
OX1 1NE

Comments should be provided by [date to be confirmed] either by email to our email address or by post to the above address.

This draft report has been formally issued to the SEA statutory consultees during this consultation period; namely the Environment Agency, Natural England and English Heritage.

1.2 Scope of Assessment and Study Area

The study area comprises the entire county of Oxfordshire (see Figure 1.1), which is located in the south east of England. The county comprises the districts of Oxford, Cherwell, Vale of White Horse, West Oxfordshire and South Oxfordshire.

Figure 1.1: Oxfordshire Study Area (OCC 2014c)

1.3 SEA

1.3.1 Introduction

SEA is the systematic appraisal of the potential environmental impacts of policies, plans, strategies and programmes, before they are approved. It ensures that any implications for the environment are fully and transparently considered before final decisions are taken.

The requirement to undertake statutory SEA stems from the EC Directive (2001/42/EC) 'on the assessment of the effects of certain plans and programmes on the environment', known as the 'SEA Directive', which came into force in 2004. The overall aim of the SEA Directive is to '*provide a high level of protection to the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development*'.

The Directive is implemented in England through the Environmental Assessment of Plans and Programmes Regulations (SI 1633 2004) – the SEA Regulations. The SEA Regulations provide a systematic method to consider likely effects on the environment and ensure environmental considerations are addressed as early as possible and in balance with technical and economic factors.

Table 1.1 sets out the principal stages in the SEA process and the steps that have been undertaken for the assessment of the Oxfordshire LTP4.

SECTION 1

Table 1.1: *SEA Stages and the SEA Process followed for Oxfordshire LTP4*

SEA Stage	What is involved	Oxfordshire LTP4 Development Milestones	SEA Milestones
A: Scoping	Setting the context and objectives, establishing the baseline and deciding on the scope	Development of high level goals and objectives for LTP4 and public consultation (20 June to 1 August 2014)	SEA Scoping Report prepared between April and May 2014. Scoping Report issued to statutory stakeholders on 11 April 2014 for five-week statutory consultation (April to May 2014).
B: Interim Assessment of LTP4 Option Development	Developing and refining LTP alternative options and assessing environmental effects in SEA matrices	Preferred strategies presented informally to County Council's Cabinet on 6 January 2015.	Interim report to Oxfordshire County Council including compatibility assessment and high level assessment of transport options – September 2014. Assessment of area and supporting strategies issued to Oxfordshire County Council to accompany presentation to Cabinet (December 2014)
C: Preparing the Environmental Report	To present the predicted environmental effects of the LTP, including alternatives, in a form suitable for public consultation and use by decision-makers.	Completion of draft LTP4 for consultation (January 2010) Approval of the draft LTP and SEA for public consultation by committee (27 January 2015).	Revision of assessment of preferred scenarios in light of further detail provided in local area strategies Preparation of this Environmental Report on the SEA of the draft LTP4 issued to Oxfordshire County Council in January 2015
D: Consulting	Consultation on the draft LTP and the Environmental Report	Consultation on draft LTP4 and Environmental Report planned for January-March 2015 Adoption of Oxfordshire LTP4 scheduled to take place by Summer 2015. Preparation of Post-adoption Environmental Statement to record how SEA was taken into account for LTP4.	
E: Monitoring	Monitor the significant effects of implementing the LTP or programme on the environment	Monitoring plan developed in December 2014	Monitoring regime to be developed and agreed by Oxfordshire County Council

1.3.2 Limitations and Difficulties Encountered

The SEA identified a number of areas where further information would either have been helpful to the SEA or will benefit the future assessment of environmental effects at the project level, including: -

- A project level desk based assessment of the historic and cultural heritage significance, which may be useful to better understand the archaeological potential of areas affected by transport improvements.
- Baseline environmental conditions have been defined using readily available information.

The assessment of the environmental effects of the LTP4 and the proposed mitigation measures are based on a number of assumptions, including: -

- The assessment is based on high level details of Area and Supporting Strategies. Detailed alignments and locations of transport improvements, and designs will be developed and assessed individually at the project level, which is likely to influence the extent and significance of environmental effects. Further environmental assessments at the project level will be required.

The following uncertainties need to be considered as project level schemes are taken forward: -

- Mitigation measures for all the potentially adverse strategic effects have been proposed. However, there are uncertainties around whether all adverse impacts may be mitigated against; there may therefore be residual adverse effects. The mitigation measures will also need to be reviewed and assessed as projects are taken forward.
- Other plans (e.g. Neighbourhood Plans) are currently being developed that have the potential for in-combination or cumulative impacts. Until the details of these plans are available, their in-combination impacts cannot be fully assessed.
- There remain uncertainties in securing funding from the Local Enterprise Partnerships and through planning obligations to implement all of the transport strategies identified, and therefore OCC will need to prepare strong business cases to support the investment in schemes that contribute to economic growth. Therefore uncertainties also remain with regard to the exact timescales for implementation.

1.4 Habitat Regulations Assessment

Due to the potential for the LTP4 to have significant effects on sites of international nature conservation importance (Natura 2000 sites – Special Areas of Conservation (SACs) (see Section 4.7.1) in Oxfordshire, a Habitats Regulations Assessment (HRA) Screening Report has been produced in parallel with this SEA.

The HRA is required under the EU Habitats Directive (EU Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora) and the Birds Directive (Council Directive 2009/147/EC) and the transposing U.K. Regulations (The Conservation of Habitats and Species Regulations, SI 2010 No. 490, as amended 2012).

The HRA has been integrated with the SEA process, with the findings used to guide the development of the alternative options to be considered as part of the SEA. The assessment considers possible impacts on Natura 2000 sites within and outside of the study area that could be affected by the recommendations of the plan.

1.5 Water Framework Directive (WFD)

The Water Framework Directive (WFD)[i] is a European Directive which provides a strategic planning process to manage, protect and improve the water environment. It came into force on 22 December 2000 and was transposed into UK law in 2003.

The Directive helps to protect and enhance the quality of surface freshwater (including lakes, streams and rivers), groundwater, groundwater dependant ecosystems, estuaries and coastal waters.

The WFD is aimed at protecting physical, chemical and biological water quality. Its purpose is to establish a framework for the protection of water bodies (including terrestrial ecosystems and wetlands directly dependent on them) which aims to:

- Prevent deterioration in the classification status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- Achieve at least good ecological and chemical status for all waters. Where this is not possible, good status should be achieved by set deadlines ranging from 2015 to 2027;
- Promote sustainable use of water as a natural resource;
- Conserve habitats and species that depend directly on water;
- Progressively reduce or phase out release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
- Contribute to mitigating the effects of floods and droughts[ii].

The LTP4 has been assessed for WFD compliance to ensure that the high level policies and strategy area/supporting area proposals comply with the WFD, and where possible, contribute to achieving WFD objectives. The WFD assessment has been incorporated into the SEA, and there is a SEA objective covering water quality, which incorporates underlying criteria to assess whether the LTP4 policies or proposals have the potential to impact on the water bodies or constrain any water bodies from achieving Good Ecological Status (GES) or Good Ecological Potential (GEP). The complete list of SEA objectives is provided in Chapter 5 of this report.

2 Consultation

2.1 Introduction

Effective stakeholder and public engagement is central to the development of the LTP4, in order to arrive at a plan that is acceptable to as many parties as possible and to engage those parties in the process. The objectives of consultation, in relation to the LTP4 are to:

- Meet regulatory requirements for consultation under the EU SEA Directive and Local Transport Act 2008; and
- Contribute to the success of the Plan and improve decision-making by;
    - Raising awareness of transport issues within Oxfordshire;
    - Informing stakeholders of the LTP4 development process and how decisions have been made;
    - Informing the development of the LTP4 by involving and working with stakeholders to understand their views, and ensure they are demonstrably considered;
    - Gathering information from stakeholders to inform the development of the plan.

Further consultation has been undertaken in relation to the LTP4, and the consultation responses received have been considered during the development of this SEA.

2.2 Scoping Consultation

During the scoping stage of the SEA in Spring 2014, existing information on Oxfordshire was collated, and a decision-making framework was established that could be used to evaluate the impact of the LTP4 on sensitive aspects of the environment.

A Scoping Report was prepared to document the scoping stage and identified issues that would require detailed consideration in this SEA ER. Table 2.1 summarises the issues scoped out of further assessment because they are not considered likely to be significant.

Table 2.1: Issues Scoped Out

Receptor	Scoped Out
Biodiversity (habitats and species)	The Strategy does not consider specific species and habitats not likely to be found in or adjacent to the study area, for example, marine / intertidal habitats or species
Soils	The interactions between the LTP4 and geology will be considered further at project EIA stage.
The Historic Environment	The SEA broadly defines the historic environment but does not determine the effects of the LTP4 options on every known feature of heritage interest. Similarly, the SEA does not consider individual sites where they relate to local finds or where they are not of demonstrably equivalent significance to scheduled assets, and therefore are unlikely to influence decision-making at the plan level. The effects on these features would be considered further at project EIA stage. The effects of the LTP4 implementation on as yet unidentified heritage resources will be considered further at project level assessment.
Landscape	Appropriate lighting levels associated with individual area or supporting strategies in the LTP4 will be considered during the project level implementation of the plan.

The Scoping Report was formally issued to statutory SEA consultees to request a scoping opinion, and was subject to a five week consultation from 11 April 2014 to 16 May 2014.

Comments were invited on the scope and content of the Scoping Report to ensure that our understanding of the study area, the key issues related to transport planning and the influences from external plans are adequately reflected in our objectives.

All comments received were recorded and acknowledged, and used to inform the development of the strategy. The consultation comments received are provided in Section 2.4.

2.3 Stakeholders

The following stakeholders have been engaged in the development of the LTP4 to contribute information, local knowledge and provide views on particular topic areas:

- Steering Group: [Richard J to confirm]
- Statutory Consultees: Environment Agency, Natural England and English Heritage
- Local Authorities: West Oxfordshire District Council, Cherwell District Council, Vale of White Horse District Council, South Oxfordshire District Council, county councils
- Transport Operators, Providers and Companies: National Express, Oxford Bus Company and Stagecoach Oxfordshire, David Pryor (Taxi Proprietor), London Oxford Airport, Highways Agency, Oxfordshire Cycling Network, Chiltern Railways, Rail Future, Road Haulage Association/Freight Transport Association
- Other Key Stakeholders: Chilterns Conservation Board, Highways Agency, North Wessex Downs AONB, Oxford Brookes, Age UK, councillors, OXTRAG, Oxfordshire Air Quality Network, University of Oxford, Campaign to Protect Rural England (CPRE), Oxford Civic Society, Oxford Preservation Trust, EZDG, parish councils
- Landowners
- Public

The outcome of consultation on the draft LTP4 and SEA will be documented within a post-adoption Statement of Environmental Particulars.

2.4 Consultee Comments

The consultation comments received during the development of the SEA are provided in Appendix A, together with a summary of how they have been addressed.

A summary of the key comments are provided below: -

- Welcome recognition given to AONBs within the county and need to consider the North Wessex Downs 2014 – 2019 AONB Management Plan, when published.
- Consider how the LTP4 can mitigate cumulative rural traffic impacts on designated landscapes from allocated housing in local plans and consider direct impacts of development within and adjacent to AONBs including loss of countryside
- Need to consider noise reduction measures for surfacing new highways
- Recommend referencing the National Heritage Protection Plan, National Heritage List, Heritage at Risk Register, a Historic Landscape Characterisation currently underway for Oxfordshire, Environmental Noise Directive areas and Transport Circular 2/2013
- Need to identify the National Planning Policy Framework's aims to conserve heritage assets
- Would be helpful to identify what changes in circumstances would be likely to place in the absence of the LTP4, with potential to affect the historic environment
- Amendments suggested to objectives, assessment criteria and scope of heritage issues
- Request for a stronger link between the baseline and sustainability issues
- Recommend that the flood section of the Scoping Report is expanded to consider flooding from groundwater, sewer and reservoir flooding and includes information from the Local Flood Risk Management Strategy when published.

- Need to identify the threats/opportunities that the plan presents to biodiversity including Oxford Meadows Special Area of Conservation (SAC)

Consultation on the draft LTP4 and this accompanying ER will be the most significant opportunity for stakeholders and the general public to influence the content and recommendations of the plan.

Following completion of the consultation period on [Richard J to confirm], OCC will consider all responses received regarding the draft LTP4 and its ER and amendments made to the plan, before publishing the final LTP4 and associated post-adoption Statement of Environmental Particulars.

3 Connecting Oxfordshire: LTP4

3.1 Introduction

LTPs are the key building blocks of the Government's integrated transport policy. Their introduction was announced in the Government's Transport White Paper 'A New Deal for Transport: Better for Everyone', published in July 1998. Local transport planning is a '*vital tool to help each local authority work with its stakeholders to strengthen its place-shaping role and its delivery of services to the community*' (Department for Transport 2009).

OCC is the transport authority for the whole of Oxfordshire, with responsibility for the county's adopted transport assets, including roads, pedestrian and cycle ways, bus shelters and bus stop infrastructure, signing and car parks. OCC is also responsible for ensuring that public transport in the county meets local needs. Motorways and trunk roads are the responsibility of the Highways Agency.

OCC has prepared three LTPs to date. The first LTP (LTP1) covered the period 2001 to 2006, the second, LTP2, covered the period 2006 to 2011. The third LTP (LTP3), which was amended in 2012, covered the period 2011 to 2030. The currently adopted LTP3 and associated SEA considered the potential impact of the strategy on various environmental receptors, and can be viewed online at www.oxfordshire.gov.uk/cms/content/local-transport-plan-2011-2030. The LTP3 has been reviewed annually since its adoption in 2011 and was amended in 2012.

Building on the earlier LTP3, the draft Oxfordshire LTP4 has now been prepared to set the policy and strategy for Oxfordshire's transport requirements, and OCC's approach to addressing the challenges of the transport system in Oxfordshire, in the period from 2015 – 2030. The draft LTP4 takes account of changes in housing and economic growth forecasts, new and emerging spatial planning, and places an increased focus on reducing demand for travel.

The LTP4 considers the demand and need for transport provision and management in Oxfordshire and the roles of individual transport modes and potential interventions. The LTP4 has been developed to help meet the following priority national goals, which are set out in the Department for Transport's 'Delivering a Sustainable Transport System.'

National Goals for LTPs (Department for Transport, 2008)

- to support national economic competitiveness and growth, by delivering reliable and efficient transport networks;
- to reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of tackling climate change;
- to **contribute to better safety, security and health** and longer life expectancy by reducing the risk of death, injury or illness arising from transport, and by promoting travel modes that are beneficial to health;
- to **promote** greater **equality of opportunity** for all citizens, with the desired outcome of achieving a fairer society; and
- to **improve quality of life** for transport users and non-transport users, **and** to promote a **healthy natural environment**.

3.2 LTP4 Objectives

The objectives for the draft LTP4 are: -

Theme 1: Supporting growth and economic vitality (Goal 1)

1. Maintain and improve transport connections to support economic growth and vitality across the county.
2. Make most effective use of all available transport capacity through innovative management of the network;
3. Increase journey time reliability and minimise end-to-end public transport journey times on main routes
4. Develop a high quality, resilient integrated transport system, that is attractive to customers and generates inward investment;

Theme 2: Cutting carbon (Goal 2)

5. Minimise the need to travel;
6. Reduce the proportion of journeys made by private car by making the use of public transport, walking and cycling more attractive
7. Influence the location of development to maximise the use and value of existing and planned strategic transport investment;
8. Reduce per capita carbon emissions from transport in Oxfordshire in line with UK government targets

Theme 3: Improving quality of life (Goals 3, 4 and 5)

9. Mitigate and wherever possible, enhance the impacts of transport on the local built and natural environment
10. Improve public health and well-being by increasing levels of walking and cycling, reducing transport emissions, reducing casualties, and enabling inclusive access to jobs, education, training and services.

The LTP4 objectives helped to set the long term aspirations of the Plan and guide the prioritisation of schemes that put forward in the LTP4.

3.3 Development of LTP4 Policies and Area Strategies

LTP4 policies were developed by OCC to support the themes and objectives identified in Section 3.2.

Area Strategies have also been developed by OCC as part of the LTP4, for those parts of the county that are due to experience significant housing and/or employment growth, and to reflect the emerging Local Plans. The Area Strategies describe how these different localities or key centres to Oxfordshire, will meet local transport needs in the county. These Area Strategies comprise: -

- Oxford
- Science Vale (an area encompassing Wantage and Grove, Abingdon, Didcot, Culham Science Centre, Milton Park and Harwell Oxford Campus)
- Bicester
- Banbury
- Witney
- Carterton

These Area Strategies, which are presented in detail in the draft LTP4, set a clear strategy for transport to guide decision-making and support future funding arrangements.
Other strategies that have been developed to support the Area Strategies are: -

- Science Transit Strategy
- Bus Strategy
- Rail Strategy
- Cycling Strategy
- Freight Strategy
- A420 Strategy
- Highways Asset Management Plan
- Green Infrastructure Strategy – not available at the time of writing this report

The likely environmental effects of alternative LTP4 policies, Area Strategies and Supporting Strategies were assessed through a staged and systematic approach, which was informed and influenced by key stakeholders.

Assessment of the environmental constraints and opportunities associated with the LTP4 was then considered over three epochs: '2015 – 2020', '2021 – 2031' and 'beyond 2031 (post LTP4)'.

In identifying the draft LTP4, the assessment considered whether the policies, Area and Supporting Strategies would: -

- Meet or support the SEA objectives and the assessment criteria previously defined
- Meet environmental legislative requirements – notably the Habitats and Species Conservation Regulations 2010 (as amended) and the Water Environment (WFD) (England and Wales) Regulations 2003
- Address the objectives of the LTP4
- Be economically feasible.

3.4 The Draft LTP4

The LTP4 policies are shown in Table 3.1. These policies will be applied across the county through:

- OCC's key role in integrated strategic land use and transport planning for the county
- Involvement in the development of Local Plans and Neighbourhood Plans
- OCC's response to strategic infrastructure and development proposals
- OCC's response to planning applications
- The development of Area Strategies for areas planned for growth
- The development of Supporting Strategies
- OCC's work with partners to develop transport solutions; and
- OCC's decision making process for all aspects of transport for which they have control.

Table 3.1: Policies of the LTP4

LTP 4 Policy	Policy Description
1.	Oxfordshire County Council will work to ensure that the transport network supports sustainable economic and housing growth in the county, whilst protecting its environmental and heritage assets, and supporting the health and wellbeing of its residents.
2.	Oxfordshire County Council will work in partnership with the Local Enterprise Partnership and developers to meet the objectives of the plan and seek external funding to support the delivery of transport infrastructure priorities as set out in the SEP, City Deal and Local Investment Plan.
3.	Oxfordshire County Council will encourage the use of modes of travel associated with healthy and active lifestyles and will improve built and green infrastructure to support greater levels of walking and cycling.
4.	Oxfordshire County Council will prioritise the needs of different types of users in developing transport schemes or considering development proposals, taking into account road classification and function/purpose, and the need to make efficient use of transport network capacity.

LTP 4 Policy	Policy Description
5.	Oxfordshire County Council will consult from an early stage in the development of schemes and initiatives so that the needs of individuals, communities and all groups sharing a protected characteristic under the Equalities Act 2010 are considered and, where appropriate, acted upon.
6.	Oxfordshire County Council will target new investment and maintain transport infrastructure to minimise long-term costs.
7.	Oxfordshire County Council will publish and keep updated its policy on prioritisation of maintenance activity: this will be set out in the Highways Asset Management Plan.
8.	Oxfordshire County Council will manage and, where appropriate, improve and extend the county's road network to reduce congestion and minimise disruption and delays, prioritising strategic routes.
9.	Oxfordshire county Council will support the use of a wide range of data and information technology to assist in managing the network and influencing travel behaviour, and work with partners to ensure that travel information is timely, accurate and easily accessible in appropriate formats for different user groups.
10.	Oxfordshire County Council will manage the parking under its control and work with district councils to ensure that overall parking provision and controls support the objectives of local communities and this Plan.
11.	Oxfordshire County Council will support initiatives to increase the proportion of freight carried by rail, and will identify suitable routes for freight movement by road and, where appropriate, implement measures to support the use of these routes, balancing the needs of businesses with protection of the local environment and maintenance of the highway network.
12.	Oxfordshire County Council will identify those parts of the highway network where significant numbers of accidents occur over a monitoring period of five years, and propose engineering solutions where these would be effective in helping to prevent accidents.
13.	Oxfordshire County Council will work with partners to support road safety campaigns and educational programmes aimed at encouraging responsible road use and reducing road accident casualties, and will keep speed limits under review, including giving consideration to the introduction of 20mph speed limits and zones.
14.	Oxfordshire County Council will carry out targeted safety improvements on walking and cycling routes to school, to encourage active travel and reduce pressure on school bus transport.
15.	Oxfordshire County Council will work with partners and particular sections of the community to identify how access to employment, education, training and services can be improved, particularly for those with disabilities or special needs, or who otherwise have difficulties in walking, cycling or using public transport, or for people without access to a car.
16.	Oxfordshire County Council will support the development and use of community transport to meet local accessibility needs.
17.	Oxfordshire County Council will promote the use of low carbon forms of transport, including electric vehicles and associated infrastructure where appropriate
18.	Oxfordshire County Council will work to reduce the carbon footprint of transport assets and operation where economically viable, taking into account energy consumption and the use of recycled materials.
19.	Oxfordshire County Council will seek to ensure that the location, layout and design of new developments minimise the need for travel, encourage walking and cycling for local journeys and leisure, allow the developments to be served by high quality public transport and will support the development of travel plans to achieve this.
20.	Oxfordshire County Council will • Secure transport improvements to mitigate the cumulative adverse transport impacts from new developments in the locality and/or wider area, through financial contributions from developers or direct works carried out by developers • Identify the requirement for passenger transport services to serve the development and seek developer funding for these to be provided until they become commercially viable, • secure works to achieve suitable access to and mitigate against the impact of new developments in the immediate area, generally through direct works carried out by the developer

LTP 4 Policy	Policy Description
	• require that all infrastructure associated with the developments is provided to appropriate design standards and to appropriate timescales • set local routeing agreements where appropriate to protect environmentally sensitive locations from traffic generated by new developments • seek support towards the long term operation and maintenance of facilities, services and selected highway infrastructure from appropriate developments, normally through the payment of commuted sums ensure that developers promote sustainable travel for journeys associated with the new development
21.	Oxfordshire County Council will support the development of air travel services and facilities that it considers necessary to support economic growth objectives for Oxfordshire.
22.	Oxfordshire County Council will record, maintain, improve and waymark the public rights of way network so that all users, including cyclists and horse riders, are able to understand and enjoy their rights in a safe and responsible way.
23.	Oxfordshire County Council will support appropriate opportunities for improving towpaths along the waterways network, for local journeys and leisure, where it would not harm the ecological value of the area or waterway network.
24.	Oxfordshire County Council will work with operators and other partners to enhance the network of high quality, integrated public transport services, interchanges, and supporting infrastructure, and will support the development of quality Bus Partnerships and Rail Partnerships, where appropriate.
25.	Oxfordshire County Council will work with the rail industry to enhance the rail network in Oxfordshire and connections to it, where this supports the county's objectives for economic growth.
26.	Oxfordshire County Council will work with partners towards the introduction and use of smart, integrated ticketing solutions for a range of transport services.
27.	Oxfordshire County Council will work to reduce negative environmental impacts of the operation of the transport network, and where possible provide environmental improvements, particularly in Areas of Outstanding Natural Beauty, Conservation Areas and other areas of high environmental importance.
28.	Oxfordshire County Council will work with partners to improve public spaces and de-clutter the street environment.
29.	Oxfordshire County Council will classify and number the roads in its control to direct traffic, particularly lorry traffic, onto the most suitable roads as far as is practicable.
30.	Oxfordshire County Council will help reduce the need to travel by seeking further opportunities to improve internet and mobile connectivity across Oxfordshire and supporting other initiatives that enable people to work at or close to home, and will work in partnership with service delivery organisations to influence the location of key services where possible
31.	Oxfordshire County Council will support measures that make more efficient use of transport network capacity by reducing the proportion of single occupancy car journeys and encouraging a greater proportion of journeys to be made on foot, by bicycle, or by public transport.
32.	Oxfordshire County Council will continue to provide support for bus services it considers socially necessary, where these cannot be provided commercially, and will develop a strategy for determining where this is applicable.
33.	Oxfordshire County Council will work with district councils to develop and implement transport interventions to support Air Quality Action Plans by reducing harmful emissions from vehicles where feasible, giving priority to measures which also contribute to other transport objectives.
34.	Oxfordshire County Council will support the development of Neighbourhood Plans (as outlined in its published Toolkit) and seek to influence neighbourhood plans with a view to ensuring consistency with the Local Transport Plan. Where a Neighbourhood Plan has been adopted, the Council will seek funding to secure the Plan's transport improvements from local developments and the Community Infrastructure Levy as appropriate.

LTP 4 Policy	Policy Description
35.	Oxfordshire County Council will support the research, development and use of new technologies and initiatives that improve access to jobs and services, taking into account their environmental impact and fit with the other objectives of LTP4.

3.5 Relationship with other relevant plans, policies and programmes

To ensure integrated success of transport and development planning objectives, the LTP4 must complement the requirements of the Core Strategies and other planning documents forming the Local Development Frameworks (LDFs) of the following District Authorities within Oxfordshire:

- Cherwell District Council;
- Oxford City Council;
- South Oxfordshire District Council;
- Vale of White Horse District Council; and
- West Oxfordshire District Council.

While needing to comply with national, regional and local policies, plans and programmes, the LTP4 will also influence, and be influenced by other statutory and non-statutory plans, strategies, policies and on-going studies. Of particular relevance are the following regional and local plans/ strategies, which have been considered during the development of the SEA: -

- Oxfordshire 2030: A partnership plan for improving quality of life in Oxfordshire;
- A Thriving Oxfordshire – Draft Corporate Plan 2014/15 – 2017/18 (OCC 2014a)
- Oxfordshire Strategic Economic Plan (2014b) (Oxfordshire Local Enterprise Partnership);
- Green Infrastructure Framework for Oxfordshire – emerging (OCC);
- Economic Development Strategy Oxfordshire 2006-2016 (OCC); and
- Oxfordshire Local Flood Risk Management Strategy – emerging.

Appendix B: 'Plans, Policies and Programmes Review (PPP Review) contains a list and summary description of the legislative and policy framework documents that are most relevant to the LTP4.

The SEA has been fully integrated into the development of the LTP4 to ensure that environmental considerations are taken into account and show how the SEA has influenced the LTP process. The Environmental Report has identified opportunities for environmental enhancement as well as mitigating any potentially adverse effects of the LTP4.

4 Baseline Environment

4.1 Population

4.1.1 Local Population

Oxfordshire is the second most rural county in the south-east of England, with a total population of approximately 661,000 people in 2012 (OCC 2014a). Approximately 50% of the population live in settlements of 10,000 or less (OCC 2013c), and rural isolation is an issue in some areas outside the major towns and cities. Connections between people and places are therefore an important consideration of the LTP, which public transport can help to facilitate.

Deprivation is generally low throughout the county. However, there are some highly deprived areas and transport services to these areas will require consideration in the developing LTP4. The county *'contains relatively high levels of deprivation on the geographic barriers index, which assesses the average road distance to key services such as hospitals and schools. 139 of the 404 neighbourhoods in the county are among the 20% most deprived nationwide in this respect. The majority of these areas are in Cherwell, South Oxfordshire, Vale of White Horse, and West Oxfordshire and are predominantly rural'* (OCC 2014b).

The county continues to have a high proportion of population aged over 65, with the number of older people increasing at greater than twice the overall population growth rate (18%).

In the ten years between the 2001 and 2011 census, population growth in Oxfordshire (8%) was well above the average for the south east region (6.7%) and there is increasing inward migration. The county supports approximately 29,000 businesses (OCC 2014a), predominantly in the tourism industry. It is estimated that the county's visitor and cultural economy contributes approximately £3.1b to the local economy (OCC 2014a).

Continued population growth is expected and will be greatest in urban areas, in particular Science Vale (including Didcot, Wantage and Grove), Oxford, Bicester, and Witney (OCC, 2012). Continued population growth in the rural areas is also anticipated due to the increasing life expectancy of the existing population (OCC 2014b). This increasing population increases demands on housing and the existing transport infrastructure, which requires improved connectivity and infrastructure to match new travel patterns.

Areas of proposed growth potential in population, employment and housing (identified as the 'Oxfordshire Knowledge Spine') at Bicester, Oxford City and Science Vale Oxford will require wider local and national transport links (OCC 2014a).

Oxfordshire has a higher number of cars per household than the national average, resulting in an increasing volume of traffic on the roads and county-wide. However, Oxford city has a higher percentage of households with no cars than elsewhere in the county. The high use of private cars in Oxfordshire overall, causes significant emissions of greenhouse gases and noise. It also contributes to community severance and can create unsafe conditions for pedestrians and cyclists, reducing rates of physical activity through these forms of travel (see Section 4.2.2).

4.1.2 Recreation

Oxfordshire's countryside access network is a significant asset to the county, comprising approximately 2,500 miles of public rights of ways (Lepus 2014), National Trails, cycle trails (including parts of the National Cycle Network), areas of common land, together with nature reserves and green spaces for informal recreation.

These areas not only attract visitors to the area, but also provide opportunities for healthier lifestyles for those living and working in Oxfordshire.

Improvements to this established network and the county's Green Infrastructure (GI) have the potential to reduce fossil fuel consumption by providing corridors for walking and cycling. These efficient and reliable modes of transport for shorter journeys can be integrated into healthy daily routines, reducing private vehicle usage and associated air pollution. An increased uptake of walking and cycling can also improve general wellbeing, health and fitness for all ages, as well as help reduce obesity levels (see Section 4.3 'Human Health').

The LTP4 will seek to maximise opportunities to natural green space, making better use of cycle trails and footpaths, and the countryside, by promoting the creation of, improvements to and extensions of the existing countryside access network and GI. Such opportunities, which should consider personal mobility within the county and the 'safe provision' of cycle/walking routes, will help improve 'quality of life'.

Population: Likely evolution of the baseline without LTP4

The population across the region has more than doubled in size since the 1940s and this increase is set to continue. The proportion of people of pension age is expected to rise in line with the general aging trend of the UK population.

Road transport is expected to increase in the county and the reliance on cars as the main mode of transport for commuters will continue unless strategic action is taken. Appropriate spatial planning can help reduce the population's need for journeys.

Traffic increases are likely to cause further community severance increasing isolation and safety fears/accidents among pedestrians and cyclists.

Ongoing development for new housing will increase settlement size, which will exert pressure on the floodplain and transport infrastructure. Increasing development within Oxfordshire will place additional pressure on open spaces, GI and recreational land.

4.2 Human Health

Health considerations have been integrated into the SEA process through the production of a Health Impact Assessment (HIA), which considers the impacts of the LTP4 on relevant health and well-being issues within the county including physical activity, obesity and environmental inequality linked to transport planning, and the distribution of those effects within the population. The HIA, which is provided in Appendix C, examines transport to work and physical activity (walking/cycling opportunities (see Section 4.2.2), community severance and barriers to active travel, road injuries and deaths, air pollution, noise, mental health and well-being, and inequalities and vulnerable groups (e.g. urban/rural areas, deprived communities, ageing population and increasing disability).

The health of those residing in Oxfordshire is generally good and better than the England average (2013c). Only 3.5% of the population declare themselves as being in bad or very bad health, with the largest proportion of these residing in urban areas. Of the eight Output Areas (small census statistic areas) with the highest proportion of residents declaring themselves in bad or very bad health, four are in Oxford City, three in Banbury, and one at Salford, near Chipping Norton (ONS, 2011).

Life expectancy in the county for a person born in 2013 was above the national average at 80.3 years for males and 84.1 years for females (Public Heath Observatories 2013); although there are variations between districts.

Although levels of physical activity are comparable in the south-east to the rest of England, and estimated levels of physical activity and obesity are better than the England average; the Oxfordshire Partnership notes that obesity levels are rising across localities and age groups. Additionally, the Joint Strategic Needs Assessment (OCC 2014b) identifies the increase in 'unhealthy' lifestyles, which leads to preventable disease, as a specific challenge. Promoting healthy lifestyles through physical activity is an effective way of reducing the risk of chronic disease and premature death (Oxfordshire Clinical Commissioning Group et al 2013), and the LTP4 can directly promote this.

The rate of road injuries and deaths is worse in Oxfordshire than the England average; however the total number of road accidents in Oxfordshire has fallen from 3,077 in 2003 to 2,304 in 2012 (OCC, 2013b).

A study combining UK and EU emissions data with models of weather and the ways in which chemicals disperse suggested that 'pollution from overall UK combustion emissions causes approximately 13,000 premature deaths a year, with road transport being the biggest source'. A further 6,000 deaths are estimated to be due to European Union emissions produced outside the UK (NHS 2012). Despite considerable improvements in air quality in the last few decades, air pollution (see Section 4.5) from road transport (in addition to combustion sources) continues to pose respiratory and inflammatory health risks to people. Elevated levels and/or long term exposure to air pollution can lead to a range of serious symptoms affecting human health. Many areas in the UK still fail to meet the health based national air quality objectives and European limit values, particularly for particles and nitrogen dioxide (www.environmental-protection.org.uk/committees/air-quality/air-pollution-and-transport/car-pollution/).

Human Health: Likely evolution of the baseline without LTP4

The numbers of serious or fatal road accidents in the county has been decreasing. However, without a road safety strategy within and beyond the county, some roads may become more dangerous, for example through inappropriate use.

Obesity, lack of exercise and unhealthy lifestyles are problems that face the county and are likely to worsen across the country. Health issues related to low physical activity and obesity are likely to reduce the use of alternative modes of transport rather than the car, compounding traffic growth.

Health issues related to air pollution are likely to increase. The Climate Change Risk Assessment for the 'health' sector (Defra 2012) shows the principal impacts of climate change on human health are expected to come from changing temperatures, ground-level ozone levels and sunlight.

Ongoing development for new housing will increase settlement size, which will exert pressure on the floodplain and transport infrastructure. Increasing development within Oxfordshire will place additional pressure on open spaces, GI and recreational land.

4.3 Noise

The National Noise Incidence Survey 2000 indicated that 55% (+/-3%) of the population in England and Wales live in dwellings that are exposed to noise levels above the day-time threshold recommended by the World Health Organisation. It also indicates that 68% (+/- 3%) of the population live in dwellings exposed to noise levels above the night-time threshold (Grimwood et al, 2000).

The same survey also indicated that an estimated 87% of the population are exposed to general road traffic noise in their homes, an estimated 2% of the population were exposed to noise in their homes from motorways and 12% are exposed to noise from railways (Building Research Institute, 2001).

In 2007/2008 there were 139 complaints per million people in the UK relating to traffic noise (Chartered Institute for Environmental Health, 2008).

The Campaign to Protect Rural England (CPRE) 'Intrusion mapping' shows that in 2007, an estimated 59% of Oxfordshire was disturbed by noise and visual intrusion from major infrastructure such as motorways and A-roads, urban areas and airports factors, compared with almost 70% in the wider South East region (CPRE, 2007).

Significant traffic noise has been considered in the assessment of the LTP4 as it can interfere with the enjoyment of those working, visiting and residing in the county.

Noise: Likely evolution of the baseline without LTP4

The increasing pressure for development and new infrastructure is likely to result in continued traffic growth, which can result in greater proportions of the population being disturbed by transport-related noise. However noise is usually a local issue and can often be mitigated with careful design of infrastructure and abatement technologies.

The overall evolution without the plan is therefore uncertain.

4.4 Air Quality

Air quality across Oxfordshire is generally good but there are a number of areas in the county where elevated levels of pollutants have been detected. Local Air Quality Management within the County is the responsibility of each district council who are required to provide routine reports on air quality in each district in relation to air quality standards and objectives, as defined in the UK Air Quality Strategy. Exceedances of air quality objectives require declaration of Air Quality Management Areas (AQMAs), along with Action Plans produced in conjunction with OCC as the transport authority.

There are currently nine declared Air Quality Management Areas (AQMAs) in Oxfordshire (Abingdon, Banbury, Botley, Oxford City, Chipping Norton, Henley, Wallingford, Watlington and Witney). In addition a number of other sites are currently being investigated in detail to see if further declarations are required, as shown on Figure 4.1.

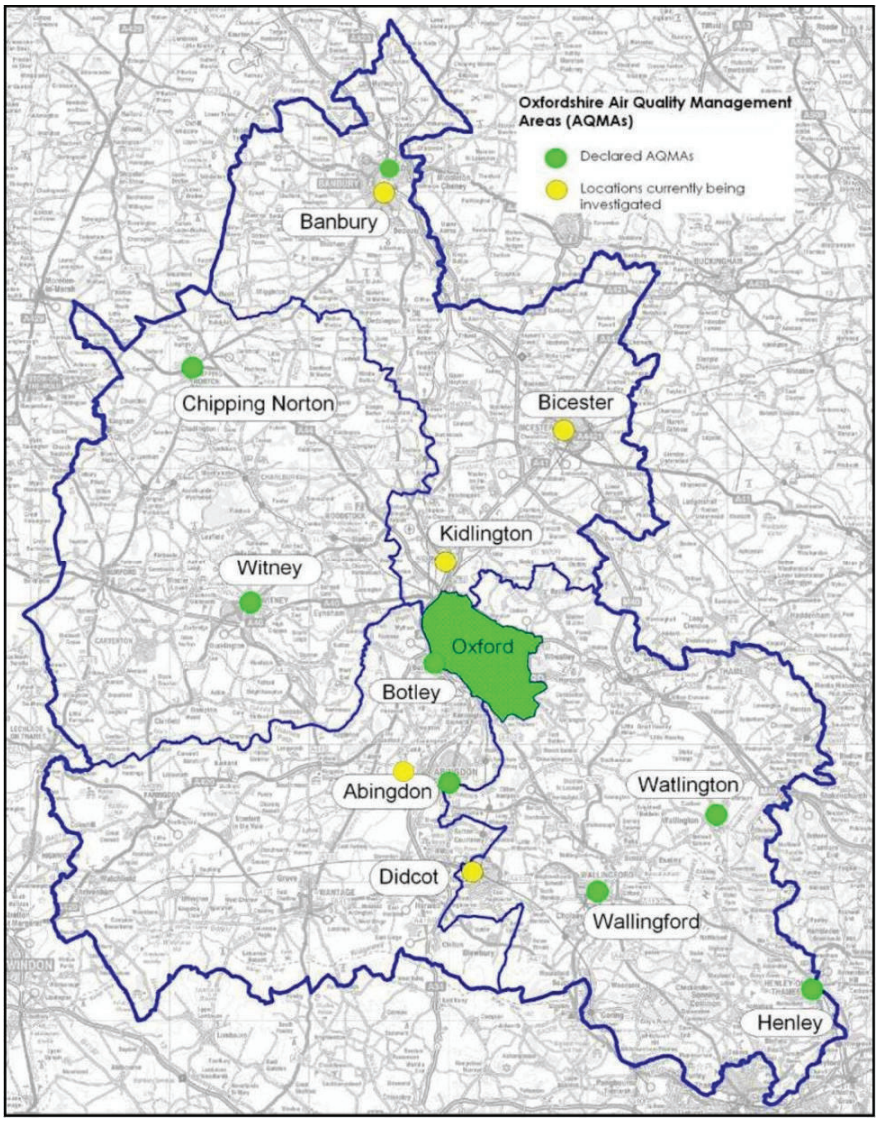
Air pollution in Oxfordshire is monitored across the county including three sites within the UK Automatic Urban and Rural Network; one in Oxford city centre, one south of Oxford city and the other in Harwell in the Vale of White Horse. A further range of automatic and non-automatic monitoring is carried out in order to determine compliance with air quality objectives. Monitoring by Cherwell, Vale of White Horse and South Oxfordshire district councils considered that additional AQMAs may need to be declared in the future, in Bicester and Kidlington (Cherwell District Council, 2014), Marcham and Didcot.

In all the AQMAs in Oxfordshire, the declaration has been made on the basis of the annual average level (and also in some cases such as Cherwell, the hourly mean) of nitrogen dioxide [NO_2]. Oxford City Council is also currently investigating whether a further declaration is required on the basis of hourly mean concentrations of nitrogen dioxide in Oxford city centre.

The trend for a reduction in emissions per vehicle as the vehicle stock is replaced by newer vehicles meeting higher emissions standards has not taken place as expected. The relative growth in numbers of newer diesel vehicles with emission control technology, have given rise to higher direct emissions of nitrogen dioxide into vehicle exhausts. The result has been detected as some increases in localised pollution levels in urban centres

and a failure of pollution levels to decrease at the rate predicted. Any downward trend can be offset locally if traffic growth exceeds reductions due to improvements in technology; overall emissions increases are even more likely if traffic growth results in increased congestion. However, traffic pollution has become worse and is now a major threat to lung health and a contributor to climate impacts.

Figure 4.1: Air Quality Management Areas in Oxfordshire (OCC 2011)



The most troublesome pollutants are:

- oxides of nitrogen;
- particles;
- volatile organic compounds; and
- carbon monoxide.

In comparison to many other countries, air pollution levels in the UK are low, although in parts of major cities, including parts of central Oxford, particularly near busy roads, they are high enough to be of concern. The local pollution picture reflects a complex mixture of sources and distribution of pollutants. They contribute not only to local air pollution impacts, but also to increasing ground levels of ozone, adding to local and global climate

impacts. Predictions of future emissions have to include consideration of future traffic levels and composition, and the manner of future traffic flow through an area.

Due to the long distance nature of some air pollutants, any potential changes in air quality that result from implementing the Oxfordshire LTP4 are not likely to be confined to Oxfordshire alone. Consequently, the SEA considers cross-boundary effects, where possible.

Air Quality: Likely evolution of the baseline without LTP4

Whilst the vehicle fleet in general is getting cleaner with improved emissions standards, the projected growth for Oxfordshire is likely to lead to increased traffic volumes and greater traffic congestion unless strategic action is undertaken.

This in turn could lead to more AQMAs being declared as the increases in traffic and congestion outweigh improvements in emissions standards.

4.5 Climatic Factors

4.5.1 Greenhouse Gas Emissions

Whilst national data shows an overall fall in greenhouse gas emissions in the UK since 1990, UK emissions of carbon dioxide (CO_2) from road transport have increased, against the trend in emissions from other sectors.

In 2009, CO_2 emissions in Oxfordshire were estimated to be 8.1tonnes of CO_2 per capita (tCO_2), declining from $9tCO_2$ per capita in 2007; however this remained higher than the national and regional average ($7.4tCO_2$ and $6.9tCO_2$ respectively) (DECC, 2009).

In 2011, CO_2 emissions in Oxfordshire were estimated to have reduced further to $6.8tCO_2$. Regional data released in 2011 also indicated that domestic sources accounted for 31% of the county's total CO_2 emissions and road transport for 29% (DECC, 2011). Traffic and associated congestion continues to increase in Oxfordshire, which will have implications for county emissions of CO_2. The LTP4 considers ways in which carbon emissions can be reduced in the county and alternative 'cleaner' modes of transport.

4.5.2 Climate Change

There is increasing concern that climate change is accelerating towards higher temperatures. It is now generally accepted that global warming is taking place, with global mean air temperatures having increased by 0.3 to 0.6^0C during the 20^{th} century and having risen at about 0.2^0C/decade over the past 25 years (UKCIP, 2009). Temperatures for Central England have seen a more rapid rise than that of the global average land-surface temperature over the same period, and considerably faster than that of the global mean temperature.

The recent Intergovernmental Panel on Climate Change (IPCC) report (IPCC 2013) indicates that more than half the increase in global surface temperatures from 1951 to 2010 is attributable to human activities, which underlies the role of fossil fuel burning in climate change.

The UK Climate Impacts Programme (UKCIP) projects that the UK climate is likely to experience hotter/drier summers, warmer/wetter winters and more weather extremes, which will increase pressure on transport assets within Oxfordshire. Studies in the South East by UKCIP indicate that by 2080 (under a medium emissions scenario), there will be an increase in winter mean temperature of 3ºC, an increase in summer mean temperature of 3.9^0C, an increase in winter mean precipitation by 22% and a reduction in summer mean precipitation of 22%.

Climatic Factors: Likely evolution of the baseline without LTP4

Greenhouse gas emissions are currently growing, however government and international targets indicate significant cuts in these emissions by 2020.

Without action, the contribution of transport to CO_2 emissions (and associated climate change) will continue to rise.

It is predicted that Oxfordshire and the South East will experience warmer, drier summers and warmer, wetter winters.

Extreme weather events such as droughts and flooding are predicted to become more frequent with increasing demands on maintenance of transport infrastructure such as repairs to structures, reinforcements to embankments and additional drainage requirements.

4.6 Biodiversity, Flora and Fauna

4.6.1 International Conservation Sites (Natura sites)

There are no Special Protection Areas or Ramsar sites in Oxfordshire. Seven Special Areas of Conservation (SACs) lie wholly or partly within Oxfordshire (see Table 4.2 and Figure 4.2).

Table 4.2: Special Areas of Conservation in Oxfordshire

SAC name	SAC Area (ha)	Component SSSIs
Oxford Meadows	265.89	Cassington Meadows
		Pixey & Yarnton Meads
		Port Meadow with Wolvercote Common and Green
		Wolvercote Meadows
Little Wittenham	68.76	Little Wittenham
Hartslock Wood	34.24	Hartslock
Hackpen Hill	35.83	Hackpen, Warren and Gramp's Hill Downs
Cothill Fen	43.55	Cothill Fen
Aston Rowant	127.75	Knightsbridge Lane
Chilterns Beechwoods	1276.48	Ashridge Commons and Woods (Bucks/ Herts)
		Ellesborough and Kimble Warrens (Bucks)
		Tring Woodlands (Herts)
		Windsor Hill (Bucks)
		Bradenham Woods, Park Wood and the Coppice (Bucks)
		Bisham Woods (Berks)
		Hollowhill and Pullingshill Woods (Bucks)
		Naphill Common (Bucks)

4.6.2 Implications of the LTP4 under the Habitats Regulations: HRA Screening

A Habitat Regulations Assessment (HRA) Screening Report has been prepared for the LTP4 to fulfil the requirements of the Conservation of Habitats and Species Regulations 2012 (as amended) and is provided in Appendix D.

The assessment identified uncertain impacts on the following internationally designated conservation sites (European sites) from delivery of some elements of the LTP4, prior to mitigation: -

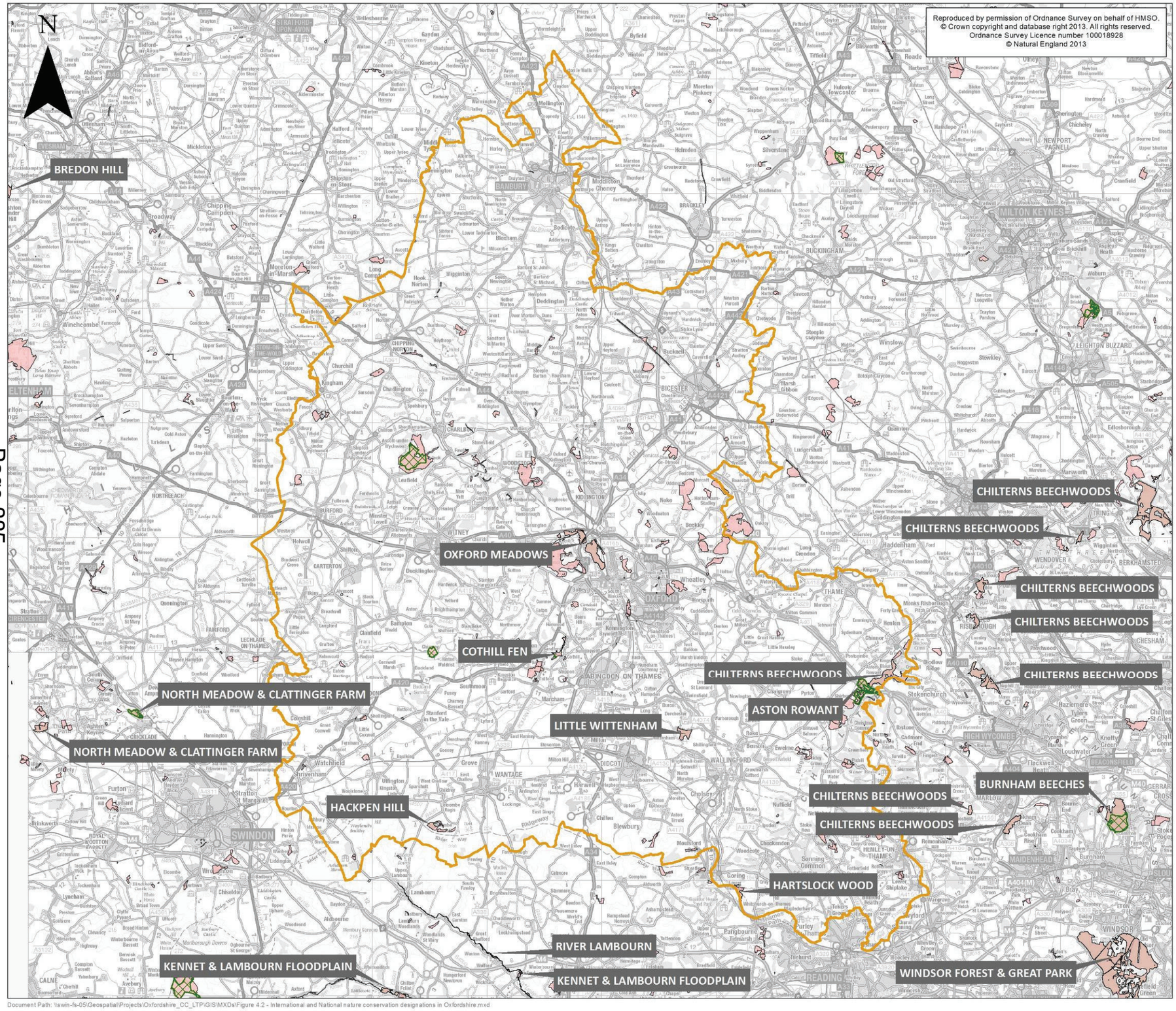
- **Oxford Meadows SAC** - Disruption to hydrological regime from changes in run-off regimes, spray and water drainage and nutrient enrichment from NO_x deposition from road transport infrastructure construction and changes in traffic flows and volumes, resulting from elements of the Oxford Transport Strategy. Such changes could affect the lowland hay meadows and creeping marshwort.
- **Little Wittenham SAC** – Loss or fragmentation of habitat that may support Great crested newts, resulting from delivery of some elements of the Science Vale Strategy.

Following the implementation of strategic level mitigation, the HRA Screening Report concluded no likely significant effects on any European sites. However, it is recommended that project level HRA is undertaken (in consultation with Natural England) when further details of the delivery of transport schemes within the Oxford and Science Vale Strategies are available, to ensure compliance with the Habitats Regulations.

4.6.3 National Conservation Sites

There are 105 Sites of Special Scientific Interest (SSSIs) in Oxfordshire and nine National Nature Reserves (NNRs) - see Figure 4.2. As shown in Table 4.2, 14 of these are constituent parts of SACs but the majority are separate entities. Approximately 99% of SSSI units within Oxfordshire are in favourable or recovering favourable condition (Natural England, 2013).

Figure 4.2: International and National Nature Conservation Designations in Oxfordshire



Key

- Oxfordshire Local Authority Boundary
- Special Areas of Conservation
- National Nature Reserve
- Site of Special Scientific Interest

0 5 10
Kilometres

Rev	By	Chkd	Apprvd	Date	Description

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OXFORDSHIRE COUNTY COUNCIL

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CH2MHILL.

Project :
Oxfordshire County Council LTP4: SEA

Drawing :
International & National nature conservation designations in and around Oxfordshire

Drawn By :	Tim Hughes	Date: 07/04/2014
Checked By :	Corinna Morgan	Date: 07/04/2014
Approved By :	John Fox	Date: 07/04/2014

Drawing No. : Figure 4.2
Revision -

Drawing Scale : 1:310,000

Document Path: \\swin-fs-05\Geospatial\Projects\Oxfordshire_CC_LTP\GIS\MXDs\Figure 4.2 - International and National nature conservation designations in Oxfordshire.mxd

4.6.4 Local Conservation Sites

Figure 4.3 shows the location of local nature conservation designations across Oxfordshire. This includes Local Nature Reserves (statutory sites), Local Wildlife Sites, ancient woodland, Sites of Local Importance for Nature Conservation (SLINCs) and Conservation Target Areas (target areas for conservation action in the county identified by the Oxfordshire Wildlife and Landscape Study (OWLS)).

The UK priority habitats within Oxfordshire comprise:

- Grasslands: lowland meadow, lowland calcareous grassland and lowland dry acid grassland.
- Woodlands: lowland wood pasture and parkland, lowland beech and yew woodland, lowland mixed deciduous woodland, wet woodland and traditional orchards.
- Wetlands: floodplain grazing marsh, fens, eutrophic standing waters, ponds, reedbeds and rivers.
- Other: hedgerows, open mosaic habitats, arable field margins and lowland heathland.

These UK priority habitats correspond to those identified under Section 41 of the Natural Environment and Rural Communities Act 2006, as habitats of principle importance.

The LTP4 has been developed to ensure that its measures do not affect the conservation status of nature conservation sites and UK priority habitats and species i.e. by the fragmentation, damage or loss of habitats by roads, increasing recreational pressures on sensitive flora/fauna, and elevating air and noise pollution or polluting aquatic environments, for example through road surface runoff. As the LTP4 is delivered, it will also need to ensure its measures align with guidance on the management of road verges (e.g. as provided for Road Verge Nature Reserves in Oxfordshire).

Delivery of the LTP4 also has potential to support improvements for biodiversity, for example, by incorporating principles on creating new biodiversity areas or restoring existing ones, implementing WFD measures, and supporting linkages between biodiversity sites as part of plans for improving GI and fostering 'living landscapes', as promoted by the UK wildlife trusts.

Biodiversity: Likely evolution of the baseline without LTP4

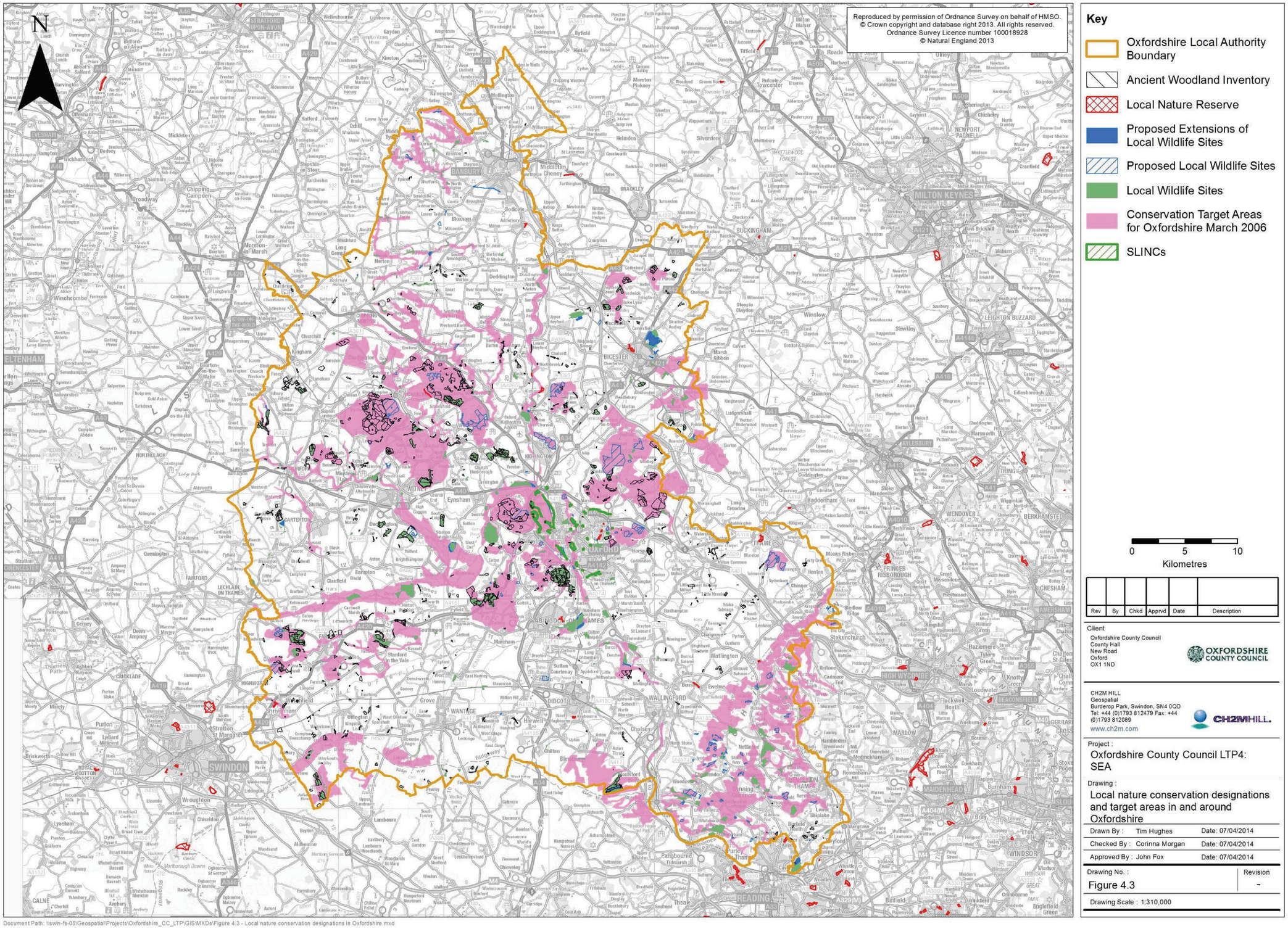
Trends in biodiversity can be due to a wide variety of factors, including climate change and land management activities. Climate change is likely to affect all habitats, for example through changes in flood risk from all sources, changes in the frequency of flooding or flow volumes to water dependant habitats. The spread of invasive species is also likely to continue.

The continued pressure for development and new infrastructure is likely to result in further loss and fragmentation of habitats and associated species.

More stringent protection of conservation sites strengthened through the government's 2020 biodiversity strategy which seeks to halt biodiversity losses by 2020 and beyond.

If there was no co-ordinated transport plan at a strategic level it is possible that new transport plan schemes or plans could have an adverse impact on wildlife at a local and strategic level.

Figure 4.3: Local Nature Conservation Designations in Oxfordshire



Document Path: \\swin-fs-05\Geospatial\Projects\Oxfordshire_CC_LTP\GIS\MXDs\Figure 4.3 - Local nature conservation designations in Oxfordshire.mxd

4.7 Water

4.7.1 Water Framework Directive (WFD)

The EU WFD (2000/60/EC) came into force in 2000 and was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. It combines water quantity and water quality issues in an integrated approach to the management of all water bodies at the river basin level. Water bodies include rivers, lakes, estuaries ("transitional" water bodies), coastal waters and groundwaters. The WFD effectively supersedes all EU environmental water-related legislation such as the Fisheries and Dangerous Substances Directives, and now drives the existing licensing and consenting framework in England.

The Directive sets out a framework for each Member State to establish River Basin Districts (RBD), for each of which a River Basin Management Plan (RBMP) must be developed and delivered. Each RBMP sets out the objectives for the water bodies within it. Oxfordshire falls largely within the Thames RBMP (Environment Agency 2009), which outlines the actions required to enable the water bodies to achieve GES/ GEP. Two river water bodies fall within the Anglian RBMP. The RBMPs have been used to guide the assessment of the implications of the proposed LTP4 on the water bodies that might be affected by it.

The WFD requires that all natural water bodies achieve good chemical status and good ecological status (GES), and Good Ecological Potential (GEP) for artificial and heavily modified water bodies (HMWB i.e. physical alterations by human activity that substantially change its hydrogeomorphological character), by set deadlines ranging from 2015 to 2027 dependent on the specific issue.

The WFD sets out a number of environmental objectives against which plans and projects should be assessed, as follows:

- WFD1 - No changes affecting high status sites;
- WFD2 - No changes that will cause failure to meet surface water good ecological status / potential or that will result in a deterioration of surface water ecological status / potential;
- WFD3 - No changes which will permanently prevent or compromise the environmental objectives being met in other water bodies;
- WFD4 - No changes that will cause failure to meet good groundwater status or result in a deterioration in groundwater status.

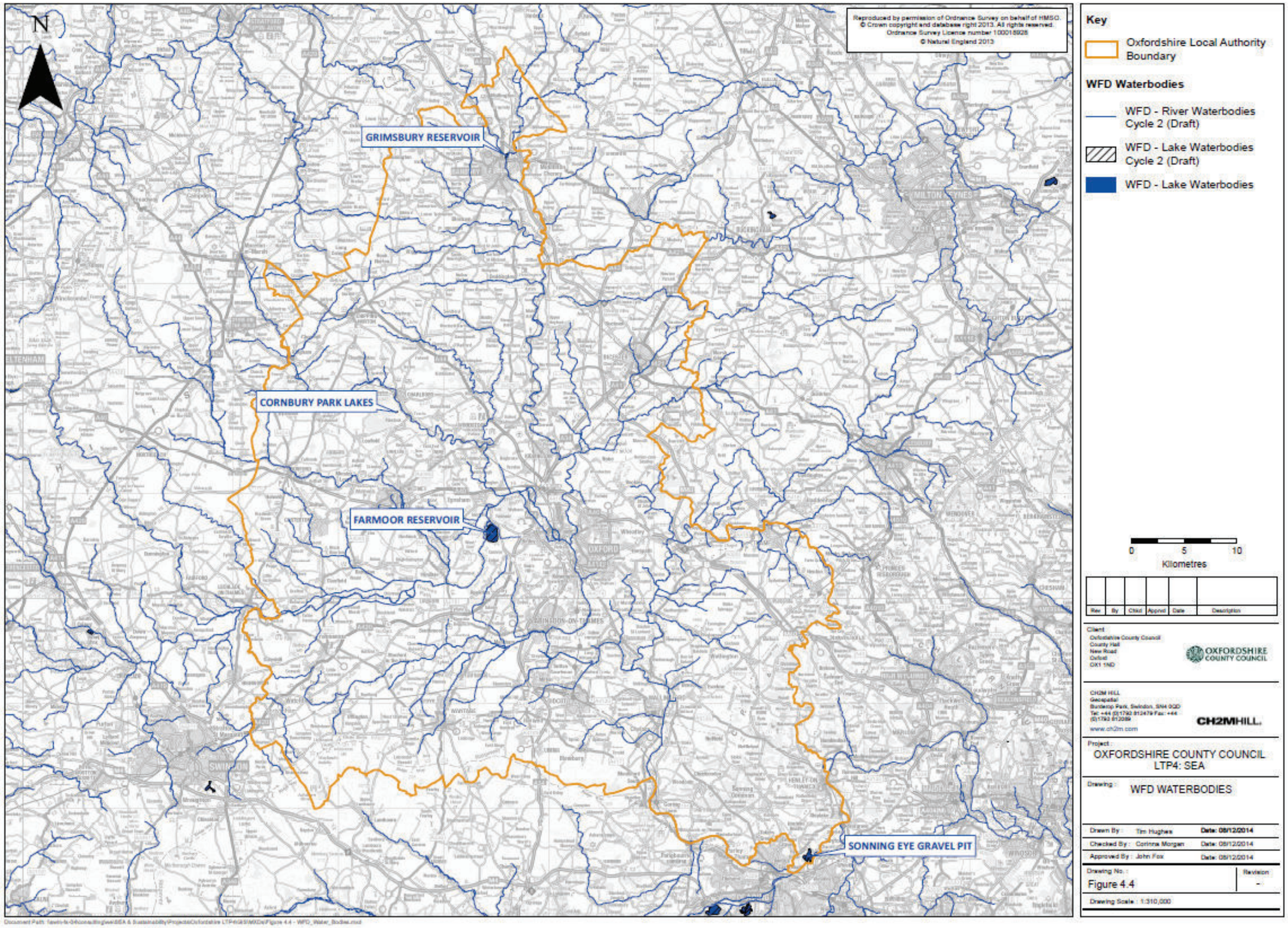
Any activity which has the potential to impact on a water body's ecological status or potential (either directly impacting biological elements, or changing physico-chemical, morphological, hydrological or chemical conditions) needs to be assessed against the objectives of the WFD. An assessment of the proposed LTP4 has therefore been undertaken to determine whether it might result in deterioration in the status of any water body or impede any water body from reaching future GES or GEP, as appropriate.

Water Bodies in the Study Area

The water bodies (as defined in the Thames and Anglian RBMPs) located within or that intersect the Oxfordshire county boundary are shown on Figure 4.4, as follows: -

- 95 river water bodies
- 4 lake water bodies: Grimsbury Reservoir, Cornbury Park Lakes, Farmoor Reservoir and Sonning Eye Gravel Pit.

Figure 4.4: River and Lake Water Bodies



4.7.2 Surface Water Quality

River water quality in Oxfordshire is variable between districts and between parameters. In 2009, 23% of surface waters in the Thames River Basin were classified to be good or better ecological status/ potential and 29% assessed surface waters as being at good or better biological status. This assessment included 571 surface water bodies assessed for ecological status/ potential and 362 for biological status.

On a county level it was not possible to determine what percentage of water pollution incidents could be attributed to transport but for England and Wales, 4% of all serious incidents are related to transport.

4.7.3 Flood risk

Large areas of Oxfordshire lie within 'main river' catchments and are prone to flooding. Approximately 12% of land in Oxfordshire is within a floodplain (Lepus 2014), including central areas of Oxfordshire, around Witney (from the River Windrush), Abingdon (River Ock and River Thames) and Oxford (from the River Thames and River Cherwell) (OCC 2013c). The Oxford Flood Risk Management Strategy (Environment Agency 2010) includes actions for a conveyance channel around the west and south of Oxford, which is currently being pursued by relevant partners in Oxfordshire.

In the past decade, Oxfordshire has experienced four major flood incidents (OCC 2014b), which have resulted in significant damage to property and potential flooding of some key transport links. OCC has been pro-active in responding to flood risk, addressing key issues identified during recent flood events and the potential impact of new development by advocating the implementation of Sustainable Drainage Systems (SuDS) (OCC, 2013c). The draft Oxfordshire Flood Risk Management Strategy (OCC 2014d) for consultation identifies areas at flood risk, provides a vision for how flood risk will be dealt with in Oxfordshire and measures to keep key transport links clear.

Water: Likely evolution of the baseline without LTP4

Water resources within Oxfordshire are under increasing pressure from a growing population and increased demand for wastewater treatment and drinking water.

Increasing traffic volumes are likely to lead to greater levels of diffused pollution from surface-water run-off on older roads and increasing pollution of adjacent water bodies.

Winter flooding and the risk of drought in summers is predicted to increase as a result of the effects of climate change. These changes could affect water supply or treatment facilities, resulting in loss of service or contamination of water supplies.

The Environment Agency is aiming to improve water quality to ensure water bodies achieve GES/GEP in line with the WFD through the Thames RBMP, and maintain this status into future years. The programme of measures required to achieve GES/GEP under the WFD by 2015 will drive improvements in the water environment.

Additionally, the UK CCRA for the water sector (UK CCRA 2012) shows that climate change is likely to cause the following impacts on water nationally:

River flows - By the 2080s, reductions in summer river flows may be significant across the UK, with the largest decreases in southern and eastern England;

Water supply - By the 2080s almost the whole UK population may be living in areas affected by a supply-demand deficit unless significant action is taken. By the 2050s, there may be a significant decrease in the number of rivers where sustainable water abstraction is possible and this situation may grow more severe by the 2080s;

Water quality - This depends to a large extent on water volume and is therefore influenced by river flows. For example, pollutants are less likely to be diluted by lower summer flows. Higher water temperatures may also contribute to changes in water quality; and

Assets and Infrastructure - Many UK sewers are part of combined systems that carry both sewerage and surface water runoff. When their carrying capacity is exceeded by heavy rainfall, or they become blocked, they overflow or 'spill'. Although heavily influenced by socio-economic factors (e.g. population change), significant increases in spill frequency may result from climate change due to changes in rainfall patterns (e.g. more heavy winter precipitation).

4.8 Geology and Soils

The study area is underlain by a series of rocks of Jurassic and Cretaceous age that are gently tilted to the south-east (www.oxfordshire.gov.uk/cms). There are 31 SSSIs notified for their geological interest and 45 Local Geology Sites that reflect the geological importance of Oxfordshire.

Approximately 78% of the land in Oxfordshire is agricultural (see Figure 4.4), although the area of agricultural land decreased from 195,510ha in 2007 (OCC 2013c) to 192,410ha in 2008.

Oxfordshire comprises 20% of Grade 2 land (very good quality for crop production), 55% of Grade 3 land (land of moderate quality), 20% of Grade 4 land (poor quality), with areas of non-agricultural/ urban land in the centre of the county.

Each of the five district councils are obligated by law to keep a contaminated land register. Very few sites have been put on the registers in the county. However, there are a large number of potentially contaminated sites that require further investigation.

In West Oxfordshire, approximately 40% of development is on previously developed land, with 60% on greenfield sites, due to the lack of available brownfield sites (West Oxfordshire District Council, 2009). There are no data on potentially developable brownfield land or contaminated land in Oxfordshire collected at a county level.

Geology and Soils: Likely evolution of the baseline without LTP4

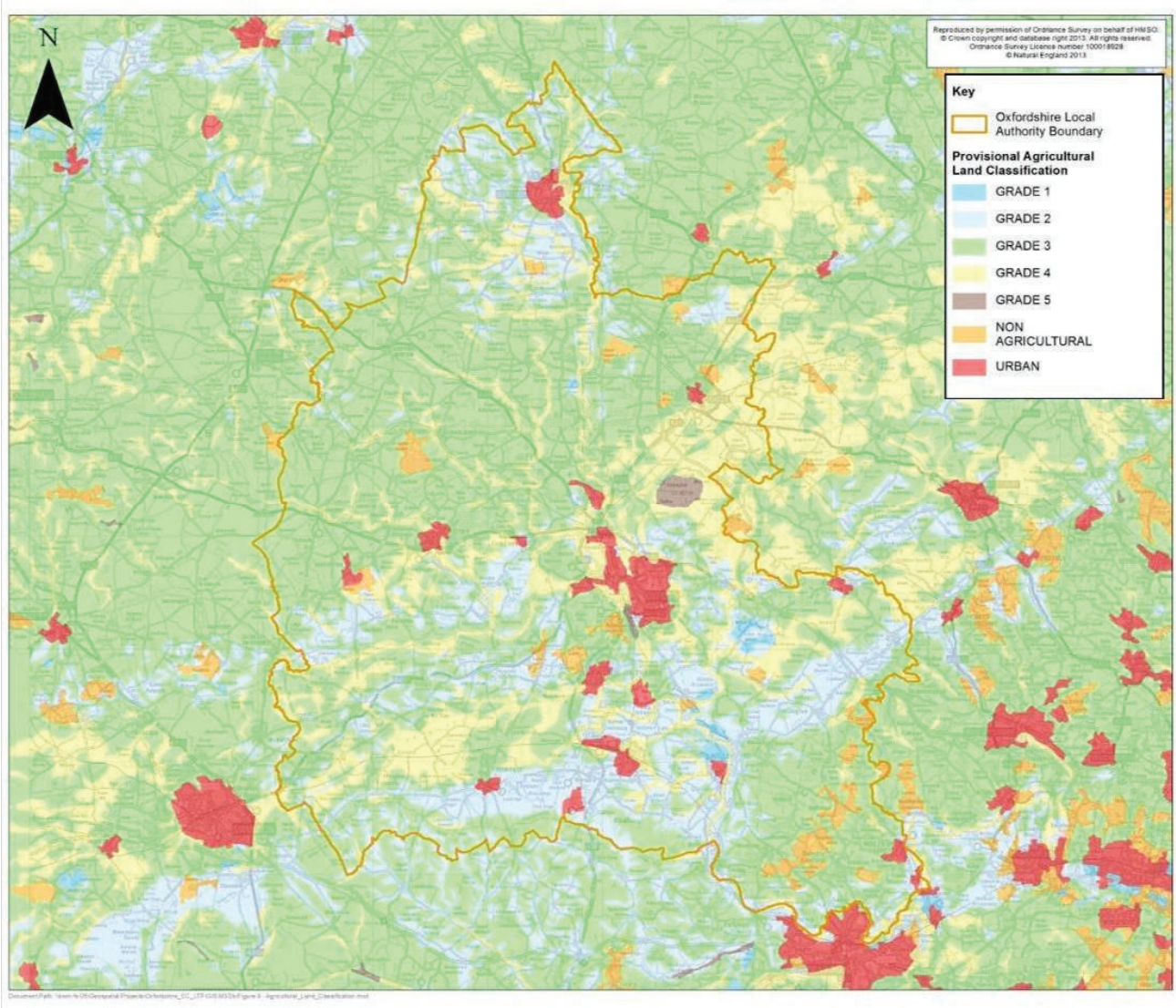
It is likely that soil erosion in the county will continue due to surface water flash flooding and other causes.

Compaction and sealing will also continue to occur, for example through an increase in developed areas and impermeable surfaces.

The continued pressure for development and new infrastructure is likely to result in further Greenfield development and loss of farmland.

Increased traffic volumes are likely to lead to greater levels of diffused pollution from surface-water run-off on older roads, causing further pollution to adjacent soil resources.

Figure 4.4: Agricultural Land Classification in Oxfordshire



4.9 Material Assets

The term "material assets" is not defined in the SEA Directive. For the purposes of this SEA, the term is used in relation to the following receptors not discussed in other sections of this report:

Critical infrastructure - these are assets that are essential for the functioning of a society and economy and include the road and rail network, energy (e.g. power stations including Didcot and associated decommissioning of Didcot A, sub-stations) and critical services (e.g. public transport system, emergency services, schools, hospitals, cemeteries etc.). Oxfordshire supports key strategic transport routes, which impact on air quality in the county, including the M40, A40, A44, A43, A420 and A34. Traffic on Oxfordshire's roads is steadily increasing and Oxford City is becoming increasingly important as a nationally important transport hub. The county also supports major rail infrastructure including main and branch railway lines.

The UK Climate Change Risk Assessment (Defra 2012) shows that flooding as a result of climate change is likely to pose an increasing threat to critical infrastructure. This includes increased risk to transport networks, as well as energy supplies, hospital and schools. There is a high risk of confidence in the 'significant likelihood of

flooding' risk posed to roads and a medium level of confidence in relation to power stations, hospitals and schools (Defra, 2012).

Mineral resources - The transport sector uses mineral resources in the construction of new infrastructure as well as fuels for vehicles. Fossil fuels are non-renewable and subject to price fluctuations on the global market due to changes in supply and demand. Dependence on car use has high resource requirements since significant land is required to accommodate traffic growth while continued capacity improvements are required on the transport network such as road widening and the provision of parking infrastructure. Increased uptake of passenger transport and walking and cycling has lower overall demands on resources per person.

Waste management - this an indicator of the inefficient use of resources.

Material Assets: Likely evolution of the baseline without LTP4

Without a strategic plan to stem road traffic, congestion and pollution, traffic numbers would be likely to rise at a faster rate than the current rate of increase. The heavy reliance on Oxfordshire's road and railway network and comprehensive public transport system will continue with increased population growth.

The condition of many roads and footpaths will deteriorate. Increasing occurrence of extreme weather events as a result of climate change is likely to increase the need for repairs to structures.

Renewable energy is likely to form a greater part of the county's energy mix as technology advances and policies to promote their uptake mature.

The volume of waste generated is likely to increase and place extra demand on the county's roads.

4.10 The Historic Environment

Figure 4.5 shows the location of designated archaeological sites and heritage across Oxfordshire.

Oxfordshire has a rich archaeological resource, with Blenheim Palace UNESCO World Heritage Site (WHS), 55 Registered Parks and Gardens, nearly 13,000 listed buildings, 242 Conservation Areas, 2 historic battlefields and approximately 350 Scheduled Monuments.

OCC is responsible for maintaining the Historic Environment Record (HER), which currently holds information on more than 13,000 archaeological remains.

There is considerable archaeological potential elsewhere in the county, which is not designated, and on sites where information is presently limited. Historic town and village centres, greenfield and previously developed sites may all contain surviving or buried archaeology.

Delivery of the LTP4 will consider how best to accommodate the proposed changes and proposed economic growth in the county while sustaining the significance and character of the heritage assets.

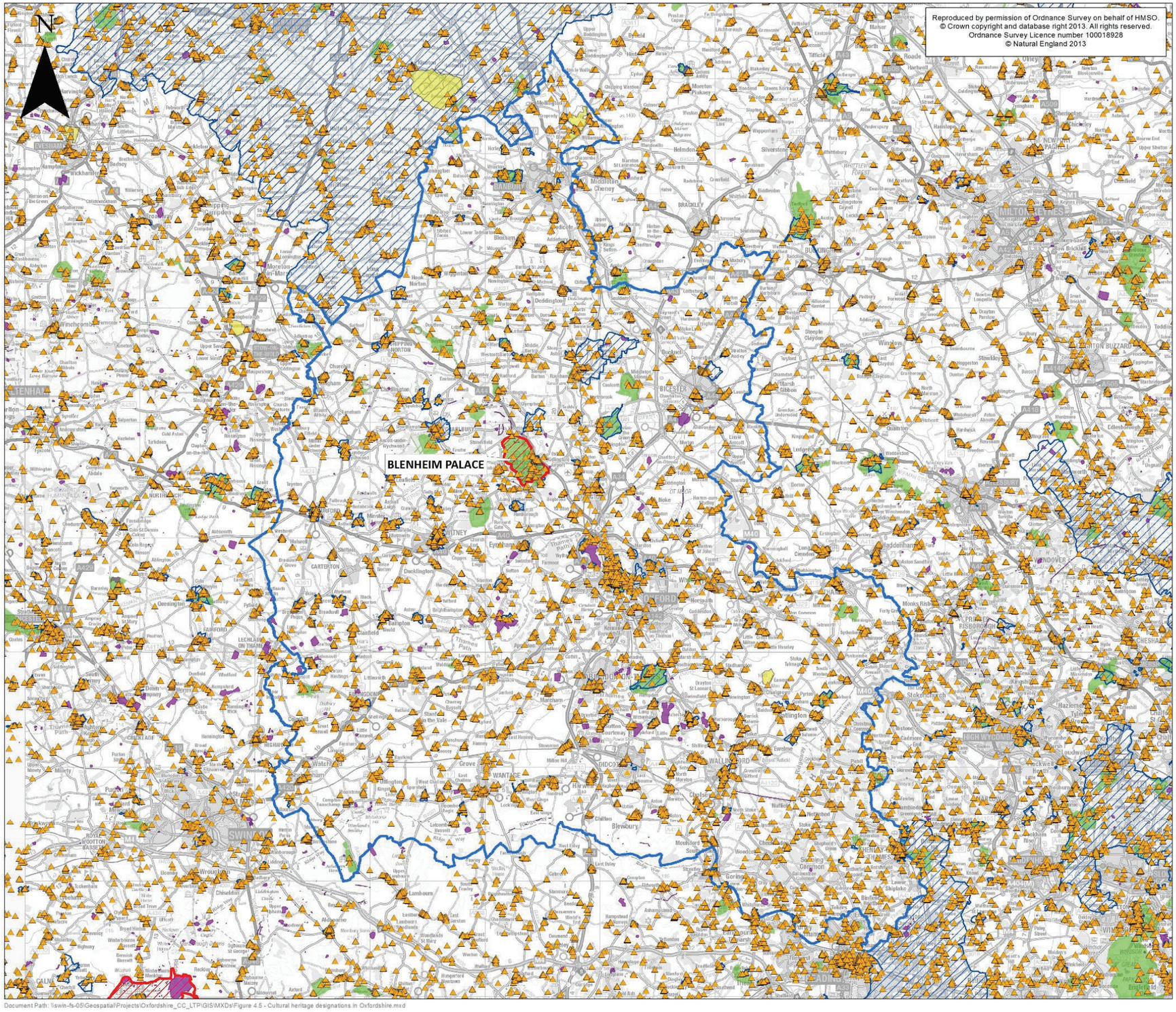
Historic Environment: Likely evolution of the baseline without LTP4

The historic environment is likely to remain an important economic, social and cultural feature of the county and the management and restoration of heritage assets is likely to continue. However, increasing traffic levels will impact upon the amenity and quality of the archaeological sensitivity of streetscapes and the cultural environment.

Air and noise pollution, physical or chemical erosion and pressures from an increasing population and important tourist industry will continue to increase pressure on Oxfordshire's cultural heritage.

The archaeological and architectural assets in Oxfordshire (and their settings) will continue to be threatened by development pressures as well as inadequate management of features, landscapes or nearby resources, neglect and inappropriate development within or near historic features or landscapes.

Figure 4.5: Cultural Heritage Designations in Oxfordshire



Key

- Oxfordshire Local Authority Boundary
- Listed Buildings
- Historic Battlefield
- Conservation Area
- Registered Park & Garden
- Scheduled Monument
- Bleinham Palace World Heritage Site

0 5 10
Kilometres

Rev	By	Chkd	Apprvd	Date	Description

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Project :
Oxfordshire County Council LTP4: SEA

Drawing :
Cultural heritage designations in and around Oxfordshire

Drawn By :	Tim Hughes	Date: 07/04/2014
Checked By :	Corinna Morgan	Date: 07/04/2014
Approved By :	John Fox	Date: 07/04/2014

Drawing No. : Figure 4.5
Revision -

Drawing Scale : 1:310,000

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4.11 Landscape

4.11.1 Landscape Character

The baseline landscape character of Oxfordshire has been assessed by OCC, Natural England and The Earth Trust in the Oxfordshire Wildlife and Landscape Study (OWLS), accessed in April 2014 (https://www.oxfordshire.gov.uk/cms/content/oxfordshire-wildlife-and-landscape-study-owls). The landscape is classified as lying within 9 Regional Character Areas (corresponding to Countryside Character Areas) and has been divided into 24 landscape types:-

1. Alluvial Lowlands
2. Chalk Downlands and Slopes
3. Clay Vale
4. Estate Farmlands
5. Farmland Hills
6. Farmland Plateau
7. Farmland Slopes & Valley Sides
8. Lowland Village Farmland
9. Pasture Hills
10. River Meadowlands
11 Rolling Clayland
12. Rolling Farmland
13. Rolling Village Pastures
14. Settled Ancient Pastures
15. Terrace Farmland
16. Upstanding Village Farmland
17. Vale Farmland
18. Wooded Downland
19. Wooded Estateland
20. Wooded Estate Slopes and Valley Sides
21. Wooded Farmland
22. Wooded Hills
23. Wooded Plateau
24. Wooded Pasture Valleys and Slopes

The value and sensitivity of these landscape character types, together with their capacity to accommodate new development in Oxfordshire varies throughout the study area.

4.11.2 Landscape Designations

Landscape designations (see Figure 4.6) are applied to areas of special value at international, national, regional or local level in response to particular qualities or historical or cultural associations. Almost 75% of Oxfordshire's landscape has been designated and comprises: -

- Green Belt: governed by the National Planning Policy Framework (NPPF) (DCLG 2012) and local planning policy to prevent urban sprawl by keeping land permanently open and safeguarding the countryside from development.
- Areas of Outstanding Natural Beauty (AONB): national designation to conserve and enhance the natural beauty of an area. The designation gives formal recognition to an area's landscape importance and allows for the development of communities and economic activity. However development is only permitted in an AONB in ways that enhance its landscape character. The NPPF emphasises the need to conserve AONBs. There are three AONBs that partly lie within Oxfordshire (see Figure 4.6) and cover 24% of the county; the Chilterns, the Cotswolds and the North Wessex Downs.
- Area of High Landscape Value: local designation to protect locally important landscapes. Approximately 14% of Oxfordshire is designated as an Area of High Landscape Value.

Oxfordshire's settlement pattern provides few opportunities for major re-use of land within existing built up areas. This has led to a high proportion of development being accommodated on greenfield sites on the edge of the County Towns (Banbury, Bicester, Didcot and Witney).
According to CPRE, light pollution is rapidly increasing in the south-east and 'there are no dark skies left in Oxfordshire'. Lighting, which can be integral to some transport policies, can affect the quality of people's lives, by providing a greater feeling of security and safety, while also limiting views of the night sky.

Landscape: Likely evolution of the baseline without LTP4

It is likely that increasing urbanisation will increase pressure on the skyline and viewpoints around Oxfordshire.

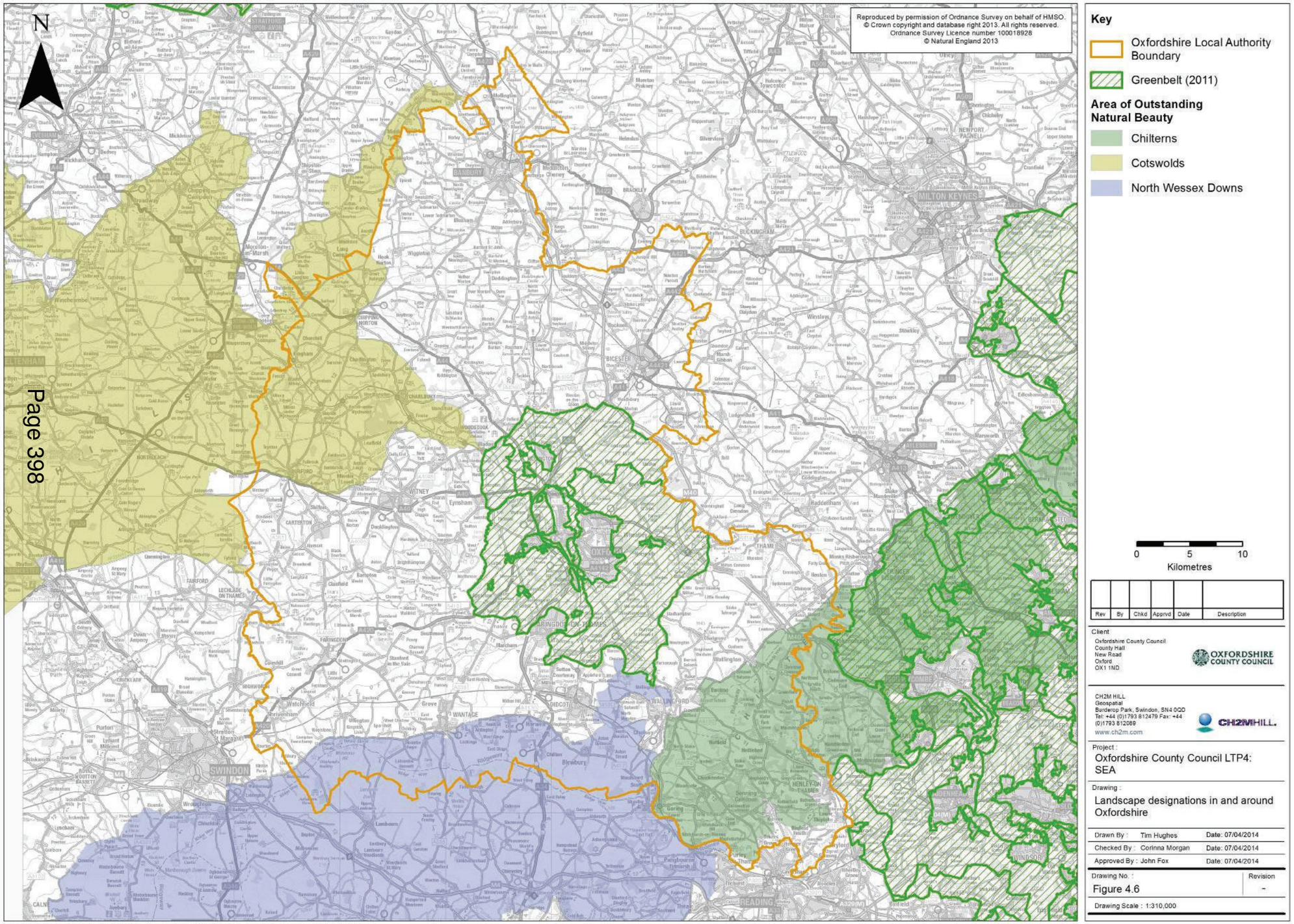
There is potential for development pressure to detract from the quality of some of the county's landscapes.

Light pollution from development will continue.

Increasing traffic volumes will increase noise disturbance in the countryside and the loss of tranquillity.

Increases in traffic will cause more vehicles to use unsuitable rural roads. However, plans to de-clutter streets and improvements to the public realm will improve the townscape in some areas.

Figure 4.6: Areas of Outstanding Natural Beauty within Oxfordshire



Key

- Oxfordshire Local Authority Boundary
- Greenbelt (2011)

Area of Outstanding Natural Beauty

- Chilterns
- Cotswolds
- North Wessex Downs

0 5 10
Kilometres

Rev	By	Chkd	Apprvd	Date	Description

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5 SEA Approach

5.1 Establishing SEA Objectives

The baseline information, PPP review (Appendix A) and relevant key environmental issues identified have been used to define a series of SEA objectives. These objectives have been developed in order to assess the environmental effects of the LTP4.

The development of SEA objectives for the Oxfordshire LTP4 has been an iterative process. The objectives proposed at the scoping stage of the SEA were reviewed and revised in the light of comments received on the SEA Scoping Report and further understanding of the key environmental problems, issues and opportunities concerning the Oxfordshire LTP4.

The final SEA objectives that have been used to assess the LTP4 are listed in Table 5.1.

SEA sub-objectives and assessment criteria were also identified for developing and appraising high level policies, Area Strategies and the Supporting Strategies, as shown in Table 5.1. The table shows the main receptors that were considered in the SEA and associated questions that were addressed to determine the implications of the plan for those receptors. These assessment criteria were developed through consultation with key organisations and knowledge of key environmental features and issues identified during the scoping stage.

The SEA objective (no. 9) covering water quality incorporates underlying criteria to assess potential impacts on the physical, chemical or biological status of water bodies, in accordance with the WFD.

Table 5.1: SEA Objectives and Assessment Criteria

SEA Receptor	LTP4 SEA Objective	Sub-objectives	Assessment Criteria
Population	**1. Maintain the vitality of town centres**	• Ensure town centres are well connected to surrounding areas by sustainable modes of travel • Provide a sustainable, functional, uncongested transport network in keeping with the character and local distinctiveness of town centres	• Is the LTP4 policy likely to reduce the impacts of traffic in the public realms of key settlements? • Will it be possible to access key settlements and proposed growth areas by convenient public transport? • Will town centres be easier to walk or cycle to and around for local residents?
	2. Improve accessibility to jobs, facilities and services	• Reduce transport related community severance • Improve access to facilities, particularly for disadvantaged groups, the elderly, mobility impaired and those without a car • Improve the integration of and between different modes of travel	• Is public transport and community transport likely to improve under the LTP4 policy? • Are all groups' transport needs catered for including rural residents without cars, elderly, disabled and children?
	3. Enhance and protect the green infrastructure and countryside	• Protect and improve the interconnectivity of green infrastructure • Enable people to access and appreciate the natural heritage • Protect and improve the quality of green infrastructure for wildlife, drainage, landscape value and accessibility • Protect and improve pedestrian, cycling and public transport routes to and from GI	• Are schemes included to promote non-motorised access and maximise opportunities to natural green space and the countryside? • Does the LTP4 policy increase the safe provision of bridleways, cycle trails and footpaths? • Do new schemes promote the creation/extension of and improvements to GI, including consideration of personal mobility?
Human Health	**4. Protect and promote everyone's physical and mental wellbeing and safety**	• Increase opportunities and amenity of active travel modes for health benefits • Promote safer non-motorised and public transport • Ensure access to health facilities by a wide range of sustainable modes of travel • Provide safer conditions for pedestrians and cyclists, including children and the infirm.	• Does the LTP4 policy improve conditions for pedestrians and cyclists? • Does the LTP4 policy demonstrate a commitment to the health benefits of physical activity and a move away from car dependency for shorter journeys? • Does the LTP4 increase capacity of transport infrastructure and improve connectivity?
Noise	**5. Reduce noise pollution**	• Reduce the number of people being affected by transport noise • Avoid/minimise the impacts of transport related noise on sensitive receptors	• Will disturbance from traffic be reduced in residential areas? • Is noise from traffic likely to change in rural locations and affect tranquility?
Air quality	**6. Reduce all forms of transport-related air pollution in the interests of local air quality**	• Minimise the negative impact of transport on Air Quality Management Areas and those areas where monitoring shows high levels of pollutants • Maintain good air quality in areas of low pollutants • Minimise the number of exceedances of Air Quality Standards • Improve air quality levels where possible	• Does the LTP4 policy encourage and facilitate the use of active travel and short journeys? • Will the LTP4 policy help to reduce traffic congestion? • Will the LTP4 policy limit the more polluting vehicles in sensitive areas? • Will the LTP4 policy help to limit traffic growth?

SEA Receptor	LTP4 SEA Objective	Sub-objectives	Assessment Criteria
Climatic factors	**7. Reduce transport related greenhouse gas emissions**	• Minimise carbon emissions from construction and maintenance activities • Improve energy/fuel efficiency in transport, by enabling a shift to alternative fuels • Minimise need to travel by promoting and protecting local facilities • Minimise freight travel distances e.g. by raising awareness of 'food' miles, air pollution etc	• Does the LTP4 policy reduce or limit dependency on finite fossil fuels? • Does the LTP4 policy support or facilitate the use of low carbon modes of transport? • Does the LTP4 policy help ensure that vehicle journeys can be made efficiently with minimum disruption or distance?
Biodiversity, flora, fauna	**8. Protect and enhance habitats and the diversity and abundance of species**	• Avoid or minimise transport related damage to habitats and species • Manage the transport network in a way that protects, and enhances biodiversity, including ecological connectivity • Minimise wildlife casualties in the transport network	• Will new schemes affect priority habitats or the conservation status of designated nature conservation sites? • Are new transport routes likely to cause severance of wildlife corridors? • Does the LTP4 policy support biodiversity improvements?
Water, geology and soil	**9. Maintain and improve the quality of water resources**	• Avoid transport related pollution of water in line with the measures to protect water resources set out in the Water Framework Directive	• Is the LTP4 policy likely to significantly increase the risk of diffuse pollution from increasing traffic volumes? • Do new schemes constrain any water bodies from achievement of GES/GEP under the WFD?
	10. Retain the floodwater storage function of riparian land and the floodplain and reduce the risk of flooding where it would be detrimental	• Avoid increasing detrimental flood risks resulting from infrastructure development and maintenance • Ensure water table is protected in natural areas dependent upon the status quo • Reduce the extent of non-permeable surfaces and promote Sustainable Drainage Systems (SuDS) in infrastructure	• Will the LTP4 policy improve capacity of drainage of existing older infrastructure? • Will the LTP4 policy lead to the inclusion of SuDS? • Will the LTP4 policy increase or reduce flood risk?
	11. Maintain resources such as minerals and soils and enhance geological diversity	• Promote the use of secondary and recycled materials for transport including manufactured aggregates and soils • Use sustainable construction and maintenance methods, and materials • Improve currently contaminated land through the construction and maintenance of transport infrastructure • Protect soils and minimise loss or contamination • Protect agricultural land, particularly the best quality land according to the Agricultural Land Classification system • Protect the varied geological features within the county and improve access to sites of greatest geodiversity	• Does the LTP4 policy require large scale demolition and construction of new infrastructure? • Will proposals under this LTP4 policy require significant resources for ongoing maintenance? • Is the LTP4 policy likely to increase demand for greenfield land and/or result in the loss of moderate to high quality (Grades 3 and above) agriculturally productive land? • Is there a likelihood that new schemes will affect geologically designated sites?
	12. Optimise the use of previously developed	• Protect greenfield land wherever possible • Make the best use of existing resources	• Do the proposals make use of previously developed sites? • Are transport improvements feasible within the footprint of existing infrastructure?

SEA Receptor	LTP4 SEA Objective	Sub-objectives	Assessment Criteria
	(brownfield) land thereby reducing waste generation		
Material Assets	**13. Adapt transport network to climate change**	• Minimise the vulnerability of transport infrastructure to climate change impacts, including surface and groundwater flooding and extreme weather • Avoid exacerbating climate change impacts such as flooding on areas adjacent to transport network	• Does the LTP4 policy provide proposals to address the issues of climate change? • Will the LTP4 policy improve capacity of drainage of existing older infrastructure
The Historic Environment	**14. Protect and enhance the historic environment, the significance of heritage assets and their settings**	• Avoid or minimise negative effects on cultural assets, the historic environment and local distinctiveness? • Protect and enhance access to areas valued for cultural heritage by sustainable modes? • Enhance the historic fabric and character of towns and villages	• Will the LTP4 policy negatively affect any cultural heritage assets and/or their setting? • Is there a likelihood that proposals will encroach upon undeveloped land, which may harbour archaeological remains? • Does the LTP4 policy include provision for (and enhancement of) sustainable access to key cultural heritage sites? • Are the LTP4 measures sympathetic to the local character of the historic environment, and provide opportunities to enhance the historic character of the towns and villages?
	15. Maintain and enhance the quality and distinctiveness of the built environment	• Promote a high quality built environment through good planning and design? • Prevent the negative impact upon designated sites, such as Conservation Areas?	• Will the LTP4 policy conserve and contribute to the enhancement of the built environment? • Does the LTP4 policy make appropriate use of existing historic buildings and structures?
Landscape	**16. Maintain and enhance the quality and character of the landscape, including its contribution to the setting and character of settlements**	• Protect and enhance landscape character from impacts of transport • Minimise light pollution caused by transport	• Will additional transport infrastructure be developed which will encroach upon designated landscapes and the countryside? • Will lighting provision change on transport infrastructure?

5.2 Assessment Approach

This section describes the appraisal process that was used to predict and appraise the environmental effects that are likely to arise from implementation of the LTP4.

The general methodology followed the various SEA stages in 'A Practical Guide to the Strategic Environmental Assessment Directive' published by the office of the Deputy Prime Minister in 2005. SEA differs from Environmental Impact Assessment (EIA) mainly because it is used to assess relatively broad strategies rather than site specific proposals (in this case, the individual infrastructure elements).

The level of detail assessed during this SEA therefore reflects the overall level of detail in the draft LTP4, and has involved assessing the three main components of the draft LTP4 described in Chapter 3: -

- High Level Policies
- Area Strategies
- Supporting Strategies

The LTP4 policies and strategies have been evaluated with consideration of their potential for significant environmental effects on the different SEA topics/receptors using assessment criteria. The assessment of these environmental effects has been informed by professional judgement and experience with other transport related SEAs, as well as an assessment of national, regional and local trends. In some cases, the assessment draws upon mapping data and GIS to identify areas of potential pressure, for example due to flood risk or presence of environmental designations.

For all LTP4 policies and strategies, a table has been used to evaluate how the environment would be affected, positively or negatively, from the implementation of the LTP4 in relation to the SEA objectives. All LTP4 policies and strategies have been assessed based on their likely impact duration and magnitude, and described in terms of their nature, permanence, scale and duration using the criteria defined below,.

Effects of the LTP4 will be described in terms of their:

- Nature: whether they are anticipated to be:
    - **Positive** (+)
    - **Neutral** (N)
    - **Negative** (X) or
    - **Uncertain** (?)
- Timescale: the timescale over which environmental effects are anticipated to arise:
    - **2015 – 2020**: effects expected up until 2020 (i.e. in the short-term).
    - **2021 - 2031**: effects expected from 2020 to 2031 (i.e. in the medium-term).
    - **Beyond 2031**: effects expected beyond the timescale of the plan (i.e. in the long-term).
- Reversibility:
    - A **reversible** effect **(R)** is an environmental effect that can be reversed, for example an incident of water pollution can be cleaned up over time.
    - An **irreversible** effect **(I)** is an environmental effect that cannot be reversed such as the loss of a historic feature or the loss of agricultural soil due to permanent development.
- Spatial Scale:
    - **Local (L)**: effect is restricted to the immediate location of the proposal or to a specific site within one of the four areas – Oxford, Larger Towns, Smaller Towns, Rural Oxfordshire

- **Regional (R)**: effect is anticipated to cover a significant proportion or all of Oxfordshire.
- **National (N):** effect covers the whole of England and/or the UK (also includes international).

- Frequency:
  - A **constant (C)** effect is one that results from a physical change that continues beyond the life of the LTP.
  - A **temporary/intermittent (T)** effect is one which results from an operational change which could change if there is a change of policy, or a short term condition such as a construction phase related impact.

The significance of effects upon each of the SEA objectives has been evaluated using the scoring criteria outlined below (Table 5.2). The determination of significance takes into account the criteria set out in the SEA Directive's Annex II.

Table 5.2: Assessment Criteria

++ **Major Positive**	The option would be significantly beneficial to the SEA objective by resolving an existing environmental issue and/ or maximising opportunities for environmental enhancement. This effect is considered to be significant at the plan level.
+ **Minor Positive**	The option would be partially beneficial to the SEA objective by contributing to resolving an existing environmental issue and/or offering opportunity for some environmental enhancement. This effect would not be considered to be of significance.
N **Neutral**	The option would have a neutral effect on the SEA objective.
? **Uncertain**	There is insufficient detail available on the option or the baseline situation in order to assess how significantly the SEA objective would be affected by the option.
x **Minor Negative**	The option would partly undermine the SEA objective by contributing to an environmental problem and/or partially undermine opportunities for environmental enhancement. This effect would not be considered to be of significance.
xx **Major Negative**	The option would severely undermine the SEA objective by contributing to an environmental problem and/ or undermining opportunities for environmental enhancement. This would be considered to be a significant effect at the plan level.

6 Assessment of LTP4 and its Alternatives

6.1 LTP4 Objectives

6.1.1 Alternative LTP4 Objectives

The development of the LTP4 objectives (see Section 3.2) was an iterative process, taking into account stakeholder consultation feedback and environmental and social acceptability. The LTP4 objectives in Table 6.1 were revised on environmental grounds.

Table 6.1: Revisions to LTP4 Objectives

Initial LTP4 Objective	Final LTP4 Objective	Relevant SEA Objective	Reason for Revision
Manage impacts of transport on human health and safety, and the environment, including reducing carbon emissions.	**Revised wording:** Reduce per capita carbon emissions from transport in Oxfordshire in line with UK government targets.	7. Reduce transport-related greenhouse gas emissions	• Revised to reflect the importance of carbon reduction and the need to reduce greenhouse gases by making this an objective in its own right.
	New objective: Mitigate and wherever possible enhance the impacts of transport on the local built and natural environment.	3. Enhance and protect the green infrastructure and countryside 8. Protect and enhance habitats and the diversity and abundance of species 9. Maintain and improve the quality of water resources 11. Maintain resources such as minerals and soils and enhance geological diversity 14. Conserve and enhance the historic environment, the significance of heritage assets and their settings 15. Maintain and enhance the quality and distinctiveness of the built environment 16. Conserve and enhance the quality and character of the landscape, including its contribution to the setting and character of settlements	• 'Manage the impacts' was felt to give insufficient assurance against damage to the environment. • The objective was therefore made clearer about what is meant by environment and how this can be measured.
Encourage and facilitate physically active travel to support health.	**Revised wording:** Improve public health and wellbeing by increasing levels of walking and cycling, reducing transport emissions i, reducing casualties, and enabling inclusive access to jobs, education and services.	2. Improve accessibility to jobs, facilities and services 4. Protect and promote everyone's physical and mental wellbeing and safety 6. Reduce all forms of transport-related air pollution in the interests of local air quality 7. Reduce transport related greenhouse gas emissions	• Brings in specific reference to air quality and road safety by including them under the health objective. • 'Walking and cycling' covers recreational opportunities, not just use of the modes for travel. • Inclusive access supports Health and Wellbeing strategy and reflects comments about lack of equalities objectives

6.1.2 Assessment of LTP4 Objectives

Appendix E presents the compatibility assessment between the SEA and LTP4 objectives, and the recommendations of the compatibility assessment.

LTP4 objective 9 '*Mitigate and wherever possible enhance the impacts of transport on the local built and natural environment*' seeks to ensure that schemes are designed in an environmentally sensitive manner and is therefore compatible with all of the SEA objectives.

No conflicts have been identified between the SEA objectives and the other LTP4 objectives; however, some uncertainties have been identified where fulfilment of the LTP4 objectives could negatively impact on the environment, depending on how the objectives are met through policy implementation. For example, the construction of new infrastructure (e.g. new road links, changes to junctions), alternative development layouts or improvements to existing infrastructure to improve transport connections, will involve new land take, which could impact upon greenfield land, water resources, habitats, soils, minerals, landscape and archaeological assets; while effects associated with growth in traffic could arise from economic growth/development (noise, air emissions and congestion).

While improvements to the cycle and walking infrastructure (including safer routes to schools) will promote green infrastructure improvements and potentially improve safety, which are considered to be positive effects, other improvements to public transport such as air travel are likely to be damaging to the countryside and affected communities.

In fulfilling the LTP4 objectives, the SEA highlighted the following recommendations, which were taken forward during the development of high level policies, area strategies and supporting strategies:

- OCC should take into account the principles of sustainable development and current spatial planning policy in seeking to make the best use of current infrastructure and to make prudent use of natural resources. The need to support economic growth should be balanced against the need to maintain the value of the environment, including the services provided by healthy ecosystems. Significant new infrastructure, where required, should be subject to detailed environmental assessment to ensure the most sustainable options are promoted and adverse environmental effects are mitigated wherever possible. Careful planning is required to ensure that new transport connections do not result in the loss of intrinsic countryside (particularly within designated sites), high value agricultural land, natural greenspace and associated biodiversity.
- In partnership with others, OCC should seek to influence the location of new development layouts, and improved cycling and public transport infrastructure at an early stage to ensure development is undertaken within the current footprint of development wherever possible or is appropriately sited to avoid impacts on designated or sensitive environmental areas.
- The use of low noise surfacing should be considered at scheme level when delivering new or upgraded transport connections, which would benefit the health and well-being of communities in close proximity to works.
- OCC should prioritise alternatives to new roads when seeking measures to reduce congestion and improve journey time reliability. For example, through encouraging modal shift from private car use to more efficient urban transport options.
- Potential opportunities to make better use of existing services and infrastructure should be prioritised. Where new infrastructure is deemed necessary, sites should be subject to detailed assessment and survey at project level to inform specific routes and mitigation requirements, and to ensure development takes place in the most sustainable locations and avoids environmentally sensitive sites.

6.2 Draft LTP4 Policies

6.2.2 Alternative LTP4 Policies

The development of the LTP4 policies (see Table 3.1) was an iterative process, taking into account stakeholder consultation feedback and environmental and social acceptability. Table 6.2 shows those policies that were revised to reflect changes to benefit the environment.

Table 6.2: Revisions to LTP4 Policies

Initial LTP4 Policy	Final LTP4 Policy	Relevant SEA Objective	Reason for Revision
Policy 3: [Richard to confirm]	**Revised wording:** Oxfordshire County Council will encourage the use of modes of travel associated with healthy and active lifestyles and will improve built and green infrastructure to support greater levels of walking and cycling	3. Enhance and protect the green infrastructure and countryside 4. Protect and promote everyone's physical and mental wellbeing and safety	• Inclusion of improvements to green infrastructure
Policy 23: : [Richard to confirm]	**Revised wording:** Oxfordshire County Council will support appropriate opportunities for improving towpaths along the waterways network, for local journeys and leisure, where it would not harm the ecological value of the area or waterway network.	3. Enhance and protect the green infrastructure and countryside 8. Protect and enhance habitats and the diversity and abundance of species	• Amended to promote protection of the ecology of the area or waterway network

6.2.3 Assessment of LTP4 Policies

The assessment of the LTP4 policies is presented in Appendix E. The assessment took the form of a compatibility assessment using a similar approach to that applied to assess the compatibility of the LTP4 Objectives.

All 35 policies in the draft LTP4 were assessed for compatibility against each of the SEA objectives using a matrix and the criteria in Table 5.3. The focus of this assessment was to highlight areas where the policies may conflict with environmental objectives in order to highlight ways to reduce the potential for environmental harm, or preferably to increase the potential for positive environmental outcomes.

A significant conflict was identified between LTP4 Policy 21 ('*Oxfordshire County Council will support the development of air travel services and facilities that it considers necessary to support economic growth objectives for Oxfordshire*') and SEA objectives 5 (noise pollution), 6 (air pollution) and 7 (greenhouse gas emissions). New infrastructure to support the development of air travel services (e.g. supporting the growth of London Oxford Airport) could encroach on undeveloped land, with the potential to impact on biodiversity, green spaces, cultural assets, the built environment and the wider landscape. The future of air travel services (e.g. those that may increase flight capacity) in Oxfordshire has the potential to cause significant negative impacts on noise, air quality and greenhouse gas emissions and negative impacts on green infrastructure, countryside, landscape and human health, which will require further consideration at the project level.

However, Policy 27 '*Oxfordshire County Council will work to reduce negative environmental impacts of the operation of the transport network, and where possible provide environmental improvements, particularly in Areas of Outstanding Natural Beauty, Conservation Areas and other areas of high environmental importance'* is likely to promote significant beneficial effects, promoting protection of, and enhancements to the environment, and supporting the majority of the SEA objectives.

Policy 28 '*Oxfordshire County Council will work with partners to improve public spaces and de-clutter the street environment*' also seeks to protect the environment and will positively (and significantly) support SEA objectives 15 (built environment) and 16 (landscape character).

Additionally, many of the LTP4 policies are likely to promote significant beneficial impacts on the environment and support the SEA objectives, particularly those objectives that relate to the population, air pollution and the built environment, as follows: -

- SEA Objective 2 - 'Improve accessibility to jobs, facilities and services' – policies 1 to 4, 8, 15, 16, 24, 25, 31 and 35 positively support achievement of this objective.
- SEA Objective 3 - 'Enhance and protect the green infrastructure and countryside' – policies 3, 22, 27 and 28 positively support achievement of this objective.
- SEA Objective 4 - Protect and promote everyone's physical and mental well-being and safety – policies 1, 3, 5, 12, 14, 19, 22 and 31 positively support achievement of this objective.
- SEA Objective 6 - Reduce all forms of transport-related air pollution in the interests of local air quality – policies 17, 18, 27, 30, 31 and 33 positively support achievement of this objective.
- SEA Objective 7 - Reduce transport related greenhouse gas emissions – policies 11, 17, 18, 27, 30 and 31 positively support achievement of this objective.

6.3 Effects of Draft LTP4

6.3.1 Area and Supporting Strategy Impacts

The assessment of the alternative Area and Supporting Strategies is presented in Appendix F.

The results of the assessments have been aggregated in the subsequent sub-sections to provide an overall assessment of the effects of the draft LTP4 on the SEA receptors and SEA objectives.

This LTP4 has been developed to benefit people and their travel, supporting accessibility and future development/economic growth. Significant positive effects are identified such as improvements to the vitality of town and city centres, air quality, the built environment and walking and cycling. However, the draft LTP4 is likely to give rise to a number of construction related impacts on the environment such as land take, change in landscape, loss of habitats, resource use and impacts upon the historic environment. In many instances, these effects are likely to be better than the 'without LTP4 scenario', where such changes to provide short-term solutions, would be unplanned.

6.3.2 Population

SEA Objective 1: Maintain the vitality of town centres

The majority of the Area Strategies have been identified as having significant beneficial impacts on town and city centres through the reduction in through traffic (including freight movements), improvements to the public realm and the provision of infrastructure to support regeneration and economic growth. Such improvements are likely to result from improved traffic management and reduced congestion, the construction of bus tunnels (e.g. at Oxford), access restrictions, improved transport links and improved access to parking and employment.

The draft LTP4 is committed to deterring the use of freight on inappropriate minor roads and movements through towns (except where this is essential for local access) and reinforcing the attractiveness of recommended lorry routes to avoid important market towns, in particular at Burford, Chipping Norton and Henley-on-Thames. In Oxford, signage will be reviewed on the ring road to ensure that lorries are directed to their destinations within the city by the most appropriate routes. Additionally, as a result of investment in strategic rail in Oxfordshire, there may also be a shift in freight from road to rail in support of Route Based Strategies in the county. These measures will help to maintain the vitality of town centres.

Additionally, the LTP4 promotes the use of public transport, which will help to improve the environment of town centres if more people use public transport in preference to vehicles. The cycling strategy aims to encourage a greater uptake of cycling, improved cycle parking facilities in cities and towns, and a higher quality cycle network, which, together with an improved public transport system, is likely to help reduce the use of cars in town centres.

However, during construction of any transport improvements, the proposed network improvements are likely to result in some initial travel disruption within town centres and in the city of Oxford.

SEA Objective 2: Improve accessibility to jobs, facilities and services

The draft LTP4 proposes major improvements to the strategic road and rail network through Area Strategies, which are all predicted to have significant beneficial impacts on accessibility in the short and medium-term. The Area Strategies will improve access and connectivity to businesses, residential areas, leisure, retail destinations, employment opportunities and new and existing development locations. The LTP4 will seek to deliver effective peripheral routes around towns, promote collaborative working and reduce out-commuting in some areas (e.g. Bicester). Additionally, some of the Area Strategies support regeneration (including the redevelopment of some town centres and train stations) and seek to attract economic investment.

The LTP4 will also improve access to/from Oxfordshire from further afield (including rail services from London and airports at Heathrow, Birmingham and Gatwick).

The LTP4 also seeks to enhance pedestrian, cycle and public transport links (e.g. faster, more frequent and more reliable bus journeys, and public transport priority measures) to improve access between train stations, key employment sites and residential areas, particularly for commuters and those in education. Such improvements will provide access though fully integrated transport systems to job opportunities and essential services and facilities for people without a car, by choice or necessity. The Rail Strategy proposes significant improvements through service upgrades, a greater choice of routes and increase in services with better links through Oxfordshire between Didcot, Oxford and Bicester to further afield. The Cycling Strategy includes the development of cycling strategies for towns and journey to work/schools, enabling people to cycle into towns, park bikes securely, and access shops, offices, stations and priority bus routes.

The Freight Strategy commits to planning the location of new employment sites and any related transport infrastructure so that these can function well, with efficient freight access to and from the strategic transport network without adverse impacts on local communities, other road users and the environment.

However, the improvements to the transport network as a result of the Area Strategies would also support significant traffic growth, which could lead to further community severance effects and reduce accessibility following delivery of the LTP4 (post 2031). The long term effects of the Area Strategies on accessibility is uncertain as the effects may be dependent upon the implementation of some proposals that may be subject to change, transport provision in future plans and the capability of the road and capacity improvements to accommodate the forecasted traffic growth.

SEA Objective 3: Enhance and protect the green infrastructure and countryside

No significant strategic impacts on the countryside and green infrastructure have been identified. The majority of impacts have been identified as uncertain, as a result of delivering the draft LTP4. The LTP4 promotes improvements to, linkages between, and the creation of new pedestrian and cycle routes (and their facilities), but there is uncertainty as to the effect of new and improved road, rail and public transport infrastructure on the countryside and existing green infrastructure during construction. The capacity improvements have the potential to impact on the countryside as a result of land-take, which will require further consideration at project level.

Cycling and walking facilities require relatively small infrastructure changes to the environment, but any impacts on the countryside will be dependent on appropriate siting of new cycle/pedestrian routes.

6.3.3 Human Health

SEA Objective 4: Protect and promote everyone's physical and mental wellbeing and safety

No negative impacts on human health have been identified as a result of the LTP4. This LTP4 identifies strategies to improve facilities, links and safety conditions for pedestrians and cyclists to encourage the uptake of walking and cycling. These improvements include the provision of super-premium and premium cycle routes, a cycling strategy for Science Vale, a Sustainable Transport Strategy for Bicester, a low traffic 'Oxford' city centre, innovative cycle parking facilities with cycle hubs and strategies to increase use of public transport. These are considered significant beneficial impacts as they will help to improve the health and well-being of local communities, tackling the increasing levels of obesity while enabling access to housing sites and facilitating movement between employment sites, retail centres and residential areas. OCC will also seek enhancements to the Public Rights of Way network from new developments, and promote the use of towpaths along the River Thames and the Oxford Canal for long distance walking, through partnership working.

This LTP4 demonstrates a commitment to maintaining the safety and condition of local roads and highway related assets with systematic prioritisation where there are safety related issues, premium bus routes and high pedestrian and cycle usage whilst still maintaining the network as a whole.

The Science Transit strategy also demonstrates a commitment to improving travel information and integrated and reliable services for the population to improve the traveller experience and support the development of road safety technologies. Such systems will seek to work with modern lifestyles and align with aspirations for personalised mobility options. Additionally, the LTP4 together with the Science Transit will develop interchange points between multiple modes of transport (hubs) that will maintain safe walk and cycle access by keeping people segregated from public transport and vehicles.

As part of the Freight Strategy, features will be developed to influence lorry routes and journey times that reduce the danger that lorries pose to cyclists. Additionally, rest areas and proper facilities will be developed for lorry drivers with security, refreshments, washing and toilets catering better for drivers in terms of health and safety.

In the longer term, there may be increasing risks to cyclists and pedestrians from the estimated increase in large lorries, but these risks will increase at a greater rate in the absence of the LTP4.

6.3.4 Noise

SEA Objective 5: Reduce noise pollution

No significant strategic impacts on noise have been identified as a result of implementing the LTP4. Any impacts of the strategies on noise are likely to be dependent on location.

There are likely to be benefits in terms of reducing noise in towns and Oxford city centre (e.g. through traffic reductions, proposals to re-route traffic and reduce freight traffic volumes, and the construction of bus tunnels). However, there will be elevated noise levels in other areas (e.g. at park and ride sites located further from towns and the city, and in more rural tranquil areas) through transport network improvements, the provision of more bus services and increased road traffic (including freight). It is uncertain how the Science Transit will align with the LTP4 and affect noise patterns through improved frequency, speed and reliability of services.

There are also likely to be negative impacts through increased noise pollution associated with construction of infrastructure works.

Noise will be assessed as part of scheme design and suitable noise mitigation will be used to reduce any impacts identified.

6.3.5 Air Quality

SEA Objective 6: Reduce all forms of transport-related air pollution in the interests of local air quality

No significant strategic impacts on air quality have been identified as a result of implementing the LTP4. Any impacts of the strategies on air quality are likely to be dependent on location and partnership working.

Improvements to air quality are likely to be realised through the support of high capacity vehicles with low or zero emissions, through zero emissions restrictions for freight and taxis in some areas (e.g. Oxford), through support for low carbon modes of public transport and through the implementation of schemes that deter road traffic from town centres or provide traffic calming measures. Improvements to air quality in cities and town centres are also likely to be realised through the implementation of measures that deter freight traffic, and consolidate freight items, combining them for onward delivery to the same destination.

Additionally, proposals to encourage the use of sustainable modes of transport (e.g. walking and cycling) are likely to improve air quality in some areas. Cycling is a largely carbon-free form of transport and will therefore help to reduce the reliance on vehicle based transport and associated air pollutants from transport.

However, increases in air pollutants may result elsewhere from the re-routing of traffic (particularly freight traffic) and the improvements to the transport network, which will increase road capacity and may encourage further traffic growth in the long-term. The construction of new road and rail infrastructure and associated facilities is also likely to elevate air pollution.

6.3.6 Greenhouse Gas Emissions

SEA Objective 7: Reduce transport related greenhouse gas emissions

No significant strategic impacts on greenhouse gas emissions have been identified as a result of implementing the LTP4.

The LTP4 will encourage greater use of sustainable modes of transport (walking and cycling) together with an improved rail service, more energy efficient buses, park and ride sites and a fully integrated and enhanced public transport system with bus priority measures, which will help to reduce greenhouse gas emissions.

However, the effects of the LTP4 on this SEA objective are uncertain in the short-term as some of these benefits may be offset by increased emissions during construction of road, rail and air infrastructure. Some of the long term effects will also be dependent on traffic growth and emission standards.

The impacts of the freight strategy on greenhouse gases are likely to be dependent on location.

6.3.7 Biodiversity, Flora and Fauna

SEA Objective 8: Protect and enhance habitats and the diversity and abundance of species

No significant strategic impacts on biodiversity have been identified as a result of implementing the LTP4.

However, the LTP4 assumes a number of new road improvements and cycle routes to improve accessibility and support housing growth, which may have an overall adverse effect upon biodiversity through the loss and fragmentation of habitats with associated impacts on species of principal importance and European protected Species. Such improvements will encourage further traffic so it is likely that there would also be an increase in road kills and air pollution effects on biodiversity and therefore ongoing negative effects.

There is also potential for negative impacts on some SSSIs, which will require further consideration at project level, when further detail is available to assess the potential for impacts as a result of planned road, rail, pedestrian and cycle network improvements and bus network aspirations.

This HRA Screening has found that no likely 'strategic' significant effects are predicted from elements of the LTP4's Area Strategies on any European sites, subject to appropriate design and mitigation. However, project level HRA is recommended (in consultation with Natural England) with regard to Oxford Meadows SAC and Little Wittenham SAC when further details of the delivery of transport schemes within the Oxford and Science Vale Strategies are available, to ensure compliance with the Habitats Regulations.

In the absence of further details of proposed works (e.g. verge cutting, highway shrub and tree maintenance) as part of the Highways Asset Management Plan (HAMP), it is uncertain whether there will be any impacts on habitats and species.

6.3.8 Water

SEA Objective 9: Maintain and improve the quality of water resources

No significant effects upon water quality are anticipated as it is assumed that any new infrastructure would be designed with appropriate drainage to address potential surface water pollution.

The LTP4 is unlikely to have any significant adverse impacts on any river or lake water bodies, but has the potential to result in pressure on the water environment, in-combination with other development. Elements of the Area Strategies in the draft LTP4 may therefore give rise to schemes or physical interventions that themselves could require a WFD compliance screening assessment; these include (but are not limited to):

- New or improved transport connections and enhancements to road capacity – potential for increased risks to water bodies
- Drainage improvements - If improved highway drainage results in additional stormwater discharge into any watercourse (water body or tributary) there is potential for effects. Flow changes could be beneficial or adverse, for example improving flow in Thames tributary brooks, or resulting in scour at discharge points. There may also be changes in water quality for example if highway runoff is poor quality, or if drainage improvements incorporate some runoff treatment.

The LTP4 may promote schemes or physical interventions that could make positive contributions towards WFD environmental objectives; these are:

- Drainage improvements – as above
- Management of flood risk, as outlined in the Oxfordshire Local Flood Risk Management Strategy.
- Partnership working - presents an opportunity to promote the WFD environmental objectives alongside other responsibilities of stakeholders, which could result in future beneficial contributions to the objectives.
- Development of GI - can support flood risk management and has potential to support WFD objectives

SEA Objective 10: Retain the floodwater storage function of riparian land and the floodplain and reduce the risk of flooding where it would be detrimental

The LTP4 demonstrates a commitment to maintaining drainage and associated infrastructure to minimise flooding on and from the highway network. This includes (but is not limited to) adopting a strategic approach to drainage and flood management and investigating reports of highway flooding and damaged or blocked highway drain, taking appropriate measures to get water off of the highway, alleviate or mitigate flooding as appropriate.

It is assumed that new capacity and access improvements would be designed with appropriate drainage to address potential flood risk.

6.3.9 Geology and Soil

SEA Objective 11: Maintain resources such as minerals and soils and enhance geological diversity

The potential transport network improvements associated with the LTP4 are likely to be resource intensive. It is assumed that increases in frequency and length of trips to be taken by road would lead to an ongoing high maintenance requirement and long term high mineral use, which would result in negative impacts (some of which may be significant). The increased frequency of public transport services may help reduce dependence on fossil fuels but this effect is likely to be undermined by the convenience of car use.

Some impacts on minerals and soils will also be dependent on appropriate siting and construction of new infrastructure. Care will be required if any road improvements are undertaken at Drayton, in association with the new housing west of Warwick Road, to ensure protection of the geologically designated Neithrop Field Cutting Site of Special Scientific Interest (SSSI).

The HAMP demonstrates a commitment to making the best use of natural mineral resources, planning for Oxfordshire's long-term minerals need whilst minimising waste going to landfill, which is considered to be a beneficial impact of the LTP4.

SEA Objective 12: Optimise the use of previously developed (brownfield) land thereby reducing waste generation

No significant strategic impacts on the brownfield land have been identified.

The impacts have been identified either as uncertain. Although the LTP4 will support growth on brownfield sites in sustainable locations, it is unknown at this plan level whether brownfield land will be used for the proposed transport network improvements, or where land-take is likely to comprise currently undeveloped greenfield sites or agricultural land.

The LTP4 will however seek to use previous brownfield land, wherever possible, for example, a currently disused underpass under the railway at Milton Park, which will be reopened for cyclists. The HAMP also demonstrates a commitment to maintaining the highway assets, following the principles of Reduce, Reuse, Replace in its use and disposal of materials. This will be done by reducing the need to transfer waste material to landfill sites, by reusing material where possible and by taking a whole life approach to asset management, which optimises maintenance requirements.

6.3.10 Material Assets

SEA Objective 13: Adapt transport network to climate change

No significant strategic impacts on climate change have been identified.

It is assumed that the LTP4 schemes would be constructed to design standards that take account of climate change predictions and therefore be more resilient than existing infrastructure, which is considered a beneficial impact. The plan also demonstrates a commitment to improving the condition of local roads, footways and cycleways, including resilience to severe weather events. However in the long term there is a risk that infrastructure would be overwhelmed by extreme weather events.

6.3.11 The Historic Environment

SEA Objective 14: Conserve and enhance the historic environment, the significance of heritage assets and their settings

The impacts of the LTP4 on the historic environment are uncertain and will be dependent on the nature, location and siting of new and improved transport infrastructure and services. Access improvements and the Sustainable Transport Strategy may also improve sustainable access to known heritage sites.

A reduction in traffic (including freight) in town centres and Oxford city is likely to benefit heritage assets and their setting, conserving historic centres though improved air quality, visual amenity and reduced vibration.

However, there may be some negative impacts upon the historic environment from the improvements to the transport network and the re-routing of road traffic although the LTP4 generally seeks to ensure that historically sensitive areas (e.g. Banbury town) are protected. In particular, there is potential for the LTP4 to affect designated (e.g. WHS buffer zone, listed building, scheduled monuments and registered parks and gardens) and undesignated heritage assets and their settings from new road and rail schemes, traffic congestion and noise/air pollution, which will require further consideration at project level. Additionally, indirect impacts, such as loss of landscape character, and changes in water table, can affect the preservation of archaeological and built heritage in situ.

Further consideration will be required at project level to understand the risk to heritage and archaeology once the location, siting, alignment and nature of transport improvements have been determined.

SEA Objective 15: Maintain and enhance the quality and distinctiveness of the built environment

No significant strategic impacts on the built environment have been identified.

It is likely that improved road and rail infrastructure, and new pedestrian and cycling facilities would benefit the built environment. The LTP4 also promotes public realm improvements to enhance the quality of the pedestrian environment by creating a sense of 'place'. Such improvements will complement proposed investment in the regeneration and redevelopment of some town centres.

The LTP4 is also committed to deterring the use of freight on inappropriate minor roads and reinforcing the attractiveness of recommended lorry routes to avoid important market towns, in particular at Burford, Chipping Norton and Henley-on-Thames. Additionally, as a result of investment in strategic rail in Oxfordshire, there may also be a shift in freight from road to rail in support of Route Based Strategies in the county, which may help to improve the built environment.
The HAMP demonstrates a commitment to maintaining street furniture, road markings and other assets that contribute to the quality of the built environment.

However, the new road infrastructure, and associated traffic growth to support housing growth could have negative effects on the built environment in the long-term.

6.3.12 Landscape

SEA Objective 16: Conserve and enhance the quality and character of the landscape, including its contribution to the setting and character of settlements

The potential for significant adverse impacts on landscape character have been identified as a result of delivering the Science Vale Area Strategy, where road improvements to improve access could affect landscape character within the Wessex Downs AONB and its wider setting (e.g. impact on landscape features, loss of open countryside, loss of tranquillity, change in visual amenity).

In other areas, the construction of new and permanent elements in the landscape such as road and junction improvements, and park & rides are likely to have an adverse effect on landscape character. The design of all new infrastructure should seek to minimise impacts on landscape character and visual intrusion.

Additionally, road improvements to improve access could have a negative effect on local landscape character during construction works implemented throughout the lifetime of the plan (i.e. 2015 to 2031), as a result of earthworks and the presence of plant and machinery.

Enhancements to existing cycle routes may including lighting to avoid conflicts between use of space by walkers and cyclists and this will require careful consideration in areas of high landscape value and rural locations.

At some locations, the LTP4 promotes potential improvements to long-term landscape character such as the construction of bus tunnels in Oxford, which will help to reduce congestion. New landscaping schemes

as part of new developments may also improve landscape character in areas where there is currently low quality landscapes.

However, new landscaping schemes as part of new developments may improve landscape character in areas where there is currently low quality landscapes. For example, proposals to redevelop parts of Science Vale to improve the visual impression of Didcot for visitors arriving by train, may benefit the area. Pedestrian improvements and the HAMP's commitment to maintain street furniture and other assets that contribute to the local landscape character (while removing redundant or obsolete street furniture) will help to improve the streetscape in some areas.

6.3.13 Cumulative Impacts

6.3.13.1 Cumulative Effects of LTP4

Many of the effects predicted for the LTP4 are cumulative in their nature. For example, the predicted positive effect on air quality depends upon a reduction in traffic arising from the cumulative effect on modal shift from the combination of public transport measures and promotion of walking and cycling.

The negative effects predicted on landscape character, soils and biodiversity are chiefly due to the cumulative effect of transport measures in combination with development pressure and land-take within greenfield sites and the countryside in general. Few of the Area Strategies will, alone, lead to any significant impacts on a strategic scale, but the additive effect of loss of greenfield land would lead to a significant overall effect.

It is anticipated that there would be a cumulative positive effect on human health through active travel. The combination of a reduction in traffic in urban centres, an increase in walking and cycling and improvements to walking and cycling facilities would combine to improve human health through a combination of increased physical activity and reduced air and noise pollution.

When project level detail associated with the LTP4 schemes (including location of transport improvements and ongoing maintenance and repair works) is available, further assessment of potential in-combination or cumulative impacts should be considered.

6.3.13.2 Cumulative Effects of Others Plans, Strategies and Projects

The LTP4 has been developed in such a way to ensure that it has been fully integrated with other plans, strategies and programmes, as follows: -

- **Local Plans** – the LTP4 has been developed alongside the district councils' Local Plans to ensure that the policies and Area/Supporting Strategies complement and do not conflict with those in the Local Plans. In particular, work is taking place by Oxfordshire County Council to understand the potential for in-combination or cumulative transport impacts on Oxfordshire from other developments (example, the Eastern Villages development proposed by Swindon Borough), which will require further consideration as the LTP4 is implemented through project level schemes.
- **Town Masterplans** - The LTP4 has also been developed alongside town masterplans to ensure that the policies and Area/Supporting Strategies complement and do not conflict with those in the masterplans. For example, Oxfordshire County Council is working with Carterton Town Council as their masterplan for Carterton, which will seek transport infrastructure and services to support regeneration initiatives is emerging.
- **MOD Proposals** - The LTP4 has the potential for in-combination and cumulative impacts with future changes and new infrastructure provided by the MOD through the intensification of military operations at RAF Brize Norton, which will require further consideration when details of their plans including Programme GATEWAY become available. This is most relevant to the Carterton Area Strategy.
- **Rail Proposals** - The Rail Strategy of the LTP4 is being developed alongside other Oxfordshire road strategies in partnership with Network Rail and other train operators to ensure that the policies do not conflict with the proposals of others. Further consideration will need to be given to the

programming of such schemes to identify in-combination constraints (e.g. travel disruption) and opportunities (beneficial re-use of resources) associated with construction.

- **Development Proposals** - The LTP4 has been developed to support new development proposals in the county associated with economic growth. The in-combination impacts of these developments on the environment will require further consideration at project level, when the nature, design and location of other developments are available. Additionally, as measures are taken forward as part of the Freight Strategy of the LTP4, consideration will be given to the potential for in-combination and cumulative impacts on freight and logistics associated with large scale residential and business developments and the council will ask developers of such sites to prepare Construction Logistics Plans and Delivery and Servicing Plans to ensure that businesses make ongoing arrangements to ensure protection of the environment.

7 Environmental Mitigation and Recommendations

The draft LTP4 provides an opportunity to protect or enhance the environment and provide more pleasant areas in which to work and live. Wherever possible the LTP4 seek to provide the greatest value to the county by delivering multiple benefits through investment in transport infrastructure.

7.1 Population

No significant negative effects on the vitality of town centres, accessibility to jobs, facilities and services or on the countryside/green infrastructure have been identified as a result of delivering the LTP4 Strategies and therefore no mitigation is required.

However, the following recommendations should be taken forward as the plan is delivered to improve local community conditions or where uncertain impacts have been identified:

- Develop schemes that are appropriately sited and designed to avoid or minimise impacts on local communities, their access to the countryside and availability of green infrastructure.
- Promote an intensive educational programme encouraging local journeys on foot or by bicycle or public transport to help support use of town centre facilities.
- Continue to take account of those without access to cars and to provide equality of opportunity, particularly to the elderly and rural communities
- Continue to develop effective partnerships with the public and private sector (e.g. Highways Agency, bus operators, developers, local employers, business groups, rail industry including Network Rail, Department of Transport and councils) to deliver the vision for improved accessibility and capacity improvements.
- Develop the concept of Intelligent Mobility and apply it to transport systems within the county during the implementation of the LTP4.
- Work closely with local planning authorities within the constraints of the National Planning Policy Framework to influence the location and design of new employment sites and any related transport infrastructure.
- Ensure developers of major sites prepare Construction Logistics Plans to minimise impacts of large scale residential and business development planned for Oxfordshire, as well as Delivery and Servicing Plans to ensure that businesses make ongoing arrangements for sustainable freight and logistics. The development of Construction Logistics Plans should also take into consideration the need to maximise opportunities to natural green space and the countryside.
- In line with guidance from Natural England (2009), plan new transport developments to integrate green infrastructure into the design. The demand management element may help to reduce traffic and open up more possibility to convert space otherwise occupied by roads or parking to new elements of green infrastructure.
- Link footpaths and cycleways to existing green infrastructure, especially play spaces, which would support safer access by children and improved physical activity.

7.2 Human Health

No significant negative effects on human health have been identified as a result of delivering the LTP4 Strategies and therefore no mitigation is required.

However, the following recommendations should be taken forward as the plan is delivered to provide improvements to human health or where uncertain impacts have been identified:

- Continue to seek opportunities at project level to promote sustainable travel to support the planned housing growth, and to improve the safety of existing rights of way as part of strategy area implementation.

- Develop new walking and cycling infrastructure where possible, maximising opportunities to natural green space and the countryside, and promoting the creation/extension of and improvements to green and blue infrastructure.
- Continue to seek opportunities at project level to improve the safety and quality of existing rights of way (e.g. improving the quality of surfaces, providing directional signage, access to public transport) as part of strategy area implementation and to provide better integration with rail and strategic bus networks.

7.3 Noise

Some negative noise impacts have been identified, which will arise during the construction of schemes, and will require mitigation: -

- Plan construction activities to minimise disturbance to pedestrians, residents, tourists and workers within affected areas, for example through the use of temporary acoustic screening where appropriate.
- Seek to ensure that freight traffic uses the most appropriate routes, as outlined in Oxfordshire's Inter-urban Freight Strategy and Oxfordshire Lorry Routes Guidance.
- Consider the use of low noise surfacing when constructing new roads and in delivering new walking and cycling routes, which would also have associated health and well-being benefits.

7.4 Air Quality

Some negative air quality impacts have been identified, which will arise during the construction of schemes, and potentially through the increased capacity of the road network to support more vehicles in the longer term, which will require mitigation: -

- Seek to implement measures to counteract traffic growth (e.g. by continuing to improve opportunities for sustainable transport).
- Continue to work with the Highways Agency, district councils, Network Rail and train operators to identify air quality improvements associated with the road and rail network to complement measures identified in Air Quality Action Plans.
- Carefully plan schemes in terms of location, scale and design at project level to ensure air quality reductions are realised.
- Apply restrictions on more polluting vehicles within Oxford to encourage a cleaner fleet. Consideration could be given as to how to apply a "polluter pays" principle into demand management measures.
- Consider use of trees in appropriate locations to filter out pollutants; urban tree planting can be beneficial to air quality, and should be considered at project level.

7.5 Greenhouse Gas Emissions

Some negative greenhouse gas emissions impacts have been identified, which will arise during the construction of schemes, and potentially through the increased capacity of the road network to support more vehicles in the longer term, which will require mitigation: -

- Plan Park & Ride facilities to minimise the likelihood of people driving greater distances than they would otherwise have done if parking.
- Carefully plan road infrastructure improvements (e.g. those on A420) in terms of location, scale and design at project level to ensure gas emission reductions are realised.
- Seek funding through allocated development sites in the Local Plans for improvements to public transport, which will help reduce reliance on private car use and thus greenhouse gases.
- Consider implementing a more intensive programme of 'Intelligent Mobility' services and demand management to increase the uptake of more carbon efficient travel (public transport, walking and cycling) within large towns where there is significant opportunity because of the relative close proximity of various services.

7.6 Biodiversity, Flora and Fauna

Some negative impacts on biodiversity have been identified, which are likely to arise during the construction of transport schemes (e.g. in the footprint of new infrastructure, through habitat fragmentation or through indirect impacts such as reduced air quality/increased noise), and these will require mitigation: -

- Detailed ecological assessment at project level should be undertaken to inform specific routes, siting of infrastructure and associated impact assessment and mitigation requirements, in consultation with Natural England.
- Consideration should be given to integrated habitat improvements as part of schemes, including (but not limited to) opportunities to plant native peripheral trees and shrubs, which can provide improved habitats for birds, invertebrates and small mammals, different mowing regimes and management to ensure pollutants in run-off from roads are intercepted or otherwise reduced.
- Where irreversible and unpreventable impacts on habitats and species are identified, habitat offsetting and replacement is likely to be required.

7.7 Water

Some negative impacts on water have been identified, which are likely to arise during the construction of transport schemes, and these will require mitigation: -

- Detailed assessment at project level should be undertaken to inform specific routes, siting of infrastructure and associated impact assessment and mitigation requirements, in consultation with the Environment Agency to ensure no impacts on water bodies. This is likely to include the requirement for a Water Framework Directive compliance assessment. Schemes will need future consideration during site-specific design to determine whether proposed highway and drainage improvements will result in any significant changes in the quantity and/or quality of highway discharges to any water body. This consideration should include the potential effects combined across the highway network as a whole, and any site-specific sensitivities within the water bodies involved.
- SuDS should be integrated into the design of new infrastructure to help provide opportunity to enhance the existing drainage network and help improve water quality further. The planting of trees and vegetation would also help to reduce surface run-off rates.

7.8 Geology and Soil

Some significant negative impacts on soils and mineral use have been identified, which are likely to arise during the construction and ongoing maintenance of transport schemes, and these will require mitigation:

- Promote the use of secondary materials to reduce the amount of resource consumption in new designs and the beneficial re-use of material. Where possible, existing infrastructure should be used or incorporated into designs to minimise the generation of waste.
- Continue to seek measures to counteract traffic growth, which would help to reduce the maintenance requirements on the road network.
- Seek previously developed sites in the design and construction of new infrastructure.
- Enhance partnership working with local planning authorities and use of the planning system to achieve better coordination between land use planning and future public service provision.
- Carry out detailed environmental assessment of the effects on land use of individual highway schemes and new park & ride facilities (e.g. at Eynsham Park, Vendee Drive junction area, Bicester Village, Lodge Hill interchange), which should be a material consideration in site selection and considered as part of detailed EIA. Wherever possible, new park and ride sites should be located where there would be the least impact upon soils, particularly productive agricultural soils. Where this is not feasible, soils should be recovered and used taking into account relevant legislation.

7.9 Material Assets

No negative impacts on material assets have been identified. However, the following recommendations should be taken forward as the plan is delivered to provide environmental improvements or to mitigate for uncertain impacts:

- Plant trees along key pedestrian walkways and cycleways to create shade and have a cooling effect, where considered appropriate
- Use SuDS and temperature resilient surfaces for new networks.
- Ensure maintenance requirements take into account climate change predictions in seeking to make adaptations such as more temperature resilient surfacing.

7.10 Historic Environment

No negative impacts on material assets have been identified. However, the following recommendations should be taken forward as the plan is delivered to provide environmental improvements or to mitigate for uncertain impacts:

- Detailed archaeological assessment at scheme level including detailed historic characterisation studies to inform development to ensure the protection of cultural heritage and archaeology during construction
- Measures to restrict access of polluting vehicles would help to preserve building facades which are vulnerable to particulate pollution.
- Wherever traffic congestion in town centres is reduced it is recommended that the benefits are locked in through reallocation of road space to enhance the public realm.
- Prepare management plans for heritage assets; as appropriate

7.11 Landscape

Significant negative impacts on landscape character have been identified as a result of the LTP4, which will require project level mitigation:

- Detailed landscape and visual impact assessment at scheme level to ensure that schemes are designed to protect national (e.g. North Wessex Downs AONB), regional and local landscape character and seek to minimise visual intrusion. This should be implemented through a detailed scheme level EIA, where appropriate.

8 Monitoring Plan

8.1 Introduction

The SEA directive sets out that 'member states shall monitor the significant environmental effects of the implementation of plans and programmes to identify at an early stage, unforeseen negative effects, and to be able to undertake appropriate remedial action' (Article 10.1). In addition, the Environmental Report should provide a 'description of the measures envisaged concerning monitoring' (Annex I(i)).

This chapter therefore documents how, once adopted, Oxfordshire County Council will monitor the environmental effects of implementing the LTP4 against the predictions made by the SEA. The key principles of implementation and monitoring are to: -

- Ensure that mitigation measures are fully implemented and are effective
- Monitor all the significant environmental effects identified during assessment and documented in the Environmental Report. This includes all significant positive, negative, foreseen and unforeseen environmental effects
- Identify any unforeseen environmental effects
- Avoid duplication of monitoring by utilising existing monitoring programmes

Monitoring is important in evaluating any unforeseen cumulative effects and can also be used to address any uncertainties or gaps in the data through the provision of a more detailed baseline.

8.2 Monitoring Proposals

The monitoring proposals included in this section refer to the significant effects that have been predicted as a result of the draft LTP4 Policies and Area/Supporting Strategies, as well as the effects which are highly uncertain.

At present the monitoring requirements are not well developed. There is currently significant uncertainty over available public funding and the monitoring programme may need to be designed to be achievable within limited budgets. Therefore it may be necessary to identify other monitoring regimes and link in with those processes to avoid duplication of effort, and to make the best use of available information. The monitoring framework will be developed further and confirmed in the SEA Statement which will be prepared once the Final SEA has been developed.

8.3 Monitoring Plan

Table 8.1 provides an overview of monitoring proposed in relation to the predicted **significant effects** (major positive and negative effects) during the life of the LTP4 (up to 2031) or where uncertain effects have been identified in this same timescale, taking into consideration the SEA assessment criteria that have been derived.

Table 8.1 Environmental Strategic Monitoring Plan [for discussion – as to what is achievable]

SEA Receptor	Assessment Criteria	Potentially Significant or Uncertain Impact	Monitoring Required	Potential Response	Target
Population	• Is the LTP4 likely to reduce the impacts of traffic in the public realms of key settlements? • Will it be possible to access key settlements and proposed growth areas by convenient public transport? • Will town centres be easier to walk or cycle to and around for local residents?	**Significant beneficial effects** Improvement to town centres	Change in accessibility to key settlements by public transport and sustainable modes of transport through level of service by bus and rail services (number of routes and frequencies), plus a qualitative assessment of cycling provision.	To be confirmed	Vitality of town centres maintained
	• Is public transport and community transport likely to improve under the LTP4? • Are all groups' transport needs catered for including rural residents without cars, elderly, disabled and children?	**Significant beneficial effects** Improved accessibility to jobs, facilities and services	Change in community severance Change in accessibility for disadvantaged groups Maintain a record of the levels of public transport and community transport available to isolated communities.	To be confirmed	Improved accessibility to jobs, facilities and services
	• Are schemes included to promote non-motorised access and maximise opportunities to natural green space and the countryside? • Does the LTP4 increase the safe provision of bridleways, cycle trails and footpaths? • Do new schemes promote the creation/extension of and improvements to GI, including consideration of personal mobility?	**Uncertain effects:** potential impacts on GI and countryside due to land-take	Change in area of GI and number of new GI improvements Area of land-take within countryside Number of new public rights of way	To be confirmed	GI and sensitive countryside protected from transport improvements
Human Health	• Does the LTP4 improve conditions for pedestrians and cyclists? • Does the LTP4 demonstrate a commitment to the health benefits of	**Significant beneficial effects** Improved facilities for pedestrians and cyclists with associated effects on health and safety	Accessibility to health facilities Accident statistics for pedestrians and cyclists	To be confirmed	Improved physical and mental well-being and safety of communities in Oxfordshire, as a result of the LTP4

SEA Receptor	Assessment Criteria	Potentially Significant or Uncertain Impact	Monitoring Required	Potential Response	Target
	physical activity and a move away from car dependency for shorter journeys? • Does the LTP4 increase capacity of transport infrastructure and improve connectivity?				
Noise	• Will disturbance from traffic be reduced in residential areas? • Is noise from traffic likely to change in rural locations and affect tranquility?	**Uncertain effects:** uncertain due to increased noise pollution during construction. Longer term impacts will be dependent on location of new infrastructure	Changes in noise levels as a result of transport improvements Change in number of sensitive receptors affected by transport noise	Project-level noise impact assessment / EIA mitigation required	Reduced transport related noise to sensitive receptors
Air quality	• Does the LTP4 encourage and facilitate the use of active travel and short journeys? • Will the LTP4 help to reduce traffic congestion? • Will the LTP4 limit the more polluting vehicles in sensitive areas? • Will the LTP4 help to limit traffic growth?	**Uncertain effects:** impacts are dependent on location of new infrastructure	Change in air quality within AQMAs Change in air quality levels	Project-level air quality impact assessment / EIA mitigation required	Air quality maintained and exceedances of air quality standards reduced
Climatic factors	• Does the LTP4 reduce or limit dependency on finite fossil fuels? • Does the LTP4 support or facilitate the use of low carbon modes of transport? • Does the LTP4 help ensure that vehicle journeys can be made efficiently with minimum disruption or distance?	**Uncertain effects:** uncertain in the short-term due to increased emissions during construction	Number of awareness campaigns to minimise freight travel	Project-level air quality impact assessment / EIA mitigation required	Reduced transport related greenhouse gas emissions
Biodiversity, flora, fauna	• Will new schemes affect priority habitats or the conservation status of designated nature conservation sites? • Are new transport routes likely to cause severance of wildlife corridors? • Does the LTP4 support biodiversity improvements?	**Significant negative effects** Potential loss and fragmentation of habitats Potential impacts on designated nature conservation sites	Change in condition of designated wildlife sites at risk from transport infrastructure or transport	Project-level ecological impact assessment / EIA mitigation required Project level HRA relating to Oxford Meadows SAC. Review and if necessary revise Area/Supporting Strategies if assessments concludes detrimental	No deterioration in condition of designated sites No net loss of habitats or species of principal importance

SEA Receptor	Assessment Criteria	Potentially Significant or Uncertain Impact	Monitoring Required	Potential Response	Target
				effects on nature conservation features	
Geology and soils	• Does the LTP4 require large scale demolition and construction of new infrastructure? • Will proposals under LTP4 require significant resources for ongoing maintenance? • Is the LTP4 likely to increase demand for greenfield land and/or result in the loss of moderate to high quality (Grades 3 and above) agriculturally productive land? • Is there a likelihood that new schemes will affect geologically designated sites?	**Significant negative effects:** The transport network improvements are likely to be resource intensive and comprise considerable land-take	Volumes of materials exported/imported to site during construction of schemes Area of agricultural land affected by schemes (in particular Grades 1 – 3 land)	To be confirmed	Protection of soils and mineral resources
	• Do the proposals make use of previously developed sites? • Are transport improvements feasible within the footprint of existing infrastructure?	**Uncertain effects:** unknown at this plan level whether brownfield land will be optimised/prioritised when safeguarding land for transport schemes	Area of brownfield and greenfield land affected by delivery of LTP4	To be confirmed	Use of greenfield land avoided or minimised as a result of delivering the LTP4
The Historic Environment	• Will the LTP4 negatively affect any cultural heritage assets and/or their setting? • Is there a likelihood that proposals will encroach upon undeveloped land, which may harbour archaeological remains? • Does the LTP4 include provision for sustainable access to key cultural heritage sites? • Are the LTP4 measures sympathetic to the local character of the historic environment?	**Uncertain impacts:** Potential damage to heritage assets and their setting, and potential opportunities to improve access	Change in number of heritage assets adversely affected by the LTP4 (using heritage Counts: State of the Historic Environment and locally derived indicators) Change in accessibility to heritage assets as a result of LTP4 delivery e.g. public transport service/pedestrian/cycle access to heritage sites Number of designated heritage assets within Air Quality Management Areas	Production of archaeological assessments during project development	Production of archaeological evaluations where heritage assets are affected. Avoidance of harm to the significance of heritage assets as a result of the LTP4 delivery. Improved access to key cultural heritage sites
Landscape	• Will additional transport infrastructure be developed which will encroach upon	**Significant negative effects** Road improvements may adversely affect landscape character within the	Area of AONB affected by transport proposals	LVIA undertaken during project development EIA, and projects involving new	No detrimental effects on landscape

SEA Receptor	Assessment Criteria	Potentially Significant or Uncertain Impact	Monitoring Required	Potential Response	Target
	designated landscapes and the countryside? • Will lighting provision change on transport infrastructure?	Wessex Downs Area of Outstanding Natural Beauty (AONB) and its wider setting (e.g. impact on landscape features, loss of open countryside, loss of tranquillity, change in visual amenity).	Change in lighting provision	transport infrastructure, should be subject to 'before' and 'after' landscape assessment	character within the North Wessex Downs AONB
Cumulative impacts	• Integration of LTP4 with plans and projects of other organisations	**Uncertain effects:** cumulative impacts with Local Plans, town masterplans, proposed and allocated development, Network Rail and rail operator proposals, and MOD proposals	Monitor development of other major plans and projects	Prepare detailed project level cumulative impact assessment	Cumulative impacts are clear and can be managed if required.

9 Next Steps

The SEA Regulations set specific requirements for consultation with the Consultation Bodies, the public and other interested parties (these could include non-governmental organisations and community groups), and require that the Environmental Report is made available for consultation alongside the consultation draft LTP4.

This Environmental Report and a separate Non-Technical Summary will be made available on the Oxfordshire County Council consultation webpage under Local Transport Plan 4:

http://www.oxfordshire.gov.uk or from

[address to be inserted].

The consultation period for the draft LTP4 and this ER will start on [to be confirmed] and will run for xno weeks [to be confirmed]. Comments received during this period will be taken into account in the preparation of the final LTP4 and a document will be prepared to explain how any comments have been addressed.

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Draft Habitats Regulations Assessment Screening Report

Local Transport Plan 4 (2015-2030)

Prepared for

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SECTION 1

1 Introduction

1.1 Background

CH2M Hill has been commissioned by Oxfordshire City Council (OCC) to undertake a Habitats Regulations Assessment (HRA) 'screening' of their fourth Local Transport Plan (LTP4). The LTP4 will set the policy and strategy for Oxfordshire's transport requirements, and OCC's approach to addressing the challenges of the transport system in Oxfordshire, in the period from 2015 – 2030.

This HRA screening report is based on the Area and Supporting Strategies of the LTP4 and builds upon the HRA Screening Report (Halcrow, 2010) produced in 2010. A summary of the HRA process is provided in Section 1.3 of this report.

Several European or *Natura* 2000 sites (hereafter referred to as European sites) designated under the EU Birds Directive and Habitats Directive, and sites designated under the Ramsar Convention on wetlands could be affected by the LTP4. A HRA has, therefore, been undertaken to comply with the requirements of Article 6(3) of the EU Birds Directive (2009/147/EC), implemented in England through the Conservation of Habitats and Species Regulations 2010 (as amended). In addition, it is UK government policy to extend this requirement to Ramsar sites (Department for Communities and Local Government 2005), and therefore the qualifying birds within relevant Ramsar sites have also been considered as part of this assessment.

The aims of this screening report are to present an assessment of whether:

- the LTP4 measures are directly connected with or necessary to the management of any European Sites; and
- the LTP4 has any potentially significant effects (either alone or in combination with other proposals) on a European site.

1.2 Study Area

The study area comprises the entire county of Oxfordshire (see Figure 1), which is located in the south east of England. The county comprises the districts of Oxford, Cherwell, Vale of White Horse, West Oxfordshire and South Oxfordshire.

Figure 1: Oxfordshire Study Area (OCC 2014a)

1.3 The HRA Process

1.3.1 Overview

The Report has been prepared in accordance with the:

- EU Habitats Directive (Council Directive 92/43/EEC), the EU Birds Directive (Council Directive 2009/147/EC) and the UK Habitats and Species Conservation Regulations 2010 (as amended in 2012);
- Methodological Guidance on the provisions of Article 6 (3) and (4) of the Habitats Directive 92/43/EEC : Assessment of plans and projects significantly affecting Natura 2000 sites (EC 2001)
- The Habitats Regulations Assessment of Local Development Documents. Revised Draft guidance by David Tyldesley and Associates for Natural England, January 2009.
- Design Manual for Roads and Bridges (DMRB). Volume 11, Section 4, Part 1: Assessment of Implications (of Highways and/or Roads Projects) on European Sites (including Appropriate Assessment) (HD 44/09).

In addition to these generic guidance documents, Natural England has also produced guidance on the effect of LTPs on the environment, which is relevant to HRA. Natural England advocates five key priorities for transport plans;

- Protection and enhancement of the natural environment;
- Climate change mitigation and adaptation;
- Improving sustainable access to the natural environment;
- Integrating Rights of Way Improvement Plans (ROWIPs); and
- Delivering green infrastructure.

The most relevant priority on this list to a HRA of a transport plan is the protection and enhancement of the natural environment, in terms of the potential significant effects of the transport plan on European sites.

1.3.2 HRA Stages

The methodological stages described in European guidance for HRA (EC 2001) are defined in Table 1.1.

Table 1.1 HRA Stages (modified from EC2001 and DCLG 2006)

HRA Stage	Description of HRA Stage
Stage 1: Screening	Process which identifies the likely impacts upon a European site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant.
Stage 2: Appropriate Assessment (AA)	The consideration of the impact on the integrity of the European site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts.
Stage 3: Assessment of Alternative Solutions	Assessment of alternative solutions — the process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the European site
Stage 4: IROPI	Assessment where no alternative solutions exist and where adverse impacts remain — an assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed (it is important to note that this guidance does not deal with the assessment of imperative reasons of overriding public interest)

The results of this screening stage (Stage 1) will be used to establish whether a full appropriate assessment is needed (Stage 2) due to likely significant effects on any European site. This conclusion would need to be agreed with Natural England, the statutory consultee.

If an Appropriate Assessment (AA) is required (Stage 2), the implications of the project must then be assessed in view of the site's conservation objectives, so as to ascertain whether or not it will adversely affect the integrity of the site. Mitigation measures should also be applied during the AA process to the point where no adverse impacts on the site(s) remain. If the plan is likely to result in any adverse effects, then it will not taken forward in its current form.

If the Stage 2 assessment were to confirm adverse impacts on the European sites as a result of the Plan and no further practicable mitigation is possible, it would be necessary to seek less damaging alternative solutions (Stage 3).

In the exceptional circumstances that the plan is justified by establishing Imperative Reasons of Overriding Public Interest (IROPI), consideration can be given to proceeding the plan in the absence of alternative solutions. In this situation, suitable compensatory measures (Stage 4) are required to maintain the coherence of the Natura 2000 network.

1.4 Consultation with Natural England

1.4.1 HRA of Oxfordshire's Earlier LTP3

Previous consultation was undertaken with Natural England regarding the HRA screening of the earlier LTP3 in September 2010. Their comments are shown in Table 1.2, which have been taken into account in the preparation of this document.

Table 1.2 Natural England Comments on HRA Baseline Report (Halcrow 2010)

Relevant section in HRA Baseline Report	Natural England comment
Sections 3.3, 3.4, 3.8 Basic Site Information for Oxford Meadows SAC, Little Wittenham SAC and Aston Rowant SAC	'Oxford Meadows component SSSI's are Port Meadow with Wolvercote Common and Green SSSI, Cassington Meadow SSSI, Pixey and Yarnton Meads SSSI and Wolvercote Meadows SSSI. Little Wittenham's component SSSI is Little Wittenham SSSI. Aston Rowant's component SSSI is Aston Rowant SSSI.'
Section 3.3.2: Vulnerability (of Oxford Meadows SAC)	'Oxford Meadows is also potentially sensitive to increased recreational pressure, due to the risk of trampling of the creeping marshwort.'
Chapter 5: Possible in- combination effects	Cherwell DC are also carrying out an AA of their core strategy Although an AA is not being carried out the current TWA Order for Bicester to Oxford (Chiltern Railways) is increasing trains on the line next to Oxford Meadows SAC and also changing the use of the Oxford-Bicester train line including providing a new station at Water Eaton and so may be relevant.

1.4.2 SEA Scoping of LTP4

Natural England was consulted on the Strategic Environmental Assessment (SEA) Scoping Report produced for the LTP4, which was formally issued to the statutory SEA consultees to request a scoping opinion in April 2014. Natural England's comments in relation to the European sites were that '*the LTP4 should identify the threats/opportunities that the plan presents to biodiversity, and seek to minimise the former and maximise the latter. The principle ones we see are:*

> *1. Impacts on Oxford Meadows Special Area of Conservation due to changes in air quality resulting from changing traffic flows and volumes.*
>
> *2. Direct impacts on biodiversity features due to infrastructure improvements.*
>
> *3. Opportunities for biodiversity enhancement from land use change within the highway estate (e.g. roadside tree planting, different mowing regimes, management to ensure pollutants in run-off from roads are intercepted or otherwise reduced).*

1.4.3 HRA of Oxfordshire's draft LTP4

A new HRA Screening Report has now been prepared to assess the effects of Oxfordshire's fourth LTP4, taking into consideration Natural England's comments received in 2010 on the LTP3. This document will be used to consult Natural England on the environmental acceptability of the plan in January 2015.

2 Oxfordshire's Local Transport Plan LTP4

2.1 Introduction

The LTP4 is being developed by OCC. OCC has responsibility for all adopted roads in the County except for the motorways and trunk roads, which are the responsibility of the Highways Agency; plus Public Rights of Way. OCC works with Network Rail and private sector public transport operators in respect of public transport services.

Building on the earlier LTP3, the draft Oxfordshire LTP4 has now been prepared to set the policy and strategy for Oxfordshire's transport requirements, and OCC's approach to addressing the challenges of the transport system in Oxfordshire, in the period from 2015 – 2030. The draft LTP4 takes account of changes in housing and economic growth forecasts, new and emerging spatial planning, and places an increased focus on reducing demand for travel.

The LTP4 considers the demand and need for transport provision and management in Oxfordshire and the roles of individual transport modes and potential interventions. The LTP4 has been developed to help meet the following priority national goals, which are set out in the Department for Transport's 'Delivering a Sustainable Transport System.'

2.2 LTP4 Policies and Area Strategies

LTP4 policies (see Appendix A) were developed by OCC and will be applied across the county through:

- OCC's key role in integrated strategic land use and transport planning for the county
- Involvement in the development of Local Plans and Neighbourhood Plans
- OCC's response to strategic infrastructure and development proposals
- OCC's response to planning applications
- The development of Area Strategies for areas planned for growth
- The development of Supporting Strategies
- OCC's work with partners to develop transport solutions; and
- OCC's decision making process for all aspects of transport for which they have control.

Area Strategies have also been developed by OCC as part of the LTP4, for those parts of the county that are due to experience significant housing and/or employment growth, and to reflect the emerging Local Plans. The Area Strategies describe how these different localities or key centres to Oxfordshire, will meet local transport needs in the county. These Area Strategies comprise: -

- Oxford
- Science Vale (an area encompassing Wantage and Grove, Abingdon, Didcot, Culham Science Centre, Milton Park and Harwell Oxford Campus)
- Bicester
- Banbury
- Witney
- Carterton

These Area Strategies, which are presented in detail in the draft LTP4, set a clear strategy for transport to guide decision-making and support future funding arrangements. Other strategies that have been developed to support the Area Strategies are: -

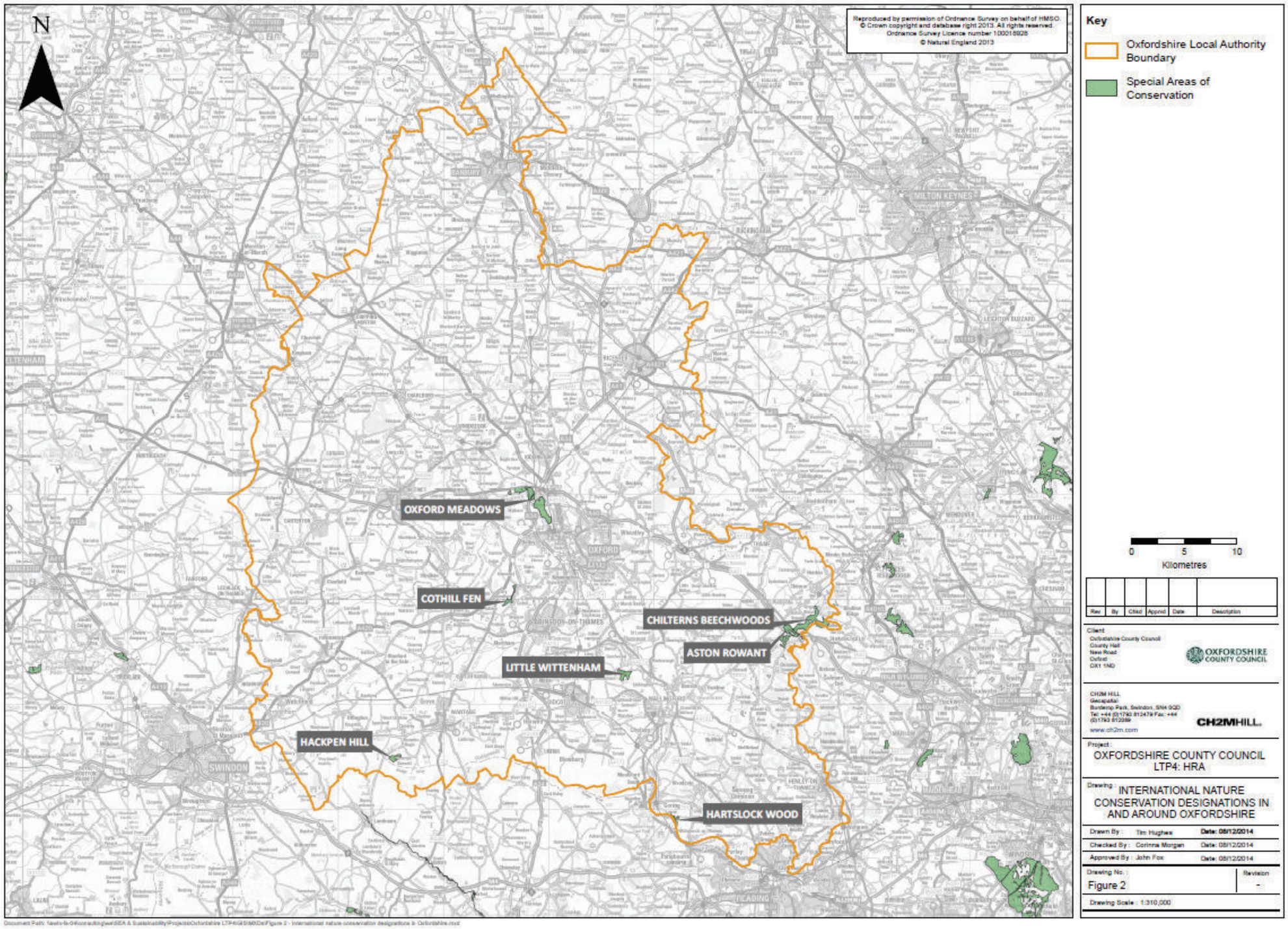
- Science Transit Strategy
- Bus Strategy
- Rail Strategy
- Cycling Strategy
- Freight Strategy

- A420 Strategy
- Highways Asset Management Plan
- Green Infrastructure Strategy – not available at the time of writing this report

3 European Sites

Table 3.1 and Figure 2 presents the European sites within or adjacent to the LTP4 study area that could potentially be affected by the plan.

Figure 2 European Sites within Oxfordshire



Document Path: \\wvls-fs-04\consulting\wed\EA & Sustainability\Projects\Oxfordshire LTP4\GIS\MXDs\Figure 2 - International nature conservation designations in Oxfordshire.mxd

Table 3.1 European Sites within and in close proximity to Oxfordshire

European Site	Unitary Authority	Qualifying Features
Aston Rowant SAC	Oxfordshire	5130 *Juniperus communis* formations on heaths or calcareous grasslands 9130 *Asperulo-Fagetum* beech forests
Chilterns Beechwoods SAC	Oxfordshire	9130 *Asperulo-Fagetum* beech forests 6210 Semi-natural dry grasslands and scrubland facies: on calcareous substrates *Festuco-Brometalia*
Cothill Fen SAC	Oxfordshire	7230 Alkaline fens 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae*)
Kennet Valley Alderwoods SAC	West Berkshire	91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae*)
Hackpen Hill SAC	Oxfordshire	6210 Semi-natural dry grasslands and scrubland facies: on calcareous substrates *Festuco-Brometalia* 1654 Early gentian *Gentianella anglica*
Hartslock Wood SAC	Oxfordshire	6211 Semi-natural dry grasslands and scrubland facies: on calcareous substrates *Festuco-Brometalia* (important orchid sites) 91J0 *Taxus baccata* woods of the British Isles
Kennet and Lambourn Floodplain SAC	West Berkshire; Wiltshire	1016 Desmoulin's whorl snail *Vertigo moulinsiana*
Little Wittenham SAC	Oxfordshire	1166 Great crested newt *Triturus cristatus*
Oxford Meadows SAC	Oxfordshire	6510 Lowland hay meadows *Alopecurus pratensis, Sanguisorba officinalis* 1614 Creeping marshwort *Apium repens*
River Lambourn SAC	West Berkshire	3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho- Batrachion* vegetation 1163 Bullhead *Cottus gobio* 1096 Brook lamprey *Lampetra planeri*

SECTION 4

4 Screening Assessment

4.1 Introduction

The methodology steps to be used for the HRA screening is shown in Table 4.1.

Table 4.1: HRA screening methodology for LTP4 (modified from EC, 2001)

Task	Description
1	List any European sites within, adjacent to or associated with the area that the plan covers. Review the site(s)' qualifying interest features, conservation objectives and Favourable Condition Tables. Analyse any underlying trends.
2	Determine whether the plan is directly connected with or necessary to the management of the European site(s). If it is, then no further assessment is necessary.
3	Identify and discount all policies and proposals that will have no significant impact on the European site(s) (including direct, indirect and secondary impacts).
4	Identify any 'in combination' effects of the plan with other plans and projects (including direct indirect and secondary impacts) i.e. the cumulative effect of influences of all the plans and projects on the site(s)' conditions required to maintain integrity.
5	Identify policies and proposals that may have a significant impact (including direct, indirect and secondary impacts) to take through to the AA (Task 2) phase if AA is considered necessary.

4.2 Identifying European Sites (Task 1)

Chapter 3 of this HRA Screening Report identifies the relevant European sites and their qualifying interest features.

4.3 Connection with Management of European Sites (Task 2)

The preparation and implementation of the Oxfordshire LTP4 is not necessary for the management of any European sites within Oxfordshire or adjoining areas.

4.4 Assessment of effects of LTP4 on European Sites (Task 3)

This section reports the results of the screening assessment, identifying whether the preferred LTP4 options are likely to have a significant effect, alone, on the European sites within the area affected by the plan. The potential in-combination effects, with other plans and strategies, are considered in Section 5.2.

During this screening assessment, where there is uncertainty about the likelihood of an option having a significant effect on a site or where causes of change are uncertain, but where a risk exists, the precautionary principle is applied so that the element of the plan must proceed to Stage 2: AA.

The results of the assessment carried out to determine whether the LTP4 is likely to significantly affect the relevant European sites, alone, or in-combination with other plans or projects, is documented in Chapter 5.

4.4.1 Potential effects of Local Transport Plans on European Sites

The principal pressures that may act on the European sites from the proposed LTP4 options and which are considered in this assessment, are identified in Table 4.2.

Table 4.2 Principal pressures/effects from Local Transport Plans

Effect	Source of Effect
Loss, physical disturbance and/or fragmentation of habitat and species	Direct losses from land-take Indirect habitat losses from changes in water quality/hydrology/air pollution Recreation – trampling from increased visitor numbers
Noise & vibration disturbance	Transport infrastructure construction Changes in traffic patterns, flows and volumes Recreational disturbance and changes in human presence
Visual disturbance	New or extended infrastructure Presence of construction works Changes in lighting
Changes in Hydrology and/ or Water Quality – Water table level changes & Road drainage impacts on water quality	Changes in run-off regimes, spray and water drainage. Increased sediment loads from works. Contamination of water from road traffic accidents
Obstructions and barrier effects to protected species/migrating birds and birds commuting between breeding sites and feeding areas	New structures causing hindrance to movement of species
Mortality or wounding of species (collision)	Direct bird strikes from vehicles/bicycles Increased road traffic or introduction of traffic into new area
Soil changes	Road spray, construction dust, use of salt
Air/dust pollution	Road transport infrastructure construction Changes in traffic flows and volumes Greenhouse gas emissions Dust emissions from operating machinery
Spread of invasive species	Inadvertent movement of species by materials/construction works

It should be noted that LTPs can also have significant beneficial impacts on European sites including the enhancement of habitats, strategic biodiversity net gains and contribution to green infrastructure, to help deliver the Biodiversity 2020 Strategy and meet government commitments in the Natural Environment White Paper.

4.4.2 Connectivity between LTP4 (and Area Strategies) and European Sites

Table 4.3 shows the connectivity between the European sites and Area Strategies, including those screened out of further assessment.

Table 4.3 Connectivity between European Sites and LTP4

Designated Site	Approximate Minimum Distance of European Site from LTP4	Connectivity between European Sites and LTP4 Area Strategies	Relevant Area Strategy	Screening In or Out
Aston Rowant SAC	18km	SAC is over 18km from any transport schemes proposed in the LTP4's Area Strategies and its qualifying features would not be vulnerable to any impacts over this distance	N/A	Out
Chilterns Beechwoods SAC	16km	SAC is over 16km from any transport schemes proposed in the LTP4's Area Strategies and its qualifying features would not be vulnerable to any impacts over this distance	N/A	Out
Cothill Fen SAC	2km	Elements of the Oxford Transport Strategy (e.g. new park and ride facilities) and Science Vale (e.g. upgraded roundabout at Lodge Hill Slips) will be delivered at a distance where potential indirect impacts could occur.	Oxford Science Vale	In
Hartslock Wood SAC	12km	SAC is over 12km from any transport schemes proposed in the LTP4's Area Strategies and its qualifying features would not be vulnerable to any impacts over this distance	N/A	Out
Hackpen Hill SAC	5km	Nearest scheme would be the Wantage Eastern Link Road as part of the Science Vale Strategy, which is approximately 5km from SAC (on the opposite side of Wantage to SAC) and does not directly affect road passing near SAC (B4001).	N/A	Out
Kennet Valley Alderwoods SAC	20km	SAC is over 20km from nearest Area Strategy (Science Vale) and its qualifying features would not be vulnerable to any impacts over this distance	N/A	Out
Kennet and Lambourn Floodplain SAC	20km	SAC is over 20km from nearest Area Strategy (Science Vale) and its qualifying features would not be vulnerable to any impacts over this distance	N/A	Out
Little Wittenham SAC	1.7km	Elements of the Science Vale Strategy (e.g. A4130 realignment) will be delivered at a distance of 1.7km from the European site and have the potential to affect habitats supporting Great crested newts.	Science Vale	In
Oxford Meadows SAC	300m	Elements of the Oxford Transport Strategy (e.g. A40 link and junction enhancements) will be delivered at a distance where potential direct and indirect impacts could occur. Other Area Strategies have potential to indirectly affect this site.	Oxford	In
River Lambourn SAC	15km	SAC is over 15km from nearest Area Strategy (Science Vale) and its qualifying features would not be vulnerable to any impacts over this distance	N/A	Out

The following European Sites have been screened out of further assessment as there is no potential connectivity to the LTP4 –

- Aston Rowant SAC
- Chilterns Beechwoods SAC
- Hartslock Wood SAC
- Hackpen Hill SAC
- Kennet Valley Alderwoods SAC
- Kennet and Lambourn Floodplain SAC
- River Lambourn SAC

5 Potential effects of the LTP4 on European sites

5.1 Introduction

The following European Sites have been identified for further assessment as there is potential connectivity between the SACs and the LTP4; -

- Cothill Fen SAC (Oxford and Science Vale)
- Little Wittenham SAC (Science Vale)
- Oxford Meadows SAC (Oxford)

It should be noted that at the time of writing this HRA Screening Report, it is not known exactly how and when the Area Strategies assessed will be implemented due to funding constraints. There is therefore some uncertainty in the assessment of potential significance and the precautionary approach has been applied.

5.2 Plans and projects with potential in-combination impacts with LTP3 (Task 4)

5.2.1 Overview

The Conservation of Habitats and Species Regulations 2010 requires the likely significant effect of a plan or programme on a European site to be assessed in combination with other plans or projects (i.e. additive and synergistic effects). An 'in-combination' assessment refers to the total effect of all influences acting on a feature from all plans and projects in the context of prevailing environmental conditions.

The draft LTP4 was undertaken in such a way as to ensure it was fully integrated with the plans, programmes and schemes shown in Table 5.1.

Table 5.1 Other plans, programmes and projects

West Oxfordshire Draft Local Plan 2012 and emerging LDF
South Oxfordshire Local Plan 2011 and LDF
Adopted Cherwell Local Plan 1996, Non-Statutory Cherwell Plan 2011, Cherwell Local Plan 2011 – 2031 (including modifications to reflect the 2014 SHMA and LDS
Vale of White Horse Local Plan 2011 and New Local Plan 2031 – Part 1, and LDF
Oxford City Local Plan 2001 – 2016 (Adopted 2005) and LDF
Town Masterplans
MOD Proposals
Proposals of Rail Operators
Strategic Housing Market Assessment 2014
Draft Green Infrastructure Framework for Oxfordshire (OCC).

5.2.2 Local Development Framework (LDF)

The Local Development Frameworks (LDF) for the five Local Planning Authorities (LPAs) (West Oxfordshire, South Oxfordshire, Cherwell, Vale of White Horse and Oxford City) within Oxfordshire contain planning policies that seek to protect and enhance biodiversity. Their future planning documents should therefore ensure that there are no significant effects on European sites within the LTP4 area. The LTP4 was also developed to avoid potential in-combination effects with other plans and strategies. Therefore, there are unlikely to be any significant in-combination effects although the individual plans are considered further below.

Relevant LDFs of LPA Plans include: -

- **West Oxfordshire District Council**
  The West Oxfordshire Draft Local Plan 2012 replaces the plan adopted in June 2006. This Local Plan sets out an overall strategy for the District over the next 17 years. The Draft West Oxfordshire Local Plan was published for public consultation from 7th November until 19th December 2012

  HRA work has been carried out to date in relation to the draft Core Strategy published in January 2011 and the proposals contained therein. Since the publication of the draft Core Strategy, a number of changes have been made to the Draft Local Plan to accommodate increases in housing numbers and a subsequent Position Statement was prepared in 2012 in relation to a HRA.

  An initial (Stage 1) HRA Screening Report identified potential impacts on Cothill Fen (an increase in water abstraction, a reduction in water quality and an increase in recreational pressure) and Oxford Meadows SAC (a reduction in air and water quality and an increase in recreational pressure), which were considered further through a Stage 2 Report. The Stage 2 report narrowed down the potential impacts to recreational pressure on both Cothill Fen and Oxford Meadows and air quality at Oxford Meadows, which were eventually highlighted as not being significant.

- **South Oxfordshire District Council**
  The South Oxfordshire Local Plan 2011 was adopted on 20 January 2006, setting out policies and proposals for development, such as housing and employment, in the district, against which planning applications were to be assessed. The Local Plan identified 'protecting and enhancing the natural and built environment' as one of its six objectives.

  An HRA screening of South Oxfordshire's District Council's submission Core Strategy (2012) was undertaken, which identified potentially significant negative effects, as a result of increased visitor pressure on Little Wittenham, Oxford Meadows, Cothill Fen and Hartslock Woods, Chiltern Beechwoods and Aston Rowant SACs. The subsequent Appropriate Assessment concluded that that none of the six European Sites assessed would be adversely impacted by the plans and policies contained in the Core Strategy alone, or in combination with other plans and policies.

- **Cherwell District Council**
  Cherwell District Council have prepared the revised 2011 - 2031 Cherwell Local Plan and a number of additional supporting guidance on particular issues and places. No HRA was available to review at the time of writing this report and therefore without details of the potential biodiversity impacts of the Local Plan, there is difficulty in identifying if issues on the European sites will arise.

- **Vale of White Horse District Council**
  The Vale of White Horse District Council has now developed Part One of their new Local Plan which will run until 2031.

  A HRA of the Vale of White Horse LDF Core Strategy was produced in 2008 and identified potentially uncertain impacts on Little Wittenham SAC, Oxford Meadows SAC, Hackpen Hill SAC; and Cothill

Fen SAC, mainly as a result of recreational pressure but in some cases also as a result of possible deteriorations in water quality.

- **Oxford City**
  The Oxford Local Plan 2001-2016 was adopted on 11 November 2005, setting out the detailed framework for land use policies against which planning applications for development are judged. Since publication, many of the policies within this plan have either been superseded by more recent policies in other Local Development Framework documents or have expired having not been "saved".

  The HRA screening of the Oxford Core Strategy identified the potential for significant impacts on the Oxford Meadows SAC with regard to air pollution, water quality, balanced hydrological regime and increased recreational pressure, which has the potential for in-combination effects with the LTP4. However, the Appropriate Assessment concluded that none of the policies in the Oxford 2026 Core Strategy are likely to have adverse effects on the integrity of Oxford Meadows SAC.

As no impacts were identified on other European sites within or around Oxfordshire, no in-combination impacts are anticipated on other European sites with delivery of the LTP4.

5.2.3 Town Masterplans

The LTP4 has also been developed alongside town masterplans to ensure that the policies and Area/Supporting Strategies complement and do not conflict with those in the masterplans. For example, Oxfordshire County Council is working with Carterton Town Council as their masterplan for Carterton, which will seek transport infrastructure and services that avoids impacting on designated conservation sites.

5.2.4 MOD Proposals

The LTP4 has the potential for in-combination and cumulative impacts with future changes and new infrastructure provided by the MOD through the intensification of military operations at RAF Brize Norton, which will require further consideration when details of their plans including Programme GATEWAY become available. This is most relevant to the Carterton Area Strategy.

5.2.5 Rail Proposals

The Rail Strategy of the LTP4 is being developed alongside other Oxfordshire road strategies in partnership with Network Rail and other train operators to ensure that the policies do not conflict with the proposals of others. Further consideration will need to be given to the programming of such schemes to identify in-combination biodiversity impacts associated with construction and land-take.

5.2.6 Strategic Housing Market Assessment (SHMA) 2014

The LTP4 has been developed to support new development proposals in the county associated with economic growth. The in-combination impacts of these developments on the environment will require further consideration at project level, when the nature, design and location of other developments are available.

5.2.7 Draft Green Infrastructure Framework for Oxfordshire (OCC)

The Green Infrastructure Strategy seeks to maintain critical ecological links between town and country while supporting sustainable development that protects nature conservation sites. One of the objectives of the framework is '*to protect and enhance biodiversity levels across and beyond the county, ensuring that development and farming affects wildlife positively, by means of restoration and creation*

of sustainable semi-natural habitats.' There are not anticipated to be any in-combination impacts between this framework and the LTP4 on European sites.

5.3 Identification of Likely Significant Effects (Task 5)

Table 5.2 summarises the results of the HRA screening assessment for the three European sites, screened into the assessment. Where uncertain effects have been identified, these have been considered as requiring further assessment, in line with the Precautionary Principle.

Table 5.2 lists only potentially significant impacts, rather than all potential impacts.

Table 5.2 LTP4 Screening Assessment

European Site	Relevant elements of Area Strategies from LTP4	Qualifying Interest Features	Potential Impacts	LSE from LTP4 alone, before mitigation? ✓/✗	LSE in combination with other plans, programmes or projects? ✓/✗	Avoidance or mitigation measures	Further Project Level HRA Screening needed[1]	LSE predicted after avoidance or mitigation? ✓/✗
Cothill Fen	**Oxford:** Mass transit schemes including super premium transit route Reorganisation of Park & Ride sites e.g. Cumnor Park & Ride	7230 Alkaline fens - This lowland valley mire contains one of the largest surviving examples of alkaline fen vegetation in central England, a region where fen vegetation is rare. 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae*)	Habitat loss /fragmentation through air pollution and recreational pressures on alkaline fens and alluvial forests. Air pollution and recreation are considered to be potentially significant pressures to the structure and function of these habitats, in particular alkaline fens.	x – Cumnor is located over 2km from the site, and P&R facilities will help to reduce car reliance (and associated vehicle emissions).	? (✓) – West Oxfordshire/South Oxfordshire/Vale of White Horse LDFs/Strategic Housing	Due to the high level nature of the LTP4, it will only be possible to fully assess the potential for combined effects of the LTP4 and the Local Plans on recreation and air quality on Cothill Fen SAC at the project level, when details on the planned transport improvements, associated development and air quality modelling become available. It is considered that any potentially adverse in-combination impacts can likely be avoided at project level through appropriate scheme design.	Project level HRA may be required to assess in-combination effects, together with air quality modelling and recreational analysis	x
	Science Vale: Upgraded and new roundabouts at Lodge Hill Slips			x – the works lies at a minimum distance of 3.9km from the site & may have a positive effect through improving free flow of traffic and reducing air pollution levels	? (✓) – West Oxfordshire/South Oxfordshire/Vale of White Horse LDFs/Strategic Housing		Project level HRA may be required, to assess in-combination effects, together with air quality modelling and recreational analysis	x
Oxford Meadows	**Oxford:** Managing traffic through ring road junction upgrades; notably A40 link and junction improvements Mass transit links including Bus rapid transit lines 1, 2 and 3, new Oxford Parkway railway station, city centre bus terminal and city centre bus tunnels). Construction of new walking and cycling routes	6510 Lowland hay meadows *Alopecurus pratensis, Sanguisorba officinalis* - Oxford Meadows represents lowland meadows in the Thames Valley. This site includes vegetation communities that are relatively unique, reflecting the influence of long-term grazing and hay-cutting on lowland meadows. The site has benefitted from the survival of traditional management, which has been undertaken for several centuries, and so exhibits good conservation of structure and function. 1614 Creeping marshwort *Apium repens* - Port Meadow is the larger of only two known sites in the UK supporting this species.	Disruption to hydrological regime from changes in run-off regimes, spray and water drainage	? (✓)	? (✓) – West Oxfordshire/South Oxfordshire/Oxford City/ Vale of White Horse LDFs/Strategic Housing	Appropriate scheme design to avoid impacts on hydrology and water quality – assessed through a project level hydrological risk assessment	Project level HRA may be required.	✗
			Nutrient enrichment from NO_x deposition from road transport infrastructure construction & changes in traffic flows and volumes	? (✓)	? (✓) – West Oxfordshire/South Oxfordshire/Oxford City LDFs/Strategic Housing	The proposed zero emission zone proposals will help offset NOx emissions within the city centre resulting from transport changes. Due to the high level nature of the LTP4, it will only be possible to fully assess the potential for combined effects of the LTP4 and the Local Plans air quality of Oxford Meadows SAC at the project level, when details on the planned transport improvements, associated development and air quality modelling become available. It is considered that any potentially adverse in-combination impacts can likely be avoided at project level through appropriate scheme design	Project level HRA may be required, together with air quality modelling and analysis for elements of the Oxford Transport Strategy within 200m of this site	✗

[1] HRA Screening at Project Level to determine 'likely significant effect' and an Appropriate Assessment, if required.

European Site	Relevant elements of Area Strategies from LTP4	Qualifying Interest Features	Potential Impacts	LSE from LTP4 alone, before mitigation? ✓/✖	LSE in combination with other plans, programmes or projects? ✓/✖	Avoidance or mitigation measures	Further HRA work needed	LSE predicted after avoidance or mitigation? ✓/✖
Little Wittenham	Science Vale: A4130 realignment New roads and upgraded/new roundabouts between Didcot and Abingdon	Great crested newt *Triturus cristatus* - comprises two main ponds set in a predominantly woodland context.	Noise and vibration disturbance from highway improvements	x - site lies over 1km from improvements and therefore unlikely to result in any noise disturbance	x	None required	x	x
			Habitat loss or fragmentation (e.g. from road schemes or recreational pressures)	? (✓) - Great crested newts have been found to move up to 1.3km from breeding sites and therefore any suitable habitat lost as part of schemes has potential to affect this qualifying interest feature.	? (✓) –South Oxfordshire / Vale of White Horse LDFs / Strategic Housing	Appropriate scheme design can ensure siting of transport infrastructure that avoids impacts on habitat suitable to support Great crested newts Need to maintain habitat diversity including unshaded, medium sized ponds, and a variety of terrestrial habitat to provide suitable resting, foraging and hibernation areas. Need to maintain water quality and levels of wetland habitats to support suitability as breeding ponds.	Project level HRA may be required to assess habitat lost in footprint of Science Vale area strategy schemes, in-combination with other plans and projects	**x**

6 Summary of Screening

This HRA Screening has found that no likely 'strategic' significant effects are predicted from elements of the LTP4's Area Strategies on any European sites, subject to appropriate design and mitigation. An Appropriate Assessment is therefore not considered to be required at this strategic level.

However, project level HRA Screenng of 'Likely Significant Effects' for Oxford Meadows SAC, Cothill Fen SAC and Little Wittenham SAC may be required (in consultation with Natural England) when further details of the delivery of transport schemes within the Oxford and Science Vale Strategies are available, together with the details of other plans, to ensure compliance with the Habitats Regulations.

It is suggested that further HRA takes place at project level rather than LTP level for the following reasons;

- many of the schemes may not be implemented due to Council funding constraints;
- at present there is not enough information on many of the transport schemes to determine whether the uncertain effects in this report (for Little Wittenham SAC, Cothill Fen SAC and Oxford Meadows SACs) are really likely to be significant effects. Following the precautionary principle enshrined in the Habitats Directive, the uncertain effects alone and in-combination were judged to be likely significant effects prior to mitigation. However, subject to mitigation comprising appropriate scheme design and the in-combination beneficial elements of other parts of the LTP4 implementation (i.e. measures to support a reduction in carbon emissions), 'no likely significant effects' have been concluded.
- when it is known which transport schemes may be implemented and there is more information on what works they will entail, it will be possible to devise appropriate avoidance and mitigation measures that are scheme-specific.

7 References

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8 Abbreviations

AA	Appropriate Assessment
DMRB	Design Manual for Roads and Bridges
EC	European Commission
HRA	Habitat Regulations Assessment
IROPI	Imperative Reasons of Overriding Public Interest
LSE	Likely Significant Effect
LTP	Local Transport Plan
OCC	Oxfordshire County Council
SAC	Special Area of Conservation
LTP	Local Transport Plan
TWA	Transport Works Act

9 Glossary

Appropriate Assessment (AA)	An assessment of the potential adverse impacts of a proposed plan on a European Site, either alone or in combination with other plans. Appropriate Assessment follows a preliminary screening phase to see if 'Appropriate Assessment' is necessary.
Habitats Regulations	These transpose the requirements of the European Union Habitats Directive into the Conservation of Habitats and Species Regulations 2010 (as amended).
Habitats Regulations Assessment (HRA)	Procedure of appraisal under the Habitats and Species Conservation Regulations 2010 (as amended) to determine whether a plan or programme may affect the integrity of a European Site. The HRA includes the 'screening' process for determining whether an Appropriate Assessment (AA) is required, and the AA stage itself, including consultation with Natural England.
Local Transport Plan 4	Local Transport Plan covering the period 2015 to 2030 (the fourth LTP to be prepared for the Oxfordshire area).
Natura 2000	A network of European-wide sites designated under the Habitats Directive (92/43/EEC) and the Birds Directive (79/409/EEC), comprising Special Areas of Conservation, Special Protection Areas and Ramsar sites. Only Special Areas of Conservation are relevant to this report.
Natural England	Natural England is the government agency responsible for nature conservation in England. It was previously part of two separate bodies, the Nature Conservancy Council, and the Countryside Commission, which merged in 1991. Natural England is in charge of designating SSSIs and NNRs, and other functions, including advising the government and undertaking research.
Ramsar Site	Wetlands designated as internationally important under the Convention on Wetlands, Ramsar, 1971.
Site of Special Scientific Interest	SSSIs are designated by Natural England. They underpin other nature conservation designations, such as Special Protection Areas and Special Areas of Conservation. SSSIs can be of biological interest (Biological SSSIs), or geological interest, (Geological SSSIs). A minority of sites are notified for both biological and geological interest.
Special Area of Conservation	SACs are designated to protect the 220 habitats and approximately 1000 species listed in Annex I and II of the Habitats Directive which are considered to be of European interest following criteria given in the directive. Each SAC has various conservation objectives.

Special Protection Area	Sites that are strictly protected sites classified in accordance with Article 4 of the EC Directive on the conservation of wild birds (79/409/EEC), (Birds Directive). They are classified for rare and vulnerable birds, listed in Annex I of the Birds Directive, and for regularly occurring migratory species.

Oxfordshire LTP4 Strategic Environmental Assessment: Appendix C - Effects on Human Health

Prepared for

Oxfordshire County Council

December 2014

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Contents

SECTION 1

1 Introduction

1.1 Background

Health Impact Assessment (HIA) is a process that uses a combination of procedures, methods and tools to help identify possible health impacts of a programme, policy or project, and the appropriate actions to manage those effects. Health is determined by a combination of factors including access to quality healthcare services, lifestyle choices and the social and economic conditions in which people live.

This HIA forms part of the Strategic Environmental Assessment (SEA) of Oxfordshire's draft Local Transport Plan (LTP) 4. It considers the relationship between transport and human health and the likely significant positive and negative effects of the draft LTP4 on human health. *'SEA is a major opportunity to prevent ill health and tackle health inequalities as set out in the White Paper 'Choosing Health and Our Health, Our Care, Our Say'* (Department of Health 2007).

In considering the effects on human health as part of the SEA, CH2M HILL has followed guidance from the Department of Health (Department of Health, 2007). Wherever possible, reference has been made to the health baseline for Oxfordshire. However for some issues, there is a lack of local evidence and therefore reference is also made to research and evidence from other locations.

The scoping stage of the SEA was undertaken between March and April 2014. This included a statutory consultation period between 11 April 2014 and 16 May 2014. During this period, Oxfordshire County Council (OCC) liaised with OCC's public health consultant and the Director of Public Health [Richard J – please confirm].

2 Transport and Human Health

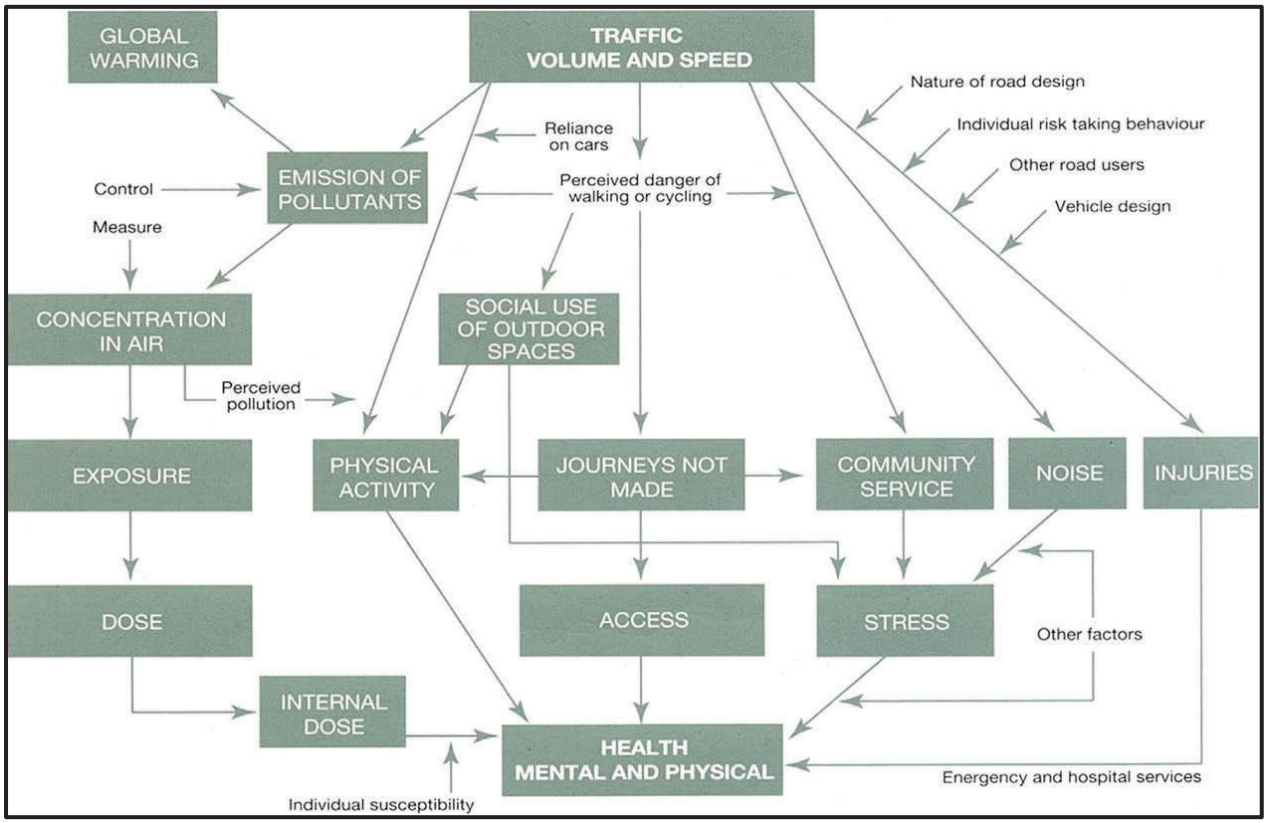
2.1 Introduction

The health of those residing in Oxfordshire is generally good and better than the England average (2013c). Only 3.5% of the population declare themselves as being in bad or very bad health, with the largest proportion of these residing in urban areas (ONS, 2011).

Transport planning has the potential to impact on human health in a variety of ways including its influence on travel choices, behaviour and cost, which are described in the following sections. Other factors such as national regulations, taxes, fuel prices, transport operators and individual preference all influence the transport choices people make. There is therefore an inherent uncertainty in the overall impact that the LTP4 strategy is likely to have on impacting people's travel behaviour.

Figure 2.1 provides an overview of the links between transport policy and human health.

Figure 2.1: Pathways from Transport Policy to Health Outcomes (Metcalfe and Higgins, 2009)



2.2 Transport and Physical Activity

One of the most significant effects of transport policy on human health is considered to be its influence on physical activity and obesity, which are challenging issues within the county. Although levels of physical activity are comparable in the south-east to the rest of England, and estimated levels of physical activity and obesity are better than the England average; the Oxfordshire Partnership notes that obesity levels are rising across localities and age groups. Additionally, the Joint Strategic Needs Assessment (OCC 2014) identifies the increase in 'unhealthy' lifestyles, which leads to preventable disease, as a specific challenge.

Table 2.1 indicates modes of travel to work by residents aged 16 to 74 years in Oxfordshire, based on the 2011 census. Driving a car or van is the most common mode of transport (accounting for 39.7% of all modes) and is one of the indicators of a sedentary lifestyle.

In the UK, there has been a general upward trend in car ownership since the 1960s and increased time spent in cars has been linked to obesity (although it is not known whether increased car use is linked to reduced physical exercise (Health Scotland 2007). Health issues related to low physical exercise and obesity are likely to reduce the use of alternative modes of transport rather than the car, increasing traffic growth. The effect of switching from active modes of travel (walking and cycling) to the use of the private car is now regarded by health professionals as the major health impact of recent transport policy and behaviour.

There are highly significant health benefits associated with adopting a more physically active lifestyle. Adults who are physically active have 20-30% reduced risk of premature death and up to 50% reduced risk of developing the major chronic diseases such as coronary heart disease, stroke, diabetes and cancer (Department of Health, 2004).

In addition, a study in 2010 (Hendrikson, et al) highlights a link between active travel and reduced rates of sickness absenteeism. The study revealed that people who cycle over 5 km more than three times a week, are absent from work for fewer days on average. The study concluded that “cycling to work is associated with less sickness absence.

The Chief Medical Officer advises that adults should undertake a minimum of 30 minutes of physical activity (1 hour for children) five times a week in order to improve health and that “For most people, the easiest and most acceptable forms of physical activity are those that can be incorporated into everyday life. Examples include walking or cycling instead of driving…”(Department of Health, 2004)

Promoting healthy lifestyles through physical activity is an effective way of reducing the risk of chronic disease and premature death (Oxfordshire Clinical Commissioning Group et al 2013), and the LTP4 can directly promote this.

Table 2.1: 2011 Census: Method of Travel to Work (ONS)

Location	Work mainly at or from home	Underground, metro, light rail, tram	Train	Bus, minibus or coach	Taxi	Motorcycle, scooter or moped	Driving a car or van	Passenger in a car or van	Bicycle	On foot	Other method of travel to work
Oxfordshire	**24,274**	**638**	**9,915**	**23,400**	**877**	**2,731**	**191,595**	**14,293**	**23,770**	**41,002**	**1,924**
Cherwell	4,757	96	2,185	3,672	298	556	47,271	4,034	2,592	8,964	404
Oxford	4300	170	1,769	11,405	264	482	23,735	2,245	12,270	12,674	493
South Oxfordshire	6229	180	3,453	2,184	103	558	43,957	2,766	2,575	7,682	400
Vale of White Horse	4472	105	1,455	3,695	111	640	39,766	2,660	4,018	5,905	354
West Oxfordshire	4516	87	1,053	2,444	101	495	36,866	2,588	2,315	5,777	273

2.3 Community Severance and Barriers to Active Travel

Traffic volumes and speed are linked to a perceived danger of cycling and walking. Therefore it is likely that there is relationship between traffic growth and the reported decline in rates of walking and cycling in England, which can increase community severance. Community severance or the 'traffic barrier effect' is:

> "…the sum of inhibiting effects upon pedestrian behaviour resulting from the impact of traffic conditions within a specific environment/street context. These effects can be either physical (observable) or psychological (unobservable) impediments to pedestrian movement."(Hine, 1994)

The Active Travel Strategy for England (Department for Transport/Department for Health, 2010) cites a number of reasons why people don't walk or cycle as much anymore. These include:

- Overestimating the distance, difficulty or time involved in undertaking a journey by bicycle or on foot;
- Lack of confidence or feeling unsafe getting back on a bicycle;
- Concerns over personal security when going out on foot after dark or allowing children to walk home from school;
- Location and design of our most common destinations. For example employment and retail parks being located on the edge of towns, or along busy roads which are difficult to cross; Ample car parking is not matched by facilities to lock up bicycles or there is a lack of storage facilities or showers in workplaces for cyclists;
- Design of streets. For example, cycle lanes which are poorly maintained, incomplete, or too narrow to allow comfortable cycling; pavements which are narrow or have gaps, intimidating conditions to pedestrians and cyclists caused by heavy or fast moving traffic; uneven pavements; better signage for drivers than for pedestrians.

The Active Travel Strategy explains that '*Contrary to popular opinion, it's not the weather – annual rainfall in Amsterdam is higher than it is in Manchester, and it's colder in winter*' that deters people from walking and cycling.

A study into the barrier effect (which included use of video analysis of behavioural responses among three age groups to variations in traffic conditions) showed that the elderly (65+) are many times more susceptible to barrier effects than other adults (more than 10 fold on the basis of the indicator used in the study) (Hine and Russell, 1996).

Since the population of the UK is ageing, barrier effects from traffic are likely to become increasingly significant.

2.4 Road Injuries and Deaths

The rate of road injuries and deaths is worse in Oxfordshire than the England average, although the total number of road accidents in Oxfordshire has fallen from 3,077 in 2003 to 2,304 in 2012 (OCC, 2013). However, without a road safety strategy within and beyond the county, some roads may become more dangerous, for example through inappropriate use.

Road traffic collisions are a major cause of preventable injuries and death (APHO and Department of Health, 2009). Data on those killed and seriously injured are collated by the Police and published by the Department for Transport.

Although pedestrians and cyclists are disproportionately impacted by road accidents (compared to the proportion who travel by those modes) it is likely to be a reflection of the lack of safety in the dominant mode of transport, the car, which accounts for this. For example, driver error is a contributory factor in 90% of accidents. (APHO and Department of Health, 2009). Pedestrians and cyclists are highly vulnerable to road accidents having little or no physical protection, and with a higher fatality rate per distance travelled than for any other mode of transport with the exception of motorcyclists. Consequently, personal safety fears may deter people from walking, cycling or using public transport.

People who live in deprived areas are more likely to be injured on the roads, both within and outside their community, partly because they tend to walk more than those who live in less deprived areas. In 2002, the Government set a three-year target to reduce casualties in deprived areas in England faster than the rest of the country, which it met. However, the most deprived areas were still over-represented in the casualty population in 2007, and pedestrians and cyclists were very overrepresented (see section 1.9.4).

Whilst there may be concern that the promotion of active travel modes would lead to greater increases in casualties among pedestrians and cyclists, evidence suggests that there is "safety in numbers" for walkers and cyclists. One key study into this concept was reported by Jacobson 2003. Jacobsen provided evidence based on analysis of national data from fourteen European countries on walking and cycling as well as data for 47 towns in Denmark, and 68 towns in California. The author concluded that:

- "there is a relationship between motor vehicle collisions with pedestrians and or cyclists and numbers of pedestrians and or cyclists. For example, in a community where walking doubles it can be expected that there will be a 32% increase in pedestrian injuries, where cycling doubles it can be expected that there will be a 34% increase in cyclist injuries;
- motorists appear to adjust their behaviour in the presence of people walking and cycling which largely controls the likelihood of collisions;
- In result, the relationship between pedestrian or cyclists exposure and casualties is not linear, that is, there is safety in numbers for these mode users"(Davis, 2010).

Following on from this study a number of other studies have provided further evidence to support the safety in numbers principle (Robinson, 2005, Bonham. et al, 2007 and Pucher, 2003). Most recently, the road safety analyst Elvik has reported on the non-linearity of risk and the promotion of sustainable transport. (2009) As with other researchers Elvik concludes that evidence for safety in numbers suggests that the risk to each individual cyclist or pedestrian declines as there are increases in walking and cycling, and that the greater the number of pedestrians and cyclists, the greater the reduction in risk. This leads him to conclude that "*the high injury rate for pedestrians and cyclists in the current transport system does not necessarily imply that encouraging walking and cycling rather than driving will lead to more accidents*".

In the context of Oxfordshire, the evidence above may mean that in urban areas, where there are already some significant pedestrian movements and some cyclists, the growth of these modes is likely to result in a non-linear relationship of risk and injury. This is likely to result as motorists' speeds are lower and they adapt more to the greater numbers of pedestrians and cyclists.

2.5 Transport and Air Pollution

A study combining UK and EU emissions data with models of weather and the ways in which chemicals disperse suggested that '*pollution from overall UK combustion emissions causes approximately 13,000 premature deaths a year, with road transport being the biggest source'*. A further 6,000 deaths are estimated to be due to European Union emissions produced outside the UK (NHS 2012). Despite considerable improvements in air quality in the last few decades, air pollution (see Section 4.5) from road transport (in addition to combustion sources) continues to pose respiratory and inflammatory health risks to people. Elevated levels and/or long term exposure to air pollution can lead to a range of serious symptoms affecting human health. Many areas in the UK still fail to meet the health

based national air quality objectives and European limit values, particularly for particles and nitrogen dioxide (www.environmental-protection.org.uk/committees/air-quality/air-pollution-and-transport/car-pollution/).

In comparison to many other countries, air pollution levels in the UK are low, although in parts of major cities, including parts of central Oxford, particularly near busy roads, they are high enough to be of concern. The local pollution picture reflects a complex mixture of sources and distribution of pollutants. They contribute not only to local air pollution impacts, but also to increasing ground levels of ozone, adding to local and global climate impacts.

Air quality across Oxfordshire is generally good but there are a number of areas in the county where elevated levels of pollutants have been detected. Local Air Quality Management within the County is the responsibility of each district council who are required to provide routine reports on air quality in each district in relation to air quality standards and objectives, as defined in the UK Air Quality Strategy. Exceedances of air quality objectives require declaration of Air Quality Management Areas (AQMAs), along with Action Plans produced in conjunction with OCC as the transport authority. There are currently nine declared AQMAs in Oxfordshire (Abingdon, Banbury, Botley, Oxford City, Chipping Norton, Henley, Wallingford, Watlington and Witney).

The trend for a reduction in emissions per vehicle as the vehicle stock is replaced by newer vehicles meeting higher emissions standards has not taken place as expected. The relative growth in numbers of newer diesel vehicles with emission control technology, have given rise to higher direct emissions of nitrogen dioxide into vehicle exhausts. The result has been detected as some increases in localised pollution levels in urban centres and a failure of pollution levels to decrease at the rate predicted. Any downward trend can be offset locally if traffic growth exceeds reductions due to improvements in technology; overall emissions increases are even more likely if traffic growth results in increased congestion. However, traffic pollution has become worse, as the high use of cars is the main mode of access in urban areas for relatively short journeys. The issue of air pollution is of particular concern within urban areas because of the density of population (therefore greater numbers of people exposed to air pollution) as well as the fact that many car journeys within urban areas are typically less than 6km and that since the effectiveness of catalytic converters in the initial minutes of engine operation is small, the average emission per distance driven is very high in urban areas (Krzyzanowski et al, 2005).

The most troublesome pollutants are:

- oxides of nitrogen;
- particles;
- volatile organic compounds; and
- carbon monoxide.

In the UK, road transport contributes to the majority of the public's exposure to these pollutants and is responsible for up to 70% of air pollution in urban areas (Environmental Audit Committee, 2010).

Both short-term and long-term exposure to air pollution is a significant cause of ill health and premature death (COMEAP, 1998 and 2009). Air pollution causes short term health effects on the respiratory system and more serious impacts due to long-term exposure including permanent reductions in lung function. Air pollution is linked to asthma, chronic bronchitis, heart and circulatory disease, and cancer (Krzyzanowski et al, 2005). It is estimated that air pollution causes as many as 50,000 premature deaths per year in the UK (Environmental Audit Committee, 2010).

Air pollution is also a significant contributor to climate impacts. The Climate Change Risk Assessment for the 'health' sector (Defra, 2012) shows the principal impacts of climate change on human health are expected to come from changing temperatures, ground-level ozone levels and sunlight.

The LTP4 could take an integrated approach to reducing air pollution and carbon emissions from road transport through the adoption of reduction targets for transport emissions within the LTP.

2.6 Transport and Noise

Significant traffic noise, will require further consideration in the LTP4 as it can interfere with the enjoyment of those working, visiting and residing in the county.

Transportation is the main source of noise pollution in Europe and, except for people living in close proximity to railway lines or airports, road traffic is the major cause of human exposure to noise (Cora and Phillips, 2000). Traffic noise causes impaired communication (difficulty in making oneself heard), sleep disturbance, annoyance and increased aggression. There is also increasing evidence of a link to heart disease and hypertension, which could be significant given the large percentage of population being exposed to noise (Cora and Phillips, 2000).

Noise is subjective i.e. what is noisy for one person may not bother someone else. However, it is known that disturbed sleep can become an issue where noise levels constantly exceed 30 dBLAeq and most people would be 'moderately annoyed' at 50 dBLAeq.

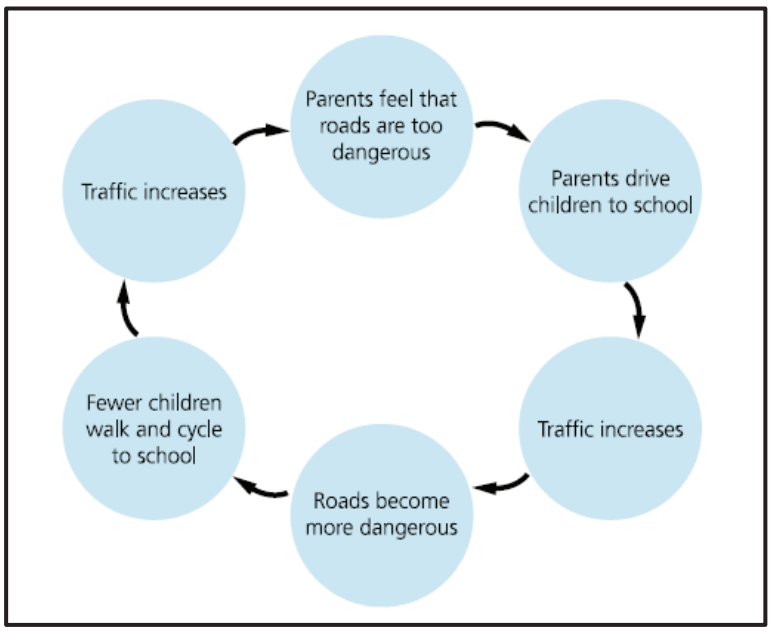
2.7 Mental Health and Wellbeing

Mental health and wellbeing is an important issue in Oxfordshire. Though deprivation in Oxfordshire is lower than the national average, deprivation continues to contribute to high levels of health inequalities and lower life expectancy. These factors impact significantly on risks that affect mental health and wellbeing such as low income, poor education, poor housing, unemployment and family breakdown, and also on the ability of the population to respond to the negative factors that increase mental health.

There are several ways in which transport can also impact upon well-being and common mental health conditions such as anxiety and depression, which are currently experienced by 64,500 people in Oxfordshire (Director of Public Health, 2013).

While traffic noise has been shown to induce nervousness, depression, sleeplessness and undue irritability; traffic congestion is linked to aggressive behaviour and increased likelihood of involvement in a crash. However, access to a car has also been linked to improved mental health, as has regular physical exercise (Health Scotland 2007).

Figure 2.2: The Effects on Ever Increasing Traffic on Children's Freedom of Movement (Sustrans, 1996)



An increased uptake of children walking and cycling can improve self-confidence and physical exercise can benefit child development, cognition, concentration and academic performance. However, high traffic density has meant that fewer children are being allowed to walk or cycle for short distances. Figure 2.2 indicates this phenomenon and the cumulative effect it has on restricting children's movement.

2.8 Inequalities and Vulnerable Groups

Oxfordshire is overall a very healthy county (OCC, 2014) but the health effects of transport are known to fall disproportionately across certain groups of the population. '*Health inequalities are one of the Department of Health's top six priorities for the NHS, which reflects a growing recognition of the impact of social disadvantages on the population's health*' (Department of Health, 2007). Such health inequalities result from exposure to a range of factors including location and socio-economic influences.

Urban areas: The negative health impacts of transport are often concentrated in inner-city districts and along busy roads i.e. areas where traffic density is particularly high and where many people live and work. The result is the increased risk of injury and death for pedestrians and cyclists, exacerbation of the severance effect of traffic and air and noise pollution levels that are higher than in suburban and rural areas (Croxford et al, 1996).

Rural areas: Rural areas suffer a disproportionate number of road fatalities, probably due to higher traffic speeds. In 2012, approximately 60% of fatalities in Great Britain occurred on rural roads, with 38% occurring on rural A-roads and a further 21% on other rural roads. This is considerably higher than the 42% of traffic which is found on these roads (Department for Transport, 2013).

Deprived communities:

- Children in the ten per cent most deprived wards in England are more than three times as likely to be pedestrian casualties as those in the ten per cent least deprived wards (Grayling et al, 2002) according to research published in 2002; more recently the DfT (May 2009) reports that pedestrians aged 0 to 16 in the most deprived areas are four times more likely to be killed or injured than those in the least deprived areas.
- Social deprivation is associated with increased injury and fatality levels in road traffic collisions. Driving at excessive speed, driver intoxication, driver/passenger failure to wear seat-belts, and unlicensed/uninsured driving is most prevalent in fatal collisions in the most deprived social classes (Clarke et al, 2009);
- Deprived communities are more likely to live in inner city areas where the polluting effects of transport are more pronounced due to higher housing density, older vehicles and exposure to busy roads;

Disability: There are 89,756 disabled people within Oxfordshire, which accounts for approximately 14% of the population (Census 2011). This is less than the national average at 18%. Adults with physical and learning disabilities wish to be more independent, with greater choice and control to be fully integrated into the wider community (OCC et al, 2014). This includes improved access to support services and good health care.

Age: Life expectancy in the county for a person born in 2013 was above the national average at 80.3 years for males and 84.1 years for females (Public Heath Observatories, 2013); although there are variations between districts.

The 2011 Census showed an increasing number of older people living in Oxfordshire, with the population aging faster than the national average (Director of Public Health, 2013). Additionally, the more rural districts are likely to experience the greatest increase in the over 85s over the coming decades.

- The elderly have been found to be most at risk of pollution-related premature death in time series studies of mortality, possibly because of higher rates of illness among this group. It has been estimated that periods of high pollution in Britain may hasten by a few days or weeks up to 24,100 deaths each year, mainly among older people and the sick; and 23900 hospital admissions, as well as causing additional emissions (Department of Health Committee, 1998).

- Nearly one third of car drivers (30%) who die or are seriously injured are under the age of 25, yet this age bracket makes up a much smaller proportion of licence holders.
- Pedestrians over the age of 70 account for a disproportionate share of deaths (Department for Transport, 2009);
- When it comes to accidental deaths, traffic kills far more children and young people (excluding babies) than all events such as fire, drowning, poisoning or falls. Four out of five accidental deaths of 10-19 year olds are in road crashes.

Pedestrians and Cyclists: Pedestrians and cyclists are particularly vulnerable road users and are disproportionately involved in crashes given the amount of time they spend on the road and the relatively short distances they travel.

- Britain's good record on road safety is marred by its high rate of child pedestrian casualties. Figures published by the Department for Transport show that in 2011, 2,412 children under the age of 16 were killed or seriously injured on the roads (http://makingthelink.net/child-deaths-road-traffic-accidents).
- Collisions with vehicles travelling at more than 20 miles per hour increase the severity of pedestrian and cyclist casualties (Department for Transport, 2009).
- In 2013, after car occupants, pedestrians were the second largest casualty killed in reported accidents (23%) in Great Britain, followed by motorcyclists (19%) and pedal cyclists (6%) (Department for Transport, 2014).

Cyclists are 12 times more likely to be killed on the road than people in cars. Cyclists are more likely to be killed in collisions with lorries (Department for Transport, 2009).

3 Scope of Assessment

Based upon the above evidence, the scope of this assessment focuses upon the following 'relevant' SEA objectives and sub-objectives (noting that only those sub-objectives affecting human health are included):

- *Protect and promote everyone's physical and mental wellbeing and safety*
  - *Increase opportunities and amenity of active travel modes for health benefits*
  - *Promote safer non-motorised and public transport*
  - *Ensure access to health facilities by a wide range of sustainable modes of travel*
  - *Provide safer conditions for pedestrians and cyclists, including children and the infirm.*
- *Reduce noise pollution*
  - *Reduce the number of people being affected by transport noise*
- *Reduce all forms of transport-related air pollution in the interests of local air quality*

Table 3.1 sets out the assessment objectives with the reasons for their selection. The table also includes a number of issues that are considered as indicators as to whether the SEA objectives would benefit or undermine the LTP4 strategy options.

Table 3.1: SEA Objectives for Effects on Human Health

Sub-objective	Link to Human Health	How objective could be achieved	Reason
Protect and promote everyone's physical and mental wellbeing and safety			
Increase opportunities and amenity of active travel modes for health benefits	Improving access and opportunities for active travel modes such as foot or bike can deliver positive health outcomes and provide the right environment for promoting active lifestyles and good use of resources.	**Provide opportunities for physical activity.** This may include the provision of additional and better quality facilities (and improved conditions) for pedestrians and cyclists including high-quality green infrastructure	Improvements to pedestrian movement /crossing points are likely to encourage more pedestrian/cycle journeys, and thus increase physical activity. Physical activity is one of the best ways of improving overall health and reducing obesity.
		Promote the health and environmental benefits of undertaking more journeys on foot or by bicycle and **encourage a move away from car dependency for shorter journeys**	Sedentary lifestyle is linked to a number of health issues including obesity and weight gain, cardiovascular disease and cancer. Therefore significant public health benefits can be achieved if more people adopt walking or cycling as all or part of their journeys rather than using the car. There are also important long term health benefits relating to reducing carbon emissions. The Association of Directors of Public Health recommends that 10% of transport budgets is committed to walking and cycling.
Promote safer non-motorised and public transport	Improvement of safety is national transport policy goal. Certain groups of society are disproportionately at risk of accidents. British Crime Survey data reveals that speeding traffic is rated as the greatest problem in local communities.	**Improvements to conditions and safety (such as lower speed limits in residential areas)** in order to encourage pedestrians and cyclists	There is evidence that levels of walking and cycling increase after the implementation of traffic calming schemes. There is unequivocal evidence from Europe for casualty reduction where 30kph zones are implemented. Implementation of 20mph limits is now favoured by the Department for Transport as a potentially effective intervention to improve safety in residential areas as well as improve quality of life. There is an opportunity to enhance the viability of non-motorised and public transport as a means of increasing travel options and cutting reliance on car use, hence reducing accidents,
		Provision of a road safety strategy which strongly promotes walking and cycling and **seeks to reduce fear of crime** for pedestrians and cyclists through good urban design	
Ensure access to health facilities by a wide range of sustainable modes of travel	Poor access to healthcare is a significant factor in social exclusion, which is associated with health problems. There is therefore a link between improved connectivity of health facilities by	**Improved connectivity and improved transport to key health services** **Reduce physical barriers by improving sustainable transport infrastructure** and	Poor access to services is a significant factor in social exclusion, which is associated with health problems. There is therefore an opportunity to enhance

Sub-objective	Link to Human Health	How objective could be achieved	Reason
	public transport, walking and cycling, and improved health.	reduce psychological barriers (e.g. road safety fears).	accessibility by foot, bike and public transport. This will help to promote healthy exercise and the sense of local community, increasing equity in the access to services and health facilities for people with poor access to transport.
Provide safer conditions for pedestrians and cyclists, including children and the infirm.	Pedestrians and cyclists are particularly vulnerable road users and are disproportionately involved in accidents given the amount of time they spend on the road and the relatively short distances they travel. Children are at high risk.	**Programmes of safety measures** to help reduce likelihood of accidents **Seek to reduce fear of crime for pedestrians and cyclists** through good urban design	Locations with a high number of crashes or fatalities may indicate a specific cause of accidents that could be addressed through targeted road improvement or alternative measures such as speed cameras.
Reduce noise pollution			
Reduce the number of people being affected by transport noise	Noise disturbance can interfere with the enjoyment of those working, visiting and residing in the county, and result in mental health problems.	**Reduce traffic volumes in residential areas**	Opportunity to divert traffic noise away from sensitive residential receptors.
Reduce all forms of transport-related air pollution in the interests of local air quality			
Improve air quality levels where possible, and minimise the number of exceedances of Air Quality Standards	Road transport contributes to air pollution, which affects human health.	**Encourage and facilitate the use of active travel and short journeys** **Reduce traffic congestion** **Limit the more polluting vehicles in sensitive areas and reduce transport emissions** **Seek initiatives to limit traffic growth.**	Opportunity to take an integrated approach to reducing air pollution and carbon emissions from road transport.

4 Method of Assessment

4.1 General Approach

A preliminary assessment has been made to identify whether the area strategies and supporting strategies of the LTP4 would compromise the achievement of the SEA objective and sub-objectives with regard to human health.

Potential impacts were considered in relation to whether they were likely to be:

- widespread or significant in scale;
- localised or limited in scale;
- Uncertain whether it affects criteria, or whether
- No potential impact has been identified.

This information was recorded on a matrix in Appendix F 'Area and Supporting Strategy Assessment Report' of the Environmental Report. This matrix presents the potential positive and negative effects on the health-related SEA objective from the combination of measures that make up the draft LTP4.

The assessment methodology is set out in Chapter 5 of the SEA Environmental Report.

4.2 Limitations and Assumptions

At this stage there is limited detail available as to how the proposals within the LTP4 would be delivered and it is therefore difficult to estimate the population likely to take advantage of, or benefit by, the new schemes. There is also significant uncertainty regarding the likely level of funding that would be available to deliver the LTP4 strategy and the Delivery Plan is not yet available so the overall timescales are uncertain.

Consequently, this assessment is largely based upon a number of assumptions. The following broad assumptions have been made:

- All proposals listed within the LTP4 would be delivered between 2015 - 2031 and therefore have an effect within the short to medium term;
- All proposals would achieve the high level goals and objectives of the LTP4.

5 Effect of LTP4 on Human Health and Safety

SEA Objective 4: Protect and promote everyone's physical and mental wellbeing and safety

No negative impacts on human health have been identified as a result of the LTP4.

The LTP4 identifies strategies to improve facilities, links and safety conditions for pedestrians and cyclists to encourage the uptake of walking and cycling. These improvements include the provision of super-premium and premium cycle routes, a cycling strategy for Science Vale, a Sustainable Transport Strategy for Bicester, a low traffic 'Oxford' city centre, innovative cycle parking facilities with cycle hubs and strategies to increase use of public transport. These are considered significant beneficial impacts as they will help to improve the health and well-being of local communities, while enabling access to housing sites and facilitating movement between employment sites, retail centres and residential areas.

This LTP4 demonstrates a commitment to maintaining the safety and condition of local roads and highway related assets with systematic prioritisation where there are safety related issues, premium bus routes and high pedestrian and cycle usage whilst still maintaining the network as a whole.

The Science Transit strategy also demonstrates a commitment to improving travel information and integrated and reliable services for the population to improve the traveller experience and road safety. Such systems will seek to work with modern lifestyles and align with aspirations for personalised mobility options. Additionally, the LTP4 together with the Science Transit will develop interchange points between multiple modes of transport (hubs) that will maintain safe walk and cycle access by keeping people segregated from public transport and vehicles.

As part of the Freight Strategy, features will be developed to influence lorry routes and journey times that reduce the danger that lorries pose to cyclists. Additionally, rest areas and proper facilities will be developed for lorry drivers with security, refreshments, washing and toilets catering better for drivers in terms of health and safety.

In the longer term, there may be increasing risks to cyclists and pedestrians from the estimated increase in large lorries, but these risks will increase at a greater rate in the absence of the LTP4.

SEA Objective 5: Reduce noise pollution

No significant strategic impacts on noise have been identified as a result of implementing the LTP4. Any impacts of the strategies on noise (and thus human health) are likely to be dependent on location.

There are likely to be benefits to human health in terms of reducing noise in towns and Oxford city centre (e.g. through traffic reductions, proposals to re-route traffic and reduce freight traffic volumes, and the construction of bus tunnels). However, there will be elevated noise levels in other areas (e.g. at park and ride sites located further from towns and the city, and in more rural tranquil areas) through transport network improvements, the provision of more bus services and increased road traffic (including freight). It is uncertain how the Science Transit will align with the LTP4 and affect noise patterns through improved frequency, speed and reliability of services.

There are also likely to be negative impacts through increased noise pollution associated with construction of infrastructure works.

Noise will be assessed as part of scheme design and suitable noise mitigation will be used to reduce any impacts identified.

SEA Objective 6: Reduce all forms of transport-related air pollution in the interests of local air quality

No significant strategic impacts on air quality have been identified as a result of implementing the LTP4. Any impacts of the strategies on air quality are likely to be dependent on location.

Improvements to air quality are likely to be realised through the support of high capacity vehicles with low or zero emissions, through zero emissions restrictions for freight and taxis in some areas (e.g. Oxford), through support for low carbon modes of public transport and through the implementation of schemes that deter road traffic from town centres or provide traffic calming measures. Improvements to air quality in cities and town centres are also likely to be realised through the implementation of measures that deter freight traffic, and consolidate freight items, combining them for onward delivery to the same destination.

Additionally, proposals to encourage the use of sustainable modes of transport (e.g. walking and cycling) are likely to improve air quality in some areas. Cycling is a largely carbon-free form of transport and will therefore help to reduce the reliance on vehicle based transport and associated air pollutants from transport.

However, increases in air pollutants may result elsewhere from the re-routing of traffic (particularly freight traffic) and the improvements to the transport network, which will increase road capacity and may encourage further traffic growth in the long-term. The construction of new road and rail infrastructure and associated facilities is also likely to elevate air pollution.

5.1 Cumulative Effects

Many of the effects predicted for the LTP4 are cumulative in their nature. For example, the predicted positive effect on air quality depends upon a reduction in traffic arising from the cumulative effect on modal shift from the combination of public transport measures and promotion of walking and cycling.

It is anticipated that there would be a cumulative positive effect on human health through active travel. The combination of a reduction in traffic in urban centres, an increase in walking and cycling and improvements to walking and cycling facilities would combine to improve human health through a combination of increased physical activity and reduced air and noise pollution.

When project level detail associated with the LTP4 schemes (including location of transport improvements and ongoing maintenance and repair works) is available, further assessment of potential in-combination or cumulative impacts should be considered.

The LTP4 has also been developed in such a way to ensure that it has been fully integrated with other plans, strategies and programmes, including those that affect human health.

5.2 Recommendations for Mitigation and/or Enhancement

The Environmental Report sets out recommendations to improve the environmental outcome of the draft LTP4. In relation to objectives for health, the recommendations include the following:

- Continue to seek opportunities at project level to promote sustainable travel to support the planned housing growth, and to improve the safety of existing rights of way as part of strategy area implementation.
- Develop new walking and cycling infrastructure where possible, maximising opportunities to natural green space and the countryside, and promoting the creation/extension of and improvements to green and blue infrastructure.
- Continue to seek opportunities at project level to improve the safety and quality of existing rights of way (e.g. improving the quality of surfaces, providing directional signage, access to public transport)

as part of strategy area implementation and to provide better integration with rail and strategic bus networks.

- Plan construction activities to minimise disturbance to pedestrians, residents, tourists and workers within affected areas, for example through the use of temporary acoustic screening where appropriate.
- Seek to ensure that freight traffic uses the most appropriate routes, as outlined in Oxfordshire's Inter-urban Freight Strategy and Oxfordshire Lorry Routes Guidance.
- Consider the use of low noise surfacing when constructing new roads and in delivering new walking and cycling routes, which would also have associated health and well-being benefits.
- Seek to implement measures to counteract traffic growth (e.g. by continuing to improve opportunities for sustainable transport).
- Continue to work with the Highways Agency, district councils, Network Rail and train operators to identify air quality improvements associated with the road and rail network to complement measures identified in Air Quality Action Plans.
- Carefully plan schemes in terms of location, scale and design at project level to ensure air quality reductions are realised.
- Apply restrictions on more polluting vehicles within Oxford to encourage a cleaner fleet. Consideration could be given as to how to apply a "polluter pays" principle within demand management measures.
- Consider use of trees in appropriate locations to filter out pollutants; urban tree planting can be beneficial to air quality, and should be considered at project level.

6 Abbreviations

AQMA	Air Quality Management Area
DfT	Department for Transport
HIA	Health Impact Assessment
LTP4	Local Transport Plan 4
NHS	National Health Service
OCC	Oxfordshire County Council
SEA	Strategic Environmental Assessment
UK	United Kingdom

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