Technical Report

M4 Junction 16 Scheme

Full Business Case

Swindon Borough Council

April 2016

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Acronyms and Abbreviations

AQMAs Air quality monitoring and air quality management areas

- BCR Benefit to Cost Ratio
- CO2 Carbon dioxide
- DFT Department for Transport
- DMRB Design Manual for Roads and Bridges
- FBC Full Business Case
- LGV Large goods vehicle
- NO2 Nitrogen dioxide
- NPV Net Present Value
- OGV Other Goods vehicle
- PM10 Particulate matter
- PRoW Public rights of way
- PVB Present value of benefits
- PVC Present value of costs
- SEBs Statutory environmental bodies
- SEP Strategic Economic Plan
- SWLEP Swindon and Wiltshire Local Economic Partnership
- WebTAG DfT's transport analysis guidance

1 Introduction

1.1 Context

A new approach to funding major local transport schemes - to be constructed in England (outside London) during the 2015-19 period - was announced by the Department for Transport (DfT) in Autumn 2012. The new approach devolved major scheme funding decisions to 38 Local Transport Bodies (LTBs). Each LTB had an indicative funding allocation to prioritise schemes being considered in their areas. In guidance issued to the LTBs, the DfT set out its requirement for each LTB to produce an Assurance Framework. This framework details the LTB's composition, governance, stakeholder engagement methods, scheme prioritisation and approval mechanisms, and approach to financial management. LTBs were asked to advise DfT of their spending priorities by the end of July 2013, in the form of a prioritised scheme list. The overarching aim of the new approach is to move towards a more transparent and local decision-making process for major transport schemes.

The Swindon and Wiltshire Local Transport Body (SWLTB) was established in 2012 to cover the areas administered by Swindon Borough Council and Wiltshire Council. It comprised cabinet members from both authorities and business representation from the Swindon and Wiltshire Local Enterprise Partnership (SWLEP). An independent technical advisor scrutinised the SWLTB's decision-making processes.

The SWLTB agreed that transport schemes in Swindon or Wiltshire that are expected to cost between £1 million and £25 million would be eligible for up to 90 per cent funding from the LTB. With a confirmed funding budget for the SWLTB area of only £10.9 million to cover the 2015-19 period, scheme assessment and prioritisation was a critical element of the SWLTB's initial work.

In line with the method set out in the Assurance Framework, the scheme promoters (Swindon Borough Council or Wilshire Council) assessed the long list of schemes during April 2013. They were then submitted to the SWLTB's Technical Officers' Group for prioritisation with sufficient supporting information.

On 8 July 2013, the SWLTB approved a provisional prioritised and contingency scheme programme for the 2015-19 funding period, with the prioritised list submitted to the DfT in advance of the 31 July 2013 deadline. Scheme promoters were then instructed to produce an Option Assessment Report and Appraisal Specification Report for each prioritised scheme, before approval could be given by the SWLTB to prepare Full Business Cases.

At its meeting on 8 January 2014, the SWLTB approved the proposed 'proportionate' appraisal approach for the three top priority schemes.

On the 31 March 2014, the SWLEP submitted its Swindon and Wiltshire Strategic Economic Plan to government. The announcement on the Swindon and Wiltshire Growth Deal was then published on 7 July 2014. The Outline Business Case for the Junction 16 scheme was approved by the Local Transport Body on 29 October 2014.

1.2 Document purpose

This document and its appendices form the Full Business Case (FBC) for the M4 Junction 16 improvements, promoted by Swindon Borough Council. The FBC represents stage 3 of the agreed 'scheme assessment and approval' process. The contents of this FBC will be used to decide whether the scheme should be approved and funded by the SWLEP. FBC approval allows Swindon Borough Council to progress the Junction 16 improvements.

This document is also intended to support the plan of further investment in the Wichelstowe development. As a strategic growth site for employment and land investment, it forms a central element of the Strategic Economic Plan (SEP).

1.3 Document status

The FBC is intended for publication on the SWLEP website. In line with the assurance framework, this document will be available to the public, in advance of scheme approval.

1.4 Structure of remainder of this document

This FBC has been prepared to the level of detail proportionate to risk and funding certainty. It is structured around the DfT's recommended five cases model for a transport business case:

- Strategic case (section 2), setting out a clear rationale for the Junction 16 improvements, the need for investment and scheme options under consideration.
- Economic case (section 3), identifying the key economic, environmental and social impacts of the scheme and its overall value for money.
- Financial case (section 4), presenting evidence of the scheme's affordability both now (for the construction phase) and in terms of ongoing revenue liabilities. This section includes scheme outturn cost details.
- Commercial case (section 5), summarising the preferred approach to scheme procurement, and justifying the commercial and legal viability of such an approach.
- Management case (section 6), setting out how Swindon Borough Council will ensure that the scheme is delivered successfully, on time and to budget, with suitable governance and risk management processes in place.

1.5 The scheme

Swindon Borough Council is promoting junction improvements to Junction 16 of the M4 with measures to increase capacity. The scheme considered in this FBC consists of:

- Creating a right-turn for Swindon Road traffic turning onto Hay Lane using one signalised junction
- Constructing a new signalised junction for traffic joining Hay Lane from J16
- Widening the M4 westbound off-slip to four lanes
- Widening the M4 eastbound off-slip to four lanes
- Widening the circulation carriageway on the Great Western Way approach, and suitable modifications to all other junction approaches
- Modifying and relocating road signage and road markings to suit the final carriageway location and configuration
- Modifying surface water drainage systems to suit the final carriageway location and configuration

Figure 1.1 shows the location of the existing junction. A scheme drawing is included in Appendix A.

The full cost of implementing the proposed scheme, including preparatory works, site supervision costs and a risk budget, is estimated to be £11.43 million. Further details are provided in section 4, the financial case. The adjusted benefit-cost ratio (BCR) is 10.2, demonstrating that the scheme **offers very high value for money.**

The proposed improvements are intended to complement works to access the Wichelstowe development. The works are complementary to the Wichelstowe Hay Lane Roundabout and Western Access schemes, which link directly into the development.

FIGURE 1-1 M4 Junction 16 location plan



The redesign of Junction 16 is a requirement of the original outline planning permission for Wichelstowe (Condition 79), and needs to be complete before the 1100th dwelling on the site is occupied.

2 Strategic case

2.1 Overview

This section sets out the 'case for change', by explaining the rationale for investment and presenting evidence on the strategic policy fit of the proposed scheme. This section also sets out the scheme options under consideration.

The strategic case establishes the:

- Context for the business case, outlining Swindon Borough Council's strategic aims and responsibilities
- Nature of the transport-related problems that have been identified, using evidence to justify intervention and examining the impact of not making the investment
- Specific, measurable, achievable, realistic and time-bound (SMART) objectives that solve the problem, based on Swindon Borough Council's strategic aims and responsibilities
- Measures for determining successful delivery of the objectives
- Scheme scope, determining what the project will and will not deliver
- Analysis of constraints and opportunities for development
- Breakdown of interdependencies on which the successful delivery of the scheme depends
- Details of main stakeholders
- Options considered.

2.2 Business strategy

Swindon Borough Council, as promoting authority, has key local policies for spatial planning and transport that guide decisions on transport infrastructure investment, including any proposals for M4 Junction 16. The key local policies are the Swindon Local Transport Plan 2011-2026 (LTP3) and the emerging Swindon Local Plan. Any scheme must address problems identified and align with these policies.

The scheme must support the economic growth aspirations set out in the Strategic Economic Plan.

Strategic Economic Plan (SEP)

The SEP identifies four key opportunities:

- 1. Innovation
- 2. Military
- 3. Town centres
- 4. Unlocking urban expansion

The Growth Deal is about accelerating major urban expansion and ensuring that growth is sustainable. This will be done by:

- Investing in infrastructure to unlock key developments
- Mitigating the impact of new development on the transport network to improve journey time reliability
- Providing alternative travel options for residents in new (and existing) communities, including rail, bus rapid transit, and other sustainable transport, such as safe cycle and walking routes.

The Swindon and Wiltshire Local Enterprise Partnership (the SWLEP) has secured £12m for 2015/16 from the Local Growth Fund (LGF) and indicatively a further £117m up to 2020/21 for delivery of capital projects subject to further LGF bidding rounds. As allocations have been made to the Local Enterprise Partnerships (LEPs) rather than to the individual authorities, a governance mechanism has been developed by the SWLEP Secretariat and subsequently agreed by the SWLEP Board.

The SEP sets out a bold vision and a transformational economic growth programme. By 2026, the SWLEP want to be recognised as one of the UK's leading hubs of innovation, home to even more world-class businesses and entrepreneurs, with a digital infrastructure second to none and a thriving network of Higher Education centres.

In 2015/16, the call on the Local Growth Fund is £44.7m to deliver projects worth £719m with local public sector contributions of £41m and over £522m of private sector investment. The total call on the Local Growth Fund for these projects to 2021 is £152.4m.

Swindon Local Transport Plan

Swindon's third Local Transport Plan identifies that Swindon is a positive and highly ambitious town, which aims to develop its status as an economic, retail and cultural centre. It notes that substantial progress has been achieved in its plans for growth but that there is much more to be done. This includes regenerating central Swindon and economic growth through planned urban extensions and, focussing on rejuvenating deprived areas. The aim is for Swindon to become a successful economic driver for the south-west of England and the entire UK. The transport challenges are to:

- Optimise the operation of key strategic transport corridors and the local road network to allow the efficient and reliable movement of people and goods, vital for the economic prosperity of the area
- Deliver transport measures and interventions that will accommodate housing and employment growth in an environmentally sustainable manner
- Contribute towards carbon reduction targets by achieving a shift to a more sustainable transport network
- Overcome barriers and severance caused by key transport corridors and ensure new development allows for walking and cycling
- Improving accessibility to/from the town centre, and ease of movement within it, to support regeneration
- Delivering transport solutions which are sympathetic to the local environment and do not adversely
 affect local quality of life
- Reducing the negative health impacts of the transport system (i.e. road safety and health benefits)

The desired transport outcomes are:

- Improved journey time reliability for all forms of transport
- Improved road safety
- Increased overall share of journeys by public transport, walking and cycling
- Reduced need to travel and reduced dependency on the private car
- Improved accessibility
- Improved local environment and quality of life
- Improved access to the town centre

The policy framework, set out in the Local Transport Plan, was approved with a view to addressing the key transport challenges and delivering the desired transport outcomes.

• Policy A – Optimise the capacity of the highway network and improve journey time reliability for all forms of transport

- Policy B Improve road safety
- Policy C Achieve and sustain a high quality, resilient and well maintained highway network for all members of the community
- Policy D Integrate land use planning and transport to reduce the need to travel and mitigate the impact of new development on the transport network
- Policy E Deliver a high quality public transport network that is accessible, easy to use and supported by appropriate priority measures
- Policy F Encourage a change in behaviour in transport by promoting alternatives to driving alone and supporting infrastructure, where appropriate

The proposed M4 Junction 16 scheme aligns well with the Local Transport Plan. It addresses an essential scheme for the strategic transport network that improves the efficient and reliable movement of people and goods. In addition, the scheme will help to deliver housing and employment growth.

Swindon Local Plan

The Local Plan articulates the planning strategy which will help to enable the delivery of other Borough Council plans, strategies and priorities. Working with the community and with other organisations, the challenge is to deliver economic growth in Swindon in a way that is balanced, sustainable and improves the quality of life for all.

The Local Plan identifies a number of significant threats to economic success, including:

- The poor performance of Swindon town centre, specifically in terms of the retail and office offer
- A lower level of residents with higher education qualifications, compared to competing towns and cities
- Swindon's perceived poor image
- Low retention of wealth within the Borough

A considerable amount of new and improved infrastructure will be needed to support the new developments proposed in the Local Plan. Specific Local Plan policies that support improvements to Junction 16 are:

- Policy SD1: Sustainable Development Principles (borough-wide infrastructure)
- Policy SD2: The Sustainable Development Strategy (strategic sites including Wichelstowe)
- Policy SD3: Managing Development
- Policy NC1: Wichelstowe

Wiltshire Core Strategy

The emerging Wiltshire Core Strategy includes a Royal Wootton Bassett and Cricklade Area Strategy which states:

Royal Wootton Bassett is the largest town within the community area, located approximately six miles from Swindon and two miles from the M4, and as such is ideally located to develop into an important employment centre. The town has therefore been identified as a location for new strategic employment growth, particularly to help reduce out commuting, as the town currently has a dormitory role to Swindon. Although the town currently has a smaller employment base than might be expected for a town of its size it does have a varied employment base and should be relatively resilient to mass job losses.

Specific issues to be addressed in planning for the Royal Wootton Bassett and Cricklade Community Area include:

- ongoing work to identify appropriate action to help address capacity issues associated with Junction 16 of the M4. Any major development proposals should demonstrate how this matter has been taken into account and propose appropriate sustainable transport solutions to help address this problem

- Swindon falls within a separate administrative area ,although its proximity to the Royal Wootton Bassett and Cricklade Community Area means that planning for future growth in Swindon should be considered holistically and with appropriate co-operation between neighbouring authorities and involve collaborative working with the Wiltshire and Swindon Local Enterprise Partnership and the Wiltshire and Swindon Local Nature Partnership.

Core Policy 66 Strategic Transport Network of the Wiltshire Core Strategy states:

Work will be undertaken in conjunction with Highways England, Network Rail, transport operators, neighbouring authorities and other agencies, that will seek to develop and improve the strategic transport network to support the objectives and policies in the core strategy and local transport plan.

2.3 Problem identified and impact of not changing

Problem Identified

Junction 16 provides an important link to and from the M4 Corridor and the A3102 to Wiltshire. It will also serve two of the four key links to the Wichelstowe development.

The inability of the existing junction to cope with current and forecast traffic levels is documented in the February 2004 Principal Urban Area Study. The report assessed the ability of a range of sites surrounding the Swindon principal urban area to cater for future development. The report stated that development 'is heavily constrained by junction 16', which is 'over capacity during peak times'.

In future years, the current transport problems will be exacerbated due to background traffic growth and housing development, in particular at Wichelstowe. Redevelopment throughout Swindon Borough and in Royal Wootton Bassett will also increase demand for travel.

In 2012, the Highways Agency (now Highways England) commissioned JMP Consultants Ltd (JMP) to assess M4 Junction 16. The work was designed to provide an evidence base to determine whether the proposed level of growth within the Wiltshire and Swindon Core Strategy areas could be accommodated by the proposed arrangements for Junction 16. JMP constructed a Paramics forecast 2026-year model. The Swindon SATURN model has been used to assess the option on a before and after comparison.

The extent and nature of the problem is illustrated by the SATURN modelling work for the do minimum scenario (excluding the scheme). This indicated the following congestion points at the junction in 2026 (where the volume to capacity is greater than 85 per cent):

- A3102 Royal Wootton Bassett approach to the junction (AM and PM)
- M4 eastbound off slip approach to the junction (AM)
- B4005 Wroughton approach to the junction (PM)

The modelling work indicates that the growth in highway traffic demand is around 30 per cent, with modelled AM peak (08:00-09:00) demand increasing from 49,500 PCUs/hr in 2006 to 64,800 PCUs/hr in 2026. In the PM peak (17:00-18:00) the increase in demand is from 51,400 PCUs in 2006 to 66,300 PCUs/hr in 2026.

Impact of not changing

There are a number of future housing and employment developments proposed in the Core Strategy for the Swindon area (see Figure 2.1). The most significant are:

- Wichelstowe
- Eastern Villages
- Kingsdown
- Tadpole Farm
- Commonhead

Other development sites, outside Swindon but within Wiltshire and in close proximity to the junction, include Ridgeway Farm.

FIGURE 2-1 Development plan



These strategic sites will add vehicle movements to the road network with congestion expected to worsen at some pinch points. Transport modelling work undertaken for the Swindon Transport Strategy in 2009 identified that a large number of links would be over-capacity when these developments are

complete. A combination of measures were identified to help alleviate these problems, including managing vehicle demand and providing essential infrastructure.

The substantial growth proposed in Swindon means congestion is expected to worsen. Swindon Borough Council's transport modelling shows that the highway network, in particular Junction 16, would become constrained without further intervention. This would have significant implications for the Swindon economy as a whole, including the town centre and other major development sites, such as Wichelstowe and Eastern Villages.

Furthermore, the impact on Wiltshire would be substantial. It has been noted elsewhere that the success of Wiltshire Council's Core Strategy is dependent on the completion of the Junction 16 scheme.

The SATURN highway model statistics and outputs have been used to summarise the main network performance statistics, including the junction delays at Junction 16 in both 2016 and 2026 (see Table 2.1).

TABLE 2.1:

SATURN highway network summary statistics

	Do-min	Do-something	DIFF	% DIFF	Do-min	Do-something	DIFF	% DIFF
	Weekday AM Peak Hour				Weekday PM Peak Hour			
NETWORK-WIDE OPERATING STATISTICS								
2016								
TIME (PCU-HRS)	21,779.20	21, 730. 30	-48.90	-0.2%	23,692.10	23,609.70	-82.40	-0.3%
DISTANCE (PCU-KMS)	1,372,220.30	1, 372, 380.10	159.80	0.0%	1,354,413.10	1,354,214.40	-198.70	0.0%
SPEED (KPH)	63.01	63.16	0.15	0.2%	57.17	57.36	0.19	0.3%
2026								
TIME (PCU-HRS)	24,669.20	24, 564. 50	-104.70	-0.4%	25,618.80	25, 372.40	-246.40	- 1.0%
DISTANCE (PCU-KMS)	1,489,955.40	1,489,994.00	38.60	0.0%	1,499,756.60	1,499,010.50	-746.10	0.0%
SPEED (KPH)	60.40	60.66	0.26	0.4%	58.54	59.08	0.54	0.9%
M4 JUNCTION 16 OPERATING ST	ATISTICS							
2016								
VOLUME (PCU/HR)	6,963	7,120	157	2.3%	6,828	7,186	358	5.2%
TOTAL DELAY (PCUS-HRS)	146.0	70.2	-75.8	-51.9%	146.0	62.7	-83.2	-57.0%
AVERAGE DELAY (SEC/PCU)	75.5	35.5	-40.0	-53.0%	77.0	31.4	-45.5	-59.2%
2026								
VOLUME (PCU/HR)	7,355	7,628	273	3.7%	7,450	8,001	551	7.4%
TOTAL DELAY (PCUS-HRS)	192.3	78.5	- 113.8	-59.2%	230.9	74.1	-156.8	-67.9%
AVERAGE DELAY (SEC/PCU)	94.1	37.0	-57.1	-60.6%	111.6	33.3	-78.2	-70.1%

The impact of the improvement scheme at Junction 16 is clearly substantial in both 2016 and 2026. In 2026, total junction and average vehicular delays decrease by between 50% and 70% in the am and pm peak hours. Traffic volumes moving through the junction increase but only slightly (probably imperceptibly for most road users).

Inspection of model results for the proposed scheme reveals critical saturations between 85 per cent and 96 per cent in the 2026 AM peak hour and between 91 per cent and 100 per cent in the 2026 PM peak hour. Saturations on the A3102, at its junction with the B4534 and the B4006 and B4553, are similar or worse in one or both peak hours. This suggests the proposed scheme is relatively wellconfigured to fit capacities on the key access route into Swindon from Junction 16. Flow differences are provided in **Appendix B**.

2.4 Objectives

In order to mitigate these problems, three SMART objectives have been identified:

- 1. Reduce congestion and delay at M4 Junction 16
- 2. Reduce likelihood of M4 online exit queuing
- 3. Improve highway access to growth areas in North Wiltshire and Swindon

2.5 Measures for success

To measure each of these objectives, at least one indicator has been established to determine what constitutes ultimate success of the scheme. Table 2.2 outlines indicators and related targets.

TABLE 2:2:

Success Indicators

Indicator	Targets	Relating to Objective
Maintain safe exit control from M4 onto slip roads	Queues on the M4 slips to be under acceptable safety limits.	 Reduce congestion Reduce M4 online exit queuing
Maintain operational capacity for overall junction while providing access to Wichelstowe development.	Actual observed vehicles to remain under junction saturation level.	 Reduce congestion Reduce M4 online exit queuing Improve access to growth areas

2.6 Scope

The proposed scheme has an offset junction arrangement to the south, with increased capacity for all movements, to improve the link to Wichelstowe, south of the M4. The scheme defines new signal timings and a revised carriageway layout. It will cover south-west Swindon and provide direct benefits to:

- Wichelstowe
- Royal Wootton Bassett
- West Swindon

2.7 Current opportunities and constraints

The significant housing and employment growth planned for Swindon and Wiltshire in the coming years is a great opportunity to deliver transport improvements and maximise economic growth in the area. The development, combined with the DfT investment, will contribute to an enhanced transport network with a resultant economic benefit.

Site condition surveys were carried out at Junction 16 in 2014 by PBA to determine a detailed picture of the site including topography, land uses, drainage issues, embankment conditions, hydrology, ecology and geology.

To the south of the junction, the majority of the area is open fields. To the north is a hotel car parking area and densely overgrown fields along the eastern embankment.

The area does not have major natural water courses and the drainage appears to be controlled by manmade ditches along major roads. The site does not lie on a floodplain. The area is generally flat, with manmade embankments and drainage ditches associated with road construction.

No potentially significant contaminative sources associated with the current site were observed during the site walkover survey.

The site condition surveys did not highlight any 'showstoppers' or outstanding natural features on the site, and the existing landscape is only of moderate amenity value.

Detailed existing service information has been collected from the main utilities companies, and a mitigation plan has been prepared detailing diversionary works that will be required. The following constraints exist at and around Junction 16:

• SSE Electric – low voltage cables at Junction 16 need removal and reinstatement

- Wales & West Utilities a medium pressure gas main in the eastern verge of the B4005 spur needs to be relocated
- Thames Water water mains in the southern verge of the B4005 need to be diverted
- BT ducts need to be diverted, and a side access to an existing chamber will be installed to allow access from the footpaths
- Esso no diversion required, but needs monitoring
- Vodafone Communications ducts and manholes need to be diverted
- LEVEL 3 Communication utilities ducts need to be diverted
- Virgin Media ducts need to be slewed

2.8 Interdependencies

The scheme has always been dependent on combined authority support and the SWLEP priorities for scheme funding. The scheme requires the Wichelstowe development to contribute a significant level of funding which, in turn, requires development and property completion. The southern access scheme is in two parts (part 1 is Junction 16; part 2 is the western access under the M4). Although access requires that both are in place, they cannot be achieved simultaneously. Therefore, the programme has been set accordingly.

The planning permission for Wichelstowe requires that the Junction 16 scheme is completed before 1100 units are occupied.

See Appendix C - Risk Register

2.9 Stakeholders

Wiltshire Council, Swindon Borough Council and Highways England all recognise the need to improve Junction 16. The improvements are part of the Wichelstowe development. Some local groups oppose the development and the Junction 16 scheme was the subject of an unsuccessful judicial review in 2008. There is still some local opposition to the proposed western access scheme. The modelling has been reaffirmed as part of the detailed design and technical approval process.

The LTP3 contains comments from stakeholders about the issue of congestion at Junction 16. The proposed scheme has been designed to address these issues by improving journey times.

2.10 Options

The process of option generation and sifting was undertaken prior to and during the process of achieving planning consent, which was granted in 2005. The resultant M4 Junction 16 enhancement scheme includes:

- Offset junction arrangement to the south with increased capacity for all movements
- An improved link to Wichelstowe, south of the M4
- New signal timings and carriageway layout

Considering these options helps to demonstrate and document the need for the junction enhancement in principle.

Table 2.3 provides a summary of the three options.

TABLE 2.3: High level options

Option considered	Impacts and Conclusions			
No enhancement to Junction 16	The planning application work for Wichelstowe considered the extent to which development could be accommodated without transport mitigation. It concluded that a package of measures, including improvements to M4 Junction 16, were required and these are included within the scheme which was given outline planning consent. Development at Wichelstowe and elsewhere is heavily constrained by Junction 16, which is over capacity during peak times.			
	If Junction 16 is not improved there will be a major impact on a number of schemes across Swindon and Wiltshire that have been approved on the basis of the scheme being in place.			
	Furthermore, if the agreed Junction 16 scheme is not in place, no more than 1100 occupations will be permitted at Wichelstowe, resulting in a housing shortfall of up to 3400 units and a loss of 12.5ha of employment land.			
Junction 16 enhancements as per planning permission	The consented scheme has been granted planning permission and has been agreed by Wiltshire Council and Highways England. Development of the scheme has commenced.			
	This is the only scheme that would meet the required timescale and has planning consent, having been through the appropriate planning and judicial process, thus will not delay housing delivery at Wichelstowe.			
Alternative enhancements to Junction 16	At this stage any alternative scheme would result in a delay of a number of years to the delivery of the required benefits to the wider area and Wichelstowe. In the medium term, Junction 16 would no longer be fit for purpose and no more than 1100 occupations will be permitted at Wichelstowe, resulting in housing supply problems for Swindon and major cash flow problems for the developer.			
	A full options analysis would have been undertaken prior to the granting of planning permission in 2005. The scheme that most economically met the objectives was put forward for planning approval. The granting of planning permission by the Local Authority following extensive public consultation is clear evidence of the validity of the chosen scheme.			

For the purposes of this full business case, these options are presented alongside a broad assessment of the extent to which they align with the overall objectives of the scheme which are to:

- Reduce congestion and delay at M4 J16
- Reduce likelihood of M4 online exit queuing
- Improve highway access to growth areas in North Wiltshire and Swindon

In addition, these options are assessed against the key additional criterion of affordability.

This analysis shows that a 'something option' (as currently being taken forward) has the clearest benefits, see Table 2.4.

TABLE 2:4: Design Options

5 1		Obje	ctive		
Option	Reduce congest- ion and delay	Reduce exit queueing	Improve access to growth areas	Affordable	Summary
Do nothing – retain existing layout.	Х	Х	Х	✓	Existing layout is a constraint to development.
Do something – scheme as described above.	~	~	~	~	The scheme will help to reduce congestion, better manage queuing and improve access to Wichelstowe. Working with the existing infrastructure helps to maximise affordability.
Alternative Do something	✓	~	Х	Х	Alternative schemes would have been reviewed prior to and during the planning application process.

2.11 Summary of strategic case

The Wichelstowe development received outline planning consent in 2005. In 2014, an updated Land Use Master Plan was approved. This process included an analysis of the need for all key infrastructure, and confirmed the need for and timing of the Junction 16 scheme. The scheme being promoted is, therefore, a key component of the housing and employment growth on this site. The options assessed and set out in Section 2.10 confirm the need for the preferred scheme and justify it.

3 Economic Case

3.1 Overview

This section sets out the economic case for the M4 Junction 16 scheme. The economic, environmental, social, public accounts and distributional impacts of the scheme have been appraised, following the principles in the DfT's transport appraisal guidance (WebTAG). This has been done in a proportionate manner, as agreed with the Officer Technical Group and Local Transport Body. The appraisal summary table (AST) provides a brief and consistent summary of the qualitative, quantitative and monetised impacts.

This section contains the following elements:

- A scheme description
- Details of the assumptions used for defining value for money
- Details of surrounding assumptions with the assessment methodology
- A value for money statement, in line with the latest DfT guidance
- An outline of the underlying assumptions used for sensitivity testing

3.2 Consideration of options and scheme description

The M4 Junction 16 improvement scheme is to amend the roundabout and approach arms to increase capacity. The scheme consists of widening the M4 off-slips, widening and realigning the circulatory carriageway and a new junction arrangement on the south side to allow direct movement between the A3102 (Royal Wootton Bassett) and the B4005 (Wroughton/Wichelstowe). A plan of the scheme is shown in **Appendix A**.

The strategic case sets out the background to the scheme and highlights the decisions made to arrive at the proposed scheme. The scheme options have not been explored further during the appraisal. The requirements of the Wichelstowe planning permission are the main driver for delivering the economic benefits, in terms of employment and housing growth.

The Junction 16 layout as proposed by the consent of the Wichelstowe Development is based on the premise that the development has 4 principle vehicle access points, as summarised below:

- Croft Road (providing access to the east)
- Mill Lane (providing access to the south)
- Redpost Drive (providing access to the north) for the off peak period only
- M4 Underpass (providing access to the west)

Western Access via the M4 underpass connecting with Junction 16 via Wharf Road and Hay Lane, has been the subject of multiple studies to confirm that this is the optimum option for a western access serving the development. To validate these previous reports, PBA were commissioned by Swindon Borough Council (SBC) in November 2012 to undertake a desktop feasibility study of the Western Access proposal within the existing Wichelstowe outline planning consent (ref: S/02/2000MWT) and consider the viability of potential alternatives.

The report details the desk based assessment process of the western access viability and alternatives review. This desktop feasibility report has been completed in conjunction with the Wichelstowe scheme Urban Design consultants (LDA) and Ecologists (Keystone) as well as input from the contractors BAM Nuttall.

The structure of the Western Access Review was based on investigation of the issues and constraints, analysis of the results and recommendations for the further development in accordance with the project delivery programme. The review considered multiple options including the route to the south across the M4 or to the west across the railway and joining Great Western Way directly or via Franklin Road.

The report concluded that the optimum western access would be to the south either bridging or travelling under the M4 in terms of viability, cost and programme.

The M4 Bridge (option 4 as defined in the report) is the preferred option, with the alternate straightened M4 tunnel (option 1a) also an option as it is likely to perform better in the WebTAG review than the consented scheme.

Therefore the consented western access strategy of crossing the M4 and accessing J16 from the south is considered the most appropriate solution in the context of the priorities set. This will allow the J16 improvements to the M4 to proceed with confidence in accordance with the current planning strategy and the outline planning consent.

3.3 Approach to appraisal

There are a number of modelling tools available to demonstrate the scheme's benefit-cost ratio (BCR) and value for money. In order to capture all Swindon-wide transport user benefits and understand the impact of all Local Plan future year developments, the SATURN model is considered the most appropriate tool. The assessment shows that the scheme results in the reassignment of traffic, which can only be evaluated in a model covering the Swindon urban area. While further detailed junction modelling software will be used to finalise lane utilisation, signal timings and technical approval detail, the SATURN model is considered significantly robust for this proportionate appraisal. Agreement has been reached between Highways England, Wiltshire Council and Swindon Borough Council that detailed modelling for technical approval will use TRANSYT. The benefits and value for money figures are of an order and level that any additional modelling would provide minor changes within the tolerance of the sensitivity tests already undertaken. Therefore, for this proportionate appraisal SATURN is considered the most appropriate model type.

The assessment of the proposed M4 Junction 16 scheme has been undertaken using the Swindon SATURN model. The Swindon SATURN model was developed using 2006 survey data. The comprehensive data collection exercise included:

- Roadside interviews (RSI)
- Automatic and manual traffic counts
- Highway journey times surveys
- Household interview surveys

The highway assignment model contains base matrices disaggregated by:

- User Class 1: Home-based work trips light vehicles
- User Class 2: 'Other' trips (excluding employers' business) light vehicles
- User Class 3: Employers' business light vehicles
- User Class 4: Heavy goods vehicles

Models for the two peak-time periods were developed representing:

- AM peak hour (8.00-9.00am)
- PM peak hour (5.00-6.00pm).

The 'simulation' network within SATURN includes explicit modelling of junctions on an area-wide basis, with the option to specify capacities available to particular turning movements. Thus, driver route

choice in the 'simulation' network is not dependant on simplistic link speed/flow relationships, with perhaps some isolated junction modelling, but is governed by the delays encountered in negotiating a series of junctions. This is more typical of congested urban road conditions such as those in Swindon. The 'simulation' network incorporates 789 nodes:

- 157 roundabouts
- 290 priority junctions
- 99 traffic signal controlled junctions
- 3 'dummy' nodes
- 240 'external' nodes

The extent of the outer 'buffer' network covers all the 'key' external road links in Swindon; sufficient to ensure that longer distance traffic movements routeing through, or to/from Swindon, enter or leave the detailed model network via the appropriate route. This network extends to include:

- The east-west M4 and A4 corridors between Bristol and Newbury
- The A420 and A34 routes to Oxford
- The A419 as far north as Cirencester
- The A4361 and A3102 routes to the south of Swindon
- The B4040 from Malmesbury to Cricklade

The results obtained for each time period show that a very high proportion of the link flow comparisons and GEH statistics (a form of the Chi-squared statistic that incorporates both relative and absolute errors for individual links or groups of links) are within the acceptability criteria. In summary:

- 89 per cent of the 'critical' links demonstrate acceptable validation in the morning peak hour model (34 of 38)
- 100 per cent of the 'critical' links demonstrate acceptable validation in the evening peak model (38 of 38)

The approach to calculating the benefits for both business and social/commuting trips has been to use TUBA (transport /user benefit appraisal) and the values in WebTAG (units 3.5.6 and 3.5.9). The outputs from the highway traffic model, covering changes in vehicle hours and kilometres travelled between the reference case and the scheme, form the inputs to the TUBA model.

A robust assessment from the existing model has used sensitivity testing to consider the range of scheme BCRs. The central case has a BCR of 10.2 and the lowest sensitivity test provides a BCR of 3.7. The level and tolerance of these benefits demonstrate that there is considerable 'headroom' within the BCR to allow for changes to the economic performance resulting from the use of more up-to-date data within the modelling.

The modelling and appraisal approach is appropriate because:

- The scheme was considered through a judicial review and is essential for the development of the Wichelstowe site (the scheme was originally approved and developed in 2003 as part of the detailed planning permission)
- The existing TRANSYT and Paramics models are being refreshed and reaffirmed as part of the detailed design process. The three Highway Authorities will approve the modelling prior to technical approval being granted see below.

A copy of the model Local Model Validation Report is provided in Appendix D.

3.4 Model Review

Swindon Borough Council recognised that the original models utilised for the original planning application supporting the Wichelstowe Development were based on 2003 baseline models and therefore well in excess of the six years old guidelines and therefore technically considered to be out of date for the purpose of verifying the validity of the data used. These area wide models were updated in 2006 to form the 2016 and 2026 local plan models. However, again in theory the baseline data was deemed to be technically out of date given the Business Case was being prepared in 2015/16.

Therefore the Council, in agreement with Highways England, Wiltshire Council Highways and Swindon Borough Council Highways undertook a review of the multiple model outputs to seek to validate the optimum data to utilise for the more detailed junction assessments proposed for Junction 16 in 2014/15.

A Technical Note was prepared which sought to provisionally compare the overall volume of flow passing through the junction and the characteristics of the link/turning counts. In addition to this provisional Transyt Assessments were carried out for the am and pm weekday peaks using all matrices to assess those which resulted with the highest impact on the provisional design.

In addition to these comparisons, Highways England also provided additional turning matrices based on a November 2011 set of surveys, which they utilised to prepare their own 2016 and 2026 matrices for their Junction 16-17 Corridor Review. These were carried out independently, but sought to utilise the growth factors and development data from the local 2016/2026 models to impose the future network growth, both consented and anticipated.

Therefore a cross-check with more recent data, from the year 2011, against the forecast models was undertaken. The data in Table 3.1 shows the total junction flows within the matrices compared to Highways England's recent 2011 count, which was utilised by them to determine their amended forecast year data.

	AM Peak	PM Peak
2019 Consented Scheme	8317	7348
2034 Consented Scheme	9051	7986
Highways England 2026	8324	8021
Forecast		
Halcrow Model 2026 Forecast	8663	8621
Nov 2011 Highway England	5513	5323
Surveys		

TABLE 3.1: Total Junction Flows

As can be seen the 2026 Halcrow forecast are in excess of the matrices which were utilised at the time of the consent, especially with respect to the pm peak for the primary forecast year of 2019. All parties have therefore agreed that although the 2026 Halcrow model may have been based on data outside of the 6 year period, the review has shown that they are still the most robust for use in the forecast modelling of the Junction 16 scheme.

PBA prepared a Technical Note to address the issue of the multiple matrices. This was issued to the wider project group, following which all parties agreed that the future junction testing exercise should utilise the 2016 and 2026 outputs from Halcrow Model as required. This methodology adopts the required proportionate approach to the modelling assessment to support the business case.

As noted above, the Transyt and Paramics models were also updated. These updates were undertaken to aid the detailed design process and inform lane allocation, lining, signage and provisional timings. The purpose of producing a Transyt model is to obtain a set of optimised signal timings that can be entered into the Paramics model to determine the best operational strategy for the junction and lanes.

A thorough review is being undertaken by the highway authorities, including a comparison of the link demands against the approved model. It has been agreed that the junction as modelled is consistent with the consented scheme parameters, which were the subject of the planning permission and judicial review process.

It is acknowledged that the Department for Transport WebTAG guidance (Unit M3.1) states that the survey data used in a base model should be less than six years old. This is not considered appropriate, for the reasons provided above.

3.5 Additional Modelling

In May 2014, Wichelstowe Design team, Highways England, Wiltshire Council Highways and Swindon Borough Council Highways began a 9 month review of the Junction 16 improvement scheme design proposed by the Wichelstowe Development.

The joint parties set up a working group with Highways England and Wiltshire Council appointing independent consultants to review the Wichelstowe Teams outputs. The group agreed a programme of work streams that would allow each stage to be agreed prior to progressing. The proposals were to utilise two junction modelling software packages;Transyt and Paramics.

In summary, PBA prepared a new Transyt Model using the most recent software version and HE already had a provisional Paramics model of Junction 16, from their previous corridor study. The premise was not to solely assess the proposed junction layout was fit for purpose, but also to consider if there were any scheme improvements which could be within the confines of the study area.

The methodology was for PBA to prepare the revised Transyt models and issue the outputs to the working group and their consultants for comment and agreement.

The working group undertook a substantial review during this period, with consideration given to the input and output options, the refining of the models and the ability to consider additional improvements, and demonstrated that the scheme could:

- support a significant increase on the current usage
- minimise queueing on the M4 slip lanes
- but would still witness queuing on Great Western Way, Swindon Road and Hay Lane.

The output suggested that there was little scope for major scheme amendments to the proposed layout within the defined study area. At this point, it was proposed to transfer the Transyt Data to the Paramics Model.

The Transyt outputs were based on a set of fixed time models for the differing peak times and forecast years. The current junction is operated by MOVA and as such prior to progressing with the Paramics modelling, the working group agreed to allow Highways England's consultant to undertake a further set of assessments using LINSIG with MOVA. The outputs utilised the fixed times as a generic basis and allowed Highways England's consultant to also assess the minor lining and kerb alterations as previously determined.

The output of this modelling retained the premise that the Wichelstowe scheme, with minor kerb and white lining alterations predominately related to the circulatory carriageways, as shown below, is the optimum scheme.

FIGURE 3-1: Minor Junction 16 Modifications



An A3 version of the above Figure can be found in Appendix G.

Highways England's consultants also assessed possible improvement schemes outside of the study area, predominantly on the Swindon Road and Great Western Way. These were assessed purely as a means of considering future additional measures that could be considered once the Wichelstowe Scheme had been implemented. It was agreed these scheme would not form part of the implemented scheme, but offer consideration for possible future improvements once the proposed scheme had reached its design life.

In January 2015, PBA modified Highways England's Paramics model to include the signal junction to the north and inputted the 2026 matrices and timing data from the Transyt and Linsig outputs to produce a micro simulation of the junction operation. These models were issued to Highways England for approval and review. In addition to the PBA assessment, Highways England's own consultant carried out a number of additional option testing exercises linked to the "right turn" layout to the south of the junction and the input of MOVA as part of the Paramics review.

Previous assessments of the need for this layout using Transyt and Linsig models, determined that the right turn link would offer benefit in the long term, as demand for access to Hay Lane increases coupled with the development build out and the new M4 underpass. Highways England's Paramics reviews concluded the same findings, and therefore the scheme as proposed with the minor kerb and lane marking alterations was the optimum scheme to be implemented within the current land constraints.

In March 2015, all parties met for a final work shop at which the following points were agreed:

- Completion of PBA's Modelling Role
- Agreement on Consented Schemes Status
- Wichelstowe team to recommence Detailed Design process with internal modifications as agreed
- If there were additional improvement schemes being considered these would progress as bolt on schemes independent of the current scheme, for future or phased introduction.

During the detailed design process, there have been material changes to the proposed scheme, however these have been to the means of construction and not the proposed layout, with retaining walls replaced by embankments and other engineering decisions which provide the optimum and most cost effective scheme.

3.6 Appraisal assumptions

The appraisal's 2016 and 2026 forecast year models include:

- Do minimum scenarios committed development and transport schemes
- Do something scenarios do minimum scenarios, with the addition of the M4 junction 16 scheme.

The committed transport schemes are shown in Table 3.2.

TABLE 3.2:

Committed highway schemes in the do minimum scenarios

Highway Schemes	2016	2026
Blunsdon Bypass	\checkmark	\checkmark
Commonhead Flyover	\checkmark	\checkmark
Schemes associated with Wichelstowe, the signalisation of Croft Road/Wichelstowe access and Croft Road/Pipers Way and the internal Wichelstowe road network	\checkmark	\checkmark
Changes associated with the Union Square development		\checkmark
Transfer Bridges and Bruce Street Bridges/ Great Western Way changes		\checkmark
The consented highway improvements associated with the Commonhead mixed development, including the proposed changes at M4 junction 15, A419 and		
development access	\checkmark	\checkmark
Highway schemes associated with Ridgeway Farm	\checkmark	\checkmark
Highway schemes associated with Tadpole Farm	\checkmark	\checkmark
Removal of the following car parks prior to 2016: Cheltenham Street (102), College (98), Regents Close (12), Princes Street (119), Carlton (590), Catherine Street (6),		
Queen Street (8), Queenstown (145)	\checkmark	\checkmark
The incorporation of the following cars parks: Union Square: 850 MSCP (short and long stay) and 694 residential and office use, Regent's Circus: 238 for food store and 212 for office and leisure, 1,000 spaces north of the railway line (long stay)		(
stayj		\checkmark

The residential development assumptions are set out in Table 3.3.

TABLE 3.3:

Residential Development Assumptions

	Status at 01/04/2012						
Location Description	No of Consents	No Completed	No Outstanding	Completed 2006-2010*	Expected 2010- 2016	Expected 2016- 2026	
Hreod Burna North	273	96	177	0	273	0	
St Joseph's Upper School, Nythe Road	262	262	0	262	0	0	
Okus Industrial Estate, Okus Road	350	350	0	324	26	0	
GWR Sports Ground, Shrivenham Road	245	0	245	0	145	100	
Tilley's Lane West, Lower Stratton	0	0	55	0	0	55	
Cavendish Square	174	174	0	174	0	0	
Somerford Close/Cricklade Road (Land r/o 611-627 Cricklade Rd)	65	0	65	0	65	0	
Great Eastern House, Greenbridge Road/Dorcan Way	143	143	0	143	0	0	
Westlea Police Station, Shaw Road, Westlea	70	70	0	0	70	0	
Bampton's, Stratton Road	0	0	45	0	45	0	
Hartwell Ford, Marlborough Road, Old Town	60	60	0	60	0	0	
Tilley's Lane Industrial Estate	0	0	37	0	0	37	
Tilley's Lane East	0	0	37	0	0	37	
Ferndale Road/Norman Road	0	0	34	0	34	0	
East side of Highworth Road	0	0	32	0	0	32	
Locarno Ballroom, The Square, Old Town	51	0	51	0	51	0	
Ridgeway School, Inverary Road, Wroughton	0	0	60	0	0	60	
Industrial buildings, Brewery Street/Shrivenham Road, Highworth	58	58	0	58	0	0	
South of Kiln Lane, Swindon	0	0	0	0	0	37	
Pipers Way (Burmah Castrol)	616	204	616	0	304	312	
Kingsdown	0	0	1650	0	200	1450	
Southern Development Area	4,500	510	3,990	250	1,375	2,875	
Northern Development Area	*	*	589	3066	589	0	
Commonhead	890	0	890	0	275	615	
Tadpole Farm	0	0	1695	0	350	1345	
Eastern Villages	0	0	8000	0	600	7400	
Station Garage, Wellington Street	61	61	0	61	0	0	

	Status at 01/04/2012						
Location Description	No of Consents	No Completed	No Outstanding	Completed 2006-2010*	Expected 2010- 2016	Expected 2016- 2026	
Princes House, Princes Street	27	27	0	27	0	0	
Paramount Apartments, Princes Street	199	199	0	199	0	0	
Princess Margaret Hospital, Okus Road	483	483	0	465	18	0	
Arriva Ford Garage, Fleming Way	0	0	0	0	0	0	
Sites 6, 7 and 9 including Chain Test House, south of Kemble Drive, Swindon	124	24	100	0	124	0	
Land rear of Goddard Arms Hotel, 1 High Street, Swindon	41	40	1	10	41	0	
Alexandra Campus, Whittingham Drive, Wroughton	47	47	0	4	43	0	
Former RAF Hospital, Old Burderop Hospital Site, Wroughton	183	183	0	96	0	0	
McArthur Court, Penzance Drive, Churchward	287	287	0	32	0	0	
Bridge House, Farnsby Street	65	65	0	65	0	0	
The Wytes, Laundry Site, Whitehouse Road	170	170	0	30	0	0	
Braydon Court, Penhill	38	38	0	38	0	0	
Barratts Yard, Moormead Road, Wroughton	36	36	0	36	0	0	
Abbey Stadium, Lady Lane	450	0	450	0	250	200	
Former Laundry Site, Aylesbury Street, Swindon	66	0	66	0	0	0	
Victoria Hospital, Okus Road, Old Town, Swindon	39	11	28	0	39	0	
Land at Shelley Street, Swindon	9	0	9	0	9	0	
36, 37, 40 and 42 Cricklade Street	34	34	0	34	0	0	
Land at former Zarlink site and Kingsdown School, Hyde Road	92	0	92	0	92	0	
Central Area (Local Plan)	0	0	0	0	150	850	

The non-residential development assumed in the model includes:

- Rivermead (RM1) 22.38 ha mixed B use
- Kembrey Park 21.96 ha B1 use
- Wichelstowe 12 ha mixed B use
- Commonhead 15 ha B1/B2 use
- Tadpole Farm 5 ha B1 use

- Eastern development area 40 ha B1/B2 use
- Triangle site 36 ha B1 use
- Windmill Hill 2.4 ha B1 use
- Site 10D South Marston Park 7.4 ha B2/B8 use
- Honda (extension) Highworth Road South Marston Airfield 5.7 ha B1/B8 use
- Keypoint K3 2.9 ha B1/B8 use
- Unit 16, Sunrise, Blagrove 3.3 ha
- Central area (Local Plan) 9 ha B use
- Former Swindon College 1.8 ha of mixed use

The assumptions associated with the calculation of benefits are:

- Appraisal based on model results of years 2016 and 2026, and two modelled hours AM and PM. The 2016 models have been used as a proxy for the opening year of the scheme, 2018.
- Appraisal over 60 years, opening year 2018.
- Discounting at 3.5 per cent of first 30 years, then 3.0 per cent after.
- The Value of Time (VOT) and Vehicle Operating Cost (VOC) is based on the WebTAG values provided in the standard economics files as part of TUBA 1.9.1, set at 2010 prices.
- Annualised factors are shown in Table 3.4 and are derived from Highways England TRADS data for the M4 between junctions 15 and 16 for an average neutral month. The Transport Users Benefit Appraisal (TUBA) assessment was based on annualisation of the modelled AM and PM peak hours to 3 hour AM (07:00-10:00) and PM periods (16:00-1900) only, based on these factors, since no interpeak period was modelled.
- Assessment of scheme assumed an optimism bias of 3 per cent, with a sensitivity test undertaken at 15%. (See Section 3.7 for more detail on the treatment of scheme costs)

TABLE 3.4:

Modelled Hour	Factor to 3 hour peak period	Factor to week	Factor to annual	Total hours per annum
AM Peak	2.64	n/a	253	668
PM Peak	2.94	n/a	253	774

Since TUBA normally requires cars and LGV trips to be modelled both together and separately, factors were required to split the trip demand. These six user classes were included as input into TUBA:

- TUBA user class 1 car business = SATURN user class 3 (51 per cent)
- TUBA user class 2 car commuter = SATURN user class (100 per cent)
- TUBA user class 3 car other = SATURN user class 2 (100 per cent)
- TUBA user class 4 LGV freight = SATRUN user class 3 (49 per cent)
- TUBA user class 5 OGV1 = SATURN user class 4 (75 per cent)
- TUBA user class 6 OGV2 = SATURN user class 4 (25 per cent)

In the absence of easily available data on the car and LGV splits by purpose type from SATURN modelling work, the factors were derived from recent autumn 2013 RSI data, including Highway Agency sites. The OGV splits were based on National Trip End Model forecasts for the south-west of England in 2015.

3.7 Treatment of Scheme Costs

The scheme costs have been revised and the processes in DfT WebTAG guidance Unit A1-2 Scheme Costs followed in order to calculate a new Present Value of Costs (PVC). A spreadsheet has been used to undertake the calculations. The following steps have been undertaken in line with WebTAG guidance:

- Deriving a base cost estimate
- Adjusting for risk and optimism bias
- Re-basing the price base to the Department's base year
- Discounting to the Department's base year
- Converting to the market prices unit of account.

The scheme is at Full Business Case stage; therefore a 3% optimism bias (OB) has been used, in line with guidance set out in WebTAG A1-2 Scheme Costs.

A sensitivity test assuming an optimism bias of 15% has also been undertaken.

The scheme costs are estimated at £9.35 million in 2015 Q4 prices. Of this amount £5.92 million funding is being sought from the SWLEP with the remainder to be split equally between local funding and third party contributions.

3.8 Value for money statement

The value for money statement summarises the impact of the transport intervention under consideration. It uses the HM Treasury Green Book method of cost-benefit analysis, by weighing the benefits against the costs to indicate whether the scheme offers 'value for money'. This section contains the value for money statement, in line with the DfT's guidance.

Assessment Type	Scheme	Detail
	Assessment	
Initial BCR	11.1	Includes monetised benefits in DfT's analysis of monetised costs and benefits (AMCB).
Net present value (NPV)	£70,093,000	NPV indicates how much of the benefits exceed the cost.
Adjusted BCR	To be confirmed	Includes additional monetised benefits above and beyond those in the AMCB.
Qualitative assessment	Neutral	There are slight adverse environmental impacts although the overall social impact is slightly beneficial.
Key risks, sensitivities	Risk has been quantified within the optimism bias	Level of optimism bias (3%) and delivery model may affect final outturn costs. Updated model post-scheme delivery. Scheme benefits increase with tunnel under M4 provided.
VfM category	Very high	The monetised assessment suggests a very high VfM category.

TABLE	3.5	:	
Value	for	mon	ev

The **very high** value for money assessment is thought to be a fair and realistic assessment, based on the numerous benefits for Swindon as a whole and vehicles using the junction. The benefits include:

- Improved journey time reliability compared to a do-nothing scenario
- Increases in vehicle movement, enabling access to the Wichelstowe development

• Regeneration and economic growth - 4500 dwellings and 12.5 ha of B1/B2/B8 employment land.

The moderately or slightly adverse environmental effects can all be mitigated as part of the ongoing design work.

3.9 Value for money sensitivity

Value for money has been considered for the core scenario and sensitivity tests and the initial BCRs are:

- Sensitivity test 1 A low growth scenario, with the Commonhead and Eastern Villages development removed from the forecasting work provides an initial BCR of 4.1.
- Sensitivity test 2 A high growth scenario with blanket growth factors of 7.906 per cent and 11.180 per cent for 2016 and 2026 respectively, applied to trips starting or ending in the simulation area of SATURN model (reflecting paragraph 5.6.4 of WebTAG Unit 3.15.2) provides an initial BCR of 20.1.
- Sensitivity test 3 a high growth scenario with 2026 to 2031 TEMPRO 6.2 car driver growth applied to 2026 trips starting or ending in the simulation area of the SATURN model provides an initial BCR of 11.3.
- Sensitivity test 4a Core growth scenario with scheme cost optimism bias of 15% provides an initial BCR of 9.9.
- Sensitivity test 4a Low growth scenario with scheme cost optimism bias of 15% provides an initial BCR of 3.7.
- Sensitivity test 5 20 per cent reduction in user benefits provides an initial BCR of 8.0.
- Sensitivity test 6 developer contribution removed and reallocated to local government funding provides an initial BCR of 7.9. Further detail of the results of this test is provided in Section 3.10.

The results shown for Sensitivity tests 1 to 5 above are based on previous cost estimates and a higher level of optimism bias. Sensitivity test 6 uses revised scheme costs and applied the optimism bias accordingly.

Overall the value for money appraisal shows that the scheme provides good value for money even with the low growth scenario. The earlier discussion on traffic flows showed that the 2026 SATURN flows were on the high side, but with the low growth scenario giving a BCR of 3.7, this provides additional confidence that the scheme will offer value for money.

3.10 Economic impacts

The results of the core economic test and sensitivity tests 1, 4a and 4b are shown in the Table 3-6. The results indicate that the scheme offers high value for money.
TABLE 3-6: Economic Results

Benefits /Costs	(3% OB)	Sensitivity Test 1 (3%OB)	Sensitivity Test 4a (15% OB)	Sensitivity Test 4b (15%OB)
Impact	Central Case	Low Growth	Central Case	Low Growth
PVB	77,041	28,791	76,856	28,606
PVC	6,948	6,948	7,758	7,758
NPV	69,239	21,843	69,098	20,848
BCR	11.0	4.1	9.9	3.7

The TEE table for the scheme is shown in Table 3.7. The business users are forecast to benefit from more predictable journey times and reduced delay through Junction 16. The total present value of transport economic benefits (TEE) is £78.212 million, including both consumer and business benefits. This is considered to be high.

TABLE 3.7:

Transport Economic Efficiency	<mark>/ (TEE) (£000</mark> s)) – 3% Optimism	Bias Scenario

Non-business: Commuting	ALL MODES		ROAD		BUS and COACH	RAIL		OTHER
User benefits	TOTAL		Private Cars and LGV	s	Passengers	Passengers		
Travel time	39,475			39,475				
Vehicle operating costs	2,066			2,066				
User charges	0			0				
During Construction & Maintenance	0			0				
NET NON-BUSINESS BENEFITS: COMMUTING	41,541	(1a)		41,541				
Non-business: Other	ALL MODES		ROAD		BUS and COACH	RAIL		OTHER
User benefits	TOTAL	-	Private Cars and LGV	s	Passengers	Passengers		
Travel time	23,535			23,535				
Vehicle operating costs	1,220			1,220				
User charges	0			0				
During Construction & Maintenance	0			0				
NET NON-BUSINESS BENEFITS: OTHER	24,755	(1b)		24,755				
Business User benefits			Goods Vehicles	Business Cars & I GVs	Passengers	Freight	Passengers	
Travel time	12 490	1		7 753		4 737	lacorigoro	
Vehicle operating costs	1 011	1		391		620		
User charges	0			0		0		
During Construction & Maintenance	0			0		0		
Subtotal	13,501	(2)		8,144	0	5,357	0	0
Private sector provider impacts	<u> </u>	_ · ·	.		4	Freight	Passengers	
Revenue								
Operating costs]						
Investment costs								
Grant/subsidy]						
Subtotal		(3)			0		0	0
Other business impacts	-	-			-	-	-	-
Developer contributions	-1,585	(4)	0		0	-1	1,585	0
	11,916	(5) = (2) + (3) + (4)					
NET BUSINESS IMPACT		-						
NET BUSINESS IMPACT TOTAL								
NET BUSINESS IMPACT TOTAL Present Value of Transport Economic Efficiency		1						
NET BUSINESS IMPACT TOTAL Present Value of Transport Economic Efficiency Benefits (TEE)	78,212	(6) = (1a) + (1b) + (5)					

3.10.1 Additional Value for Money Test

More predictable journey times through the junction are expected, particularly if flows between the A3102 (west) and B4005 can be removed from the circulatory entirely. Scheme options tested to date are forecast to reduce the maximum degree of saturation on most arms, even with large increases in traffic flows resulting from the Southern Development Area (November 2005 M4 Junction 16: Proposed Amendments Modelling Audit/Design Appraisal – Final Addendum Report, Halcrow). These could be in the order of 10 per cent of in-vehicle hours, representing the changes associated with reliability savings.

3.10.2 Regeneration and wider impacts

Increasing capacity at M4 Junction 16 will allow more people to access the Wichelstowe site, as well as other employment and housing to the west of Swindon.

Due to the junction's strategic location, the scheme will improve access to the whole of Swindon from the west, thus supporting all housing and growth plans for the town. It would also improve access to Royal Wootton Bassett, although the scheme will not impact directly on any of the development sites in the Wiltshire Core Strategy. The scheme will support the Wichelstowe development (4500 dwellings and 12.5 ha of B1/B2/B8 employment land).

The junction is just over 1 km from the Windmill Hill Business Park in Swindon, so this area will benefit from the junction improvements.

This scheme is located on the M4 corridor and so might also assist with unlocking new jobs in this economic zone, as part of the Swindon and Wiltshire City Deal.

It will support 4,500 new dwellings, 2000 new jobs (based on B1=264 jobs per ha, B2=94 jobs per ha; and B8=58 jobs per ha) at Wichelstowe.

3.11 Environment

3.11.1 Noise

The scheme is unlikely to have a noise impact on households. There will potentially be a slight increase in noise during construction. These impacts will need to be managed by the contractor during construction.

Overall assessment is slight adverse.

3.11.2 Air quality

There are no air quality management areas (AQMAs) near the proposed scheme. Potentially, there are sensitive receptors within 200 m of the scheme including three properties adjacent to the M4 westbound on-slip (accessed via Spittleborough Farm Road, off Swindon Road) and three hotels north of the junction. The local and specific nature of the proposed scheme means impacts are unlikely to be identifiable. The scheme is an enhancement to an existing heavily used junction located along the M4 with predominantly business premises adjacent to the site. Less than 50 houses would be affected by changes in air quality. The works provide mitigation for impacts on Old Town and Kingshill Road that would otherwise experience critical air quality issues without this scheme.

Overall assessment is **slight adverse**.

3.11.3 Greenhouse gases

The scheme will help alleviate some congestion. The reduction in greenhouse gas emissions equates to £682,000 of benefits in 2010 prices and values. This is associated with changes in trip patterns. The scheme will improve traffic flow and reduce delays that would result in lower emissions.

Greenhouse gases' impact is **£0.682 million** benefit in 2010 prices.

3.11.4 Landscape

There are no nationally designated landscape areas (for example, Areas of Outstanding Natural Beauty, Environmentally Sensitive Areas) within 2 km of the site. Seven blocks of hedgerow and trees, within the search area along the M4 corridor, are covered by Tree Preservation Orders (TPO). The closest is to the south-east of the site in the adjacent field and within 100 m of the site. However, no impacts from the scheme are anticipated.

The motorway junctions over bridges are level with the immediate surroundings to the north and raised slightly above the adjacent fields to the south and east. There will be limited visibility of the scheme from the surrounding landscape due to landforms and screening from mature hedgerows and woodland blocks. There will be good mitigation opportunities which will limit the impact on the wider landscape, providing sufficient land is made available to reinstate or replace hedgerows and woodland lost through the works. The impacts on the wider landscape character will be slightly adverse providing these measures are undertaken. There will be moderate adverse impacts on several nearby individual farms and dwellings due to loss of intervening screening vegetation, but these should reduce with time as new screening grows.

The motorway runs under the junction and will have limited visibility of the changes, but the loss of vegetation and increase in vertical highway features (signs, lighting, traffic lights) will be evident. Views from the A3102 and the B4005 will also be affected by these impacts, and will be affected by an increase in junction complexity to the south of the motorway. There are several Public Rights of Way (PRoW) running south of the junction which will have increased visibility of the proposals due to loss of existing vegetation. Impacts can be mitigated by planting new hedgerows and woodland, replacing those lost by construction.

The existing road corridor and junction, suburban housing and commercial properties are already lit. Individual farms and dwellings, south of the motorway, do not have street lighting, except in the vicinity of the A3102 corridor. The proposed scheme will have additional lighting closer to the rural areas but, when viewed from distance, there will be only slight adverse changes affecting the landscape as it will be seen against existing suburban edge.

Overall assessment is slight adverse.

3.11.5 Townscape

The scheme is on the outskirts of Swindon and is screened by landforms and established landscaping bunds. The coherence and distinctiveness of the urban environment will not be affected by the proposals.

The scheme will be highly visible to the commercial properties adjacent to the junction, but these premises will screen views from buildings and residential areas further from the site. The scheme will help rationalise and support the existing urban gateway to Swindon.

Overall assessment is neutral.

3.11.6 Heritage of historic resources

The scheme is unlikely to have an impact on any archaeological or heritage sites since none of the following heritage assets are present:

- World Heritage Site
- Scheduled Ancient Monument
- Registered Park and Garden
- Registered Battlefield
- Conservation Area
- Listed Building

There is potential for locally listed historic buildings and both recorded and as yet unknown archaeological sites to be present within the scheme's footprint.

Overall assessment is Neutral.

3.11.7 Biodiversity

No impact on any internationally or nationally designated sites is anticipated. The scheme may have an impact on:

- Hedgerows and woodland habitats
- Ditches and streams
- Grassland and road verges

All of these impacts will be mitigated as part of the final scheme delivery.

An ecological appraisal and a detailed reptile survey have been carried out, establishing that the potential constraints to development are nesting birds, badgers and Great Crested newts.

Overall assessment is *neutral*.

3.11.8 Water environment

The scheme will lead to an increase in surface water run off as a result of an increase in the impermeable area. A surface water drainage strategy may be required.

The scheme is located near the River Ray (approximately 250 m north west) and Brinkworth Brook (approximately 500 m south).

The scheme will not impact on the effectiveness of a floodplain, as the site lies in Environment Agency Flood Zone 1. The nearest Flood Risk Area is to the east at Wichelstowe, around 4 km away.

Overall assessment is slight adverse.

3.12 Social

3.12.1 Commuting and other users (TEE Tables) and reliability impacts on commuting and other users

Commuters and other users are forecast to benefit from more predictable journey times and reduced delays through Junction 16 (see Section 3.4). The Total Present Value of Transport Economic Benefits (TEE) is £66.296 million, including both consumer and business benefits. This is considered to be very high.

3.12.2 Physical activity

The scheme will not have a significant impact on the number of pedestrians and cyclists using the junction. There is currently limited provision for pedestrians and cyclists.

3.12.3 Journey quality

It is assumed that the scheme will not have a significant impact on traveller care, travellers' views or travel stress at the junction. Journey time reliability will improve and the road layout will benefit all users by providing clearer routing. The modelling shows over 20,000 passenger capacity units per hour, demonstrating the large number of users benefiting from these improvements.

3.12.4 Accidents

Local traffic accident data has been obtained from Wiltshire Council for the last three year from 01/10/2011 to 30/09/2014, see Figure 3.1.

The accident data indicates that during the last three years, 25 accidents have occurred on the local highway network, within a 400m radius zone around Junction 16, which have been reported to the police.

A preliminary analysis of the accident data has been undertaken, with regard to the safety record of the local highway network, but it is not intended to identify responsibility for any of the accidents detailed.

Of the 25 accidents occurred in the vicinity of the junction, we can confirm the following;

- 22 incidents have been classified as slight.
- 2 incidents have been classified as serious
- 1 incident has been classified as fatal

Reviewing the type of accidents which have occurred:

- 13 incidents have been identified as rear end shunts or multiple rear end shunts.
- 3 incidents are due to failure to give way at a junction / traffic signal
- 5 incidents are due to vehicle striking the offside / nearside of a adjacent vehicle
- The remaining 4 incidents, do not fall into any standard pattern

Overall assessment is slight beneficial.

FIGURE 3.2: Plan Showing Locations of Accidents at Junction 16 in the last 3 years



3.12.5 Security

The roundabout is currently lit but not uniformly enough to satisfy current standards. A development to the north of the roundabout provides limited additional security during operating hours for the adjacent section of the roundabout. High and sustained traffic volumes also improve security compared to similar junctions with much lower traffic volumes.

Upgrading the junction may result in very minor security benefits, especially if more uniform and standard-compliant lighting is provided as proposed. However, other security considerations will be broadly unchanged.

Overall assessment is neutral.

3.12.6 Access to services

The appraisal of access to services is to consider the impact of public transport accessibility to employment, services and social networks, with particular emphasis on accessibility to key destinations.

The junction capacity will be improved and consequently access for those people travelling to health and education services in Swindon (for example, Lydiard Academy). The scheme will also improve public transport journey times (for example, services 31, 54, 55).

Overall assessment is slight beneficial.

3.12.7 Affordability

The proposed scheme will not materially change the cost of transport in Swindon/Wiltshire, although it does have the potential to slightly reduce travel costs by car as a result of the reduced congestion. There will be no significant savings to bus operators that would be passed onto passengers through fare level reductions.

Overall assessment is **neutral**.

3.12.8 Severance

The junction is a pinch point on the Strategic Route Network and provides important access to Swindon to and from the south and south-west, as well as the M4. As such, existing and increased congestion at the junction stands to sever Swindon from areas to the south of the M4. The scheme's capacity improvements will address existing and future congestion issues.

There is an existing footway which is generally utilised for maintenance access, but can be utilised by the public around the whole of the outer perimeter of the roundabout and there is a short length on the A3102 with a request bus stop. Carriageway crossings are uncontrolled and there are no dedicated facilities for cycle or other NMUs within the carriageways.

The motorway does pose a severance to NMU's, but this is sought to be addressed as part of a wider M4 crossing strategy, which has led to the provision of two new bridges to the east of Junction 16, which provide safe access north/south across the motorway which have been provided by the Wichelstowe Development. We believe that there may be scope for similar facilities to be considered to the west of the junction in the future.

The proposed scheme maintains a similar level of footway provision to the existing situation. However, pedestrian facilities around the south of the junction will be greatly improved. The scheme will not materially change walking and cycling routes. Indeed, improved signal head positioning and better pedestrian provision around the south of the junction will improve matters for pedestrians. Detailed design may enable further but limited improvements (e.g. destination signing) to pedestrian and cycle provision within the consented design parameters. *Overall assessment is neutral.*

3.12.9 Option Values

Option and non-use values are most closely associated with a willingness to pay to preserve an option to use public transport services, especially rail, even if an individual or household never uses them. Thus, this impact does not apply to this business case.

3.12.10 Distributional impacts

The scheme is located in an area with no vulnerable groups that are particularly sensitive to noise or reduced air quality in the immediate area – the nearest school is approximately 1 km away.

Overall assessment is **neutral**.

3.13 Public accounts

3.13.1 Broad transport budget

The 'cost to broad transport budget' covers the scheme costs, including the full stream of maintenance and operating costs anticipated over the 60-year appraisal period. These costs will be borne by the public sector, whether by local or central government.

Table 3.8 sets out the public accounts.

TABLE 3-8: Public Accounts (£000s) - 3% Optimism Bias Scenario

Public Accounts (PA) Table						
	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	TOTAL		INFRASTRUCTURE			
Revenue	0		0			
Operating Costs	0		0			
Investment Costs	3,170		3170			
Developer and Other Contributions	-1,585		-1585			
Grant/Subsidy Payments	0		0			
NET IMPACT	1,585	(7)	1585			
Central Government Funding: Transport				-		
Revenue	0		0			
Operating costs	0		0	-		
Investment Costs	5,363		5363		-	
Developer and Other Contributions	0		0			
Grant/Subsidy Payments	0		0			
NET IMPACT	5,363	(8)	5363			
Central Government Funding: Non-Transport				-	-	
Indirect Tax Revenues	1,799	(9)	1,799			
TOTALS						
Broad Transport Budget	6,948	(10) = (7) + (8))			
Wider Public Finances	1,799	(11) = (9)				
	appear as n All entries ar	egative numbers e discounted pre	esent values in 2010 prices and v	values.		

3.14 Indirect tax revenues

The indirect tax revenues are £1,799,000 in 2010 prices and values.

3.14.1 Sensitivity and risks

A number of sensitivity tests have been completed on the central case BCR:

- Sensitivity test 1 a low growth scenario, with the Commonhead and Eastern Villages development removed from the forecasting work
- Sensitivity test 2 a high growth scenario with blanket growth factors of 7.906 per cent and 11.180 per cent for 2016 and 2026 respectively, applied to trips starting or ending in the simulation area of SATURN model (reflecting paragraph 5.6.4 of WebTag Unit 3.15.2)
- Sensitivity test 3 a high growth scenario with 2026 to 2031 TEMPRO 6.2 car driver growth applied to 2026 trips starting or ending in the simulation area of the SATURN model
- Sensitivity test 4a Core Scenario with an increase in optimism bias to 15% optimism bias
- Sensitivity test 4a Low Growth Scenario with an increase in optimism bias to 15% optimism bias
- Sensitivity test 5 20 per cent reduction in user benefits
- Sensitivity test 6 developer contribution removed and reallocated to local government funding.

The results of the sensitivity tests are shown in Table 3.9.

TABLE 3.9

Economic sensitivity tests

	Core	Test 1	Test 2	Test 3	Test 4a	Test 4a	Test 5	Test 6
PVB	76,187	28,791	150,589	84,279	76,856	28,606	60,228	78,626
PVC	6,948	6,948	6,948	6,948	7,758	7,758	6,948	9,928
NPV	69,239	21,843	143,641	77,331	69,098	20,848	53,280	68 <i>,</i> 698
BCR	11.0	4.1	21.7	12.1	9.9	3.7	8.7	7.9

The proposed scheme is very sensitive to the low growth and WebTAG - informed high growth scenarios - and much less so to the other four sensitivity tests (TEMPRO-based growth scenario, increased capital expenditure, reduced user benefits, removal of developer contribution).

3.15 Summary of impacts

3.15.1 Analysis of monetised costs and benefits (AMCB) tables

There are no monetised benefits for GVA, air quality, noise, accidents and journey quality claimed, and no benefits claimed for bus passengers and active modes included in the AMCB (see Table 3.10). Measures for these modes will be included in the scheme design. It is considered that the presented BCR is a conservative estimate. The proposed scheme has clear economic benefits and these outweigh its costs and any negative impacts. The scheme currently has a BCR of 11.0 and a net present value of £69,239 million.

The sensitivity tests undertaken, as part of the economic case, demonstrated the very high value for money, even in the most significant downside scenario. The tests show that the scheme performs well and provides a robust business case.

TABLE 3-10: Analysis of monetised costs and benefits (AMCB) Table (±000s) - 3% Optimism Bias Scenario Analysis of Monetised Costs and Benefits 0 (12) Noise (13) 0 Local Air Quality 628 (14) Greenhouse Gases 0 (15) Journey Quality 0 (16) Physical Activity 0 (17) Accidents 41,541 (1a) Economic Efficiency: Consumer Users (Commuting) 24,755 (1b) Economic Efficiency: Consumer Users (Other) 11,062 (5) Economic Efficiency: Business Users and Providers -1,799 - (11) - sign changed from PA Wider Public Finances (Indirect Taxation Revenues) table, as PA table represents costs, not benefits 76,187 (PVB) = (12) + (13) + (14) + Present Value of Benefits (see notes) (PVB) (15) + (16) + (17) + (1a) + (1b) + (5) - (11) 6,948 Broad Transport Budget 10 6,948 (PVC) = (10)Present Value of Costs (see notes) (PVC) **OVERALL IMPACTS** NPV=PVB-PVC 69.239 Net Present Value (NPV) 11.0 BCR=PVB/PVC Benefit to Cost Ratio (BCR)

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

3.15.2 Appraisal Summary Table (AST)

The scheme AST is shown below.

TABLE 3.11 – APPRAISAL SUMMARY TABLE

Ар	praisal Summary Table		Date produced: 15-Aug-14		C	ontact:
	Name of scheme:	M4 Junction 16 - Junction Improvement		_	Name	James Jackson
	Description of scheme:	Capacity improvements to M4 Junction 16. The scheme will provide new dedica	ated lanes between the A3102 Royal Wootton Bass	ett and the	Organisation	SBC
		B4005 Wroughton. Extra lanes on the M4 east and west off slips. The scheme	also includes full signalisation of the junction.		Role	Promoter/Official
	Impacts	Summary of key impacts	Ass	69,239,000		
			Quantitative	Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & trans providers	bort Scheme reduces congestion at the junction, and thus improves journey times at the junction. M4 Junction 16 is a key gatew ay into the Sw indon, and thus capacity improvements has a positive impact on netw ork wide delays.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min 2 to 5min > 5min	Beneficial	£ 11,062,000	Not assessed
	Reliability impact on Business users	The scheme would result in improved journey time reliability associated with reduced congestion.		Slight Beneficial	Not assessed	
	Regeneration	Improved access to Wichelstow e, Royal Wootton Bassett and west Swindon.		Slight Beneficial	Not assessed	
	Wider Impacts	The scheme will help enable the creation of 2000 jobs, by improving development access		Slight Beneficial	Not assessed	
101	Noise	Local increases in noise at the junction associated with increase in demand	New of houses effected =	Slight Adverse	Not assessed	Not assessed
20	Air Quality	Local reduction in air quality at the junction associated with increase in demand	New of houses effected =	Slight Adverse	Not assessed	Not assessed
ironn	Greenhouse gases	Reduction in greenhouse gases associated with journey time savings	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	Beneficial	£ 628,000	
Envi	Landscape	There will be limited visibility of the scheme in the surrounding landscape due to landform and existing screening from mature hedgerows and woodland blocks. There will be good mitigation opportunities along most of scheme which will limit impacts on wider landscape, providing sufficient land is made available for reinstatement and/ or replacement of hedgerows / woodland lost through the works.	Not applicable	Slight Adverse	Not applicable	
	Tow nscape	Scheme is on the outskirts of the urban / suburban developments and is screened by existing landform and established landscape bunds. The coherence / distinctiveness of the urban environment will not be affected by the proposals.	Not applicable	Neutral	Not applicable	
	Historic Environment	There are no known heritage assets of the following types that will be directly affected by the scheme: World Heritage Site; Scheduled Ancient Monument; Registered Park and Garden; Registered Battlefield; Conservation Area; and Listed Building(s).	Not applicable	Neutral	Not applicable	
	Biodiversity	No impacts on internationally or nationally designated sites are anticipated. Hedgerow / w oodland habitats, ditches / streams habitats and grassland and road verges have the potential to be impacted as part of the proposed scheme. The scheme has potential to support the following species: reptiles; badgers; dormice; great crested new ts; breeding birds; otters; w ater voles; w hite-claw ed crayfish; foraging / commuting bats; roosting bats w ithin mature trees.	Not applicable	Neutral	Not applicable	
	Water Environment	The scheme will lead to an increase in surface water run-off as a result of the increase in an impermeable area. A surface water drainage strategy may be required. The scheme is located in close proximity to River Ray (approximately 250m north west) and Brinkw orth Brook (approximately 500m south).	Not applicable	Slight adverse	Not applicable	
Corial	Commuting and Other us	ters Scheme reduces congestion at the junction, and thus improves journey times at the junction. M4 Junction 16 is a key gatew ay into the Sw indon, and thus capacity improvements has a positive impact on netw ork wide delays.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min 2 to 5min > 5min	Beneficial	£ 66,296,000	Not assessed
	Reliability impact on Commuting and Other us	The scheme would result in improved journey time reliability associated with reduced ers congestion.		Slight Beneficial	Not assessed	
	Physical activity	This impact is not applicable to this business case, as it is assumed that the scheme will not have a significant impact to the change in number of pedestrians/cyclists using the junction.	Not applicable	Not applicable	Not applicable	
	Journey quality	This impact is not applicable to this business case, as it is assumed that the scheme will not have a significant impact to traveller care, travellers views or travel stress at the junction.	Not applicable	Not applicable	Not applicable	
	Accidents	The scheme could reduce the online exit queuing and blocking back betw een M4 junction 16 and Blagrove and hence reduce the chances of shunting incidents.	Not assessed	Slight Beneficial	Not assessed	Not assessed
	Security	Upgrading the junction may result in very minor security benefits, especially if more uniform and standard-compliant lighting is provided as proposed. How ever, other security considerations will be broadly unchanged.	Not applicable	6,948 ight	Not applicable	Not assessed
	Access to services	The junction capacity will be improved and with it access for those people travelling to health and education services in Swindon (e.g. Lydiard Academy). The scheme will also improve public transport journey times (e.g services 31, 54, 55).	Not applicable	Slight Beneficial	Not applicable	Not assessed
	Affordability	The proposed scheme will not make material changes to the cost of public transport in Sw indon/Wiltshire.	Not applicable	Neutral	Not applicable	Not assessed
	Severance	The proposed scheme generally maintains a similar level of footway provision to the existing situation. How ever, pedestrian facilities around the south of the junction will be greatly improved. The scheme will not materially change walking and cycling routes.	Not applicable	Neutral	Not applicable	Not assessed
	Option and non-use value	les Not applicable	Not applicable	Not applicable		
ublic	Cost to Broad Transport Budget	Construction and maintenance costs would be incurred by the public sector			£ 7,489,000	
	Indirect Tax Revenues	Indirect tax revenues would increase slightly due to the increase in travel			£ 1,799,000	

4 Financial case

4.1 Introduction

This section presents evidence of the scheme's affordability, both now and including inflation. The costs presented in this section (rather than those in the economic case) should be used for funding totals. The scheme costs have been revisited in assessment work undertaken by Swindon Borough Council in 2014.

4.2 Costs

A summary of the implementation costs are set out in Table 4.1 and further details are set out in Appendix F.

TABLE 4.1 Implementation costs (prices)

Cost type	M4 Junction 16 Cost 2014(£m)
Preparation (design and survey work)	1.49
Preliminaries	0.20
Construction	8.23
Site supervision	0.12
Land	0.33
Quantified risk assessment budget	1.07
Total cost	11.43

The cost estimates have been developed using the following assumptions:

- Preparatory all preparatory work is included in this figure including design, technical approval fees, and site surveys.
- Preliminaries a figure has been included to account for site set-up costs and initial works.
- Construction this is based on a recent assessment of the scheme, but there are a number of assumptions, particularly regarding traffic management requirements.
- Site supervision no further commentary necessary.
- Land for the embankments
- Quantified risk budget this figure is based on an analysis of outstanding risks by the quantity surveyor
- Inflation has been set to zero because of the start date being this year and Tender process already underway

4.3 Budgets and funding

The profile of expenditure is set out in Table 4.2.

TABLE 4.2: Funding profile (outturn costs)

Cost	14/15	15/16	16/17	17/18	18/19	19/20		
Local government funding	0.14	0.44	1.55	0.63	0.00	0.00		
LGF funding	0.00	0.00	2.96	2.96	0.00	0.00		
Developer funding	0.14	0.44	1.54	0.63	0.00	0.00		
Total	0.28	0.88	6.05	4.22	0.00	11.43		

4.4 Whole-life costs

The costs considered with the infrastructure over the 60-year appraisal period are:

- Resurfacing, as agreed with Highways England
- Signal maintenance, as agreed with Highways England

It has been assumed that these costs are similar to those required for the current infrastructure, so no additional costs have been included in this cost-benefit assessment

4.5 Funding assumptions

Swindon Borough Council is to fund the balance, including scheme design and business case development. The Council will cover all risk budgets for the scheme with LGF funding secured and capped at £5.92 million.

4.6 Budget statement

The budget was confirmed as part of the capital budget setting, done annually through Swindon Borough Council's Cabinet. £11.54m was approved by Cabinet in June 2015, with £5.92m funded by the LGF and the balance by the Council/Wichelstowe JV. £11.43 represents the latest cost estimate prior to tender submissions.

5 Commercial case

5.1 Overview

This section sets out relevant information for a robust contracting and procurement strategy. It considers:

- Where risks lie and who is responsible.
- How the procurement strategy was agreed and whether there is market appetite.
- Is the proposed risk allocation consistent with cost estimate and does this incentivise performance, efficiency and innovation?

The assumed risk associated with the commercial case is low.

The scheme is a requirement of the original outline planning permission for Wichelstowe (Condition 79), and needs to be complete before the 1100th dwelling on the site is occupied.

This section sets out the key requirements and assumptions for procurement. Consideration is given to each of the available procurement options and the preferred procurement strategy is described.

5.2 Required outputs

The scheme is defined as a junction improvement to M4 Junction 16, with an offset junction arrangement to the south with increased capacity for all movements, to include new signal timings and carriageway layout.

The scheme involves:

- Widening of A3102 and B4005 south of the M4
- Additional link and lanes to provide access to the Wichelstowe development, ultimately linking to the tunnel under the M4
- Creation of an offset junction arrangement and upgraded signals

The scheme would comprise localised highway widening, drainage improvements, structures' widening, street lighting, signs, traffic signals and road markings. The land required for the scheme is wholly within the highway boundary or council land.

The estimated construction value of the scheme is £11.43 million. General arrangement drawings are included in Appendix A. A complete design including specification and drawing has been developed and presented to the Independent Technical Advisor.

5.3 Issues and risks

Apart from the usual risks associated with construction projects, there are specific construction risks for Junction 16 associated with:

- Utilities buried in the vicinity of the site
- Ground conditions
- Weather conditions during onsite works
- Existing structural faults and maintenance required prior to scheme delivery
- Provision of sufficient drainage
- Presence of protected species

The following issues are relevant to procurement:

- The scheme estimate is higher than the OJEU limit and, therefore, needs to be procured in accordance with the relevant EU rules.
- The most important criterion is to obtain an economically advantageous tender.
- Funding will be fixed so price certainty is important.
- Due to the requirements of the development, the scheme must be delivered by late 2017. Furthermore, the terms of the funding require the scheme to be delivered by March 2018.
- Provision needs to be made for season/weather/night time working and significant levels of traffic management.
- Minimising the impact on the travelling public during construction is a priority.

5.4 Procurement strategy

The project governance, discussed in Chapter 6, determined the preferred procurement strategy. The key risks identified and managed through any procurement process are:

- Time (speed or certainty of completion date)
- Cost (price level or cost certainty)
- Quality (functionality and performance)

Quality can be managed through the procurement process, whether traditional or design and build. The following options have a variety of advantages and disadvantages:

5.4.1 Option 1 - Traditional contract

The traditional approach with any project, particularly in the construction industry, is to have design as a separate function from construction. Outline design has already been started and detailed design is complete .

5.4.2 Option 2 - Design and build

There are a number of variants of design and build contracting, including just design and build (D&B), design, build and operate (DBO) and design, build, operate and maintain (DBOM). A greater or lesser proportion of the design work can be included in the design and build contract. Due to the involvement of a number of parties (including three highway authorities) and ongoing design work, a full design and build contract is unlikely to provide value for money. However, options for incorporating an element of design and build into the construction contract remain open.

5.4.3 Option 3 - Prime contracting

This is conceptually very similar to D&B. A single contractor again acts as the sole point of responsibility to a client for the management and delivery of a construction project, on time, within budget (this time defined over the lifetime of a project) and in accordance with a performance specification.

5.4.4 Option 4 - Management contracting

This option involves the Management Contractor assisting the Client in putting together the scope of the work and procuring the works. This form of contract is suitable for fast tracking projects, rather than achieving cost certainty and the transfer of risk. It is likely to provide benefit only if instigated right at the start of project development.

5.5 Procurement option assessment

A simple analysis was carried out to evaluate the benefits of the four delivery options, consisting of rating the cost, time and quality of each option from 1 (good) to 4 (poor). This was multiplied by a risk factor (also 1 to 4) to assess the relative risks associated with each option.

TABLE 5.1: Evaluation of delivery options

Delivery option		Cost			Time		Quality			Grand Total
	Level	Risk	Total	Level	Risk	Total	Level	Risk	Total	
Traditional form of contract	3	1	3	2	1	2	2	2	4	9
Design & build / Prime contracting	2	3	6	1	2	2	3	3	9	17
Management contracting	2	3	6	3	3	9	2	2	4	19

Given the advanced status of the design, the design and build option was unlikely to provide many benefits. Even if some cost or time savings could be achieved through changes to the design or early start on site, these were likely to be small, and the risk of the changes resulting in a scheme that is no longer acceptable outweighed the benefits.

At this stage, entering into a management contract would delay the scheme and add a layer of complexity that is not required.

Therefore the traditional form of contract was selected as the appropriate approach in this instance.

5.6 Sourcing options

The potential options for sourcing the provision of the services include partnerships, frameworks, existing supplier arrangements and one-off procurement. In this instance a one-off procurement process was selected.

The Council does not have any established partnerships or existing supplier arrangements in place with contractors that it would be able to make use of within the confines of public procurement regulations, and neither has it set up any frameworks that would cover this type of major construction scheme.

Even if it had arrangements in place that could be used, which it does not, the Council would wish to ensure best value for a scheme of this size. A one-off procurement process was therefore selected in this instance.

The Council did explore the opportunity to make use of other established frameworks in the public sector, but was not convinced of the benefits they would provide, including their appropriateness for this scheme, any time savings they could achieve, and their ability to demonstrate best value.

5.7 Payment mechanisms

The funding will form part of the allocation provided to the Local Enterprise Partnership as part of the Strategic Economic Plan budget. The process currently in place for providing this funding is set out in the Assurance Framework. The funding allocations will be made available to the Local Enterprise Partnership quarterly in advance.

With regard to payment mechanism between Swindon Borough Council and its contractor, the scheme will be based on an NEC3 Option A contract as noted below. This contract links payment to the completion of deliverables. A set of activities have been defined and included in the tender, and the contractor can add to these if desirable to create the 'Activity Schedule'. Payments to the contractor will be made monthly, and the contractor will only be due payment for the activities that have been completed in full during that month. The NEC3 Project Manager, with the help of the Supervisor, will

define the appropriate payment each month, taking into consideration any payment applications submitted by the contractor.

5.8 Pricing framework and charging mechanisms

Within the civil engineering industry in the UK there are two widely used forms of contract - the ICE Conditions of Contract, and the New Engineering Contract (NEC3). Both are suitable, although the NEC3 is a more modern, partnership oriented form. The Council's preference is the NEC3 contract, and its staff have training and experience in its use.

In this instance the priced contract with activity schedule (Option A) has been selected.

This is the most appropriate option in this situation, as there will be limited opportunity for innovation on this scheme.

Delay damages have been included within the terms and conditions of the contract to ensure the contractor has sufficient incentivisation to deliver the scheme within the defined programme.

5.9 Risk allocation and transfer

The NEC3 Option A contract sets out a list of risks that remain with the employer (in Clause 80.1). If any of these risks arise the contractor will be able to make a claim via the compensation event process. All other risks are transferred to the contractor.

As with all other employers, Swindon Borough Council has added and amended clauses as appropriate to ensure it deals with risks in a manner it considers most appropriate making use of its experience and expertise.

5.10 Contract length

The contract length will be approximately 30 months to account for an 18 month construction period and a 12 month maintenance period.

5.11 Contract management

Contract management will be undertaken by Peter Brett Associates (PBA), who will take on the role of Project Manager under the NEC3 contract. PBA has extensive contract management experience and a team of high quality staff has been put forward to undertake the role, led by a Director.

The Supervisor role will also be undertaken by PBA, making use of staff already involved in leading the design process.

Swindon Borough Council's client team will continue to be led by the same key staff members involved in the design, planning and procurement, ensuring continuity throughout the delivery process. A Project Board is in place and meets monthly, and reporting lines through to the Council's Strategic Highways Programme Board, the Wichelstowe Joint Venture, the Swindon and Wiltshire LEP, and the Joint Highway Authorities are all well established.

6 Management case

6.1 Introduction

The management case sets out how the project will be delivered. It provides evidence from similar projects and programmes to show that the governance, organisational structure and roles are appropriate. The programme assurance and approval processes oversee delivery to ensure risks are identified and mitigated. The management case is ultimately about delivering the scheme's objectives with the benefits being realised, assessed and monitored.

This section contains:

- Programme and project dependencies
- Governance, organisational structure and proposed roles
- A project plan for scheme development and implementation
- Information on proposed communication and stakeholder management
- Risk identification and a risk management
- A benefits' realisation, monitoring and evaluation plan.

6.2 Overall assessment of scheme deliverability

The scheme has been programmed to meet the rate of housing completions and the requirements of the planning permission conditions. It is important to note that the design has planning permission. Approval by all relevant authorities is subject to technical approval of the detailed design which was achieved in March 2015.

The scheme has been challenged and even taken to judicial review but remains deliverable with support from Swindon Borough Council, Wiltshire Council and Highways England.

6.3 Evidence of similar projects

Swindon Borough Council has experience of large scale infrastructure delivery, having delivered a number of multi-million pound highway and infrastructure schemes, including Wichelstowe Contract 2-3a, Wichelstowe Contract 4 and most recently Bruce Street Bridges.

Peter Brett Associates (PBA) has been appointed as designer, Principal Designer, NEC3 Project Manager and NEC3 Supervisor. PBA is a multidisciplinary civil engineering consultancy with a broad range of experience on similar schemes, including recent relevant experience designing and supervising a major junction improvements scheme at Junction 11 of the M4. PBA was named New Civil Engineer's 'Consultants of the Year' for both 2014 and 2015.

6.4 Programme/project dependencies

The Junction 16 scheme is a standalone scheme which can be delivered, as designed, independent of other schemes. Ultimately, the full benefits of the scheme - to provide access to the Wichelstowe development - will be achieved on completion of the western access (M4 crossing).

Now that funding has been provisionally allocated to the western access, the risks of delivering the ultimate development access to Wichelstowe are significantly reduced. The interdependency of the two elements means any delay to Junction 16 would impact on the ability to deliver the western access. The phase and traffic management requirements require each scheme to be delivered separately.

See Appendix C - risk register and Appendix E - programme.

6.5 Governance, organisational structure and roles

Swindon Borough Council is the delivery agent. The programme and project governance is already in place to allow full delivery of the scheme.

The structure is shown in Figure 6.1.

FIGURE 6.1: Project organogram



The 'Consultants and Contractors' set out in the table above consists of a number of organisations, including the following:

- Peter Brett Associates (design, contract management and supervision)
- Keystone (ecological advisors)
- A range of contractors for various survey and site investigation works
- The main construction contractor (not yet appointed)

The 'Internal Service Areas' set out in the table above include the following:

- Highways Transport Development Management (approvals including technical approval, with CH2M Hill as their partner)
- A range of advisors from the legal team
- Property, procurement and finance teams
- Additional project support from the Highways Project and Programme Delivery team

6.6 Programme/project plan

Table 6.1 sets out the key milestones from current programme. This will be updated throughout the project, the programme is set out in Appendix E. A full construction delivery programme will be in place once the selected contractor is appointed.

Once construction has commenced, the Project Manager will report scheme costs against forecast spend every month to the Project Board. The Project Manager will produce highlight reports to inform the Project Board of progress with the programme as required.

The Project Board is ultimately responsible for the delivery of works against time, budget, quality and outcome.

TABLE 6.1	
Key milestones	
Milestone	Estimated Date
Technical approval granted	March 2016
Finalise scheme detail design	March 2016
Full Business Case (FBC) submission	April 2016
FBC approval	May 2016
Out to tender	April 2016
Award contract	June 2016
Start construction	July 2016
Complete construction	+ 18 months

6.7 Assurance and approval plan

The Junction 16 improvements scheme is being progressed in line with the Assurance Framework.

This FBC represents Stage 3 of the SWLEP process. The SWLEP will use the contents of this FBC to decide whether the scheme should be funded.

Full business case approval is programmed for May 2016. In accordance with the Assurance Framework, a formal agreement will be made between the owner of the devolved funding (currently SWLEP) and Swindon Borough Council. The agreement will set out the terms and conditions for the devolved funding. Funding will then be released to Swindon Borough Council in line with those terms and conditions.

The scheme was submitted for prioritisation as part of the Local Transport Body, and was therefore subject to competition for prioritisation with schemes from other local authorities.

Having been prioritised as part of the local growth fund the scheme has subsequently been approved as part of the Swindon and Wiltshire LEP Growth Deal, by central government.

The Independent Technical Advisor has provided scrutiny over the technical aspects of the business case.

As the programme of works forms part of the Swindon and Wiltshire LEP Growth Deal, the independent assurance will be provided by the LEP.

6.8 Communications and stakeholder management

The scheme has been in the public domain for a number of years. It is therefore proposed that communications will be directly linked to statutory requirements and for information for residential or commercial properties likely to be affected during construction. Wider publicity will be through press releases in the local media and drop-in information sessions prior to commencement on site. A communication strategy can be seen in Appendix H.

6.9 Risk management strategy

The risk management strategy is simply a process for identifying adequate assessment and response to risk. The process in place should allow early decision making to mitigate these. See Appendix C risk register, this is managed and reviewed through the project management process.

Where appropriate risk will be transferred to the contractor by the contract thus giving an acceptable level of financial predictability and stability. A risk register has been prepared for this project with example risk including:

- Utilities
- Geotechnical
- Drainage

The register in Appendix C is the live document currently being utilised by the detailed design team, it is subject to ongoing updates, but it offers a rounded consideration of the multiple risk categories which are being considered.

6.10 Benefits' realisation plan

The objectives and indicators to success are set out in the strategic case. The three objectives are:

- Reduced congestion
- Reduced M4 online exit queuing
- Enabling Wichelstowe development access.

These have been assessed by reviewing queue lengths and saturation flows on the junction. The monitoring and evaluation to assess the benefit realisation has been set out below.

6.11 Monitoring and evaluation

The Monitoring and Evaluation Plan identifies how scheme delivery, including wider scheme impacts, construction and budget management, are to be evaluated. The plan will lead to the production of Post-Implementation Reports; it is proposed that reports be produced as follows:

- One Year After Report using data collected at least one year after scheme opening. This will focus on the construction elements of the scheme and immediate impacts;
- Final Report based on; both one year after data and further data collected 5 years after the scheme opening. This will focus on the wider impacts of the scheme.

The plan identifies the methodology to monitor the following measures:

- Scheme build
- Scheme costs
- Travel demand
- Travel times and reliability of travel times
- Impacts on the economy
- Carbon impacts

Data Requirements - Data requirements are set out in Table 6-2.

Responsibilities and Resources

Data collection and preparation of the report will be managed in-house by Swindon Borough Council Transport Planning officers. The existing most recent modelling assessment and associated surveys will form the basis of the baseline against which the outcomes will be assessed.

Table 6.2:

ltem	Measure	Data Required	Report	Output/Outcome
Scheme Build	Delivery	Performance against	1 year	Scheme delivered
	Programme	key milestones		to programme
	Stakeholder	Lessons Learnt	1 year	
	Management			
Scheme Costs	Scheme cost	Out-turn cost	1 year	
Travel Demand	Traffic Flows	Traffic flow on	1 and 5	Increase in flow
		approaches	year	throughput
Travel Times and journey	Journey Times	Journey times	1 and 5	Reduction in
time reliability		through junction	year	journey times
Impacts on the economy	Journey times to	Journey times to key	1 and 5	Reduction in
	businesses	businesses	year	journey times
Carbon	Traffic flows and	Traffic flows and	1 and 5	Reduction in
	speeds	speeds	year	Carbon emissions

6.12 Project management summary

- The scheme is being delivered by Swindon Borough Council's Highways Delivery team.
- The risk register and contingency reporting will continue to be updated through the project management process.
- The external communication will be followed through the statutory processes identified.
- The benefits' realisation will be monitored by Swindon Borough Council, as part of its existing Transport Planning function.





Appendix B SATURN flow difference plots

2016 AM - Impact of M4 J16 Scheme



2016 AM - Impact of M4 J15 & M4 J16 Schemes







2016 PM - Impact of M4 J15 & M4 J16 Schemes



2026 AM - Impact of M4 J16 Scheme



2026 AM - Impact of M4 J15 & M4 J16 Schemes



2026 PM - Impact of M4 J16 Scheme



2026 PM - Impact of M4 J15 & M4 J16 Schemes



Appendix C Risk register

PETER BRETT ASSOCIATES

M4 Junction16 Interchange Improvements

Risk Assessment

(Open Document Dec 2015)

Risk Categories Include

- Topography
- Geotechnical
- Utilities
- Highways
- Drainage
- Structures
- Land Issues / Orders
Topographical Survey

ID No	ltem	Source of Information	Information/Risks	Impact	Likelihood	Date by which Action needs to be completed	Action	Owner	Action completed	Date Action Completed
1	M4 slips		Existing survey does not cover the area required for the design of the possible revised motorway slips	М	Н		If motorway slips are required then a survey will need to be commissioned to design the slips. This will need to include all details of existing drainage and stats etc	PBA	yes	22/07/14

Geotechnical

ID No	ltem	Source of Information	Information/Risks	Impact	Likelihood	Date by which Action needs to be completed	Action	Owner	Action completed	Date Action Completed
1	Piling in to limestone	PBA bore hole logs	Impact on construction and will increase costs	М	L		Additional dynamic probes to be undertaken	PBA	Awaiting technical approval	

Utilities										
ID No	ltem	Source of Information	Information/Risks	Impact	Likelihood	Date by which Action needs to be completed	Action	Owner	Action completed	Date Action Completed
1	Service diversions		Programme and cost implications to divert services	н	М		Contact utilities early to obtain details of necessary diversion. Check to see if alterations can be made to avoid the need to divert/protect	PBA		
2	BT Diversions		High cost of BT Diversions	н	М		Determine exact location by hand dug trial holing. Agree more reasonable diversion proposals with BT to reduce costs. Consider re-design of layout is specific areas if advantageous	PBA		
3	Services associated with M4		Delay to works due to unknown utilities and cost implications.	Н	М		Obtain record plans from utility companies and where applicable commission other measures such as detection and trial pits to accurately locate services on site	PBA	Hard copies obtained, site sett out to be carried out.	
4	Proposed utilities		Delay in programme for new supplies, and insufficient space allowed for provision of services. Clashes with drainage and other utilities	Н	М		Contact utility company early to establish programme and detail routes to allow sufficient time to coordinate services	PBA		
5	ССТУ		Delay in agreement on number and location of CCTV. Insufficient landtake/conflict with other services for CCTV base and duct requirement	М	М		Early Agreement with HA and RBC regarding locations of CCTV	PBA		

Highways (Alignment)

ID No	ltem	Source of Information	Information/Risks	Impact	Likelihood	Date by which Action needs to be completed	Action	Owner	Action completed	Date Action Completed
1	Farm Access / Bus stop		Revision to alignment required.	Н	М		Progress and conclude discussions with HA.			
2	Departures from Standard		Basic scheme may require Departures, which will require approval.	Н	М		Early review of scheme to establish need for Departures.			
3	Supplementary signing requirements.		Need for VMS etc will impact on design (SSD, gantries etc.)	М	М		Early discussion with relative authorities required			
4	Maintenance Areas		Need for safe maintenance areas to be located within the scheme	М	L		Discussion with LA to establish requirements			
5	Changes to road speed		Change in road speed with allow for change in design specification of the works	М	L		Source traffic speed survey and up to date accident data.	PBA		

Drainage

ID No	ltem	Source of Information	Information/Risks	Impact	Likelihood	Date by which Action needs to be completed	Action	Own er	Action completed	Date Action Completed
1	Attenuation		Sufficient space to attenuate flows in accordance with EA requirements.	Н	М		Early review of likely attenuation volume and check area allocated is sufficient.			
2	Existing Capacity on slip roads and local road network		Additional discharge into existing pipe network. Larger queuing area on slip road may increase discharge into existing carrier drain. (EA require no increase in discharge rate)	М	М		Early review of options and discuss with EA.			

Structures

ID No	ltem	Source of Information	Information/Risks	Impact	Likelihood	Date by which Action needs to be completed	Action	Own er	Action completed	Date Action Completed
1	Approval Procedures		Awaiting Technical Approval from JT	Н	М		Programme in sufficient time for liaison, consultations, deliberations, etc			
2	Sufficient land-take for construction of structures		Delays to programme, construction delays, political embarrassment	н	L		Develop sufficient design and construction concept at early stage to mitigate			

Land Issues /Orders

ID No	ltem	Source of Information	Information/Risks	Impact	Likelihood	Date by which Action needs to be completed	Action	Owner	Action completed	Date Action Completed
1	Land Negotiations and Compulsory Purchase Orders		Insufficient landtake in land negotiations or CPO due to revisions in highway alignment, slope stability, traffic signs and construction issues	н	Μ		Ensure scheme design is complete in sufficient detail and allowance for construction issues (ie working space / construction & traffic phases) for land negotiation or CPO to be undertaken	SBC		
2	Future easements for inspections of structures		Land negotiations not resolved leading to need for CPO	М	L		Progress and conclude discussion with land owners	SBC		

Appendix D Local model validation report



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				Т	5	- W	3	T N	1	P []	Т	5	W.	5	Т	M		Т	5	W	5	Т	M		Т	3	W	3	Т	M
1	Complete detailed design	R104/03/16	Thu 31/03/10	h																										
Z	Technical approval	Thu 31/08/16	Thu 31/03/10	- 51	03																								1	
- 5	Rinalise land and screen in	(Fri 04/03/16	Fri 17/06/16				5																						I	
4	Press release and comms	Wed 11/05/1	FA 15/07/16			C		5																					I	
5	Advanced veg clearance	Wed 01/06/1	Fri 22/07/16			E.		5																					I	
6	Develop Full Business Cas	(Fri 04/03/16	Thu 21/04/18		1																								I	
7	Submit Full Business Case	Rrl 22/04/16	Thu 19/05/16		Ċ	<u>5</u>																							I	
a.	Pull Business Case approvi	Thu 19/05/16	Thu 19/05/16			- 19/ 0	35																							
9	Tender	Fri 04/03/16	Fit 15/07/16					<u>h</u>																					1	
10	Award contract	Rt 15/07/16	Fit 15/07/16	1				₹_15/0	7																					
11	Construction	RH 15/07/16	Fit 15/12/17	1				e" 👘																					1	

Appendix F Cost breakdown

Cost type	M4 Junction 16 Cost 2014(£m)
Preparation (design and survey work)	1.49
Preliminaries	0.20
Construction	8.23
Site supervision	0.12
Land	0.33
Quantified risk assessment budget	1.07
Total cost	11.43

<u>Note</u>

Construction retained at £7,770,500 for purpose of Business Case

2016 Updated Cost Profile

South of M4	£4,229,120
North of M4	£1,589,554
Overbridge	£89,920
Utilities	£500,000
Preliminary	£1,255,989
Provisional 2016	£7,662,583

<u>Note</u>

Utilities are subject to confirmation as such for purpose of Business Case retain previous construction cost £7,770,500

Appendix G Figure 3.1 – Minor Junction 16 Modifications Plan



1.1		

Appendix H Communications Strategy

	Who is the stakeholder?	When will they be contacted?	Who will be responsible for making sure it
			happens?
Ref	Stakeholder	Frequency	Owner
1	Wiltshire Council	Bi-monthly pre-construction	SBC Project Manager
-		Monthly during construction	
2	Highways England	Bi-monthly pre-construction	SBC Project Manager
-		Monthly during construction	
2	SBC LHA	Bi-monthly pre-construction	SBC Project Manager
5		Monthly during construction	
4	Senior SBC Officers - Core team	Monthly	SBC Project Manager
5	Wichelstowe Joint Venture	Monthly	SBC Project Manager
6	SWLEP	Monthly	SBC Project Manager
7	Lead Member	Bi-monthly	SBC Project Manager / Strategic Lead
Q	SBC and HE Streetworks	Ad hoc	SBC Project Manager / PBA pre-construction
0	Coordination		Contractor during construction
٥	Senior SBC Officers - Highways	Various Board meetings	SBC Project Manager / Strategic Lead
9	and Wichelstowe teams		
10	Local Ward / Wichelstowe	Ad hoc	SBC Project Manager / Strategic Lead
10	Members		
11	Royal Wootton Bassett Town	When scheduled. Likely to be 2-3 in	SBC Project Manager
	Council	total	
12	Wroughton Parish Council	When scheduled. Likely to be 2-3 in	SBC Project Manager
12		total	
13	CPRE	As and when required	SBC Project Manager
	General public - daily users of	Various, but ensure that the	SBC Project Manager pre-construction.
14	junction	communication, particularly during	SBC Project Manager and Contractor during
		construction, is regular and clear	construction.
15	Local press - Swindon Adver and	Ad hoc. Aim for press release circa 3	SBC Project Manager
15	BBC Wiltshire	months pre-construction	
	Local landowners	Once pre-construction.	SBC Project Manager pre-construction
16		Contractor to liaise as required	Contractor during construction
		during construction.	
	General public - occasional users	As required	SBC Project Manager pre-construction.
17	of junction		SBC Project Manager and Contractor during
			construction.
	Local Businesses - Windmill Hill	Once pre-construction.	SBC Project Manager pre-construction.
18	and Blagrove	Contractor to liaise as required	SBC Project Manager and Contractor during
		during construction.	construction.