Church Commissioners for England

Land at Chidswell, Dewsbury

Interim Transport Assessment

Draft Report

August 2016

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Document Control

Document:	Interim Transport Assessment
	Draft Report
Project:	Land at Chidswell, Dewsbury
Client:	Church Commissioners for England
Job Number:	A079758
File Origin:	X:\Projects\2012\A070000\A079758 - Land at Chidswell (Fee) (29.10.2012)\40 Reports\Interim TA (June 2016)\A079758 Land at Chidswell - Interim TA Draft5 220816 for issue.docx

Document Checking:

Prepared by:	Cesar Calvo / Tim de Laat	Signed:	

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Verified by:	Paul Smith	Signed:	

Issue	Date	Status
1	19/07/2016	Draft for Client / Project Team review and comments.
2	05/08/2016	Revised draft for Client / Project Team review and comments.
3	15/08/2016	Revised draft for Client / Project Team review and comments.
4	22/08/2016	Revised draft for Client / Project Team review and comments.
5	22/08/2016	Revised draft for Client / Project Team review and comments.

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Introduction

Overview

WYG is commissioned by the Church Commissioners for England (the 'Commissioners') to prepare an Interim Transport Assessment (TA) in connection with proposals for a new major mixed-use residential and employment masterplan development at land situated to the north-east of Chidswell, near Dewsbury, West Yorkshire (hereafter referred to as 'Land at Chidswell' and the 'site').

The Local Planning Authority is Kirklees Council (KC) and the Local Transport and Highways Authority is KC Highways.

This Interim TA has been prepared to consider the transport and highway implications arising from the potential future masterplan development at the site.

Background

In 2013 WYG prepared a 'Transport Feasibility and Sustainable Transport Strategy' report in the context of three previous Concept Masterplan options at the site, each of which comprised approximately 35 hectares (ha) of employment land plus between approximately 500 and 1,800 residential dwellings. The 2013 WYG report concluded that a comprehensive and overarching Sustainable Transport Strategy would be required to actively promote and encourage travel to and from the site by 'sustainable' (i.e. non-car) travel modes, such as walking, cycling and public transport. This would aim to reduce the overall impact of the masterplan scheme on the surrounding local and strategic road networks.

In December 2015, WYG prepared an 'Accessibility and Connectivity Review' Technical Note (TN) which was submitted to the Council in January 2016. This Technical Note, included at **Appendix A**, considers two new concept masterplan options that have been developed on behalf of the Commissioners, developed by John Thompson and Partners (JTP), and how they contribute to addressing future employment and housing demand in the area. The TN also provides confirmation of the proposed points of access/egress to/from the site in the context of the latest concept masterplan options. It includes an update to the relevant chapters of 2013 WYG Transport Feasibility Study and Sustainable Strategy report, including an audit of existing key local facilities and services.

On 21 April 2016, WYG submitted an Interim TA Scoping Note in relation to the current indicative masterplan proposals. This Scoping Note, included at **Appendix B**, sets out the proposed scope of the Interim TA, based on previous technical notes and discussions with KC officers.

Existing Transport Situation

Introduction

Chapter 2 of this Interim TA establishes the existing, or 'baseline', transport conditions currently prevailing at the site and within the surrounding area. It describes the existing conditions, also

covering 'sustainable' (i.e. non-car) modes, including 'active' travel modes, such as walking and cycling.

Site Location and Description

The site is located to the east of the A653 Leeds Road which is a strategic corridor between Dewsbury and Leeds. In the immediate vicinity of the site, Leeds Road runs in the north-south direction adjoining the A638 Wakefield Road in the south and the Junction 28 (Tingley Interchange) of the M62 Motorway to the north. In addition, the A638 Wakefield Road links with Junction 40 (Flushdyke Interchange) of the M1 Motorway to the east of the site.

The site extends to Heybeck Lane to the north and Chidswell Lane to the south. Chidswell Lane provides access back onto Leeds Road to the south-west of the site and to the B6128 Owl Lane, via Windsor Road, to the south. Owl Lane in turn connects to the A638 Wakefield Road to the east, which connects to the M1 Junction 40, and heads towards Ossett to the west.

Local Highway Network and Strategic Transport Corridors

The Leeds City Regional Transport Strategy (RTS) (October 2009) as well as the KC Core Strategy (CS) Development Plan Document (DPD) (p. 99 'Core networks') (2012) identify strategic transport corridors. These corridors, which include road and rail routes, connect Leeds to the north with Bradford, Wakefield, Halifax and the main towns within Kirklees District, including Dewsbury and Huddersfield, with the Highways England (HE) Strategic Road Network (SRN). The site is situated within the Leeds – North Kirklees – Huddersfield – Manchester transport corridor, which is identified as the main strategic corridor in Kirklees District as it links the major towns with the adjoining regional centres. The proposals for development in the KC CS have as far as possible been linked with this main corridor, both to take advantage of the highest quality transport links in the District and to ensure new developments are well connected and sustainable.

Public Transport Services

The site is situated within a pivotal point on the local bus network, being served by a large number of bus routes providing key convenient links to major employment areas and town centres elsewhere in the District and beyond. There are various existing bus stops located within close proximity to the Masterplan site, including at the northern, western and southern edges of the site, with bus stops situated along the A653 Leeds Road, Heybeck Lane and Chidswell Lane respectively.

There are two mainline railway stations located within relatively short distances from the site. Batley Railway Station is located approximately 3km to the west and Dewsbury Railway Station is located approximately 4km to the south-west. Both stations can be accessed by existing bus routes and bus stops are provided close to both stations; Dewsbury Station also has a dedicated public transport interchange facility located directly outside the station.

Walking and Cycling Networks and Facilities

According to the Department for Transport (DfT), walking is considered to be the most important mode of travel at the local level with the greatest potential to replace short car trips, particularly under 2 kilometres. WYG has carried out an accessibility appraisal of the site in accordance with DfT accessibility criteria identifying the various services and destinations accessible within various walking and cycling catchments from the site. Within 2km of the site, which equates to a less than

half an hour walk, Chidswell village, Hanging Heaton, Ossett Street Side and parts of West Ardsley can all be reached.

The majority of roads surrounding the site, including Leeds Road, Heybeck Lane, Chidswell Lane and Windsor Road, have footways provided on both sides of the carriageway to facilitate pedestrian movement, as confirmed during the two initial WYG site visits, carried out on Tuesday 20 November 2012 and Thursday 24 January 2013, subsequent site visits and desk-based research.

According to the DfT, cycling has potential to replace short car trips, particularly those under 5km. The 5km cycling catchment from the site includes Dewsbury, Batley, Morley, East Ardsley, Ossett and parts of Wakefield.

Appropriate cycling provision is available in the local area with cycle lanes being provided on Leeds Road in order to promote cycling.

Access to Services

The DfT publishes 'Core Accessibility Indicators' as ways of measuring accessibility from a site by walking, cycling, public transport and car/van to various types of services, namely employment centres; primary, secondary and further education; healthcare including GP surgeries and hospitals; and retail including food stores and town centre. Recommended, and maximum acceptable, travel times are given for each type of services.

WYG has carried out a Geographic Information Systems (GIS) modelling exercise in order to identify the accessibility of the site to the various types of services and facilities, to compare with the recommended and maximum DfT travel times. The various GIS accessibility map outputs that accompany this accessibility assessment are included at Appendix A of the WYG Accessibility and Connectivity Review TN (December 2015), included at **Appendix A** of this Interim TA report.

Baseline Traffic Surveys

In order to inform the traffic modelling aspects of this Interim TA, WYG recently commissioned Nationwide Data Collection Ltd (NDC), an independent transport survey company and one of WYG's approved sub-consultants, to carry out various traffic turning count and traffic queue length surveys at 10 key junctions in the area surrounding the site (the majority of these junctions were subsequently modelled, as agreed with KC Highways officers). The scope of the surveys was agreed with KC Highways officers in advance.

Surveys were carried out Thursday 5 May 2016 at the following agreed junctions:

1. M1 Junction 40 (Flushdyke Interchange) – signal controlled roundabout;
2. M62 Junction 28 (Tingley Interchange) – signal controlled roundabout;
3. A653 Leeds Road / Heybeck Lane – signal controlled junction;
4. A653 Leeds Road / Chidswell Lane – priority T-junction;
5. A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – signal controlled junction;
6. B6128 Owl Lane / Windsor Road – priority T-junction;
7. A638 Wakefield Road / A638 Chancery Road / B6128 Owl Lane / B6128 Leeds Road – priority roundabout;
8. Chidswell Lane / Windsor Road – priority T-junction;

9. A653 Leeds Road / Owl Lane – signal controlled junction; and
10. B6128 John Ormsby V C Way / B6128 Owl Lane / Horace Waller V C Parade – priority roundabout.

Surveys at each junction were carried out over a continuous 12 hour period covering each junction arm to record demand and queuing, with data analysed for three hours in the morning (AM), between 07:00-10:00 hours, and three hours in the afternoon/evening (PM), between 16:00-19:00 hours, coinciding with the AM and PM peak periods respectively.

Traffic surveys were undertaken on Thursday 5 May 2016. Based on the survey data, the AM peak hour was identified as 07:30-08:30 hours and the PM peak hour was identified as 16:45-17:45 hours.

Indicative Masterplan Proposals

Proposed Development

The current indicative masterplan proposals are for a total of 1,535 residential dwellings. For the purpose of this Interim TA it is assumed that 80% of the dwellings will be private and 20% will be affordable. The indicative masterplan proposals also include approximately 35 hectares (ha) of employment land, which as agreed with KC and WYG Planning has been assumed to translate to approximately 122,500 square metres (m^2) of commercial employment Gross Floor Area (GFA). This has been agreed as acceptable by KC for the purpose of this assessment.

The employment development mix is unknown at this stage and an even split between B1(a) Business (Office) (25%); B1(c) Business (Light Industry) (25%); B2 General Industry (25%); and B8 Storage or Distribution (25%) has been utilised for the purpose of this Interim TA. The 25% x 4 assessment used is considered a robust approach as it considers a high proportion of B1(a) Business (Office) space, the highest employment trip generator of the mix. As such, the assessment considers a 'worst case' from a transport and highways perspective in terms of trip rates and trip generation.

Indicative Masterplan Layout

An indicative masterplan layout, prepared by John Thompson and Partners (JTP), is provided in Chapter 3 of this Interim TA report.

Proposed Land Parcels and Access/Egress Arrangements

A schematic layout of the same indicative masterplan proposals, highlighting the five proposed site access/egress points and various land use types, is provided in Chapter 3 of this Interim TA report. As shown and described, for the purpose of this assessment the masterplan is subdivided into five main areas (land parcels), comprising the following:

- **Area 1** – Up to approximately 250 residential dwellings accessed via Heybeck Lane;
- **Area 2** – Up to approximately 30 ha of employment land accessed via Leeds Road (North) and Owl Lane;
- **Area 3** – Up to approximately 5 ha of employment land accessed via Leeds Road (South) and Owl Lane;

- **Area 4** – Up to approximately 1,035 residential dwellings accessed via Leeds Road (South) and Owl Lane; and
- **Area 5** – Up to approximately 250 residential dwellings accessed via Chidswell Lane.

Trip Generation, Assignment and Distribution

Introduction

Chapter 4 of this Interim TA report identifies person trip rates and predicted mode splits for the site. It includes a review of the industry-standard TRICS trip rate database and Office for National Statistics (ONS) 2011 Census data, which have been used to derive the trip rates and trips. It also sets out suitable mode splits for the AM and PM peak periods as well as likely overall vehicle trip generation for the site. This chapter also outlines the method used for generating the likely distribution of trips across the local road network as well as the allocation of the trips to the site's five access and egress points.

Trip Generation Approach

For the purpose of identifying potentially suitable trip rates and modal splits for the potential future development at the site, the industry-standard TRICS trip rate database (version 2011(a) v.6.11.1) and Office for National Statistics (ONS) 2011 Census data have been interrogated. The trip rates used in this Interim TA are considered acceptable for the purpose of this assessment by KC Highways officers.

Trip Distribution

The ONS Census 'Travel to Work' database was further interrogated in order to identify the likely trip distribution of trips being generated from, and attracted to, the site. The Travel to Work database was examined for both types of trips:

- Residents of the proposed site travelling out of the site for local employment opportunities; and
- Residents of local areas travelling to the proposed site for work.

Residents of the potential future masterplan are considered likely to mirror the trip patterns identified within the Census data. Therefore, the largest number of work-related trips is likely to be to and from Leeds, Wakefield and Dewsbury town/city centres. Trip patterns for employees working at the site show a similar trend with approximately 84% of employees likely to travel to the site from Kirklees (28%), Leeds (33%) and Wakefield (23%) Local Authority Districts (LADs). The Barnsley, Bradford and Calderdale districts are considered likely to account for a further 10% of employment trip origins.

Highway Capacity Assessment

Chapter 5 of this Interim TA sets out the results of a highway capacity assessment, carried out to identify the likely traffic impact of the indicative masterplan proposals in two future assessment years (2020 and 2030). As part of the highway capacity assessment, the following off-site junctions have been surveyed and modelled:

1. M1 Junction 40 (Flushdyke Interchange) – signal controlled roundabout;
2. M62 Junction 28 (Tingley Interchange) – signal controlled roundabout;
3. A653 Leeds Road / Heybeck Lane – signal controlled junction;
4. A653 Leeds Road / Chidswell Lane – priority T-junction;
5. A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – signal controlled junction;
6. B6128 Owl Lane / Windsor Road – priority T-junction; and
7. A638 Wakefield Road / A638 Chancery Road / B6128 Owl Lane – priority roundabout.

The junctions identified above have been agreed with KC Highways officers. The five site access junctions identified above and within Chapter 3 of this Interim TA report have also been assessed.

The methodology followed within Chapter 5 was agreed in principle with KC Highways officers during the course of scoping discussions related to this Interim TA. The junctions have been modelled using industry-standard Transport Research Laboratory (TRL) ARCADY and PICADY software and JCT LinSig software.

Assessment Periods

Junction modelling has been carried out for both the weekday AM and PM peak periods. The traffic survey data described in Chapter 2 has been used to identify the current peak hours on the local highway network, including the two strategic junctions being the M1 Junction 40 (Flushdyke Interchange) and the M62 Junction 28 (Tingley Interchange).

As described previously, the AM and PM peak periods identified for the junction assessments are:

- Weekday (AM network peak) – 07:30-08:30 hours; and
- Weekday (PM network peak) – 16:45-17:45 hours.

Assessment Scenarios

In order to accurately assess the impact of the indicative masterplan proposals, and in line with the DfT Circular 02/2013, 'The Strategic Road Network and the Delivery of Sustainable Development' (September 2013) (paragraph 25), it has been agreed with KC Highways that the future assessment years are 2020 and 2030, which is also consistent with the future years contained within the Council's SATURN strategic traffic model.

For the purpose of this assessment, by 2020, the following elements of the indicative masterplan proposals are expected to have come forward (approximate):

- **Area 1** – Up to approximately 250 residential dwellings accessed via Heybeck Lane;
- **Area 2** – Up to approximately 30 ha of employment land accessed via Leeds Road (North) and Owl Lane;
- **Area 3** – Up to approximately 5 ha of employment land accessed via Leeds Road (South) and Owl Lane;
- **Area 4** – No development;
- **Area 5** – Up to approximately 230 residential dwellings accessed via Chidswell Lane; and
- **Total by 2020** – Up to approximately 480 residential dwellings and 35 ha of employment land.

The quantum of employment development described above is considered unlikely to be delivered by 2020 and is therefore considered to represent a theoretical 'worst case' scenario from a transport and highways perspective.

For the purpose of this assessment, by 2030, the following elements of the indicative masterplan proposals are expected to have come forward (approximate):

- **Area 1** – Up to approximately 250 residential dwellings accessed via Heybeck Lane;
- **Area 2** – Up to approximately 30 ha of employment land accessed via Leeds Road (North) and Owl Lane;
- **Area 3** – Up to approximately 5 ha of employment land accessed via Leeds Road (South) and Owl Lane;
- **Area 4** – Up to approximately 1,035 residential dwellings accessed via Leeds Road (South) and Owl Lane;
- **Area 5** – Up to approximately 250 residential dwellings accessed via Chidswell Lane; and
- **Total by 2030** – Up to approximately 1,535 residential dwellings and 35 ha of employment land.

Paragraph 27 of the DfT Circular 02/2013 states:

> *"Where the overall forecast demand at the time of opening of the development can be accommodated by the existing infrastructure, further capacity mitigation will not be sought".*

In light of this, it is understood that mitigation will only be required if the potential emerging masterplan proposals result in any of the tested junctions operating beyond their theoretical capacity in the agreed opening year (mitigating the impact of the scheme proposals).

Therefore the following assessments have been undertaken:

- Base Assessment (2016/2020/2030) – Observed traffic flows
  - Weekday AM Peak (07:30-08:30 hours); and
  - Weekday PM Peak (16:45-17:45 hours).
- 2020 Base with Development Assessment – Observed traffic flows plus development traffic
  - Weekday AM Peak (07:30-08:30 hours); and
  - Weekday PM Peak (16:45-17:45 hours).
- 2030 Base with Development Assessment – Observed traffic flows plus development traffic
  - Weekday AM Peak (07:30-08:30 hours);
  - Weekday PM Peak (16:45-17:45 hours).

The above scenarios have been discussed and agreed in principle with KC Highways.

Base Year Traffic Data

As previously stated, surveys were carried out at several agreed junctions within the site's surrounding area on Thursday 5 May 2016. The results of these surveys form the 2016 baseline for this modelling assessment.

Committed Development

The first step in modelling the impact of the indicative masterplan proposals is to identify any background growth and future changes in traffic levels, resulting from overall population growth

and any changes to traffic patterns brought about through local investment and network improvement projects.

Following discussions with KC Highways officers, it was determined and agreed that the KC SATURN strategic traffic model of the wider area should be used for determining future travel volumes and trip patterns. The model, built in 2014 by KC's transport consultants, includes a 2014 base scenario as well as two future year scenarios, both broadly coinciding with the construction milestones of the proposed site, in 2020 and 2030.

The model was originally used to evaluate the likely impact of a range of local highway improvements which will be in place by 2020 and 2030 and as such is considered to be a robust indicator of background growth to be used as a benchmark of changes in traffic patterns resulting from the introduction of the proposed scheme.

Following discussions with both KC Highways officers and its transport consultants, it was agreed that WYG would have access to the SATURN model and would be able to use its outputs in order to generate data on future background vehicle flows (i.e. committed development flows plus traffic growth), which can then be applied to the various junctions assessed in this assessment.

Further details relating to how the committed development traffic has been extracted from the SATURN model are contained within Chapter 5 of this Interim TA report.

Off-Site Junction Assessment Results

A capacity assessment has been carried out of a number of key junctions within the surrounding highway network of the site, which were agreed further to discussions with KC Highways officers, might be impacted by the potential traffic generated as a result of the indicative masterplan proposals.

The key off-site junctions included within this assessment were as follows:

1. M1 Junction 40 (Flushdyke Interchange) – signal controlled junction;
2. M62 Junction 28 (Tingley Interchange) – signal controlled junction;
3. A653 Leeds Road / Heybeck Lane – signal controlled junction;
4. A653 Leeds Road / Chidswell Lane – priority T-junction;
5. A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – signal controlled junction;
6. B6128 Owl Lane / Windsor Road – priority T-junction; and
7. A638 Wakefield Road / A638 Chancery Road / B6128 Owl Lane / B6128 Leeds Road – priority roundabout.

The results of this exercise indicate that the majority of these junctions have the potential to operate at or within capacity levels in all scenarios including within the future year 2030, once the estimated development traffic and background growth has been added to the 2016 observed flows. These junctions include the M1 J40, the M62 J28 and the Leeds Road / Heybeck Lane signalised junctions; and the Leeds Road / Chidswell Lane priority T-junction. It is worth noting that the signal controlled junctions would require optimisation/re-validation of the signals so as to maximise the vehicle throughput and achieve these results in terms of capacity.

The results of the assessment of the three junctions along Owl Lane suggest that, generally, these junctions would operate at capacity until the future year 2020 (with and without development traffic). However, in the future year 2030 scenarios, these junctions would become over saturated even without development traffic, which would be a result of the projected background growth in the area. This indicates that there will be a shortage in capacity regardless of whether the indicative masterplan proposals are brought forward, and that the addition of the future development traffic would only exacerbate an underlying issue.

Proposed Site Access Junction Assessment Results

A capacity assessment has been carried out of the potential five accesses proposed as part of the indicative masterplan proposals.

The junctions included within this assessment were as follows:

- Proposed site access via Heybeck Lane - priority T-junction;
- Proposed site access via Leeds Road (North) – signal controlled junction;
- Proposed site access via Leeds Road (South) – signal controlled junction;
- Proposed site access via Chidswell Lane - priority T-junction; and
- Proposed Site Access via Owl Lane - priority roundabout.

The results from the junction capacity assessments show that all proposed site accesses would operate well within capacity (less than 90% 'Degrees of Saturation' (DoS) or 0.85 'Ratio of Flow to Capacity' (RFC) on all lanes) in both future year scenarios, 2020 and 2030, once the estimated development traffic and background growth has been added to the 2016 observed flows.

1 Introduction

Overview

1.1 WYG is commissioned by the Church Commissioners for England (the 'Commissioners') to prepare an Interim Transport Assessment (TA) in connection with proposals for a new major mixed-use residential and employment masterplan development at land situated to the north-east of Chidswell, near Dewsbury, West Yorkshire (hereafter referred to as 'Land at Chidswell' and the 'site').

1.2 The Local Planning Authority is Kirklees Council (KC) and the Local Transport and Highways Authority is KC Highways.

1.3 This Interim TA has been prepared to consider the transport and highway implications arising from the potential future masterplan development at the site.

Background

1.4 The Commissioners has strategic land holdings in Chidswell, Dewsbury, situated within Kirklees District (the 'District'). The site, known as Land at Chidswell, is situated to the north-east of Dewsbury town centre and north-east of the village of Chidswell, and is to the east of the A653 Leeds Road, connecting Leeds and Dewsbury. The site extends from Heybeck Lane to the north, Chidswell Lane and Owl Lane to the south and east and Leeds Road to the west. In 2013 WYG, as SBA, produced a 'Transport Feasibility Study and Sustainable Transport Strategy' report in connection with proposals for a major strategic development at the site.

Previous Masterplan Proposals

1.5 As detailed in the 2013 WYG report, the KC Strategic Housing Land Availability Assessment (SHLAA) (October 2010) identified the potential to provide up to 2,445 new homes at the site. The previous KC Core Strategy (CS) Development Plan Document (DPD) (March 2012) identified the site as a strategic location for growth, and that it has the potential to accommodate a development of some 35 hectares (ha) of non-residential (employment) land use and some 500 residential dwellings. In response to this, three Indicative Concept Masterplan options were previously developed in 2012/2013 which were:

- **Option A** – A previous CS DPD compliant Concept Masterplan scheme comprising approximately 35 ha of employment land plus approximately 500 residential dwellings;
- **Option B** – A Concept Masterplan scheme comprising approximately 35 ha of employment land plus approximately 1,050 residential dwellings; and
- **Option C** – A Concept Masterplan Scheme comprising approximately 35 ha of employment land plus approximately 1,800 residential dwellings.

1.6 The Indicative Concept Plans for each development option identified areas of land that could be developed, the locations of site accesses and potential site layouts. The Indicative Concept Plans included arrangements for traffic circulation within the site, corridors for walking and cycling and for providing linkages with surrounding communities, and provision of a local centre and other

community facilities which, it is considered, could be supported by the residential and employment development. Masterplan Options B and C also included the provision of a new primary school.

Previous WYG Transport Feasibility Study and Sustainable Transport Strategy Report (2013)

1.7 The 2013 WYG report concluded that a comprehensive and overarching Sustainable Transport Strategy would be required to actively promote and encourage travel to and from the site by 'sustainable' (i.e. non-car) travel modes, such as walking, cycling and public transport. This would aim to reduce the overall impact of the masterplan scheme on the surrounding local and strategic road networks.

1.8 The previous 2013 WYG report identified that there are numerous services and facilities located within recommended walking, cycling and public transport travel times. It concluded that the site is highly accessible and conveniently located in relation to Department for Transport (DfT) core services and facilities.

1.9 The previous 2013 WYG report recognised that there is great potential with the site to encourage a significant modal shift away from single occupancy car use towards sustainable modes, including 'active' travel modes such as walking and cycling. It also concluded that the proposed Masterplan options (whether Option A, B or C) would likely create the need to enhance existing bus services and to improve existing bus frequencies to key local destinations. Public transport penetration into the site was also considered, together with the potential provision of a new shuttle bus, linking the masterplan site with the nearby Dewsbury Railway Station.

Current WYG Accessibility and Connectivity Review Technical Note (December 2015)

1.10 In December 2015, WYG prepared an 'Accessibility and Connectivity Review' Technical Note (TN) which was submitted to the Council in January 2016. This Technical Note, included in **Appendix A**, considers two new concept masterplan options that have been developed of the Commissioners, developed by John Thompson and Partners (JTP), and how they contribute to addressing future employment and housing demand in the area. The TN also provides confirmation of the proposed points of access/egress to/from the site in the context of the latest concept masterplan options.

1.11 The December 2015 Accessibility and Connectivity Review TN includes an update to the relevant chapters of the 2013 WYG Transport Feasibility Study and Sustainable Transport Strategy report prepared by WYG relating to accessibility and connectivity, including to Dewsbury town centre. Furthermore, the TN includes an audit of existing key local facilities and services, including employment; primary, secondary and further education; healthcare; retail; and recreation and leisure.

WYG Interim TA Scoping Note (April 2016)

1.12 On 21 April 2016, WYG submitted an Interim TA Scoping Note in relation to the current indicative masterplan proposals. This Scoping Note, included at **Appendix B**, sets out the proposed scope of the Interim TA, based on previous technical notes and discussions with KC officers.

Report Structure

1.13 Following this introductory chapter, the remainder of this Interim TA is structured as follows:

- **Chapter 2: Existing Transport Situation** – This chapter provides an outline and review of the existing, or 'baseline', transport conditions prevailing at the site and within the immediate surrounding area.
- **Chapter 3: Indicative Masterplan Proposals** – This chapter provides an outline of the indicative masterplan proposal including proposed access/egress arrangements and relevant parking requirements.
- **Chapter 4: Trip Assessment and Distribution** – This chapter presents the outcome of an initial multi-modal trip generation assessment carried out to identify the potential future trip patterns associated with the indicative masterplan proposals at the site.
- **Chapter 5: Highway Impact Assessment –** This chapter presents capacity testing of proposed site access/egress arrangements and other highway junction models in close vicinity of the site and identifies whether they have sufficient capacity with the additional development traffic flows; and
- **Chapter 6: Summary and Conclusions** – This chapter provides a summary and conclusion by highlighting the key points raised within the report.

1.14 Technical appendices (A and B) are included at the end of this Interim TA report for reference.

2 Existing Transport Situation

Introduction

2.1 This chapter of this Interim TA establishes the existing, or 'baseline', transport conditions currently prevailing at the site and within the surrounding area. It describes the existing conditions, also covering 'sustainable' (i.e. non-car) modes, including 'active' travel modes, such as walking and cycling.

2.2 Baseline studies have been informed by the WYG 'Accessibility and Connectivity' TN (December 2015) (submitted to the Council in January 2016), the subsequent Interim TA Scoping Note (April 2016) and a desk-based research exercise carried out up to July 2016.

Site Location and Description

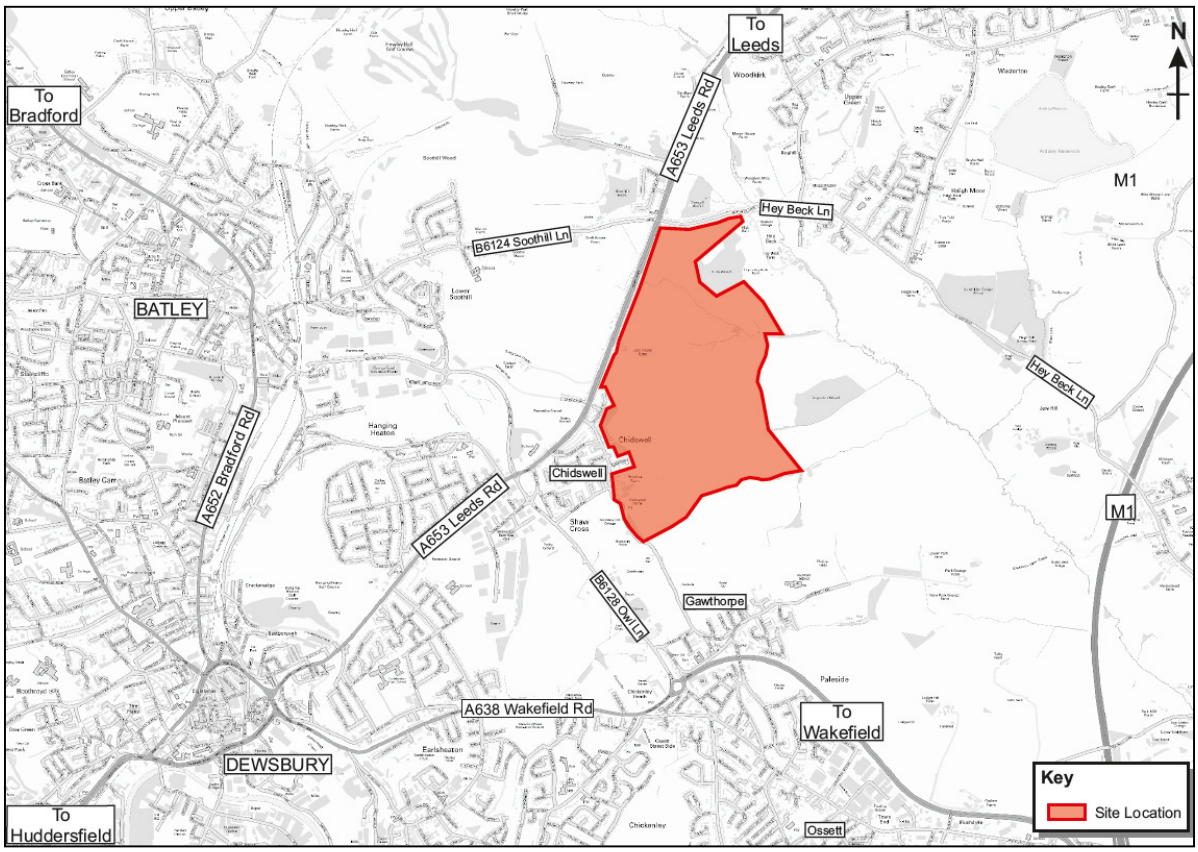
2.3 The site is located to the east of the A653 Leeds Road which is a strategic corridor between Dewsbury and Leeds. In the immediate vicinity of the site, Leeds Road runs in the north-south direction adjoining the A638 Wakefield Road in the south and the Junction 28 (Tingley Interchange) of the M62 Motorway to the north. In addition, the A638 Wakefield Road links with Junction 40 (Flushdyke Interchange) of the M1 Motorway to the east of the site.

2.4 The site extends to Heybeck Lane to the north and Chidswell Lane to the south. Chidswell Lane provides access back onto Leeds Road to the south-west of the site and to the B6128 Owl Lane, via Windsor Road, to the south. Owl Lane in turn connects to the A638 Wakefield Road to the east, which connects to the M1 Junction 40, and heads towards Ossett to the west.

2.5 To the east of the site there is land predominantly in agricultural uses.

2.6 A detailed site location plan is provided in **Figure 2.1**.

Figure 2.1 Detailed Site Location Plan



Source: Contains Ordnance Survey data © Crown copyright and database right 2016.

Local Highway Network and Strategic Transport Corridors

2.7 The A653 Leeds Road is a two-lane dual carriageway providing access between Leeds and the M62 Junction 28 (Tingley Interchange) to the north and the town of Dewsbury to the south. The site is fronted by residential properties and also has a number of small farm accesses, including access to Lees House Farm which forms part of the Masterplan site.

2.8 South of the site, Leeds Road becomes a single carriageway road with a single lane of traffic in each direction. It continues to be fronted by residential properties although various local shops and facilities are provided between the site and Dewsbury town centre. As Leeds Road enters Dewsbury town centre, it meets the Dewsbury Ring Road which is dual carriageway with limited frontage.

2.9 The B6128 Owl Lane is a single carriageway road with a single lane of traffic in each direction. It connects the A653 Leeds Road with the A638 Wakefield Road. The junction of Leeds Road and Owl Lane a signalised crossroads.

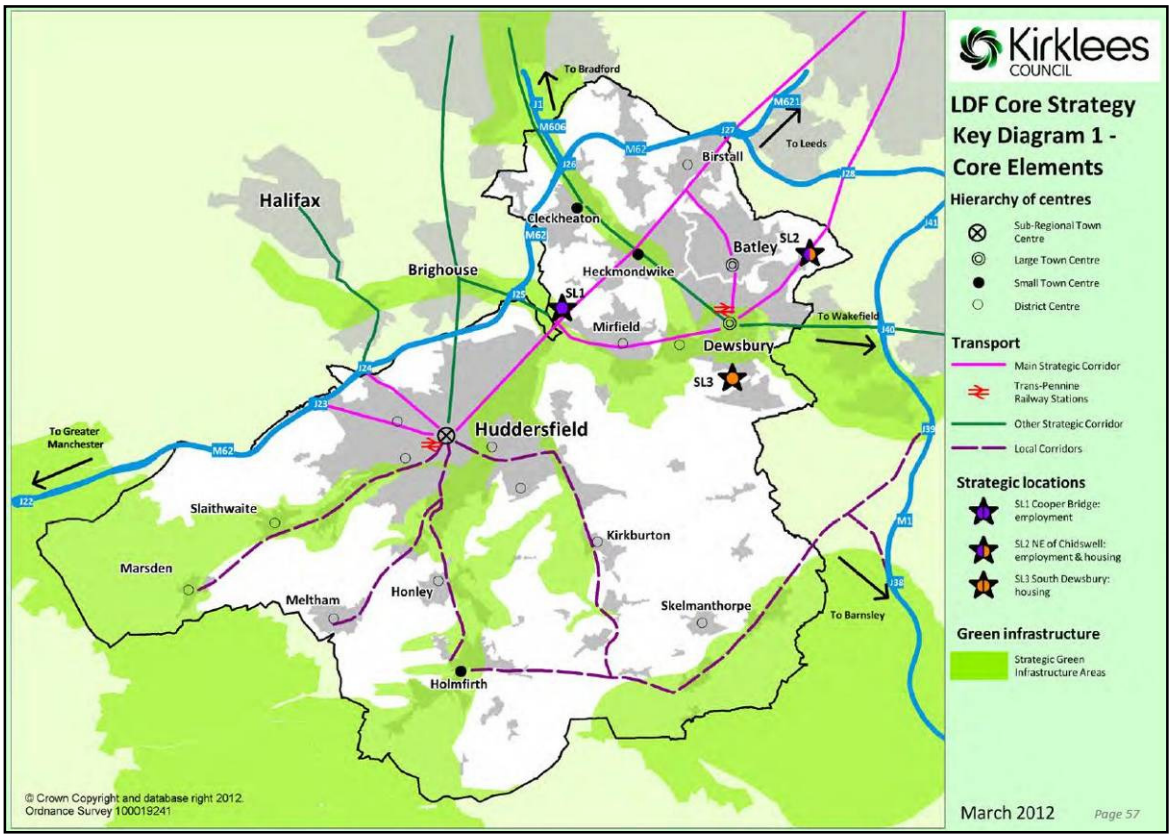
2.10 The Leeds City Regional Transport Strategy (RTS) (October 2009) as well as the KC CS DPD (p. 99 'Core networks') (2012) identify strategic transport corridors. These corridors, which include road and rail routes, connect Leeds to the north with Bradford, Wakefield, Halifax and the main towns

within Kirklees District, including Dewsbury and Huddersfield, with the Highways England (HE) Strategic Road Network (SRN).

2.11 The site is situated within the Leeds – North Kirklees – Huddersfield – Manchester transport corridor, which is identified as the main strategic corridor in Kirklees District as it links the major towns with the adjoining regional centres. This corridor comprises several transport routes within Kirklees including strategic roads and the TransPennine Railway. The proposals for development in the KC CS have as far as possible been linked with this main corridor, both to take advantage of the highest quality transport links in the District and to ensure new developments are well connected and sustainable.

2.12 Key strategic corridors are highlighted in pink on the LDF Core Strategy diagram shown in **Figure 2.2**; the Masterplan site is also highlighted as 'Site SL2: North East of Chidswell employment & housing'. The proposals for development in the core strategy have as far as possible been linked with this main corridor, both to take advantage of the highest quality transport links and ensure new development proposals are well connected.

Figure 2.2 Core Strategy Key Diagram 1: Core Elements



Source: Kirklees Council, March 2012.

Public Transport Services

Bus Services

2.13 The site is situated within a pivotal point on the local bus network, being served by a large number of bus routes providing key convenient links to major employment areas and town centres elsewhere in the District and beyond. There are various existing bus stops located within close proximity to the Masterplan site, including at the northern, western and southern edges of the site, with bus stops situated along the A653 Leeds Road, Heybeck Lane and Chidswell Lane respectively.

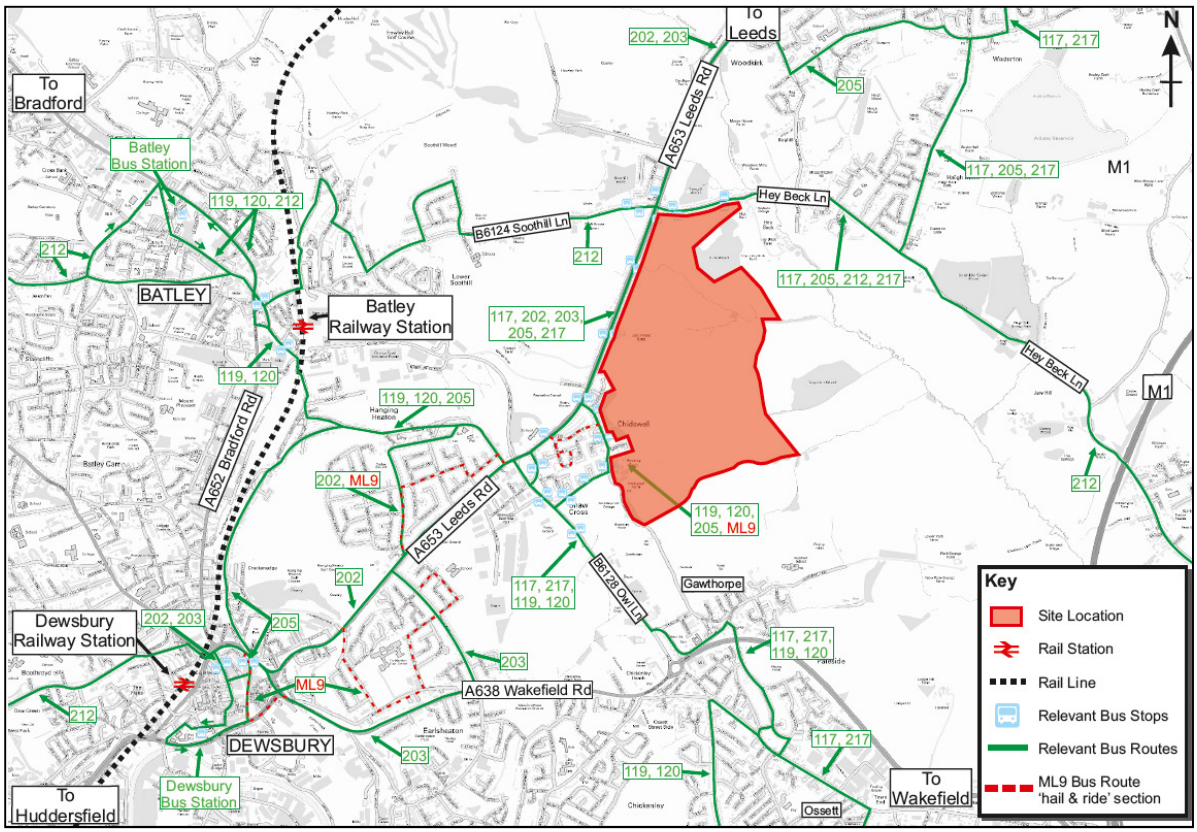
2.14 The northern part of the site is served by local bus routes 117, 205, 212 and 217 in both directions along Heybeck Lane. Routes 117 and 217 connect Wakefield with Leeds via Chidswell; route 205 connects Dewsbury with Pudsey; and route 212 connects Wakefield with Batley, to the west, providing a direct bus service between the Masterplan site and Batley Rail Station.

2.15 The site's western edge, along Leeds Road, has three bus stops. These are served by routes 117, 202, 203, 205 and 217; routes 202 and 203 run from Huddersfield to Leeds via Dewsbury, all major nearby employment centres.

2.16 The site's southern edge is also served by route 205 and additionally routes 199, 120 and ML9. Route ML9 connects Chidswell with Dewsbury town centre by five buses a day (Monday to Saturday), once an hour between 10:00 and 14:00 hours, offering a 'hail and ride' service for most of the route. Routes 199 and 120 link Wakefield to Batley via Chidswell.

2.17 **Figure 2.3** shows the various bus routes connecting the site. **Table 2.1** provides a summary of existing bus services passing the site, including their typical Monday to Saturday daytime and evening, and Sunday, frequencies, and closest bus stops to the site.

Figure 2.3 Bus Stops Surrounding the Site



Source: Contains Ordnance Survey data © Crown copyright and database right 2016.

Table 2.1 Summary of Existing Bus Services Surrounding the Site

Bus Route	Route Description	Frequency (minutes)			Closest Bus Stop
		Monday to Saturday		Sunday	
		Daytime	Evening		
117/217	Wakefield - Ossett Bus Stn - Chidswell - White Rose Centre - Leeds City Bus Stn	60	60	60	Heybeck Lane / Leeds Rd / Chidswell
119/120	Wakefield Bus Stn - Horbury Jnc - Ossett Bus Stn - Owl Ln - Batley Bus Stn	60	60	-	Chidswell
202/203	Huddersfield Bus Stn - Dewsbury Bus Stn - Chidswell - White Rose Centre - Leeds City Bus Stn	15	30	30	Leeds Rd
205	Dewsbury - Chidswell - Morley Town Hall - Gildersome Green - Pudsey Bus Stn	60	-	-	Heybeck Lane / Leeds Rd / Chidswell
212	Dewsbury Bus Stn - Batley Bus Stn - Babes in the Wood - Wakefield Bus Station	60	60	60	Heybeck Lane
ML9	Dewsbury Long Causeway - Bennet Lane - Chidswell - Bendigo Road - Dewsbury	60	60	-	Chidswell

2.18 Chidswell is placed in a strategic location and benefits from bus services to Dewsbury, Batley, Leeds, Wakefield and Huddersfield. **Table 2.2** includes the average journey times from Chidswell to the main attractors in the area.

Table 2.2 Average Journey Times from Chidswell

Destination	Average Journey Time (minutes)
Dewsbury	13
Batley	15
Leeds	39
Wakefield	50
Huddersfield	60

Rail Services

2.19 There are two mainline railway stations located within relatively short distances from the site. Batley Railway Station is located approximately 3km to the west and Dewsbury Railway Station is located approximately 4km to the south-west. Both stations can be accessed by existing bus routes and bus stops are provided close to both stations; Dewsbury Station also has a dedicated public transport interchange facility located directly outside the station.

2.20 To access Batley Station from the site passengers could use routes 119 or 120 from the southern side of the site or route 212 from the northern side of the site. Dewsbury Station can be accessed via routes 202, 203 and 205. Figure 2.3 shows the location of these two rail station.

2.21 Both Dewsbury and Batley stations are served by the Northern Rail Train Operating Company (TOC) and are served by half hourly daytime services to both Leeds and Huddersfield (calling at most intermediate stations). In addition, Dewsbury Station, which is also served by the First TransPennine Express TOC, also provides fast train services to Leeds, Huddersfield, Manchester Piccadilly, York and Newcastle.

2.22 **Table 2.3** provides a summary of typical journey times by rail from both Batley and Dewsbury rail stations.

Table 2.3 Typical Journey Times from Batley and Dewsbury Railway Stations

Origin	Destination	Average Journey Time (minutes)
Batley	Leeds	18
	Huddersfield	24
	Manchester Victoria	87
Dewsbury	Leeds	15
	Huddersfield	9
	York	45
	Manchester Piccadilly	43
	Newcastle	120

Walking and Cycling Networks and Facilities

Pedestrian Networks and Facilities

2.23 According to the Department for Transport (DfT), walking is considered to be the most important mode of travel at the local level with the greatest potential to replace short car trips, particularly under 2 kilometres. WYG has carried out an accessibility appraisal of the site in accordance with DfT accessibility criteria identifying the various services and destinations accessible within various walking and cycling catchments from the site. Within 2km of the site, which equates to a less than half an hour walk, Chidswell village, Hanging Heaton, Ossett Street Side and parts of West Ardsley can all be reached.

2.24 The Chartered Institution of Highways & Transportation (CIHT) Guidance 'Planning for Walking' also states the following:

> *"Across Britain about 80 per cent of journeys shorter than 1 mile are made wholly on foot"*

2.25 This would indicate that a large percentage of the trips within the site itself and within a 1 mile radius of the site would be made on foot.

2.26 The majority of roads surrounding the site, including Leeds Road, Heybeck Lane, Chidswell Lane and Windsor Road, have footways provided on both sides of the carriageway to facilitate pedestrian movement, as confirmed during the two initial WYG site visits, carried out on Tuesday 20 November 2012 and Thursday 24 January 2013, subsequent site visits and desk-based research.

2.27 Along the A653 Leeds Road, good quality wide footways are provided on both sides of the carriageway. Pedestrian crossing facilities are also provided at various junctions, to provide pedestrian connectivity. Leeds Road is well lit and is considered safe for pedestrians.

2.28 Heybeck Lane also provides good quality wide footways on both sides of the carriageway. It is also well lit making this a safe walking environment for pedestrians.

2.29 Chidswell Lane provides good quality footways on both sides of the carriageway, which are considered sufficiently wide for high volumes of pedestrian traffic and are also well lit.

Cycle Network and Facilities

2.30 According to the DfT, cycling has potential to replace short car trips, particularly those under 5km. The 5km cycling catchment from the site includes Dewsbury, Batley, Morley, East Ardsley, Ossett and parts of Wakefield.

2.31 Appropriate cycling provision is available in the local area with cycle lanes being provided on Leeds Road in order to promote cycling.

2.32 In addition, towns such as Wakefield, Horbury, Morley and Middleton can all be reached by bicycle within 30 minutes via existing safe cycle routes and Public Rights of Way (PRoWs).

2.33 Furthermore, the site is surrounded by, and connected to various destinations by various National Cycle Network (NCN) routes. NCN route 69 connects Dewsbury with Ravensthorpe and, in turn via NCN route 66, with Huddersfield and Bradford. NCN route 69 also connects Dewsbury with Ossett and, in turn via NBCN route 699, to the 'Wakefield Wheel'. Finally, to the north of the site, there are several local traffic-free cycle routes that link Tingley to Beeston and Middleton to Leeds city centre.

2.34 Furthermore, to the north of the site, there are several local traffic-free routes that also link Tingley to Beeston and Middleton to Leeds City Centre.

Access to Services

DfT Core Accessibility Indicators

2.35 The DfT publishes 'Core Accessibility Indicators' as ways of measuring accessibility from a site by walking, cycling, public transport and car/van to various types of services, namely employment centres; primary, secondary and further education; healthcare including GP surgeries and hospitals; and retail including food stores and town centres. Recommended, and maximum acceptable, travel times are given for each type of services.

2.36 The eight DfT key services and facilities are:

- Employment centres;
- Primary schools;

- Secondary schools;
- Further education institutions (e.g. colleges, universities);
- GP surgeries;
- Hospitals,
- Food stores / supermarkets; and
- Town centres.

2.37 WYG has carried out a Geographic Information Systems (GIS) modelling exercise in order to identify the accessibility of the site to the various types of services and facilities, to compare with the recommended and maximum DfT travel times. The various GIS accessibility map outputs that accompany this accessibility assessment are included at Appendix A of the WYG Accessibility and Connectivity Review TN (December 2015), included at **Appendix A** of this Interim TA report.

Methodology

Site Selection

2.38 The DfT Accessibility Destinations for the assessment (with data from June 2011) was used to identify the locations of the various types of services and facilities, including primary schools; secondary schools; further education institutions; GP surgeries; hospitals; and town centres.

2.39 The DfT data does not provide a comprehensive record of employment destinations in the local area. Therefore, in order to establish the various employment destinations a desk-top based research exercise was carried out, where general areas of employment were located and a primary 'access point', to act as a proxy for the purposes of the GIS mapping exercise, were selected. The access point to each employment site was taken to be the nearest point to the site that could be reached by the existing highway network.

2.40 The locations of existing food stores / supermarkets were determined through a similar research exercise together with reviewing historic DfT food store data available. The historical data was checked and updated for the immediate surroundings of the site using a Google Maps search and Google Street View for large food stores (i.e. supermarkets) and smaller food stores (i.e. local convenience stores).

2.41 Whilst every effort has been made to ensure that this data is up to date, there is still the possibility that some services have been opened or closed that are not captured. However, this has been considered to be a typical scenario.

Walking Journey Times

2.42 To calculate the walking times to the destinations a network based on OpenStreetMap data was updated to ensure it included designated Public Rights of Way (PROW) in the area. Journeys were taken from the site origin and routes were taken from there as straight lines to the main site accesses and any other points where the site boundary intersected existing PROWs. The distance travelled to each destination was converted to a time using the walking speed of 4.8km/h.

Cycling and Public Transport Journey Times

2.43 The cycle and public transport journey times were generated using the Transport Direct Batch Journey Planner. The origin was taken as the point on the main road where the site accesses are proposed to be located. Furthermore, an additional journey time of 6 minutes for walking (to

public transport) and 2.5 minutes for cycling were added to account for this link to the journey times generated by Transport Direct. The input to transport direct was the eastings / northings of each of the destination points. The default option of the cycle journey planner (on the Transport Direct Batch Journey Planner) prioritises the use of cycle paths, cycle lanes, quiet streets and routes recommended for cycling, and where possible avoids steep hills. The cycle journey results on Transport Direct take into account the input cycle speed, 12km/h (in accordance with DfT), the gradient of the paths and roads and appropriate speeds for those paths and roads.

2.44 The public transport routes that were selected had up to two changes and allowed the use of both bus and rail.

DfT Core Accessibility Summary Results

Summary of Results

2.45 The travel time indicators measure the time taken for users to reach the nearest service. The DfT recommended and maximum acceptable journey times are set out in **Table 2.4**. Also shown in this table is the number of centres identified to be within both the recommended and maximum acceptable journey times.

Table 2.4 DfT Core Accessibility Indicators and Centres Identified

Service	DfT Travel Time Indicator (min)		Number of Centres Identified	
	Recommended Travel Time	Maximum Travel Time	Within the Recommended Travel Time	Within the Recommended & Maximum Travel Time
Employment	20	40	7	25
Primary School	15	30	11	73
Secondary School	20	40	4	21
Further Education	30	60	9	27
GP Surgeries	15	30	7	46
Hospitals	30	60	2	7
Food Stores	15	30	7	37

Public Transport

2.46 **Table 2.5** provides a summary of the service centres located within the recommended and maximum travel time when travelling by public transport.

Table 2.5 Service Centres Reached by Public Tranport

Service	Number of Centres Identified	
	Within the Recommended Travel Time	Within the Recommended & Maximum Travel Time
Employment	3	13
Primary School	2	21
Secondary School	2	8
Further Education	2	16
GP Surgeries	0	11
Hospitals	0	4
Food Stores	2	13
Town Centres	0	2

Cycling

2.47 **Table 2.6** comprises a summary of the service centres that can be reached by cycle within the recommended and maximum travel time.

Table 2.6 Service Centres Reached by Cycle

Service	Number of Centres Identified	
	Within the Recommended Travel Time	Within the Recommended & Maximum Travel Time
Employment	6	23
Primary School	11	71
Secondary School	3	20
Further Education	9	25
GP Surgeries	7	41
Hospitals	2	6
Food Stores	7	34
Town Centres	1	7

Walking

2.48 **Table 2.7** comprises a summary of the service centres that can be reached on foot within the recommended and maximum travel time.

Table 2.7 Service Centres Reached on Foot

Service	Number of Centres Identified	
	Within the Recommended Travel Time	Within the Recommended & Maximum Travel Time
Employment	2	5
Primary School	1	7
Secondary School	0	2
Further Education	0	2
GP Surgeries	0	1
Hospitals	0	2
Food Stores	1	4
Town Centres	0	0

2.49 As noted above, the various GIS accessibility map outputs that accompany this accessibility assessment are included at Appendix A of the WYG Accessibility and Connectivity Review TN (December 2015), included at **Appendix A** of this Interim TA report.

Baseline Traffic Surveys

2.50 In order to inform the traffic modelling aspects of this Interim TA, WYG recently commissioned Nationwide Data Collection Ltd (NDC), an independent transport survey company and one of WYG's approved sub-consultants, to carry out various traffic turning count and traffic queue length surveys at 10 key junctions in the area surrounding the site (the majority of these junctions were subsequently modelled, as agreed with KC Highways officers). The scope of the surveys was agreed with KC Highways officers in advance.

2.51 Surveys were carried out Thursday 5 May 2016 at the following agreed junctions:

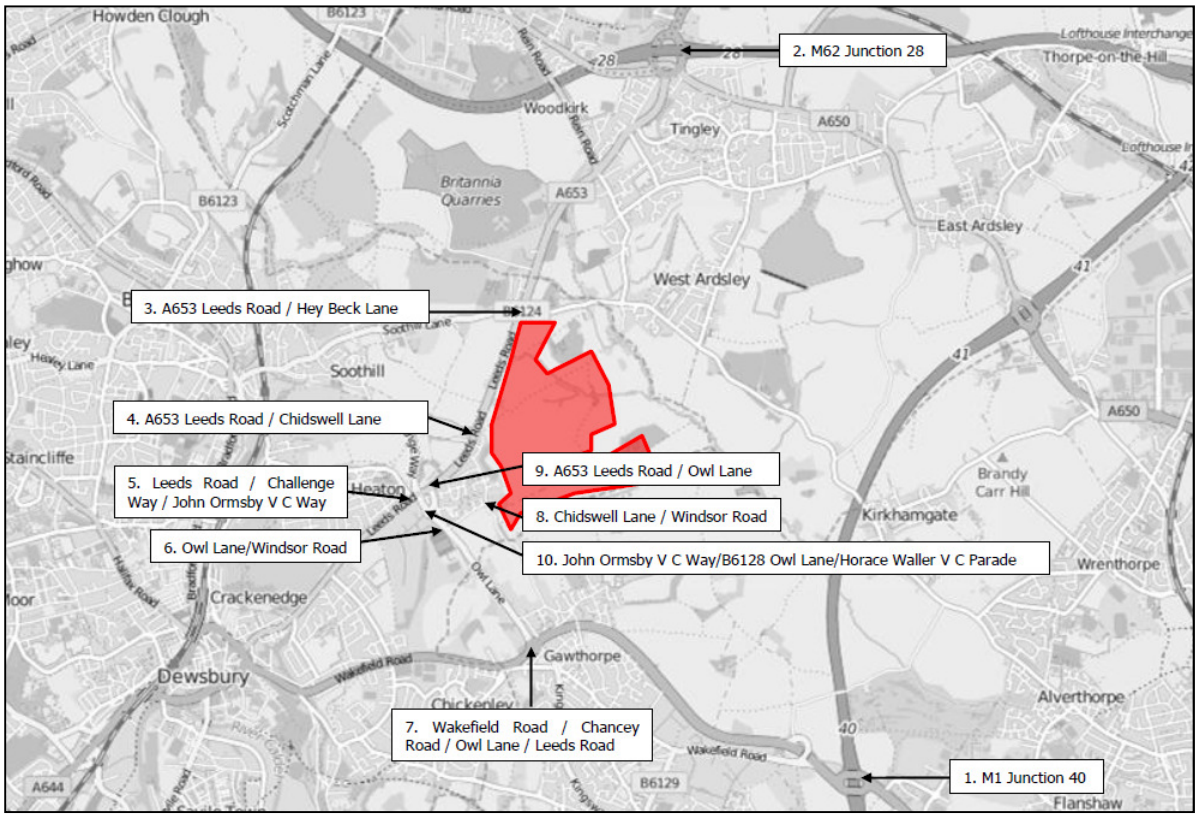
1. M1 Junction 40 (Flushdyke Interchange) – signal controlled roundabout;
2. M62 Junction 28 (Tingley Interchange) – signal controlled roundabout;
3. A653 Leeds Road / Heybeck Lane – signal controlled junction;
4. A653 Leeds Road / Chidswell Lane – priority T-junction;
5. A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – signal controlled junction;
6. B6128 Owl Lane / Windsor Road – priority T-junction;
7. A638 Wakefield Road / A638 Chancery Road / B6128 Owl Lane / B6128 Leeds Road – priority roundabout;
8. Chidswell Lane / Windsor Road – priority T-junction;
9. A653 Leeds Road / Owl Lane – signal controlled junction; and
10. B6128 John Ormsby V C Way / B6128 Owl Lane / Horace Waller V C Parade – priority roundabout.

2.52 Surveys at each junction were carried out over a continuous 12 hour period covering each junction arm to record demand and queuing, with data analysed for three hours in the morning (AM),

between 07:00-10:00 hours, and three hours in the afternoon/evening (PM), between 16:00-19:00 hours, coinciding with the AM and PM peak periods respectively.

2.53 **Figure 2.4** shows the locations of junctions that were surveyed as part of the baseline transport assessment of this Interim TA.

Figure 2.4 Surveyed Junction Locations



Source: Contains Ordnance Survey data © Crown copyright and database right 2016.

2.54 Traffic surveys were undertaken on Thursday 5 May 2016. Based on this survey data, the AM peak hour was identified as 07:30-08:30 hours and the PM peak hour was identified as 16:45-17:45 hours.

3 Indicative Masterplan Proposals

Introduction

3.1 This chapter provides an overview of the indicative masterplan proposals at the site, including proposed access/egress arrangements.

3.2 The Commissioners propose a comprehensive mixed-use development comprising residential and employment land uses as well as local community facilities, including shops and a school.

Proposed Development

3.3 The current indicative masterplan proposals are for a total of 1,535 residential units. For the purpose of this Interim TA it is assumed that 80% of units will be private and 20% will be affordable. The indicative masterplan proposals also includes approximately 35 hectares (ha) of employment land, which as agreed with KC and WYG Planning has been assumed to translate to approximately 122,500 square metres (m^2) of commercial employment gross floor area (GFA). This has been agreed as acceptable by KC for the purpose of this assessment.

3.4 The employment development mix is unknown at this stage and an even split between B1(a) Business (Office) (25%); B1(c) Business (Light Industry) (25%); B2 General Industry (25%); and B8 Storage or Distribution (25%) has been utilised for the purpose of this Interim TA. The 25% x 4 assessment used is considered a robust approach as it considers a high proportion of B1(a) Business (Office) space, the highest employment trip generator of the mix. As such, the assessment considers a 'worst case' from a transport and highways perspective in terms of trip rates and trip generation.

3.5 A summary of the indicative masterplan proposals is provided in **Table 3.1**.

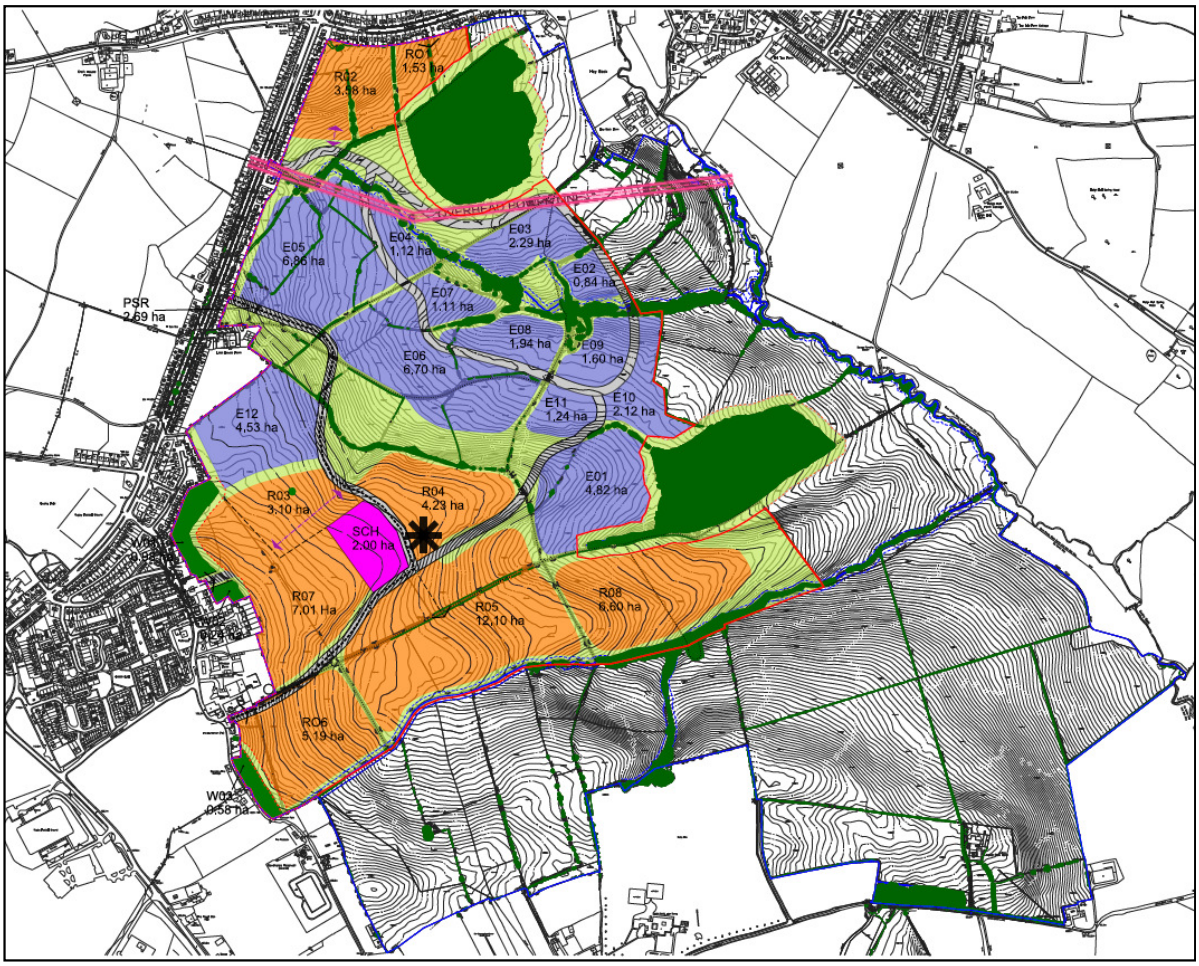
Table 3.1 Indicative Masterplan Proposals Summary

Land Use	Use Class	Split (%)	Quantum of Development
Residential (1,535 units)			
Residential Dwellings (Private)	C3	80%	1,228 units
Residential Dwellings (Affordable)	C3	20%	307 units
Total Residential		**100%**	**1,535 units**
Employment (122,500m^2)			
Business (Office)	B1(a)	25%	30,625m^2
Business (Light Industry)	B1(c)	25%	30,625m^2
General Industry	B2	25%	30,625m^2
Storage or Distribution	B8	25%	30,625m^2
Total Employment		**100%**	**122,500m^2**

Indicative Masterplan Layout

3.6 An indicative masterplan layout, prepared by John Thompson and Partners (JTP), is provided in Figure 3.1.

Figure 3.1 Indicative Masterplan Layout

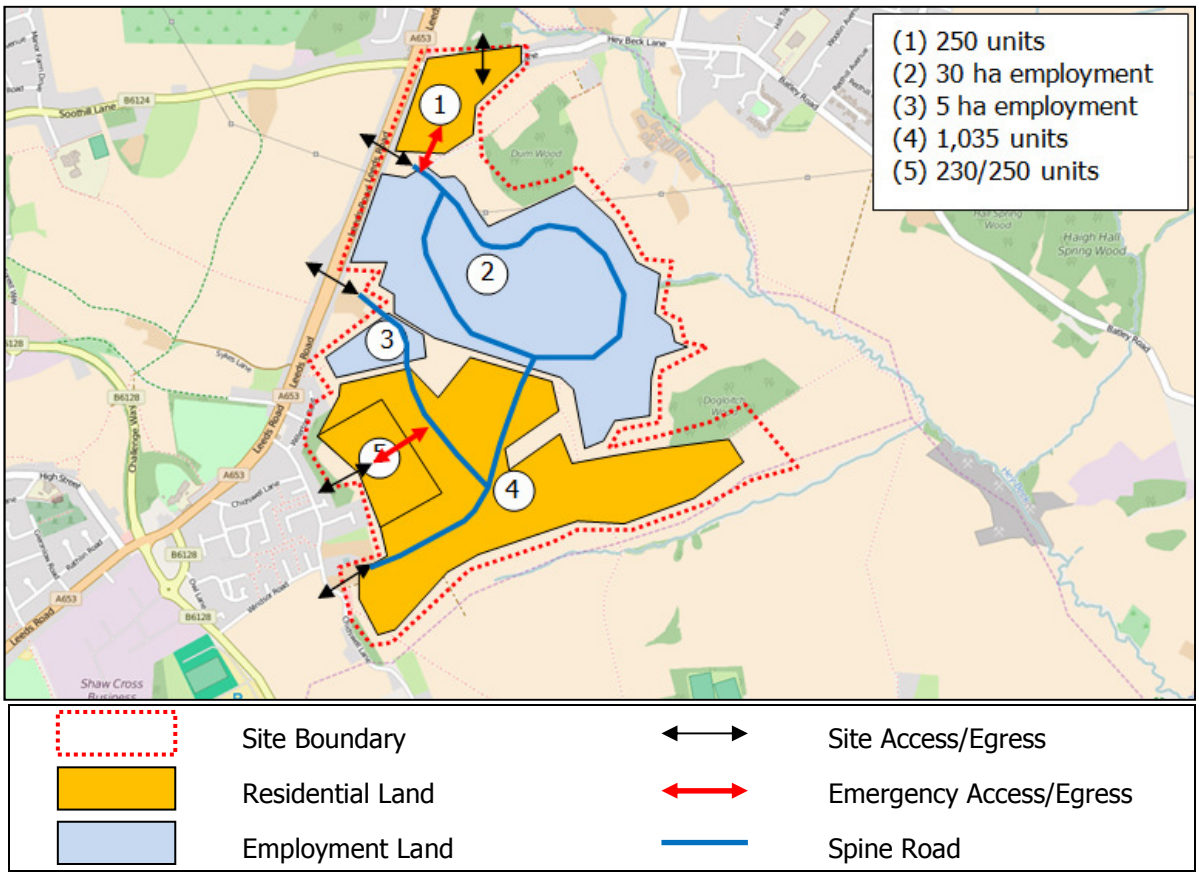


Source: John Thompson and Partners (JTP) 'Land Budget Plan' drawing no. 00974_SK035 Revision D, 8 August 2016.

Proposed Land Parcels and Access/Egress Arrangements

3.7 A schematic layout of the same indicative masterplan proposals, highlighting the five proposed site access/egress points and various land use types, is provided in **Figure 3.2**.

Figure 3.2 Schematic Masterplan Layout



Source: Contains OpenStreetMap (http://www.openstreetmap.org), February 2016; © OpenStreetMap contributors (http://www.openstreetmap.org/copyright); with WYG annotations based on John Thompson and Partners (JTP) 'Land Budget Plan' drawing no. 00974_SK035 Revision D, 8 August 2016.

3.8 As shown in Figure 3.1 and Figure 3.2, for the purpose of this assessment the masterplan is subdivided into five main areas (land parcels), comprising the following:

- **Area 1** – Up to approximately 250 residential dwellings accessed via Heybeck Lane;
- **Area 2** – Up to approximately 30 ha of employment land accessed via Leeds Road (North) and Owl Lane;
- **Area 3** – Up to approximately 5 ha of employment land accessed via Leeds Road (South) and Owl Lane;
- **Area 4** – Up to approximately 1,035 residential dwellings accessed via Leeds Road (South) and Owl Lane; and
- **Area 5** – Up to approximately 250 residential dwellings accessed via Chidswell Lane.

4 Trip Generation, Assessment and Distribution

Introduction

4.1 This chapter of the Interim TA identifies person trip rates and predicted mode splits for the site. It includes a review of the industry-standard TRICS trip rate database and Office for National Statistics (ONS) 2011 Census data, which have been used to derive the trip rates and trips. It also sets out suitable mode splits for the AM and PM peak periods as well as likely overall vehicle trip generation for the site. This chapter also outlines the method used for generating the likely distribution of trips across the local road network as well as the allocation of the trips to the site's five access and egress points.

Trip Generation Approach

4.2 For the purpose of identifying potentially suitable trip rates and modal splits for the potential future development at the site, the industry-standard TRICS trip rate database (version 2011(a) v6.11.1) and Office for National Statistics (ONS) 2011 Census data have been interrogated.

4.3 Proposed trip rates were initially set out in the WYG Interim TA Scoping Note (dated 21 April 2016). These trip rates were subsequently reviewed by KC Highways and comments were received by WYG on 23 May 2016. Revised trip rates, reflecting comments from KC Highways officers, were presented to KC Highways on 9 June 2016. These have been considered acceptable by KC officers and used for the purpose of this assessment.

4.4 ONS 2011 Census travel to work data was used to identify the likely modal split for both residents of the site as well as residents of neighbouring areas coming to the site for employment purposes. Therefore, total person trip rates were derived from TRICS with Census mode splits applied to them.

Development Proposals

4.5 For the purpose of the trip generation exercise, the study considers the indicative masterplan proposals as comprising of the following:

- **Residential Units** – Up to approximately 1,535 residential dwellings, with an assumed 80%/20% split between private and affordable housing.
- **Employment Areas** – Up to approximately 35 hectares (ha) of employment land equating to approximately 122,500m^2 Gross Floor Area (GFA), comprising a mix of office, light industry, general industry and storage/distribution, with an even split in proportions of the employment land uses. The employment development mix is unknown at this stage and an even split between B1(a) Business (Office) (25%); B1(c) Business (Light Industry) (25%); B2 General Industry (25%); and B8 Storage or Distribution (25%) has been utilised for the purpose of this Interim TA. The 25% x 4 assessment used is considered a robust approach as it considers a high proportion of B(a) Business (Office) space, the highest employment trip generator of the mix. As such, the assessment considers a 'worst case' from a transport and highways perspective in terms of trip rates and trip generation.

TRICS Trip Rate Database

Site Selection

4.6 Person trip rates from the industry-standard TRICS trip rates have been derived from selected survey sites identified as sharing characteristics similar to the indicative masterplan scheme upon first occupation, based on a number of criteria. The site selection process has been carried out in accordance with the TRICS *Good Practice Guide* (2012).

4.7 For the purposes of the trip generation assessment, the development site is identified as being within a 'Neighbourhood Centre'. In accordance with the TRICS Good Practice Guide 2012, only survey sites which are categorised as being located within a 'Neighbourhood Centre', 'Edge of Town' or 'Suburban Area', have therefore been included. Sites in town centres, edge of town centres, etc, have been excluded. Sites in Greater London and Ireland have also been excluded. Site selection focused on the North, North West Yorkshire, Midlands and East Anglia regions. Sites in Wales, Scotland and the South East were only considered where a lack of comparable sites from the northern regions was evident.

4.8 With regard to the data range, it is noted that in accordance with the TRICS Good Practice Guide, a cut-off date of 1 January 2005 should be taken into account the purpose of using only up-to-date surveys. However, in order to meet KC's preference for specific trip rates whilst ensuring that an adequate range of sites was included into the trip generation process, data from sites surveyed from 2000 was also considered.

Residential Areas – C3 Residential Dwellings

4.9 It is expected that the residential dwellings at the proposed site are likely to be made up of a mix of privately owned and affordable housing, for the purpose of this assessment, an assumed approximately 80% of the proposed dwellings being private and the remaining approximately 20% being affordable. Trip rates were therefore extracted separately out of TRICS for 'Privately Owned Houses' and 'Affordable/Local Authority Houses' to represent the two distinct trip generation patterns characteristic of the two types of dwellings.

4.10 Private housing sites were selected based on size, whereby only sites with 100 or more dwellings were considered in the trip rate calculation. A total of 12 sites were selected from the TRICS database and trip rates thus extracted were applied to 80% of the total number of proposed dwellings.

4.11 Affordable housing sites within TRICS were selected in order to identify trip patterns for the remaining 20% of the proposed units. A total of seven sites were used for this analysis with no minimum dwelling number restrictions applied during the site filtering process.

4.12 A total of 19 sites were therefore identified to represent trip generation patterns for the residential element of the indicative masterplan proposals.

Employment Areas – B1(a) Business (Office)

4.13 With regard to the proposed offices, a number of buildings occupied by separate organisations is envisaged and therefore reference to the '02 Employment - (B) Business Park' section of the database is considered appropriate. According to the above criteria, four survey sites were identified in total.

Employment Areas – B1(c) Business (Light Industry) and B2 General Industry

4.14 The 'Employment - (D) Industrial State' section of the database was considered for the trip rate generation for both the B1(c) and B2 land use types proposed within the site. This approach is considered a robust means of trip generation calculation since both land uses are expected to exhibit similar trip volumes and profiles. A total of 21 sites were identified that complied with the criteria set above.

Employment Areas – B8 Storage or Distribution

4.15 The 'Employment - (F) Warehousing (Commercial)' section of the database has been considered for the trip rate generation, where a total of three sites have been identified that complied with the criteria set above.

Total Person Trip Rates

4.16 **Table 4.1** sets out the total person trip rates for each land use as derived from the TRICS trip rate database.

Table 4.1 TRICS Total Person Trip Rates (Trips / Dwelling / 100m^2)

Land Use	Time Period	Arrivals	Departures	Total Two-Way
Residential Dwellings (Private) (C3 Use Class)	08:00 – 09:00	0.233	0.818	1.051
	17:00 – 18:00	0.605	0.390	0.995
	Daily (07:00-19:00)	**4.185**	**4.445**	**8.630**
Residential Dwellings (Affordable) (C3 Use Class)	08:00 – 09:00	0.211	0.669	0.880
	17:00 – 18:00	0.477	0.373	0.850
	Daily (07:00-19:00)	**3.472**	**3.607**	**7.079**
Business (Office) (B1(a) Use Class)	08:00 – 09:00	1.970	0.268	2.238
	17:00 – 18:00	0.218	1.627	1.845
	Daily (07:00-19:00)	**7.148**	**7.022**	**14.170**
Business (Light Industry) (B1(c) Use Class) and General Industry (B2 Use Class)	08:00 – 09:00	0.537	0.277	0.814
	17:00 – 18:00	0.170	0.486	0.656
	Daily (07:00-19:00)	**3.976**	**4.036**	**8.012**
Storage or Distribution (B8 Use Class)	08:00 – 09:00	0.045	0.022	0.067
	17:00 – 18:00	0.020	0.050	0.070
	Daily (07:00-19:00)	**1.402**	**0.962**	**2.364**

Source: TRICS 2016 v7.3.1, July 2016; Note: Arithmetic errors due to rounding.

Total Two-Way Person Trips

4.17 The total person trip rates identified in Table 4.1 have been used to derive the total number of person trips expected to be generated by a future development at the site. These two-way person trips are presented in **Table 4.2** and **Table 4.3**. Table 4.2 comprises the expected trips generated by the affordable as well as privately owned house units proposed as part of the development. The trip numbers are based on the assumption that 80% of the proposed 1,535 dwellings will be private residential units whereas 20% will be affordable housing.

Table 4.2 TRICS Total Residential Two-Way Person Trips

Residential Trips	Time Period	Arrivals	Departures	Total Two-Way
Residential (Private) (C3 Use Class) 1,228 dwellings	08:00 – 09:00	286	1005	1291
	17:00 – 18:00	743	479	1,222
	Daily (07:00-19:00)	**5,139**	**5,458**	**10,598**
Residential (Affordable) (C3 Use Class) 307 dwellings	08:00 – 09:00	65	205	270
	17:00 – 18:00	146	115	261
	Daily (07:00-19:00)	**1,066**	**1,107**	**2,173**

Source: TRICS 2016 v7.3.1, July 2016; Note: Arithmetic errors due to rounding.

4.18 Trips for each employment land use type are itemised in Table 4.3. Light Industry (B1c) and General Industry (B2) are shown with combined trips as the same trip rates have been used for their calculation. Of the total proposed 35ha of employment area, an equal proportion is allocated to each of the four employment land uses. Therefore, each employment type is assumed to occupy 25% of the proposed employment area, with light industry and general industry land uses together occupying 50%.

Table 4.3 TRICS Total Employment Two-Way Person Trips

Employment Scenario	Hour	Arrivals	Departures	Total Two-Way
Business (Office) (B1(a) Use Class) 8.75 ha (30,625m^2 GFA)	08:00 – 09:00	603	82	685
	17:00 – 18:00	67	498	565
	Daily (07:00-19:00)	**2,189**	**2,150**	**4,340**
Business (Light Industry) (B1(c) Use Class) 8.75 ha (30,625m^2 GFA) and **General Industry (B2 Use Class)** 8.75 ha (30,625m^2 GFA)	08:00 – 09:00	329	170	499
	17:00 – 18:00	104	298	402
	Daily (07:00-19:00)	**2,435**	**2,472**	**4,907**
Storage or Distribution (B8 Use Class) 8.75 ha (30,625m^2 GFA)	08:00 – 09:00	14	7	21
	17:00 – 18:00	6	15	21
	Daily (07:00-19:00)	**429**	**295**	**724**

Source: TRICS 2016 v7.3.1, July 2016; Note: Arithmetic errors due to rounding.

2011 Census Data

4.19 The trip rates derived by TRICS are considered accurate for representing a development of this nature and location in terms of all person trips. However, a review of Office for National Statistics (ONS) 2011 Census data has additionally been carried out in order to identify the mode split applicable to the trips identified through TRICS analysis.

Residential Travel to Work Modal Split

4.20 The modal split for the site has been extracted for the Dewsbury East ward (reference no. E05001398) which is considered to be the ward most representative of the Site's location. The Census data was used to identify the proportion of drivers, public transport users and other mode shares for all residents of the Dewsbury East area. The travel to work modal split used as part of the analysis is shown in **Table 4.4**.

Table 4.4 2011 Census Residential Modal Split (%)

Mode	Dewsbury East Ward (%)
Driving a Car or Van	66
Passenger in Car or Van	8
Public Transport	11
Bicycle	12
On Foot	1
Taxi/Other	2
Total	**100**

Source: Office for National Statistics (ONS) 2011 Census, Resident Population 'Method of Travel to Work'.

Employment Travel to Work Modal Split

4.21 Analysis of the Census data was also undertaken to identify the likely modal split of residents in the local area who will access the site for employment purposes. The 'Travel to Work' database was thus additionally interrogated for the Kirklees Middle Layer Super Output Area (MSOA) E02002284, which corresponds to the site's location.

4.22 Surrounding districts including Kirklees, Bradford, Leeds, Sheffield and Wakefield were then selected as 'usual residence'. The resulting mode split is shown in **Table 4.5** and was used to indicate the likely modal split for the employment area of the proposed site.

Table 4.5 2011 Employment Modal Split (%)

Mode	Dewsbury East Ward (%)
Driving a Car or Van	70
Passenger in Car or Van	10
Public Transport	6
Bicycle	2
On Foot	10
Taxi/Other	2
Total	**100**

Source: Office for National Statistics (ONS) 2011 Census, Daytime Population 'Method of Travel to Work'.

Total Vehicular Trips

4.23 The modal split extracted from the Census 2011 data was subsequently applied across the trips generated using the TRICS database. This provided an overall anticipated trip profile for the proposed site, which is summarised in **Table 4.6**.

Table 4.6 Total Development Trips by Mode

AM Peak (08:00-09:00)	Residential		Employment		Total	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Driving a Car or Van	232	799	662	181	894	979
Passenger in Car or Van	28	97	95	26	123	123
Public Transport	39	133	57	16	95	149
Bicycle	42	145	19	5	61	150
On Foot	4	12	95	26	98	38
Taxi/Other	7	24	19	5	26	29
Total	**351**	**1,210**	**946**	**258**	**1,297**	**1,468**
PM Peak (17:00-18:00)	**Residential**		**Employment**		**Total**	
	Arrivals	**Departures**	**Arrivals**	**Departures**	**Arrivals**	**Departures**
Driving a Car or Van	587	392	124	568	711	960
Passenger in Car or Van	71	47	18	81	89	129
Public Transport	98	65	11	49	108	114
Bicycle	107	71	4	16	110	87
On Foot	9	6	18	81	27	87
Taxi/Other	18	12	4	16	21	28
Total	**889**	**593**	**177**	**811**	**1,066**	**1,405**

Source: TRICS 2016 v7.3.1, July 2016; and Office for National Statistics (ONS) 2011 Census; Note: Arithmetic errors due to rounding.

Trip Distribution

4.24 The ONS Census 2011 'Travel to Work' database was further interrogated in order to identify the likely trip distribution of trips being generated from, and attracted to, the site. The Travel to Work database was examined for both types of trips:

- Residents of the proposed site travelling out of the site for local employment opportunities; and
- Residents of local areas travelling to the proposed site for work.

4.25 This element of the analysis focused on trips taken by car drivers only, excluding trips taken by other transport modes. In addition, the analysis was carried out for 2030 future year, assuming all construction work is complete and all proposed units and employment floor areas are occupied and fully utilised. This ensures a robust assessment of the trends as it demonstrates 'worst case scenario' trends for the site.

Approach

4.26 The entire Region of Yorkshire and the Humber was considered as part of the analysis as a possible catchment area for all work-related trips to and from the site. Six MSOA areas geographically covering the area closest to the indicative masterplan proposals were subsequently identified as representative of origin and destination trips for the site. These include the following MSOAs:

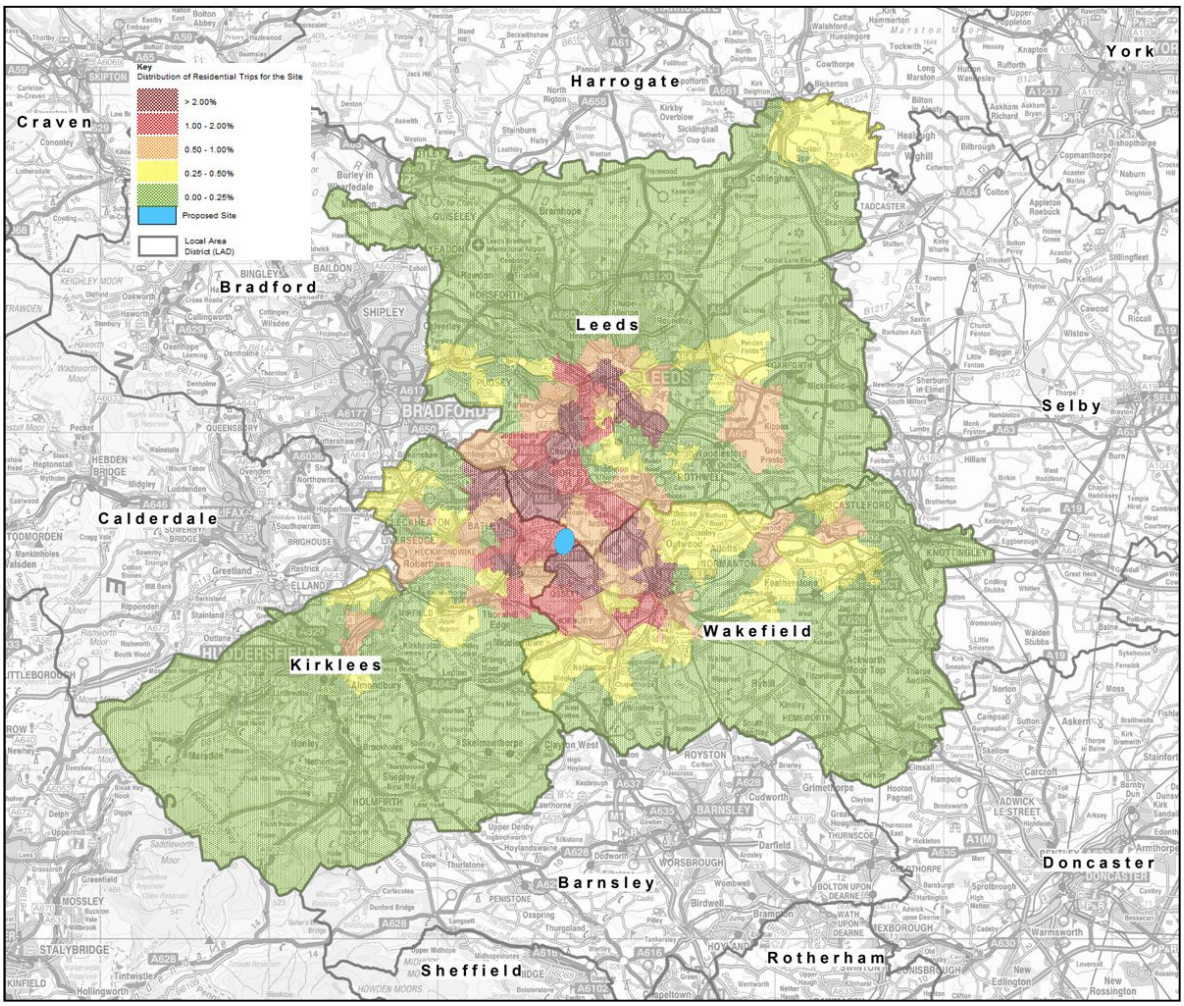
- E02002435, E02002436 and E02002437 within the Local Authority District (LAD) of Leeds;
- E02002277 and E02002284 within the LAD of Kirklees; and
- E02002458 within the LAD of Wakefield.

4.27 Data has been extracted out of the Travel to Work 2011 Census separately for the residential and the employment areas of the development, using the above six regions as an origin of trips for the wider area's residential journeys and as a destination of work trips for the region's employment journeys.

Local Area Distribution

4.28 Census data analysis suggests that approximately 89% of residents of the proposed site are likely to travel to work in Kirklees, Leeds or Wakefield LAD areas (24%, 44% and 22% respectively), with the largest concentrations of trip destinations at and around urban centres within those administrative districts. A small proportion of residents are also likely to travel to work further away in Bradford (5%) and Calderdale (2%). **Figure 4.1** shows the distribution of trip destinations based on Census Travel to Work data for the three LADs with the greatest number of trips – Leeds, Wakefield and Kirklees.

Figure 4.1 Census Travel to Work Residential Distribution

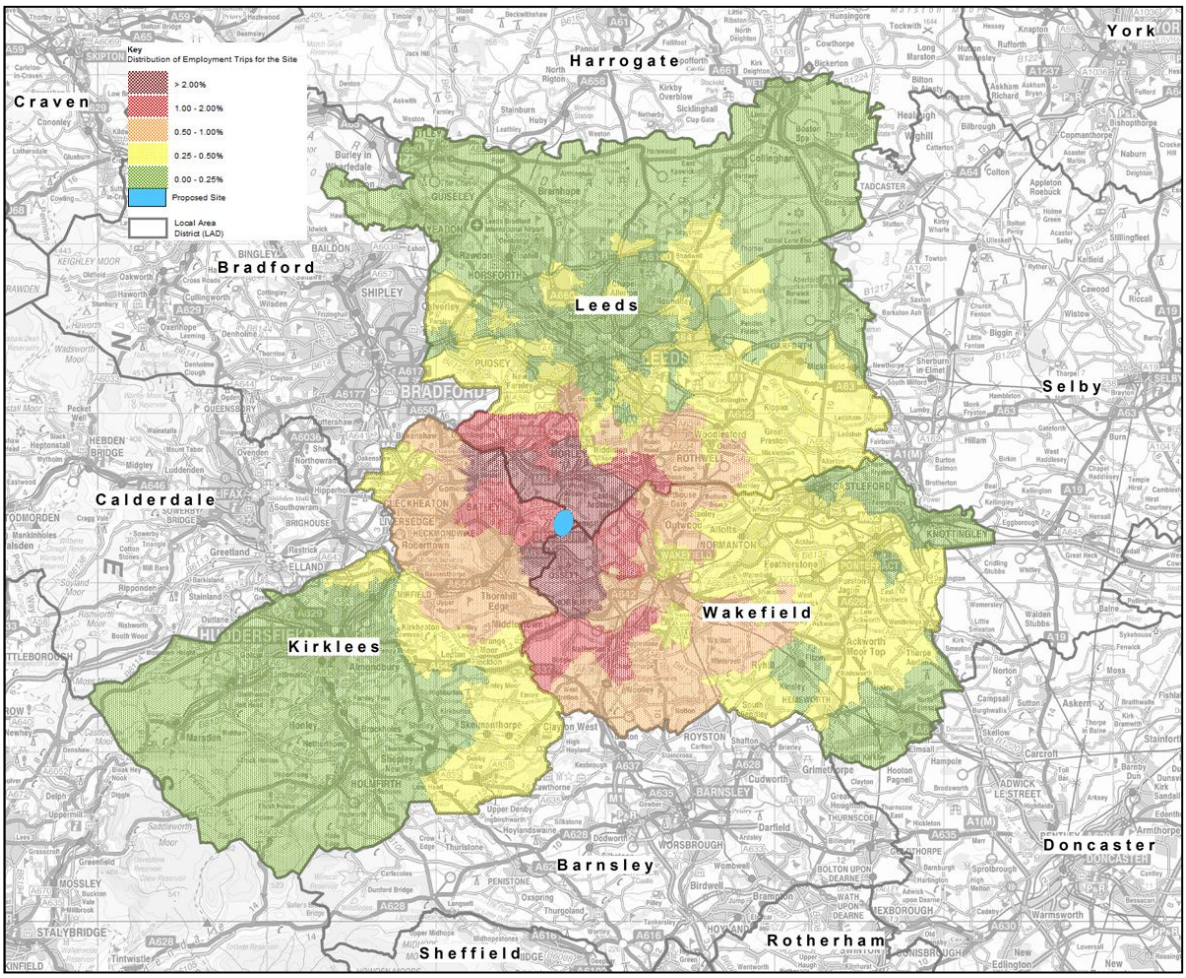


Source: 2011 Census/WYG GIS Mapping, June 2016

4.29 Residents of the potential future masterplan are considered likely to mirror the trip patterns identified within the Census data. Thus, the largest number of work-related trips is likely to be to and from Leeds, Wakefield and Dewsbury town/city centres.

4.30 Trip pattern for employees working at the site show a similar trend with approximately 84% of employees likely to travel to the site from the above three LADs – 28% from Kirklees, 33% from Leeds and 23% from Wakefield. The Barnsley, Bradford and Calderdale districts are considered likely to account for a further 10% of employment trip origins. **Figure 4.2** demonstrates the distribution of trips for the employment land use within the site.

Figure 4.2 Census Travel to Work Employment Distribution



Source: 2011 Census/WYG GIS Mapping, June 2016

4.31 In general the data suggests that neither residents nor employees of the site are likely to travel in excess of 30km as-the-crow-flies distance for their work-related trips. However, the distribution is geographically broader for employees than for residents, suggesting a wider catchment area for the employment site than for the residential land use.

Routes

4.32 Route allocation for development trips has been carried out using the assumption that drivers are likely to choose the shortest route to get to their destination. In addition, it is considered that long-distance trips are more likely to be made using the motorway and primary road network even when the distance travelled is greater. It is considered that shorter trips are likely to use the local road network and prioritise shorter travel distances.

4.33 In addition, it was assumed that different routes will be taken depending on the access route taken from the development site itself. Thus, residents of the residential element of the development proposed at the northern side of the site will exit the site onto Heybeck Lane and are therefore more likely to use Heybeck Lane to travel east or west out of the site to access work. Conversely,

residents of the southern element of the development, who will predominantly use the access route onto Chidswell Lane are more likely to use this route for their trips to the east and west.

4.34 Where sites have access to more than one access/egress points, it has been assumed that the destination route would determine which access/egress point would be selected. Thus, vehicles that can enter the wider road network at both Leeds Road and Owl Lane will only choose to access Owl Lane if travelling east or south. Conversely, if travelling west or north, they are more likely to use the access point on Leeds Road.

Site Access/Egress Routes

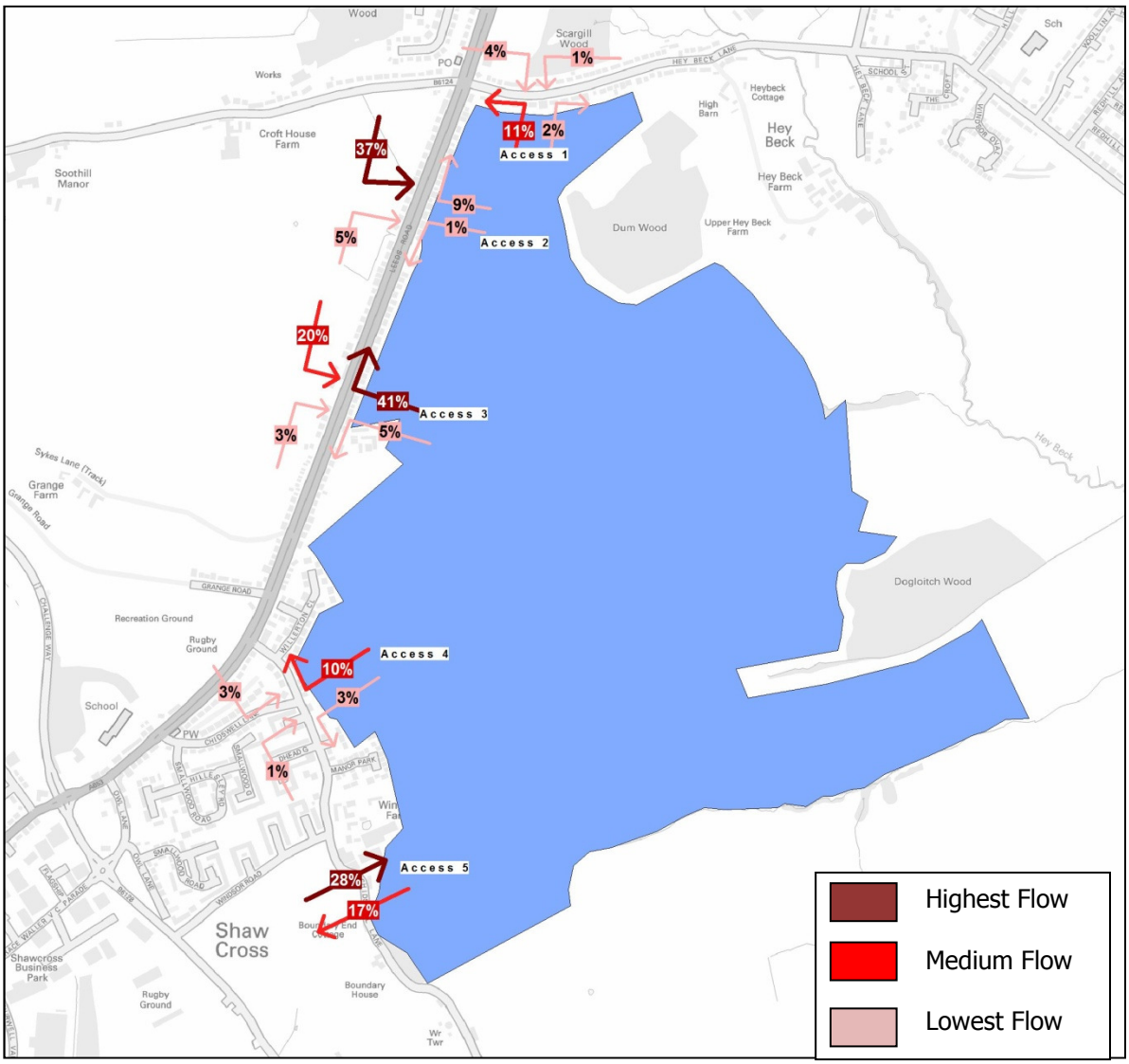
4.35 As outlined in **Chapter 3**, it is considered that a total of five access/egress points are necessary to facilitate the initial masterplan proposals at the site. In addition, for the purpose of this assessment, it is assumed that various elements of the development will use specific access/egress points onto the external road network. The volumes of trips identified during the trip generation exercise have subsequently been allocated into areas of the development. Thus:

- **Area 1** – Up to approximately 250 residential dwellings accessed via Heybeck Lane;
- **Area 2** – Up to approximately 30 ha of employment land accessed via Leeds Road (North) and Owl Lane;
- **Area 3** – Up to approximately 5 ha of employment land accessed via Leeds Road (South) and Owl Lane;
- **Area 4** – Up to approximately 1,035 residential dwellings accessed via Leeds Road (South) and Owl Lane; and
- **Area 5** – Up to approximately 250 residential dwellings accessed via Chidswell Lane.

4.36 The resulting distribution of trips suggests that the largest proportion of trips – for the purpose of this initial assessment made up exclusively from employment trips – is likely to be observed at Access 2 on Leeds Road. This is due to the largest employment area using this access route. In addition, a large proportion of trips are likely to travel north, thereby choosing to use access route 2 over access route 5 on Owl Lane. A similar trend is evident for area 3, albeit the trips at this location are dominated by residential rather than employment movements.

4.37 The trip volumes identified using TRICS and Census data were applied to the trip distribution patterns, generating a likely scenario for journeys into and out of the indicative masterplan proposals site for both the AM and the PM peak periods. **Figure 4.3** demonstrates the likely proportion of trips accessing and egressing the five proposed site access points, showing the proportion of movements into and out of each one during the AM peak, between 08:00 and 09:00.

Figure 4.3 AM Peak Access/Egress Distribution – Total Development



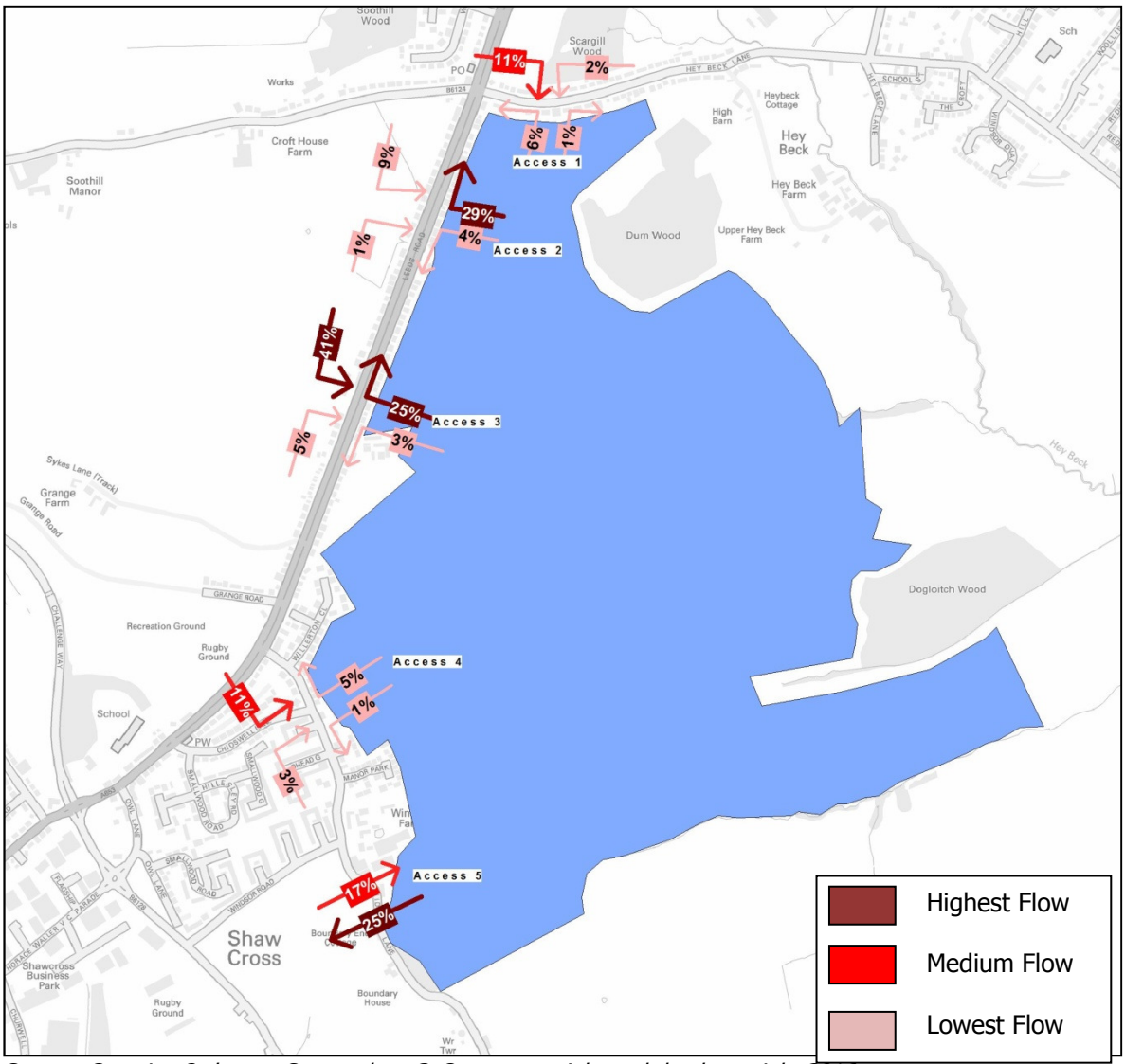
Source: Contains Ordnance Survey data © Crown copyright and database right 2016.

4.38 The AM peak diagram suggests that the largest proportion of arriving trips (37%) is expected to be using Access 2 on Leeds Road, with Access 5 also experiencing a large proportion of the arriving volumes (28% of all arriving trips). This is expected, due to the two access points allowing access to the largest proposed employment area of the site, with approximately 30 hectares of mixed employment use. The greatest proportions of egressing trips at that time of day are likely at Access points 3 and 5, which connect Area 3 to the local road network and account for the exit points associated with largest element of residential units.

4.39 In both cases, the access/egress routes along Leeds Road are expected to be used by a greater proportion of vehicles than Owl Lane, due to a greater proportion of vehicles likely to be travelling to/from the north and therefore choosing the northern-most of the two access routes.

4.40 **Figure 4.4** summarises proportions of trips into and out of all five entry/egress points during the PM peak, between 17:00 and 18:00.

Figure 4.4 PM Peak Access/Egress Distribution – Total Development



Source: Contains Ordnance Survey data © Crown copyright and database right 2016.

4.41 It is considered that the largest proportion of departing trips (29%) in the PM peak is likely to be at Access 2, due to a large proportion of employees leaving the site and travelling north towards the Leeds LAD. The largest proportion of arriving trips (41%) is likely at Access 3, due to residents of Area 3 returning home. It is considered that there is a propensity for vehicles to access the site from Leeds Road rather than Owl Lane (Access 3 as opposed to Access 5).

Summary

4.42 This chapter of this Interim TA report has identified what are considered to be suitable and robust person trip rates which can be used to identify the expected travel patterns the emerging masterplan proposals at the site; this has included residential and employment proposals. It has also provided a modal split of trips, thus providing an indication of the likely trip generation by

mode. The trip rates used in this assessment are considered suitable and have been agreed with KC.

4.43 It is considered that the mode splits identified in the TRICS trip rate database, combined with mode splits indicated within the Census data, will provide a suitable and robust indication of the likely mode split achievable at the site in the end scenario, i.e. at the point at which the site is fully occupied. It is currently expected that the full occupation of the site will occur by 2030. It should be noted that the mode split used is based on existing travel patterns, as identified through census data. Any future modal shift away from single occupancy car use is not reflected here.

4.44 This chapter also outlines the method used for generating the likely distribution of trips across the local road network as well as the allocation of the trips to the site's five access and egress points.

5 Highway Capacity Assessment

Introduction

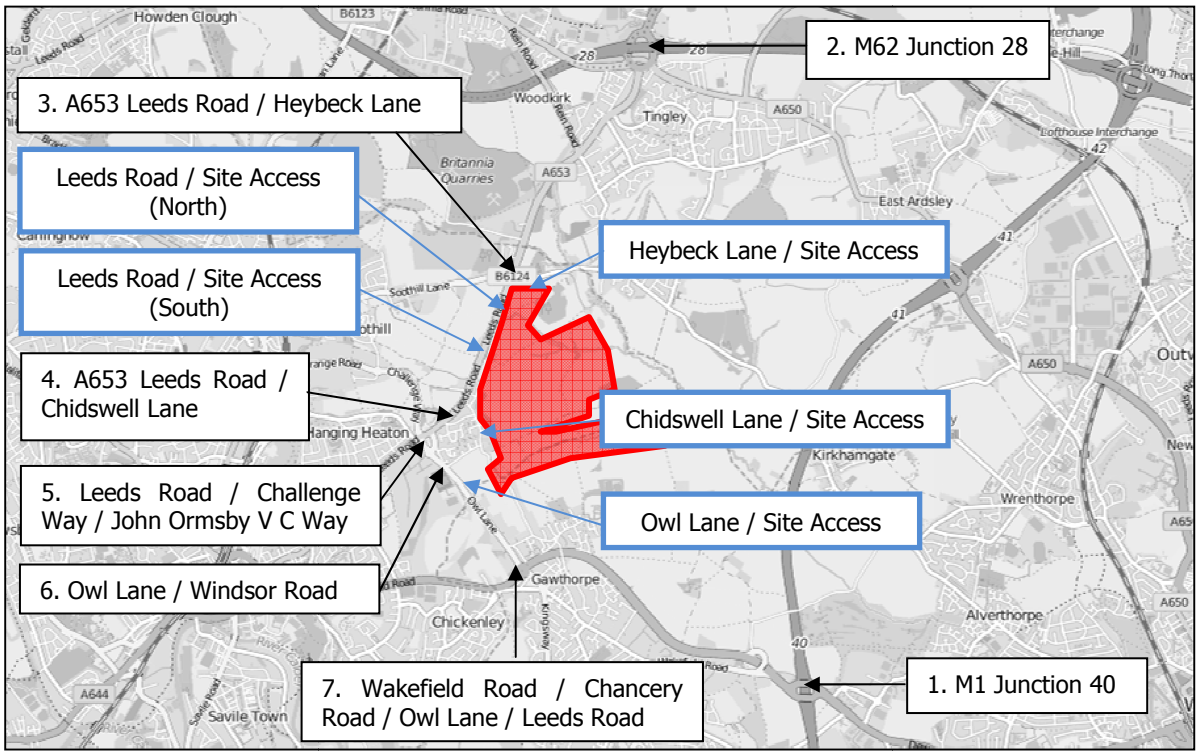
5.1 This chapter of the Interim TA sets out the results of a highway capacity assessment, carried out to identify the likely traffic impact of the indicative masterplan proposals in two future assessment years (2020 and 2030). As part of the highway capacity assessment, the following off-site junctions have been surveyed and modelled:

1. M1 Junction 40 (Flushdyke Interchange) – signal controlled roundabout;
2. M62 Junction 28 (Tingley Interchange) – signal controlled roundabout;
3. A653 Leeds Road / Heybeck Lane – signal controlled junction;
4. A653 Leeds Road / Chidswell Lane – priority T-junction;
5. A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – signal controlled junction;
6. B6128 Owl Lane / Windsor Road – priority T-junction; and
7. A638 Wakefield Road / A638 Chancery Road / B6128 Owl Lane – priority roundabout.

5.2 The junctions identified above have been agreed with KC Highways officers. The five site access junctions previously set out in Chapter 3 of this Interim TA report have also been assessed.

5.3 **Figure 5.1** shows the approximate location of the junctions modelled in this assessment, with proposed site access junctions highlighted in blue.

Figure 5.1 Modelled Junctions



5.4 The methodology followed within this chapter was agreed in principle with KC Highways officers during the course scoping discussions related to this Interim TA. The junctions have been modelled using industry-standard Transport Research Laboratory (TRL) ARCADY and PICADY software and JCT LinSig software.

Assessment Periods

5.5 Junction modelling has been carried out for both the weekday AM and PM peak periods. The traffic survey data described in Chapter 2 has been used to identify the current peak hours of the local highway network, including the two strategic junctions being the M1 Junction 40 (Flushdyke Interchange) and the M62 Junction 28 (Tingley Interchange).

5.6 As described previously within this Interim TA report, the AM and PM peak periods identified for the junction assessments are:

- Weekday (AM network peak) – 07:30-08:30 hours; and
- Weekday (PM network peak) – 16:45-17:45 hours.

Assessment Scenarios

5.7 The DfT Circular 02/2013, 'The Strategic Road Network and the Delivery of Sustainable Development' (September 2013), paragraph 25 states:

> *"The overall forecast demand should be compared to the ability of the existing network to accommodate traffic over a period up to ten years after the date of registration of a planning application or the end of the relevant Local Plan whichever is the greater. This is known as the review period".*

5.8 In order to accurately assess the impact of the indicative masterplan proposals, it has been agreed with KC Highways that the future assessment years are 2020 and 2030, which is also consistent with the future years contained within the Council's SATURN strategic traffic model.

5.9 **Table 5.1** shows the indicative housing delivery schedule per year (April to March) for the indicative masterplan proposals.

Table 5.1 Housing Delivery Schedule – Indicative Proposals

Built Year	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	Total
Delivery assumptions	120	120	120	120	120	120	120	120	120	120	120	120	95	**1,535**

Source: Kirklees Council.

5.10 For the purpose of this assessment, by 2020, the following elements of the indicative masterplan proposals are expected to have come forward (approximate):

- **Area 1** – Up to approximately 250 residential dwellings accessed via Heybeck Lane;
- **Area 2** – Up to approximately 30 ha of employment land accessed via Leeds Road (North) and Owl Lane;
- **Area 3** – Up to approximately 5 ha of employment land accessed via Leeds Road (South) and Owl Lane;
- **Area 4** – No development;
- **Area 5** – Up to approximately 230 residential dwellings accessed via Chidswell Lane; and
- **Total by 2020** – Up to approximately 480 residential dwellings and 35 ha of employment land.

5.11 It is noted however, that the estimated quantum of development set out above is considered well unlikely to be delivered by 2020, and thus this is just a highly robust 'theoretical worst-case' scenario utilised for the purposes of the capacity assessment only.

5.12 For the purpose of this assessment, by 2030, the following elements of the indicative masterplan proposals are expected to have come forward (approximate):

- **Area 1** – Up to approximately 250 residential dwellings accessed via Heybeck Lane;
- **Area 2** – Up to approximately 30 ha of employment land accessed via Leeds Road (North) and Owl Lane;
- **Area 3** – Up to approximately 5 ha of employment land accessed via Leeds Road (South) and Owl Lane;
- **Area 4** – Up to approximately 1,035 residential dwellings accessed via Leeds Road (South) and Owl Lane;
- **Area 5** – Up to approximately 250 residential dwellings accessed via Chidswell Lane; and
- **Total by 2030** – Up to approximately 1,535 residential dwellings and 35 ha of employment land.

5.13 In addition, Paragraph 27 of the DfT Circular 02/2013 states:

> *"Where the overall forecast demand at the time of opening of the development can be accommodated by the existing infrastructure, further capacity mitigation will not be sought".*

5.14 In light of this, it is understood that mitigation will only be required if the potential emerging masterplan proposals result in any of the tested junctions operating beyond their theoretical capacity in the agreed opening year (mitigating the impact of the scheme proposals).

5.15 Therefore the following assessments have been undertaken:

- Base Assessment (2016/2020/2030) – Observed traffic flows
  - Weekday AM Peak (07:30-08:30 hours); and
  - Weekday PM Peak (16:45-17:45 hours).
- 2020 Base with Development Assessment – Observed traffic flows plus development traffic
  - Weekday AM Peak (07:30-08:30 hours); and
  - Weekday PM Peak (16:45-17:45 hours).
- 2030 Base with Development Assessment – Observed traffic flows plus development traffic
  - Weekday AM Peak (07:30-08:30 hours); and
  - Weekday PM Peak (16:45-17:45 hours).

5.16 The above has been discussed and agreed in principle with KC Highways.

Base Year Traffic Data

5.17 As previously stated in Chapter 2 of this Interim TA, surveys were carried out at several agreed junctions within in the site's surrounding area on Thursday 5 May 2016. The results of these surveys form the 2016 baseline for this modelling assessment.

Committed Development

5.18 The first step in modelling the impact of the indicative masterplan proposals is to identify any background growth and future changes in traffic levels, resulting from overall population growth and any changes to traffic patterns brought about through local investment and network improvement projects.

5.19 Following discussions with KC Highways officers, it was determined and agreed that the KC SATURN strategic traffic model of the wider area should be used for determining future travel volumes and trip patterns. The model, built in 2014 by KC's transport consultants, includes a 2014 base scenario as well as two future year scenarios, both broadly coinciding with the construction milestones of the proposed site, in 2020 and 2030.

5.20 The model was originally used to evaluate the likely impact of a range of local highway improvements which will be in place by 2020 and 2030 and as such is considered to be a robust indicator of background growth to be used as a benchmark of changes in traffic patterns resulting from the introduction of the proposed scheme.

5.21 Following discussions with both KC Highways officers and its transport consultants, it was agreed that WYG would have access to the SATURN model and would be able to use its outputs in order to generate data on future background vehicle flows (i.e. committed development flows + traffic growth), which can then be applied to the various junctions assessed in this assessment.

5.22 The Base Year model for the Land at Chidswell study has been constructed and validated using 2016 data. It was therefore not a direct match to the SATURN Base Year model of 2014, the data for which was collected in 2013. Considering the age of the data, and the availability of actual surveys on the junctions in 2016. It was considered the SATURN Base Year Model of 2014 was unsuitable for direct use in the study.

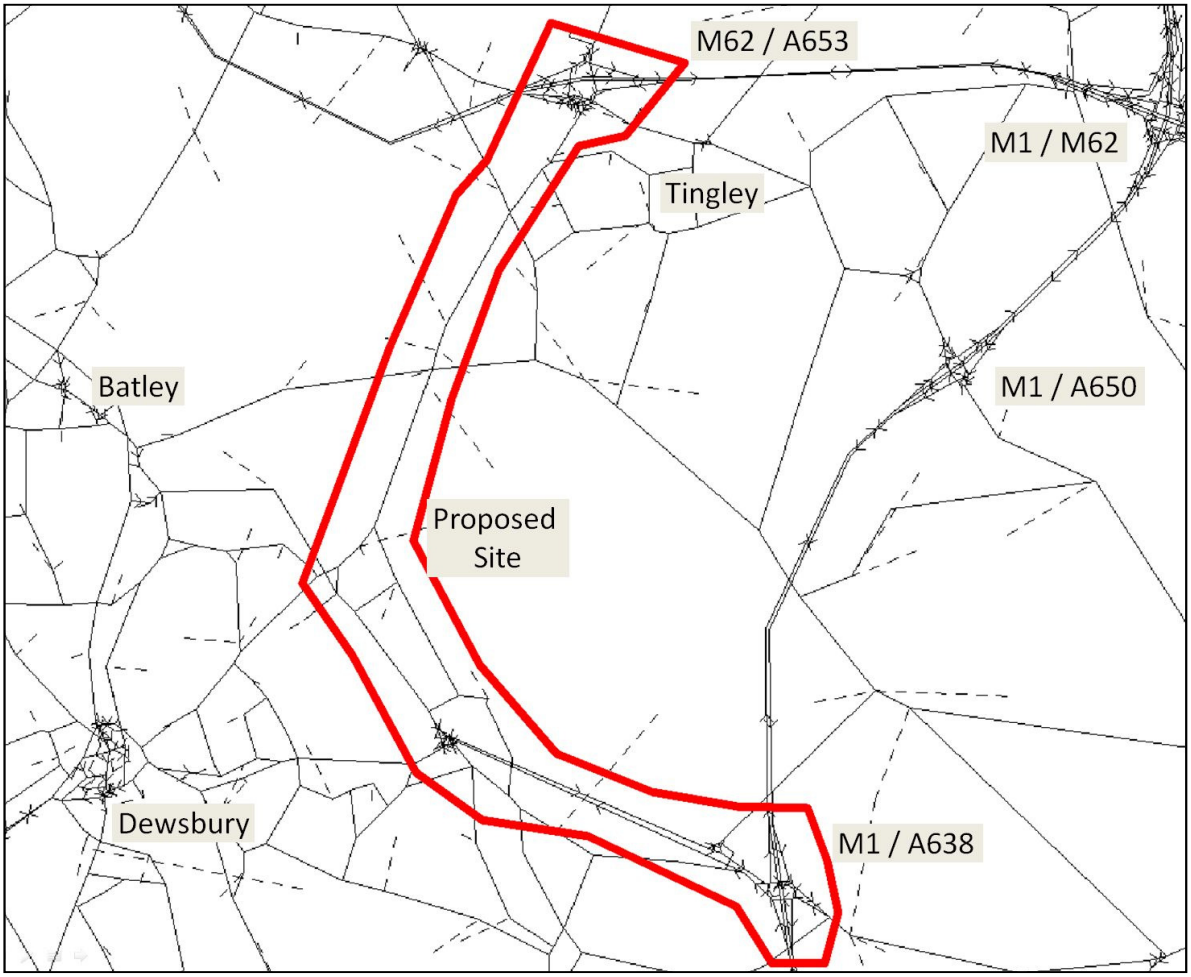
5.23 However, it was agreed that the SATURN model would be used to extract the difference between its Base Year and the Future Year scenarios, with the difference directly translated into the Land at Chidswell study in order to generate its Future Year scenarios and inform their growth rates.

5.24 To ensure that the strategic SATURN network is directly applicable to the study, a cordon has been extracted out of the area-wide model to correspond directly with the main area of impact within the road network around Chidswell.

5.25 This included the length of A653 Leeds Road between Junction 28 of the M62 and the junction with B6128, B6128 between the junctions with A653 Leeds Road and A638 and A638 between the junctions of B6128 and the M1. The extent of thus defined cordon of the SATURN model is shown in **Figure 5.2**.

5.26 The extent of the cordon focused on the area expected to experience the greatest impact from the development. The shape of the cordon was used in order to limit route choice in the model and facilitate the identification of routes through the network. This ensured that only trips passing through the cordon were considered during the future year growth calculations.

Figure 5.2 SATURN Model Cordon



5.27 2014 Base Year, 2020 + Development and 2030 + Development flows where extracted from the SATURN model in the form of a matrix showing all flows between all entry and exit points of the cordoned network, as denoted by the red-line boundary in Figure 5.2.

5.28 A comparison was then carried out to identify the difference in flows between the base and the two future years. This was considered to be a means of extracting the future growth rates for all vehicle movements within the network. Thus extracted, the difference between the Base Year and 2020 + Development scenario and the Base Year and the 2030 + Development scenario was calculated to be represented using the Geoffrey E. Havers (GEH) statistic.

5.29 The GEH statistic is a mathematical formula which considers the relative size of the compared values as well as the proportional change between them. It is a robust means of examining flow differences between two sets of data as it considers the change in value relative to the original number and does not exaggerate the difference for small values (as do percentage differences).

5.30 The resulting matrix of differences between Base Year and the two future year scenarios was applied across routes within the cordoned network. Once applied, the differences were considered to represent the change in demand corresponding to the given period of time, either up to the year 2020 or 2030.

5.31 The factoring was only applied to routes with differences showing a value of GEH of 5 or greater. A low GEH indicates that there is very little difference between the compared values. In line with Department for Transport (DfT) Transport Analysis Guidance (TAG), a difference between values is significant only where its GEH value exceeds 5.

5.32 This approach was applied as part of the future year demand calculations for the Chidswell model with changes to link volumes identified within SATURN only applied where the GEH value indicated a significant (GEH of 5 or more) change. Conversely, where the difference between SATURN's Base Year and Future Year flows showed a GEH value of less than 5, it was assumed that little or no change in traffic levels is expected at this location between 2014 and 2020 or 2030.

5.33 The change in demand, applied from each origin to each destination across the network, was subsequently applied into all junctions along each route, informing the turning movements for the relevant corridor through the network. The resulting output was the basis for the creation of two future year models for both peaks, representing baseline growth for 2020 and 2030.

Results Assessment – Background Information

5.34 A stated previously, a number of junctions both off-site and site related have been assessed in order to determine their operational levels, available capacity and the potential impact that the indicative masterplan proposals might have on their operation. All assessments have been carried out utilising Passenger Car Unit equivalents (PCUs).

LinSig Software

5.35 Signal controlled junctions (either roundabouts or crossroads) have been modelled and assessed utilising industry standard LinSig software version 3.2.27.0, the latest available version. When using this software the capacity of the junctions is assessed against the Degree of Saturation (DoS) and the Practical Reserve Capacity (PRC).

5.36 The DoS is the ratio of demand flow to maximum flow (capacity). Values greater than 100% on a lane indicate that this is over saturated and, therefore, queues will likely occur as, on average, traffic on that lane is no longer able to fully discharge through the junction during every signal cycle. Best practice considers a lane being at its theoretical/practical capacity when it reaches a DoS of 90% or greater; this is to allow for certain level of flexibility when working with a traffic model.

5.37 The PRC is calculated from the maximum (worst) DoS on a lane in the junction and indicates the amount by which traffic demand can grow before practical capacity is reached; in other words, it measures how much additional traffic could pass through a junction whilst maintaining a maximum degree of saturation of 90% on all lanes. PRC therefore provides a quick overview of the operation of the junction, where a positive value represents a junction operating within practical capacity.

5.38 It is noted that due to the variability of queues and sensitivity to changes in conditions within the model (e.g. increased traffic flows); once a lane is oversaturated the resulting MMQs might be slightly inaccurate (i.e. reported MMQs longer than in reality). This is due to the fact that the MMQ is the sum of the maximum back of the queue in a modelled typical cycle and the calculated 'Random' and 'Oversaturated Queue', with the latter two representing potential cyclic changes in the expected residual queue throughout the modelled period, which grow continuously when a lane is oversaturated.

PICADY and ARCADY Software

5.39 Priority junctions have been modelled and assessed using industry standard PICADY software version 5.1. Priority roundabouts have been modelled and assessed using industry standard ARCADY software roundabout module version 9 (Junctions 9 V.9.0.1.4646), which is the latest available version.

5.40 The Ratio of Flow to Capacity (RFC) is the ratio of demand flow to capacity at a junction. The RFC provides the basis for judgement of the performance of a junction. Best practice suggests that an RFC of less than 0.85 is considered to indicate satisfactory performance, where an RFC of 0.850 would represent a junction nearing 'practical capacity'. This is due to these values being averages calculated with formulae based on a large number of sites and the actual values can vary due to site-to-site and day-to-day variation.

Off-Site Junction Assessment Results

M1 Junction 40 (Flushdyke Interchange) – Signal Controlled Roundabout

Calibration and Validation Methodology

5.41 Existing signal timing information including cycle times, phasing, staging and intergreens; as well as the current junction layout were obtained from the Highways officer at Kirklees Metropolitan Council (on behalf of Wakefield Metropolitan District Council Highways) for calibration.

5.42 The junction is split into two controllers with two traffic streams each, one managing the M1 (south) off-slip and the A638 (west approach) junctions (226w) and one managing the M1 (north) off-slip and A638 Wakefield Road approach (216w); both of them running on fixed time plans over

the AM and PM peaks. The cycle time was stated in the data sheets (and observed from the traffic survey video footage) to be 60 seconds.

5.43 Lane saturation flows were entered as 1,900pcu/hour as per best practice. Lane connectors have been assigned in line with observations from the video footage obtained along with the survey data. Existing short lanes on M1 (north) and A638 (west) arms, which should be lanes 1 (the nearest the footway), have been modelled as being lane 2 instead. This is due to the fact that they appeared to act as the main long lane whilst lanes 2 acted as short lanes as observed on the video footage. Bonus green times have also been applied to lanes in line with observations from the video footage.

5.44 Queues were recorded by the Survey Company at the end of the red in each signalised lane for every cycle of the signals throughout the survey period. Hourly average queue length observations on all lanes on all 4 approaches to the junction as well as observed queues on internal circulatory lanes were utilised to validate the base year model.

5.45 Delay-based cruise times have been applied to certain lane connectors so as to achieve O-D flow apportionments on approaches that matched the observed queues (i.e. from Arm 3/Lane 2 to Arm 11/lane 2; and from Arm 2/Lane 2 to Arm 7/Lane 2). This was observed to be acceptable and in line with observations from the video footage obtained along with the survey data.

Base Year Scenario (2016 Observed Traffic Flows)

5.46 The results of the Base Year assessment (2016 observed traffic flows) for the weekday AM and PM peak hours are summarised in **Table 5.2**.

Table 5.2 M1 Junction 40 (Flushdyke Interchange) – Base Year Scenario (2016 Observed Traffic Flows) – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
M1 Off-slip (North) Ahead and Left	1/1+1/2	66.1%	6.6	80.7%	9.7
M1 Off-slip (North) Ahead	1/3	40.1%	4.3	68.8%	9.2
A638 Wakefield Rd (East) Ahead Left	2/2+2/1	86.5%	14.4	77.9%	11.3
A638 Wakefield Rd (East) Ahead	2/3	**92.7%**	18.2	83.0%	13.0
M1 Off-slip (South) Left	3/1	81.3%	10.8	80.0%	9.9
M1 Off-slip (South) Ahead	3/2	52.0%	5.4	49.6%	4.8
A638 (West) Ahead Left	4/1+4/2	**94.5%**	18.5	70.8%	8.9
A638 (West) Ahead	4/3	88.4%	13.8	73.0%	10.6
Practical Reserve Capacity (%)		-5.0		8.4	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.47 Table 5.2 shows that the existing signalised junction operates at capacity during the AM peak hour modelled period, with the A638 east and west approaches experiencing slightly more congestion,

which translates into longer queues. The results indicate that the junction operates within capacity during the PM peak hour. The highest DoS and MMQ are during the AM peak hour on the A638 (west) approach at 94.5% and 18.5 PCUs respectively.

5.48 The internal circulatory lanes show to be well within capacity, with the highest modelled DoS being 82% during the PM peak hour. Some queues were observed to be formed on some of these lanes as traffic from the approaches to the junction joined the back of the queues (particularly during the PM peak hour); however, these were observed to be dissipated without delay.

Future Year 2020 Scenario (Observed Traffic plus Growth)

5.49 The operation of the junction has been tested for the Future Year 2020 scenario (2016 observed traffic flows plus committed development traffic) utilising the same existing fixed time plans. The results of this assessment for the weekday AM and PM peak hours are summarised in **Table 5.3**.

Table 5.3 M1 Junction 40 (Flushdyke Interchange) – Future Year 2020 Scenario (Observed Traffic plus Growth) – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
M1 Off-slip (North) Ahead and Left	1/1+1/2	73.3%	8.0	82.0%	10.2
M1 Off-slip (North) Ahead	1/3	34.2%	3.5	66.6%	8.6
A638 Wakefield Rd (East) Ahead Left	2/2+2/1	87.5%	15.0	**92.1%**	18.0
A638 Wakefield Rd (East) Ahead	2/3	**91.7%**	17.3	**94.6%**	20.1
M1 Off-slip (South) Left	3/1	81.4%	10.9	81.2%	10.2
M1 Off-slip (South) Ahead	3/2	52.9%	5.5	54.7%	5.5
A638 (West) Ahead Left	4/1+4/2	**111.1%**	**79.8**	85.1%	13.4
A638 (West) Ahead	4/3	**109.9%**	**57.6**	67.8%	9.3
Practical Reserve Capacity (%)		-23.4		-5.1	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.50 Table 5.3 above shows that, when utilising the existing fixed time plans for the Future Year 2020 scenario assessment, the junction would operate over capacity during the AM peak hour modelled period, with the A638 west approach experiencing significant queues and delays. The junction would operate at capacity during the PM peak hour assessment, with the A638 Wakefield Road approach experiencing the highest DoS and MMQs at 94.6% and 20.1 PCUs respectively.

5.51 The internal circulatory lanes show to be within capacity, with the highest modelled DoS being 84.2% during the PM peak hour. As it was the case with the Base Year scenario assessment some queues formed on some of these lanes as traffic from the approaches to the junction joined the back of the queues (particularly during the PM peak hour); however, these should also be dissipated without significant delay.

Future Year 2020 Scenario with Development (Observed Traffic plus Growth and Proposed Development Traffic)

5.52 The operation of the junction has been tested for the Future Year 2020 scenario with development (2016 observed traffic flows plus committed developments and proposed development traffic) utilising the same existing fixed time plans. The results of this assessment for the weekday AM and PM peak hours are summarised in **Table 5.4**.

Table 5.4 M1 Junction 40 (Flushdyke Interchange) – Future Year 2020 Scenario (Observed Traffic plus Growth and Proposed Development) – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
M1 Off-slip (North) Ahead and Left	1/1+1/2	71.7%	7.7	81.5%	9.9
M1 Off-slip (North) Ahead	1/3	36.1%	3.7	67.5%	9.0
A638 Wakefield Rd (East) Ahead Left	2/2+2/1	**93.6%**	19.3	**93.9%**	19.6
A638 Wakefield Rd (East) Ahead	2/3	**95.2%**	20.7	**95.6%**	21.2
M1 Off-slip (South) Left	3/1	83.1%	11.4	81.7%	10.3
M1 Off-slip (South) Ahead	3/2	59.2%	6.3	56.8%	5.7
A638 (West) Ahead Left	4/1+4/2	**111.1%**	**83.1**	85.5%	13.5
A638 (West) Ahead	4/3	**109.9%**	**57.6**	73.0%	10.6
Practical Reserve Capacity (%)		-23.4		-6.3	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.53 Table 5.4 shows that, when utilising the existing fixed time plans for the Future Year 2020 scenario assessment (including proposed development traffic), the junction would operate at very similar capacity levels as per the Future Year 2020 assessment without development traffic. The results indicate that the junction would be over capacity during the AM peak hour modelled period, with the A638 west approach experiencing significant queues and delays. The junction would operate at capacity during the PM peak hour assessment, with the A638 Wakefield Road approach experiencing the highest DoS and MMQs at 95.6% and 21.2 PCUs respectively.

5.54 The internal circulatory lanes show to be within capacity, with the highest modelled DoS being 85.2% during the PM peak hour. As it was the case with the Base Year and Future Year 2020 (without development) scenario assessments, some queues formed on some of these lanes as traffic from the approaches to the junction joined the back of the queues (particularly during the PM peak hour); however, these should also be dissipated without significant delay.

Future Year 2030 Scenario (Observed Traffic plus Growth)

5.55 The operation of the junction has been tested for the Future Year 2030 scenario (2016 observed traffic flows plus committed development traffic) utilising the same existing fixed time plans. The results of this assessment for the weekday AM and PM peak hours are summarised in **Table 5.5**.

Table 5.5 M1 Junction 40 (Flushdyke Interchange) – Future Year 2030 Scenario (Observed Traffic plus Growth) – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
M1 Off-slip (North) Ahead and Left	1/1+1/2	75.8%	8.5	80.2%	9.6
M1 Off-slip (North) Ahead	1/3	44.3%	4.9	69.6%	9.3
A638 Wakefield Rd (East) Ahead Left	2/2+2/1	70.2%	9.3	77.9%	11.3
A638 Wakefield Rd (East) Ahead	2/3	89.3%	15.7	83.0%	13.0
M1 Off-slip (South) Left	3/1	83.2%	11.5	85.6%	11.5
M1 Off-slip (South) Ahead	3/2	59.9%	6.6	70.5%	7.8
A638 (West) Ahead Left	4/1+4/2	**123.9%**	**172.9**	**91.7%**	17.3
A638 (West) Ahead	4/3	**140.1%**	**178.3**	87.9%	16.3
Practical Reserve Capacity (%)		-55.7		-1.9	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.56 Table 5.5 shows that, when utilising the existing fixed time plans for the Future Year 2030 scenario assessment, the junction would operate over capacity during the AM peak hour modelled period, with the A638 west approach experiencing significant queues and delays. The junction would operate at capacity during the PM peak hour assessment, with the A638 west approach experiencing the highest DoS and MMQs at 91.7% and 17.3 PCUs respectively.

5.57 The internal circulatory lanes show to be within capacity, with the highest modelled DoS being 81.4% during the PM peak hour. Some queues formed on some of these lanes as traffic from the approaches to the junction joined the back of the queues (particularly during the PM peak hour); however, these should be dissipated without significant delay.

Future Year 2030 Scenario with Development (Observed Traffic plus Growth and Proposed Development Traffic)

5.58 The operation of the junction has been tested for the Future Year 2030 scenario with development (2016 observed traffic flows plus committed developments traffic and proposed development traffic) utilising the same existing fixed time plans. The results of this assessment for the weekday AM and PM peak hours are summarised in **Table 5.6**.

Table 5.6 M1 Junction 40 (Flushdyke Interchange) – Future Year 2030 Scenario (Observed Traffic plus Growth and Proposed Development) – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
M1 Off-slip (North) Ahead and Left	1/1+1/2	74.4%	8.1	78.7%	9.3
M1 Off-slip (North) Ahead	1/3	46.7%	5.3	72.0%	9.9
A638 Wakefield Rd (East) Ahead Left	2/2+2/1	80.0%	12.0	85.5%	14.0
A638 Wakefield Rd (East) Ahead	2/3	**91.0%**	16.9	83.0%	13.0
M1 Off-slip (South) Left	3/1	85.0%	12.0	86.8%	12.0
M1 Off-slip (South) Ahead	3/2	66.7%	7.6	74.0%	8.5
A638 (West) Ahead Left	4/1+4/2	**123.9%**	**182.6**	**92.4%**	17.7
A638 (West) Ahead	4/3	**145.8%**	**201.6**	**93.9%**	21.2
Practical Reserve Capacity (%)		-62.0		-4.4	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.59 Table 5.6 shows that, when utilising the existing fixed time plans for the Future Year 2030 scenario assessment (including proposed development traffic), the junction would operate at very similar capacity levels as per the Future Year 2030 assessment without development traffic. The results indicate that the junction would be over capacity during the AM peak hour modelled period and at capacity during the PM peak hour assessment.

5.60 The internal circulatory lanes show to be within capacity, with the highest modelled DoS being 85.3% during the PM peak hour.

Future Year Assessments - Potential Mitigation

5.61 A sensitivity test has been undertaken for the worst-case scenarios (Future Year 2030 with and without Development traffic) in order to understand whether there is capacity at the junction for the additional traffic as a result of the background growth and the proposed development at the Site.

5.62 The operation of the junction has therefore been tested for the Future Year 2030 scenario with and without development, utilising the same cycle time length but allowing for the optimisation of the stages so as to provide as much vehicle throughput as possible. The results of this test for the weekday AM and PM peak hours are summarised in **Table 5.7**.

Table 5.7 M1 Junction 40 (Flushdyke Interchange) – Optimised Future Year 2030 Scenarios (Base plus Growth with and without Proposed Development) – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)				PM Peak (16:45-17:45)			
		Without Dev		With Dev		Without Dev		With Dev	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
M1 Off-slip (North) Ahead and Left	1/1+1/2	82.0%	10.0	84.0%	10.6	80.1%	9.6	78.4%	9.2
M1 Off-slip (North) Ahead	1/3	62.4%	7.3	71.3%	8.4	75.1%	10.6	78.0%	11.4
A638 Wakefield Rd (East) Ahead Left	2/2+2/1	63.2%	8.0	70.3%	9.6	75.2%	10.7	82.3%	13.0
A638 Wakefield Rd (East) Ahead	2/3	86.3%	14.9	85.5%	14.7	80.1%	12.2	80.4%	12.3
M1 Off-slip (South) Left	3/1	83.2%	11.5	85.0%	12.0	82.2%	11.4	83.0%	11.6
M1 Off-slip (South) Ahead	3/2	59.9%	6.6	66.7%	7.6	54.3%	5.8	57.6%	6.3
A638 (West) Ahead Left	4/1+4/2	84.0%	12.3	85.2%	12.5	81.8%	11.7	82.8%	11.9
A638 (West) Ahead	4/3	82.0%	15.0	85.3%	16.7	74.0%	11.6	79.1%	13.5
Practical Reserve Capacity (%)		4.3		4.9		4.5		0.6	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.63 Table 5.7 shows that, once optimised, the junction would operate within capacity in all Future Year 2030 scenarios both with and without development traffic.

5.64 The internal circulatory lanes show to be also within capacity, with the highest modelled DoS being 89.4% during the PM peak hour with Development traffic.

M62 Junction 28 (Tingley Interchange) – Signal Controlled Roundabout

Calibration and Validation Methodology

5.65 Existing signal timing information including cycle times, phasing, staging and intergreens were obtained from the officers at KC Highways (on behalf of Leeds City Council Highways) for calibration.

5.66 The junction is divided into three controllers/junctions with several traffic streams each (8 streams in total). Controller 769L manages the M62 (east) off-slip and the A650 Bradford Road (east approach) junctions. Controller 770L manages the A653 Dewsbury Road (south) and A650 Bradford Road (west approach) junctions. Finally, controller 771L manages the M62 (west) off-slip and A653 Dewsbury Road (north approach) junctions. All three controllers operate on fixed time plans over the AM and PM peaks, which were used to calibrate the model. However, controller 3 (771L)/Stream 1 was altered in the AM peak hour model in line with observations from survey data

(video footage). The cycle time was stated in the data sheets (and observed from the traffic survey video footage) to be 60 seconds.

5.67 Lane saturation flows were entered as 1,900pcu/hour as per best practice. Lane connectors have been assigned in line with observations from the video footage obtained along with the survey data. Entry lane speeds were applied to all lanes on accesses to the network as per observations and maximum speed limits. Bonus green times have also been applied to a number of lanes in line with observations from the video footage to account for vehicles generally running over the amber prior to the red at the end of their stage.

5.68 Queues were recorded by the survey company at the end of the red in each signalised lane for every cycle of the signals throughout the survey period. Hourly average queue length observations on all lanes on all 6 approaches to the junction as well as observed queues on internal circulatory lanes were utilised to validate the base year model.

5.69 Flows have been apportioned over lanes on some approaches to the interchange to account for existing driver behaviour as per observations from survey video footage. These vary between AM and PM and include the M62 eastern off-slip, A650 Bradford Road and A653 Dewsbury Road on its south approach. This was observed to provide a suitable output in line with observations from the video footage obtained along with the survey data. It is noted however that these (fixed) apportionments have been unlocked in the future year assessments as it has been assumed that, although drivers currently appear to have a preference for certain lanes/routes, once traffic congestions grows within the junction drivers will use whatever lane appropriate for the route and is less congested.

Base Year Scenario (2016 Observed Traffic Flows)

5.70 The results of the Base Year assessment (2016 observed traffic flows) for the weekday AM and PM peak hours are summarised in **Table 5.8**.

Table 5.8 M62 Junction 28 (Tingley Interchange) – Base Year Scenario (2016 Observed Traffic Flows) – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
A653 Dewsbury Rd (North) Ahead and Left	1/2+1/1	51.0%	5.1	67.9%	8.1
A653 Dewsbury Rd (North) Ahead	1/3	35.0%	3.2	46.5%	5.3
A653 Dewsbury Rd (North) Ahead	1/4	43.1%	4.1	62.4%	8.0
M62 J28 Off-Slip (East) Left and Ahead	2/2+2/1	72.2%	7.4	**93.0%**	10.5
M62 J28 - Off-Slip (East) Ahead	2/3	**94.4%**	18.3	**94.7%**	12.2
Bradford Rd (East) Left and Ahead	3/1	81.6%	9.9	78.3%	9.4
Bradford Rd (East) Ahead	3/2+3/3	65.2%	7.0	56.8%	5.6
A653 Dewsbury Rd (South) Left Ahead	4/2+4/1	76.5%	8.3	68.2%	5.9
A653 Dewsbury Rd - South Ahead	4/3	**92.3%**	15.7	79.4%	7.7
Bradford Rd (West) Left	5/1+5/2	58.6%	5.3	71.5%	6.7
Bradford Rd (West) Ahead	5/3	57.2%	5.4	73.9%	7.4
Bradford Rd (West) Ahead	5/4	28.3%	2.3	37.2%	3.0
M62 J28 Off-Slip (West) Ahead and Left	6/2+6/1	37.2%	2.6	38.3%	3.1
M62 J28 Off-Slip (West) Ahead	6/3	67.0%	5.5	59.2%	5.7
Practical Reserve Capacity (%)		-4.8		-5.3	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.71 Table 5.8 shows that the existing signalised junction operates at capacity during both the AM and PM peak hour modelled periods, with the M62 (east) off-slip and the A653 Dewsbury Road (south) approaches experiencing more congestion, which translates into longer queues. The highest DoS is during the PM peak hour on the M62 (east) off-slip approach at 94.7% and the longest MMQ is identified during the AM on the same lane and the same approach.

5.72 The internal circulatory lanes show to be well within capacity, with the highest modelled DoS being 89.8% during the PM peak hour. Some queues were observed to be formed on some of these lanes as traffic from the approaches to the junction joined the back of the queues; however, these were observed to be dissipated without delay.

Future Year 2020 Scenarios (Observed Traffic plus Growth with and without Development Traffic)

5.73 The operation of the junction has been tested for the Future Year 2020 scenario (Base traffic plus growth with and without Development Traffic) utilising the same existing fixed time plans. The results of this assessment for the weekday AM and PM peak hours are summarised in **Table 5.9**.

Table 5.9 M62 Junction 28 (Tingley Interchange) – Future Year 2020 Scenario (Observed Traffic plus Growth with and without Proposed Development) – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)				PM Peak (16:45-17:45)			
		Without Dev		With Dev		Without Dev		With Dev	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
A653 Dewsbury Rd (North) Ahead and Left	1/2+1/1	36.5%	3.3	36.5%	3.3	57.6%	6.1	57.6%	6.1
A653 Dewsbury Rd (North) Ahead	1/3	35.3%	3.2	37.5%	3.5	41.6%	4.5	45.1%	5.0
A653 Dewsbury Rd (North) Ahead	1/4	42.8%	4.1	57.8%	6.1	56.8%	7.1	60.5%	7.7
M62 J28 Off-Slip (East) Left and Ahead	2/2+2/1	79.4%	8.9	82.1%	9.4	**100.1%**	16.7	**100.1%**	20.8
M62 J28 - Off-Slip (East) Ahead	2/3	89.1%	14.5	**90.3%**	15.3	**95.7%**	12.9	**98.6%**	15.4
Bradford Rd (East) Left and Ahead	3/1	69.2%	7.3	69.0%	7.3	78.5%	9.5	78.8%	9.5
Bradford Rd (East) Ahead	3/2+3/3	73.7%	8.0	73.4%	7.9	53.5%	5.2	52.8%	5.1
A653 Dewsbury Rd (South) Left Ahead	4/2+4/1	85.8%	10.8	**93.8%**	15.4	83.4%	8.6	**102.3%**	28.1
A653 Dewsbury Rd - South Ahead	4/3	75.4%	9.4	88.6%	13.6	69.9%	6.1	**100.2%**	19.1
Bradford Rd (West) Left	5/1+5/2	**92.6%**	14.0	**93.2%**	14.4	58.5%	5.1	58.5%	5.1
Bradford Rd (West) Ahead	5/3	63.5%	6.3	63.7%	6.3	56.7%	5.0	56.7%	5.0
Bradford Rd (West) Ahead	5/4	62.7%	6.2	62.5%	6.2	54.4%	4.7	54.4%	4.7
M62 J28 Off-Slip (West) Ahead and Left	6/2+6/1	30.5%	2.1	30.5%	2.1	38.3%	3.1	38.3%	3.1
M62 J28 Off-Slip (West) Ahead	6/3	67.0%	5.5	87.5%	9.3	59.2%	5.7	65.0%	6.5
Practical Reserve Capacity (%)		-10.3		-14.6		-11.2		-13.7	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.74 Table 5.9 shows that the junction would operate at similar capacity levels both with and without Development traffic when utilising the existing fixed time plans for the Future Year 2020 scenario assessments. In summary, the junction would operate over capacity during both the AM and PM peak hour modelled periods (both with and without Development Traffic). In regard to the approaches to the interchange, the M62 (east) off-slip and the A653 Dewsbury Road (south) approaches would experience the most congestion, being over capacity during the PM peak hour assessments.

5.75 The internal circulatory lanes show to operate over capacity during the AM peak hour scenarios (both with and without Development); whilst they appear to operate within capacity during the PM peak hour scenarios.

Future Year 2030 Scenarios (Observed Traffic plus Growth with and without Development Traffic)

5.76 The operation of the junction has been tested for the Future Year 2030 scenario (Base traffic plus growth with and without Development Traffic) utilising the same existing fixed time plans as in the Base Year model. The results of this assessment for the weekday AM and PM peak hours are summarised in **Table 5.10**.

Table 5.10 M62 Junction 28 (Tingley Interchange) – Future Year 2030 Scenario (Observed Traffic plus Growth with and without Proposed Development) – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)				PM Peak (16:45-17:45)			
		Without Dev		With Dev		Without Dev		With Dev	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
A653 Dewsbury Rd (North) Ahead and Left	1/2+1/1	38.9%	3.6	38.9%	3.6	44.3%	4.3	44.3%	4.3
A653 Dewsbury Rd (North) Ahead	1/3	33.0%	3.0	41.8%	3.9	44.3%	4.9	51.1%	6.0
A653 Dewsbury Rd (North) Ahead	1/4	51.7%	5.1	66.5%	7.4	65.6%	8.9	77.1%	11.9
M62 J28 Off-Slip (East) Left and Ahead	2/2+2/1	86.5%	10.7	**94.8%**	18.2	**99.6%**	15.8	**104.9%**	33.8
M62 J28 - Off-Slip (East) Ahead	2/3	**91.2%**	15.8	**96.3%**	20.5	**96.0%**	13.1	**105.9%**	25.8
Bradford Rd (East) Left and Ahead	3/1	78.5%	9.2	77.8%	9.1	81.8%	10.3	79.8%	9.9
Bradford Rd (East) Ahead	3/2+3/3	73.9%	8.2	79.3%	8.9	64.8%	6.9	62.7%	6.4
A653 Dewsbury Rd (South) Left Ahead	4/2+4/1	**95.4%**	17.7	**118.2%**	**139.2**	**115.6%**	**63.5**	**139.8%**	**163.1**
A653 Dewsbury Rd - South Ahead	4/3	**90.6%**	14.6	**117.7%**	**83.9**	**114.5%**	**48.3**	**138.7%**	**107.8**
Bradford Rd (West) Left	5/1+5/2	75.6%	8.0	75.6%	8.0	**119.6%**	**81.5**	**119.6%**	**82.1**
Bradford Rd (West) Ahead	5/3	76.3%	8.5	76.5%	8.5	70.0%	6.7	69.8%	6.7
Bradford Rd (West) Ahead	5/4	75.5%	8.2	75.3%	8.2	68.0%	6.4	68.2%	6.5
M62 J28 Off-Slip (West) Ahead and Left	6/2+6/1	13.1%	0.8	13.1%	0.8	38.3%	3.1	38.3%	3.1
M62 J28 Off-Slip (West) Ahead	6/3	83.7%	8.3	**107.6%**	**30.7**	64.7%	6.4	76.8%	8.5
Practical Reserve Capacity (%)		-6.0		-31.4		-32.9		-55.3	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.77 Table 5.10 shows that the junction would operate at similar capacity levels during the PM peak hour both with and without Development traffic when utilising the existing fixed time plans for the Future Year 2020 scenario assessments. The AM peak hour assessments results show that the

junction would operate at capacity in the Future Year 2030 scenario without development traffic, whereas once the latter has been added to the network, the junction would be over capacity.

Optimised Future Year Assessments (With and Without Development Traffic)

5.78 A sensitivity test has been undertaken for the worst-case scenarios (Future Year 2030 with and without Development traffic) in order to understand whether there is capacity at the junction for the additional traffic as a result of the background growth and the proposed development at the Site.

5.79 The operation of the junction has therefore been tested for the Future Year 2030 scenario with and without development, utilising the same cycle time length but allowing for the optimisation of the stages so as to provide as much vehicle throughput as possible. In addition, bonus greens have been applied to all lanes to represent drivers running over the amber prior to the red at the end of their stage, which was observed to happen when congestion was present on a particular lane/junction.

5.80 The results of this test for the weekday AM and PM peak hours are summarised in **Table 5.11**.

Table 5.11 M62 Junction 28 (Tingley Interchange) – Optimised Future Year 2030 Scenarios (Observed Traffic plus Growth with and without Proposed Development) – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)				PM Peak (16:45-17:45)			
		Without Dev		With Dev		Without Dev		With Dev	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
A653 Dewsbury Rd (North) Ahead and Left	1/2+1/1	38.9%	3.6	38.9%	3.6	44.3%	4.3	44.3%	4.3
A653 Dewsbury Rd (North) Ahead	1/3	27.8%	2.5	34.3%	3.1	44.2%	4.9	46.7%	5.3
A653 Dewsbury Rd (North) Ahead	1/4	56.8%	5.9	73.9%	8.8	65.7%	8.9	81.5%	13.4
M62 J28 Off-Slip (East) Left and Ahead	2/2+2/1	78.6%	8.5	86.2%	11.3	75.0%	7.1	79.0%	7.9
M62 J28 - Off-Slip (East) Ahead	2/3	86.8%	14.5	**93.2%**	18.6	86.1%	9.8	83.0%	9.3
Bradford Rd (East) Left and Ahead	3/1	75.9%	9.0	76.2%	9.0	80.8%	10.5	84.9%	10.6
Bradford Rd (East) Ahead	3/2+3/3	86.8%	10.7	72.9%	8.1	58.7%	6.1	77.6%	8.7
A653 Dewsbury Rd (South) Left Ahead	4/2+4/1	86.9%	11.3	**94.7%**	18.5	86.3%	11.2	87.7%	13.2
A653 Dewsbury Rd - South Ahead	4/3	77.0%	10.8	**90.5%**	17.7	79.1%	9.6	80.6%	11.8
Bradford Rd (West) Left	5/1+5/2	71.6%	7.6	85.1%	9.4	80.6%	11.2	89.4%	13.7
Bradford Rd (West) Ahead	5/3	72.5%	7.9	85.3%	9.8	45.7%	4.8	52.3%	5.4
Bradford Rd (West) Ahead	5/4	71.7%	7.8	84.3%	9.6	44.6%	4.7	49.7%	5.0
M62 J28 Off-Slip (West) Ahead and Left	6/2+6/1	13.1%	0.8	13.1%	0.8	37.0%	3.1	38.3%	3.1
M62 J28 Off-Slip (West) Ahead	6/3	83.7%	8.3	**107.6%**	**30.7**	61.4%	6.2	76.8%	8.5
Practical Reserve Capacity (%)		-1.4		-19.5		1.8		-0.9	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.81 Table 5.11 shows that, once optimised, the junction would operate at or within capacity in the majority of the assessed Future Year 2030 scenarios both with and without development traffic. The results indicate that the junction would be over capacity during the AM peak hour modelled period with Development traffic.

Future Year 2030 Scenario (with Development) - Potential Mitigation

5.82 A further sensitivity test has been undertaken for this scenario in order to understand whether minor changes within the controller and existing road markings/signage would have the potential to bring the junction to acceptable operational levels.

5.83 The potential mitigation includes the reduction of the minimum green time from 10 to 6 seconds for pedestrian phase K in Controller 770L, across the northbound Tingley Interchange circulatory carriageway. The crossing was observed to have limited use by pedestrians (if any); however, the intergreen value for this phase has been retained at 11 seconds for safety. In addition, lane connectors have been included between Arms 11 and 12 (within the internal circulatory lanes) to represent the option for traffic travelling from the M63 (west) off-slip approach lane 2 (middle lane) to the A653 Dewsbury Road (south).

5.84 The results of this test for the weekday AM Future Year 2030 with development traffic are summarised in **Table 5.12**. The results for the weekday AM Future Year 2030 with development traffic assessment without mitigation are also included in Table 5.11 for comparison.

Table 5.12 M62 Junction 28 (Tingley Interchange) – Future Year 2030 AM Peak Hour Scenario (Observed Traffic plus Growth with Proposed Development) – Including Potential Mitigation LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)			
		Without Mitigation		With Mitigation	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
A653 Dewsbury Rd (North) Ahead and Left	1/2+1/1	38.9%	3.6	38.9%	3.6
A653 Dewsbury Rd (North) Ahead	1/3	34.3%	3.1	53.0%	5.4
A653 Dewsbury Rd (North) Ahead	1/4	73.9%	8.8	55.3%	5.6
M62 J28 Off-Slip (East) Left and Ahead	2/2+2/1	86.2%	11.3	78.0%	8.4
M62 J28 - Off-Slip (East) Ahead	2/3	**93.2%**	18.6	87.1%	15.4
Bradford Rd (East) Left and Ahead	3/1	76.2%	9.0	76.2%	9.0
Bradford Rd (East) Ahead	3/2+3/3	72.9%	8.1	72.3%	8.1
A653 Dewsbury Rd (South) Left Ahead	4/2+4/1	**94.7%**	18.5	**94.7%**	18.5
A653 Dewsbury Rd - South Ahead	4/3	**90.5%**	17.7	**90.5%**	17.7
Bradford Rd (West) Left	5/1+5/2	85.1%	9.4	**90.7%**	11.1
Bradford Rd (West) Ahead	5/3	85.3%	9.8	**90.4%**	11.3
Bradford Rd (West) Ahead	5/4	84.3%	9.6	89.8%	11.0
M62 J28 Off-Slip (West) Ahead and Left	6/2+6/1	13.1%	0.8	76.7%	5.8
M62 J28 Off-Slip (West) Ahead	6/3	**107.6%**	**30.7**	76.9%	5.8
Practical Reserve Capacity (%)		-19.5		-5.2	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.85 Table 5.12 shows that in the future year with the proposed mitigation, the junction has the potential to operate a similar capacity levels as per the existing situation.

A653 Leeds Road / Heybeck Lane – Signal Controlled Junction

Calibration and Validation Methodology

5.86 Existing signal timing information including cycle times, phasing, staging and intergreens was obtained from the KC Highways officers for calibration.

5.87 Survey data provided by the survey company identified the cycle time at the junction as currently being approximately 96 seconds on average during the modelled peak hours and this has been utilised in order to represent the existing average situation.

5.88 Measurements such as physical lane lengths for long and short lanes, lane widths and turning radii were measured and calculated from online imagery observations and ordnance survey mapping. Lane saturation flows were recorded by the survey company for each signalised lane and peak period and an average of these has been used for each one of the main lanes at the junction. The saturation flows for the two short lanes on Leeds Road (one on each one of the approaches), serving the right turn movement, have been estimated using the programme built-in RR67 calculation as these could not be recorded onsite due to the fact that these turning movements give way to opposing traffic movements.

5.89 In line with observations from the video footage obtained along with the survey data, bonus green times have been applied to a number of lanes to account for vehicles generally running over the amber prior to the red at the end of their stage.

5.90 As part of the controller specifications, it was stated that Stage 3, all pedestrian crossings, would only run with a demand for some of the pedestrian phases. This stage was observed to be only called 3-4 times over the entire AM peak hour and 1-2 times over the PM peak hour, and thus the model has been validated under the assumption that an average cycle will not include this stage being called.

5.91 Queues were recorded by the Survey Company at the end of the red in each signalised lane for every cycle of the signals throughout the survey period. Given that the green time for each signalised stage varied with each cycle depending on demand (due to the MOVA system in place), the length of these green times were extended to match observations taken from the video survey footage and the survey vehicle queue length data (matched with Mean Max Queue results from the model) in order to validate the base year model.

5.92 Delay-based cruise times have been applied to the lane connector between Arm1/Lane 2 and Arm 6/Lane 1 so as to achieve O-D flow apportionments on that approach to the junction that matched the observed queues. This was observed to be acceptable and in line with observations from the video footage obtained along with the survey data.

Traffic Model Results

5.93 **Table 5.13** includes a summary of the LinSig model results for all scenarios for the Leeds Road / Heybeck Lane junction.

Table 5.13 A653 Leeds Road / Heybeck Lane – LinSig Results

Movement		AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
		DoS (%)	MMQ (PCU)	DoS (%)	MMQ (PCU)
Base 2016					
1/1	Leeds Road (North) Ahead Left	52.5%	10.4	58.9%	12.7
½+1/3	Leeds Road (North) Ahead Right	40.5%	6.4	49.8%	8.3
2/1	Leeds Road (South) Ahead Left	59.7%	12.4	53.6%	10.1
2/2+2/3	Leeds Road (South) Ahead Right	61.9%	11.0	64.8%	9.0
3/1	Heybeck Lane (West)	80.1%	10.2	88.2%	10.6
4/1	Heybeck Lane (East)	50.6%	6.1	64.1%	6.9
Practical Reserve Capacity (%)		12.4		2.1	
Base 2020					
1/1	Leeds Road (North) Ahead Left	68.3%	12.6	60.1%	12.2
½+1/3	Leeds Road (North) Ahead Right	67.1%	10.8	58.3%	8.7
2/1	Leeds Road (South) Ahead Left	62.1%	13.0	48.1%	9.6
2/2+2/3	Leeds Road (South) Ahead Right	64.3%	11.4	59.4%	8.3
3/1	Heybeck Lane (West)	67.8%	11.5	60.5%	7.5
4/1	Heybeck Lane (East)	39.0%	6.2	45.2%	5.9
Practical Reserve Capacity (%)		31.8		48.8	
Base 2020 + Development					
1/1	Leeds Road (North) Ahead Left	85.8%	18.8	69.9%	14.7
½+1/3	Leeds Road (North) Ahead Right	85.8%	17.9	67.1%	12.1
2/1	Leeds Road (South) Ahead Left	71.6%	16.0	60.5%	13.6
2/2+2/3	Leeds Road (South) Ahead Right	73.8%	14.1	66.3%	11.9
3/1	Heybeck Lane (West)	85.9%	16.1	69.9%	8.8
4/1	Heybeck Lane (East)	69.5%	11.4	63.3%	8.1
Practical Reserve Capacity (%)		4.8		28.7	
Base 2030					
1/1	Leeds Road (North) Ahead Left	76.1%	14.9	69.2%	13.2
½+1/3	Leeds Road (North) Ahead Right	85.3%	13.4	72.0%	11.7
2/1	Leeds Road (South) Ahead Left	85.0%	19.2	70.2%	13.3
2/2+2/3	Leeds Road (South) Ahead Right	85.7%	17.3	74.5%	12.5
3/1	Heybeck Lane (West)	83.4%	16.1	72.4%	12.3
4/1	Heybeck Lane (East)	42.5%	6.9	36.5%	5.7
Practical Reserve Capacity (%)		5.0		20.8	
Base 2030 + Development					
1/1	Leeds Road (North) Ahead Left	**98.1%**	30.4	**91.9%**	22.4
½+1/3	Leeds Road (North) Ahead Right	**103.6%**	37.3	**93.6%**	22.9
2/1	Leeds Road (South) Ahead Left	**106.8%**	63.3	**90.7%**	24.4
2/2+2/3	Leeds Road (South) Ahead Right	**106.7%**	61.1	**92.8%**	22.7
3/1	Heybeck Lane (West)	**105.6%**	42.8	**94.2%**	20.3
4/1	Heybeck Lane (East)	72.6%	13.0	57.5%	9.2
Practical Reserve Capacity (%)		-18.7		-4.7	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.94 Table 5.13 indicates that the junction currently operates within capacity, with all lanes showing DoS lower than 90%.

5.95 It has been assumed that the junction operation will adjust to changes in demand (traffic growth) due to the MOVA control system in place; therefore, future year scenarios in LinSig have been

optimised with the purpose of showing the potential capacity level of the junction. Taking this into account, Table 5.13 shows that the junction would potentially operate within capacity until future year 2030 with development traffic, where it would reach oversaturated levels during the AM peak hour period.

Future Year Assessment – Potential Mitigation

5.96 A sensitivity test has been undertaken for the worst-case scenario (Future Year 2030 with development traffic) to understand whether there is sufficient capacity at the junction for the additional traffic as a result of the background growth and the proposed development at the site.

5.97 In order to maximise the capacity of the junction and to represent the traffic conditions of the future year, the following changes have been made to the base model:

- Phase inter-green limit values have been used (as per the controller specification data).
- Pedestrian phases have been set to run only when there is demand for pedestrians. This would only run as part as an all pedestrian crossing stage (not on an average cycle) as it was the case with the Base model for this junction.
- Bonus greens have been applied to all lanes to account for vehicles generally running over the amber prior to the red at the end of their stage.
- Delay-based cruise times that had been applied to the lane connector between Arm1/Lane 2 and Arm 6/Lane 1 so as to achieve O-D flow apportionments on that approach to the junction that matched the observed queues have been removed. This has been done under the assumption that, as traffic flows grow, drivers will make use of the less congested lane that leads to their destination.

5.98 The results of this test for the weekday AM and PM peak hours are summarised in **Table 5.14**.

Table 5.14 A653 Leeds Road / Heybeck Lane – Optimised Future Year 2030 Scenario (Base plus Growth and Proposed Development) – LinSig Results

Movement		AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
		DoS (%)	MMQ (PCU)	DoS (%)	MMQ (PCU)
Base 2016					
1/1	Leeds Road (North) Ahead Left	79.8%	14.5	72.0%	12.1
½+1/3	Leeds Road (North) Ahead Right	**90.6%**	15.3	78.6%	13.4
2/1	Leeds Road (South) Ahead Left	**91.0%**	21.8	78.5%	14.9
2/2+2/3	Leeds Road (South) Ahead Right	**92.0%**	20.1	81.2%	14.2
3/1	Heybeck Lane (West)	**93.4%**	18.4	81.1%	12.1
4/1	Heybeck Lane (East)	65.4%	9.4	52.4%	6.6
Practical Reserve Capacity (%)		-3.8		9.6	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 60 seconds.

5.99 Table 5.14 indicates that, once optimised, the junction has the potential to operate at or within capacity in the Future Year 2030 with development scenario.

A653 Leeds Road / Chidswell Lane – Priority T-Junction

Methodology

5.100 The operation of the existing Leeds Road/Chidswell Road priority 'T' junction has been modelled using industry standard PICADY software, version 5.1. The results of this assessment for each of the scenarios are summarised below.

5.101 Peak hour traffic has been entered as ODTAB in order to assess a worst-case scenario, as this traffic demand data entry type, produces a demand peak profile within the peak hour. Heavy goods vehicle proportions have been based on the existing proportions (as per the survey data) and have been set to vary with each modelling period.

Traffic Model Results

5.102 **Table 5.15** shows a summary of the PICADY model results for all scenarios for the Leeds Road / Chidswell Lane Junction.

Table 5.15 A653 Leeds Road / Chidswell Lane – PICADY Results

Arm	AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
	RFC	Queue (Vehicles)	RFC	Queue (Vehicles)
Base 2016				
Chidswell Lane to Leeds Road (south)	0.087	0.1	0.052	0.1
Chidswell Lane to Leeds Road (north)	0.321	0.5	0.169	0.2
Leeds Road (south) to Leeds Road (north) and Chidswell Lane	0.026	0.0	0.051	0.1
Base 2020				
Chidswell Lane to Leeds Road (south)	0.091	0.1	0.49	0.1
Chidswell Lane to Leeds Road (north)	0.349	0.5	0.160	0.2
Leeds Road (south) to Leeds Road (north) and Chidswell Lane	0.027	0.0	0.48	0.1
Base 2020 + Development				
Chidswell Lane to Leeds Road (south)	0.211	0.3	0.081	0.1
Chidswell Lane to Leeds Road (north)	0.636	1.7	0.290	0.4
Leeds Road (south) to Leeds Road (north) and Chidswell Lane	0.043	0.0	0.085	0.1
Base 2030				
Chidswell Lane to Leeds Road (south)	0.094	0.1	0.049	0.1
Chidswell Lane to Leeds Road (north)	0.371	0.6	0.182	0.2
Leeds Road (south) to Leeds Road (north) and Chidswell Lane	0.028	0.0	0.268	0.4
Base 2030 + Development				
Chidswell Lane to Leeds Road (south)	0.300	0.4	0.087	0.1
Chidswell Lane to Leeds Road (north)	0.751	2.7	0.358	0.6
Leeds Road (south) to Leeds Road (north) and Chidswell Lane	0.047	0.1	0.323	0.5

5.103 Table 5.15 shows that the junction would operate well within capacity during all the assessed peak periods in all scenarios, with the highest RFC being 0.751 on Chidswell Lane for right turners, which results on a queue of 2.7 vehicles.

A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – Signal Controlled Junction

Calibration and Validation Methodology

5.104 Existing signal timing information including cycle times, phasing, staging and intergreens was obtained from the KC Highways officers for calibration.

5.105 Survey data provided by the survey company identified the cycle time at the junction as currently being approximately 72 seconds on average during the modelled peak hours and this has been utilised in order to represent the existing average situation.

5.106 Measurements such as physical lane lengths for long and short lanes, lane widths and turning radii were measured and calculated from online imagery observations and ordnance survey mapping. Lane saturation flows were recorded by the survey company for each signalised lane and peak period and an average of these has been used for each one of the main lanes at the junction. The saturation flows for the short lanes on Leeds Road (north) and Challenge Way, serving the right turn movement, have been estimated using the programme built-in RR67 calculation as these could not be recorded onsite due to the fact that these turning movements give way to opposing traffic movements.

5.107 In line with observations from the video footage obtained along with the survey data, bonus green times have been applied to a number of lanes to account for vehicles generally running over the amber prior to the red at the end of their stage.

5.108 Queues were recorded by the survey company at the end of the red in each signalised lane for every cycle of the signals throughout the survey period. Given that the green time for each signalised stage varied with each cycle depending on demand (due to the Urban Traffic Control , UTC, system in place), the length of these green times were extended to match observations taken from the video survey footage and the survey vehicle queue length data (matched with Mean Max Queue results from the model) in order to validate the base year model.

Traffic Model Results

5.109 The results of the Base Year assessment (2016 observed traffic flows) for the weekday AM and PM peak hours are summarised in **Table 5.16**.

Table 5.16 A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – Base Year Scenario – LinSig Results

Movement		AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
		DoS (%)	MMQ (PCU)	DoS (%)	MMQ (PCU)
1/1+1/2	Leeds Road (South)	79.9%	13.5	77.8%	13.2
2/2+2/1	Leeds Road (North) Ahead Left	56.6%	8.5	66.6%	11.1
2/3	Leeds Road (North) Right	23.9%	1.4	9.2%	0.6
3/1+3/2	Challenge Way	94.5%	12.7	92.0%	11.8
4/1	John Ormsby V C Way Left	76.6%	5.6	83.6%	9.3
4/2	John Ormsby V C Way Ahead & Right	82.3%	8.2	70.6%	6.8
5/1	Challenge Way (EXIT)	31.2%	0.8	24.9%	0.6
6/1+6/2	Leeds Road (Right into High St)	36.0%	0.3	48.1%	0.5
7/1	High Street	45.9%	0.4	51.8%	0.5
Practical Reserve Capacity (%)		-5.0		-2.2	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 72 seconds.

5.110 As it can be seen in Table 5.16, the results show that the junction is currently at capacity, with the Challenge Way approach experiencing the highest DoS.

5.111 It has been assumed that the junction operation will adjust to changes in demand (traffic growth) due to the UTC system in place; therefore, future year scenarios in LinSig have been optimised with the purpose of showing the potential capacity level of the junction. Taking this into account, **Table 5.17** shows the results of the Future Year 2020 scenario with and without development, for the weekday AM and PM peak hours.

Table 5.17 A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – Future Year 2020 Scenarios – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)				PM Peak (16:45-17:45)			
		Without Dev		With Dev		Without Dev		With Dev	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
1/1+1/2	Leeds Road (South)	87:7%	18.6	89.6%	18.3	87.3%	17.0	93.3%	21.7
2/2+2/1	Leeds Road (North) Ahead Left	81.4%	13.3	67.3%	9.6	58.2%	8.6	65.3%	10.1
2/3	Leeds Road (North) Right	29.5%	1.7	13.6%	0.7	10.7%	0.6	13.3%	0.7
3/1+3/2	Challenge Way	81.9%	8.8	54.7%	6.1	71.8%	7.3	69.2%	7.2
4/1	John Ormsby V C Way Left	77.5%	6.5	89.3%	12.1	89.3%	12.1	91.3%	13.5
4/2	John Ormsby V C Way Ahead & Right	67.7%	6.5	54.2%	6.1	67.0%	7.0	65.1%	7.0
5/1	Challenge Way (EXIT)	33.9%	3.6	25.3%	0.6	25.3%	0.6	25.2%	0.6
6/1+6/2	Leeds Road (Right into High St)	40.3%	0.3	45.6%	0.4	45.6%	0.4	49.4%	0.5
7/1	High Street	48.7%	0.5	54.1%	0.6	53.7%	0.6	56.5%	0.6
Practical Reserve Capacity (%)		2.7		0.4		0.8		-3.7	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 72 seconds.

5.112 Table 5.17 shows that, once optimised, the junction could potentially operate within capacity in the future year 2020 both with and without development traffic.

5.113 The Future Year 2030 LinSig model has been optimised and the average cycle time has been extended to 96 seconds in order to increase the vehicle throughput at the junction to its maximum and assess whether there is capacity for both traffic growth and development traffic growth. The results for this scenario (with and without development) are summarised in **Table 5.18**. These suggest that the junction will become oversaturated in the future year, both with and without development traffic added to the network. It is noted that the LinSig model represents an average cycle within an average hour period, and that it assumes average arrival profiles. However, in reality, arrival patterns might vary and be spread across the peak hour and thus, given the UTC system in place, the operation of the junction in reality might be slightly superior to that shown in Table 5.18.

Table 5.18 A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – Future Year 2030 Scenarios – LinSig Results

Arm	Link Number	AM Peak (07:30-08:30)				PM Peak (16:45-17:45)			
		Without Dev		With Dev		Without Dev		With Dev	
		DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)	DoS (%)	MMQ (pcu)
1/1+1/2	Leeds Road (South)	115.7%	111.1	122.1%	150.5	120.3%	107.4	124.1%	128.8
2/2+2/1	Leeds Road (North) Ahead Left	100.3%	30.4	121.1%	91.6	89.7%	19.0	96.3%	25.8
2/3	Leeds Road (North) Right	66.1%	3.7	72.8%	4.4	21.0%	1.0	23.3%	1.1
3/1+3/2	Challenge Way	113.4%	86.9	120.2%	110.1	119.3%	126.6	126.1%	153.1
4/1	John Ormsby V C Way Left	46.1%	6.9	49.1%	7.2	45.3%	7.8	51.6%	9.0
4/2	John Ormsby V C Way Ahead & Right	88.0%	16.0	93.3%	18.7	47.7%	8.7	51.2%	9.4
5/1	Challenge Way (EXIT)	45.7%	1.6	48.3%	1.7	31.7%	6.5	32.0%	5.8
6/1+6/2	Leeds Road (Right into High St)	44.6%	0.4	42.7%	0.4	47.0%	0.4	51.7%	0.5
7/1	High Street	67.4%	4.6	74.2%	5.7	54.1%	0.6	60.2%	0.8
Practical Reserve Capacity (%)		-28.6		-33.7		-35.6		-40.1	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 96 seconds.

5.114 Table 5.18 shows that both the Leads Road (south) and Challenge Way approaches would be over capacity with and without development traffic in the future year 2030.

B6128 Owl Lane / Windsor Road – Priority T-Junction

Methodology

5.115 The operation of the existing priority 'T' junction has been modelled using industry standard PICADY software, version 5.1. The results of this assessment for each of the scenarios are summarised below.

5.116 Peak hour traffic has been entered as ODTAB in order to assess a worst-case scenario, as this traffic demand data entry type, produces a demand peak profile within the peak hour. Heavy goods vehicle proportions have been based on the existing proportions (as per the survey data) and have been set to vary with each modelling period.

Traffic Model Results

5.117 **Table 5.19** shows a summary of the PICADY model results for all scenarios for the Owl Lane / Windsor Road Junction.

Table 5.19 B6128 Owl Lane / Windsor Road – PICADY Results

Arm	AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
	RFC	Queue (Vehicles)	RFC	Queue (Vehicles)
Base 2016				
Windsor Road to Owl Lane (east)	0.180	0.22	0.428	0.74
Windsor Road to Owl Lane (west)	0.013	0.01	0.070	0.07
Own Lane (east) to Owl Lane (west) and Windsor Road	0.331	1.41	0.286	1.18
Base 2020				
Windsor Road to Owl Lane (east)	0.188	0.23	0.429	0.74
Windsor Road to Owl Lane (west)	0.015	0.02	0.076	0.08
Own Lane (east) to Owl Lane (west) and Windsor Road	0.375	1.75	0.318	1.41
Base 2020 + Development				
Windsor Road to Owl Lane (east)	0.253	0.34	0.463	0.85
Windsor Road to Owl Lane (west)	0.017	0.02	0.086	0.09
Own Lane (east) to Owl Lane (west) and Windsor Road	0.442	2.28	0.454	2.35
Base 2030				
Windsor Road to Owl Lane (east)	2.860	16.48	0.510	1.02
Windsor Road to Owl Lane (west)	2.302	0.59	0.153	0.17
Own Lane (east) to Owl Lane (west) and Windsor Road	0.991	39.23	0.423	2.46
Base 2030 + Development				
Windsor Road to Owl Lane (east)	***	32.23	0.560	1.24
Windsor Road to Owl Lane (west)	***	0.57	0.204	0.24
Own Lane (east) to Owl Lane (west) and Windsor Road	1.035	40.19	0.636	5.23

5.118 Table 5.19 shows that the junction would operate well within capacity until the Base Year 2020 scenarios (both with and without development traffic). However, the junction would become overcapacity in the Base Year 2030 scenario, with growth but without development traffic. This indicates that there will be a lack in capacity issue regardless of whether the indicative masterplan proposals are brought forward, and that the addition of the future development traffic would only exacerbate an existing issue

A638 Wakefield Road / A638 Chancery Road / B6128 Owl Lane / B6128 Leeds Road – Priority Roundabout

Methodology

5.119 The operation of the existing priority roundabout has been modelled using industry standard ARCADY software roundabout module version 9 (Junctions 9 V.9.0.1.4646). The results of this assessment for each of the scenarios are summarised below.

5.120 Peak hour traffic has been entered as ODTAB in order to assess a worst-case scenario, as this traffic demand data entry type, produces a demand peak profile within the peak hour. Heavy goods vehicle proportions have been based on the existing proportions (as per the survey data) and have been set to vary with each modelling period.

5.121 The model has been validated against observed queues at the junction as reported by the survey company (as well as observations from the traffic surveys video footage). In order to achieve validation, minor alterations were required to the slope and intercept values to reduce the overall capacity of the junction and match the observe queue values.

Traffic Model Results

5.122 **Table 5.20** shows a summary of the ARCADY model results for all scenarios for the Chancery Road / Leeds Road / Wakefield Road / Owl Lane roundabout.

Table 5.20 A638 Wakefield Road / A638 Chancery Road / B6128 Owl Lane / B6128 Leeds Road – ARCADY Results

Arm	AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
	RFC	Queue (Vehicles)	RFC	Queue (Vehicles)
Base 2016				
Chancery Road	0.810	4.3	0.938	11.9
Leeds Road	0.859	5.9	0.739	2.9
Wakefield Road	0.922	9.8	0.793	3.8
Owl Lane	0.736	2.8	0.975	17.6
Base 2020				
Chancery Road	0.770	3.4	0.921	10.1
Leeds Road	0.863	6.1	0.835	4.9
Wakefield Road	0.816	4.3	0.772	3.3
Owl Lane	0.782	3.6	0.954	13.9
Base 2020 + Development				
Chancery Road	0.866	6.4	0.945	13.4
Leeds Road	1.006	22.3	0.877	6.5
Wakefield Road	0.898	7.6	0.795	3.8
Owl Lane	0.858	5.8	1.110	76.8
Base 2030				
Chancery Road	0.825	4.8	0.994	26.0
Leeds Road	1.623	343.7	0.989	18.0
Wakefield Road	1.089	65.6	0.643	1.8
Owl Lane	1.187	114.0	0.967	16.1
Base 2030 + Development				
Chancery Road	0.929	11.6	1.053	59.9
Leeds Road	1.879	458.2	1.067	40.2
Wakefield Road	1.162	102.0	0.671	2.0
Owl Lane	1.313	212.6	1.159	107.3

5.123 Table 5.20 shows that the junction already operates at capacity (nearing saturation) in the Base 2016 and Future Year 2020 scenarios (both in the AM and PM peak hours). The Base 2020 + Development scenario show that the junction would operate over capacity when the potential

emerging development is added. The junction is also shown to operate over capacity in the Future year 2030 both with and without development traffic scenarios.

Off-Site Junction Assessment Summary

5.124 A capacity assessment has been carried out of a number of key junctions within the surrounding highway network of the site, which were agreed further to discussions with KC Highways officers, might be impacted by the potential traffic generated as a result of the indicative masterplan proposals.

5.125 The key off-site junctions included within this assessment were as follows:

1. M1 Junction 40 (Flushdyke Interchange) – signal controlled junction;
2. M62 Junction 28 (Tingley Interchange) – signal controlled junction;
3. A653 Leeds Road / Heybeck Lane – signal controlled junction;
4. A653 Leeds Road / Chidswell Lane – priority T-junction;
5. A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – signal controlled junction;
6. B6128 Owl Lane / Windsor Road – priority T-junction; and
7. A638 Wakefield Road / A638 Chancery Road / B6128 Owl Lane / B6128 Leeds Road – priority roundabout.

5.126 The results of this exercise indicate that the majority of these junctions have the potential to operate at or within capacity levels in all scenarios including within the future year 2030, once the estimated development traffic and background growth has been added to the 2016 observed flows. These junctions include the M1 J40, the M62 J28 and the Leeds Road / Heybeck Lane signalised junctions; and the Leeds Road / Chidswell Lane priority T-junction. It is worth noting that the signal controlled junctions would require optimisation/re-validation of the signals so as to maximise the vehicle throughput and achieve these results in terms of capacity.

5.127 The results of the assessment of the three junctions along Owl Lane suggest that, generally, these junctions would operate at capacity until the future year 2020 (with and without development traffic). However, in the future year 2030 scenarios, these junctions would become over saturated even without development traffic, which would be a result of the projected background growth in the area. This indicates that there will be a shortage in capacity regardless of whether the indicative masterplan proposals are brought forward, and that the addition of the future development traffic would only exacerbate an underlying issue.

Proposed Site Access Junction Assessment Results

Heybeck Lane / Proposed Site Access – Priority T-Junction

Methodology

5.128 The operation of the proposed priority 'T' junction has been modelled using industry standard PICADY software, version 5.1. The results of this assessment for each of the scenarios are summarised below.

5.129 Peak hour traffic has been entered as ODTAB in order to assess a worst-case scenario, as this traffic demand data entry type, produces a demand peak profile within the peak hour. Default

proportions of heavy goods vehicles have been assumed so as to ensure that the assessment is robust and includes a worst case scenario.

Traffic Model Results

5.130 The results of the Heybeck Lane / Site Access Junction capacity assessment for the 2020 + Development and 2030 + Development scenarios in the AM and PM peak hours are summarised in **Table 5.21**.

Table 5.21 Heybeck Lane / Proposed Site Access – PICADY

Movement	AM Peak		PM Peak	
	RFC	Queue	RFC	Queue
2020 Base + Development				
Site Access to Heybeck Lane (west)	0.231	0.3	0.105	0.12
Site Access to Heybeck Lane (east)	0.076	0.1	0.033	0.03
Heybeck Lane (west) to Heybeck Lane (east) and Site Access	0.064	0.1	0.156	0.18
2030 Base + Development				
Site Access to Heybeck Lane (west)	0.238	0.3	0.110	0.1
Site Access to Heybeck Lane (east)	0.086	0.1	0.036	0.0
Heybeck Lane (west) to Heybeck Lane (east) and Site Access	0.066	0.1	0.162	0.2

5.131 Table 5.21 shows the potential Heybeck Lane site access would be expected to operate well within capacity in both the 2020 + Development and 2030 + Development scenarios.

A653 Leeds Road / Proposed Site Access (North) – Signal Controlled Junction

Methodology

5.132 This proposed signal controlled junctions has been modelled and assessed utilising industry standard LinSig software version 3.2.27.0. The cycle time at the junction has been taken as 72 seconds.

5.133 Measurements such as physical lane lengths for long and short lanes, lane widths and turning radii have been measured and calculated from the proposed junction layout drawings. Lane saturation flows have been estimated using the programme built-in RR67 calculation.

5.134 Intergreen times have been calculated over the proposed junction layout drawings using industry standard QuickGreen Intergreen Calculator software V1.1.15.0 (JCT Consultancy Ltd).

5.135 The results of this assessment for each of the scenarios are summarised below.

Traffic Model Results

5.136 Table 5.22**Table 5.22** shows the LinSig output for the Leeds Road/North Site Access junction in the Base 2020 + Development and Base 2030 + Development scenarios.

Table 5.22 A653 Leeds Road / Proposed Site Access (North) – LinSig Results

Movement	AM Peak (07:30-08:30)	PM Peak (16:45-17:45)

		Deg Sat. (%)	Mean Max Queue (PCU)	Deg Sat. (%)	Mean Max Queue (PCU)
Base 2020 + Development					
1/1	Leeds Road (north) Before Xing Ahead	49.6%	6.8	43.6%	5.7
1/2	Leeds Road (North) Before Xing Ahead	55.2%	8.0	46.4%	6.2
2/1	Leeds Road (north) Ahead Left	51.1%	0.9	44.3%	0.5
2/2	Leeds Road (north) Ahead	49.5%	0.9	43.3%	0.4
3/1	Leeds Road (south) Ahead	67.2%	10.5	68.3%	10.1
3/2+3/3	Leeds Road (South) Ahead Right	70.0%	11.8	69.9%	11.2
4/1	Proposed Northern Site Access Left	4.1%	0.2	9.5%	0.6
4/2	Proposed Northern Site Access Right	28.6%	1.8	67.5%	6.1
Practical Reserve Capacity (%)		28.6		28.7	
Base 2030 + Development					
1/1	Leeds Road (north) Before Xing Ahead	56.4%	9.2	56.5%	9.4
1/2	Leeds Road (North) Before Xing Ahead	61.4%	10.7	59.2%	10.1
2/1	Leeds Road (north) Ahead Left	55.0%	1.1	56.1%	0.8
2/2	Leeds Road (north) Ahead	52.4%	0.8	54.2%	0.8
3/1	Leeds Road (south) Ahead	87.3%	20.7	74.9%	14.1
3/2+3/3	Leeds Road (South) Ahead Right	88.4%	22.6	76.3%	15.4
4/1	Proposed Northern Site Access Left	4.5%	0.2	10.5%	0.7
4/2	Proposed Northern Site Access Right	31.8%	2.0	74.9%	7.3
Practical Reserve Capacity (%)		1.8		18.0	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 72 seconds.

5.137 The output shows that the Leeds Road/North Site Access junction works well within capacity in the 2020 Base + Development and 2030 Base + Development scenarios.

A653 Leeds Road / Proposed Site Access (South) – Signal Controlled Junction

Methodology

5.138 This proposed signal controlled junctions has been modelled and assessed utilising industry standard LinSig software version 3.2.27.0. The cycle time at the junction has been taken as 72 seconds.

5.139 Measurements such as physical lane lengths for long and short lanes, lane widths and turning radii have been measured and calculated from the proposed junction layout drawings. Lane saturation flows have been estimated using the programme built-in RR67 calculation.

5.140 Intergreen times have been calculated over the proposed junction layout drawings using industry standard QuickGreen Intergreen Calculator software V1.1.15.0 (JCT Consultancy Ltd).

5.141 The results of this assessment for each of the scenarios are summarised below.

Traffic Model Results

5.142 **Table 5.23** shows the LinSig output for the Leeds Road/South Site Access junction in the Base 2020 + Development and Base 2030 + Development scenarios.

Table 5.23 A653 Leeds Road / Proposed Site Access (South) – LinSig Results

Movement		AM Peak (07:30-08:30)		PM Peak (16:45-17:45)	
		Deg Sat. (%)	Mean Max Queue (PCU)	Deg Sat. (%)	Mean Max Queue (PCU)
Base 2020 + Development					
1/1	Leeds Road (north) Before Xing Ahead	33.7%	3.6	35.5%	3.8
1/2	Leeds Road (North) Before Xing Ahead	37.3%	4.2	38.4%	4,5
2/1	Leeds Road (north) Ahead Left	35.7%	1.4	37.0%	1.6
2/2	Leeds Road (north) Ahead	38.7%	1.6	39.9%	1.8
3/1	Leeds Road (south) Ahead	44.7%	5.6	37.7%	4.4
3/2+3/3	Leeds Road (South) Ahead Right	47.3%	6.5	40.3%	5.2
4/1	Proposed Northern Site Access Left	0.9%	0.0	3.6%	0.2
4/2	Proposed Northern Site Access Right	7.0%	0.3	22.3%	1.1
5/1	Leeds Road North Exit Ahead	41.7%	0.4	36.5%	0.7
5/2	Leeds Road North Exit Ahead	44.6%	0.7	39.3%	0.9
Practical Reserve Capacity (%)		90.4		123.1	
Base 2030 + Development					
1/1	Leeds Road (north) Before Xing Ahead	54.3%	8.0	59.5%	9.3
1/2	Leeds Road (North) Before Xing Ahead	58.6%	9.6	64.4%	11.5
2/1	Leeds Road (north) Ahead Left	56.8%	1.6	59.1%	1.5
2/2	Leeds Road (north) Ahead	58.6%	1.8	60.2%	1.7
3/1	Leeds Road (south) Ahead	69.2%	11.7	46.8%	6.5
3/2+3/3	Leeds Road (South) Ahead Right	71.2%	13.1	50.1%	7.6
4/1	Proposed Northern Site Access Left	10.3%	0.8	8.9%	0.6
4/2	Proposed Northern Site Access Right	72.1%	8.3	62.6%	5.2
5/1	Leeds Road North Exit Ahead	60.4%	2.7	46.0%	2.7
5/2	Leeds Road North Exit Ahead	62.5%	3.0	48.4%	3.0
Practical Reserve Capacity (%)		24.8		39.7	

Note. DoS = Degree of Saturation. MMQ = Mean Max Queue. Cycle Time = 72 seconds.

5.143 The output shows that the Leeds Road/South Site Access junction works well within capacity in the 2020 Base + Development scenario as well as the 2030 Base + Development scenario.

Chidswell Lane / Proposed Site Access – Priority T-Junction

Methodology

5.144 The operation of the proposed priority 'T' junction off Chidswell Lane has been modelled using industry standard PICADY software, version 5.1. The results of this assessment for each of the scenarios are summarised below.

5.145 Peak hour traffic has been entered as ODTAB in order to assess a worst-case scenario, as this traffic demand data entry type, produces a demand peak profile within the peak hour. Default proportions of heavy goods vehicles have been assumed so as to ensure that the assessment is robust and includes a worst case scenario.

Traffic Model Results

5.146 The results of the Chidswell Lane / site access junction capacity assessment for the 2020 + Development and 2030 + Development scenarios in the AM and PM peak hours are summarised in **Table 5.24**.

Table 5.24 Chidswell Lane / Proposed Site Access – PICADY

Movement	AM Peak		PM Peak	
	RFC	Q	RFC	Q
2020 Base + Development				
Site Access to Chidswell Lane (south)	0.055	0.1	0.028	0.0
Site Access to Chidswell Lane (north)	0.235	0.3	0.121	0.1
Chidswell Lane (south) to Chidswell Lane (north) and Site Access	0.068	0.1	0.040	0.0
2030 Base + Development				
Site Access to Chidswell Lane (south)	0.061	0.1	0.036	0.0
Site Access to Chidswell Lane (north)	0.255	0.3	0.163	0.2
Chidswell Lane (south) to Chidswell Lane (north) and Site Access	0.016	0.0	0.052	0.1

5.147 Table 5.24 shows the potential Chidswell Lane/site access junction would be expected to remain well within capacity in the 2020 + Development and 2030+ Development scenarios.

B6128 Owl Lane / Proposed Site Access – Priority Roundabout

Methodology

5.148 A potential four arm site access roundabout is proposed off Owl Lane, which would allow vehicles to access the masterplan site from the south. The operation of this priority roundabout has been modelled using industry standard ARCADY software roundabout module version 9 (Junctions 9 V.9.0.1.4646). The results of this assessment for each of the scenarios are summarised below.

5.149 For completeness, a forth arm has been included to the south of the proposed junction, which is not expected to be active during peak hours. Therefore, no traffic flows have been assumed to arrive or depart from this arm during the AM or PM peak hour periods.

5.150 Peak hour traffic has been entered as ODTAB in order to assess a worst-case scenario, as this traffic demand data entry type, produces a demand peak profile within the peak hour. Heavy goods vehicle proportions have been based on the existing proportions (as per the survey data and extracted for a junction located nearby) and have been set to vary with each modelling period.

Traffic Model Results

5.151 **Table 5.25** shows the ARCADY output for the Owl Lane/Site Access roundabout in the 2020 Base + Development and 2030 Base + Development scenarios.

Table 5.25 B6128 Owl Lane / Site Access – Priority Roundabout – ARCADY

Movement	AM Peak		PM Peak	
	RFC	Q	RFC	Q
2020 Base + Development				
Owl Lane (West)	0.55	1.3	0.62	1.7
Site Access	0.06	0.1	0.20	0.3
Owl Lane (East)	0.66	1.9	0.54	1.2
Fourth Access	0.000	0.0	0.00	0.0
2030 Base + Development				
Owl Lane (West)	0.80	4.2	0.78	3.5
Site Access	0.22	0.3	0.30	0.4
Owl Lane (East)	0.84	5.3	0.63	1.7
Fourth Access	0.00	0.0	0.00	0.0

5.152 Table 5.25 shows the Owl Lane / Site Access roundabout would be expected to operate within capacity in the 2020 Base + Development and 2030 Base + Development scenarios.

Site Related Junction Assessment Summary

5.153 A capacity assessment has been carried out of the potential five accesses proposed as part of the indicative masterplan proposals.

5.154 The junctions included within this assessment were as follows:

- Proposed site access via Heybeck Lane - priority T-junction;
- Proposed site access via Leeds Road (North) – signal controlled junction;
- Proposed site access via Leeds Road (South) – signal controlled junction;
- Proposed site access via Chidswell Lane - priority T-junction; and
- Proposed Site Access via Owl Lane - priority roundabout.

5.155 The results from the junction capacity assessments show that all proposed site accesses would operate well within capacity (less than 90% DoS and 0.85 RFC on all lanes) in both future year scenarios, 2020 and 2030, once the estimated development traffic and background growth has been added to the 2016 observed flows.

6 Summary and Conclusions

Key Points

6.1 WYG is commissioned by the Church Commissioners for England (the 'Commissioners') to prepare an Interim Transport Assessment (TA) in connection with proposals for a new major mixed-use residential and employment masterplan development at land situated to the north-east of Chidswell, near Dewsbury, West Yorkshire (hereafter referred to as 'Land at Chidswell' and the 'site').

6.2 The Local Planning Authority is Kirklees Council (KC) and the Local Transport and Highways Authority is KC Highways.

6.3 This Interim TA has been prepared to consider the transport and highway implications arising from the potential future masterplan development at the site.

6.4 The site, known as Land at Chidswell, is situated to the north-east of Dewsbury town centre and north-east of the village of Chidswell, and is to the east of the A653 Leeds Road.

6.5 The indicative masterplan proposals are for a total of 1,535 residential units. For the purpose of this Interim TA it has been assumed that 80% of units will be private and 20% will be affordable. Additionally, the masterplan comprises of approximately 35 hectares (ha) of employment land, which translates into approximately 122,500sqm of commercial employment gross floor area (as agreed with KC officers).

6.6 Five site access points are proposed, one via Heybeck Lane and one via Chidswell Lane serving exclusively residential areas; and two via Leeds Road and one via Owl Lane serving both the employment and the remaining of the residential elements.

6.7 For the purpose of this assessment, by 2020, the following elements of the indicative masterplan proposals are expected to have come forward (approximate):

- **Area 1** – Up to approximately 250 residential dwellings accessed via Heybeck Lane;
- **Area 2** – Up to approximately 30 ha of employment land accessed via Leeds Road (North) and Owl Lane;
- **Area 3** – Up to approximately 5 ha of employment land accessed via Leeds Road (South) and Owl Lane;
- **Area 4** – No development;
- **Area 5** – Up to approximately 230 residential dwellings accessed via Chidswell Lane; and
- **Total by 2020** – Up to approximately 480 residential dwellings and 35 ha of employment land.

6.8 The quantum of employment development described above is considered unlikely to be delivered by 2020 and is therefore considered to represent a theoretical 'worst case' scenario from a transport and highways perspective.

6.9 For the purpose of this assessment, by 2030, the following elements of the indicative masterplan proposals are expected to have come forward (approximate):

- **Area 1** – Up to approximately 250 residential dwellings accessed via Heybeck Lane;
- **Area 2** – Up to approximately 30 ha of employment land accessed via Leeds Road (North) and Owl Lane;
- **Area 3** – Up to approximately 5 ha of employment land accessed via Leeds Road (South) and Owl Lane;
- **Area 4** – Up to approximately 1,035 residential dwellings accessed via Leeds Road (South) and Owl Lane;
- **Area 5** – Up to approximately 250 residential dwellings accessed via Chidswell Lane; and
- **Total by 2030** – Up to approximately 1,535 residential dwellings and 35 ha of employment land.

6.10 Traffic surveys including manual classified counts and traffic queue lengths were undertaken over a 12 hour period on a single neutral weekday in May 2016 by a third party survey specialist company at several key junctions in the site's surrounding highway network (the scope of the surveys was agreed with KC Highways officers in advance). The following junctions were included within the survey:

1. M1 Junction 40 (Flushdyke Interchange) – signal controlled roundabout;
2. M62 Junction 28 (Tingley Interchange) – signal controlled roundabout;
3. A653 Leeds Road / Heybeck Lane – signal controlled junction;
4. A653 Leeds Road / Chidswell Lane – priority T-junction;
5. A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – signal controlled junction;
6. B6128 Owl Lane / Windsor Road – priority T-junction;
7. A638 Wakefield Road / A638 Chancery Road / B6128 Owl Lane / B6128 Leeds Road – priority roundabout;
8. Chidswell Lane / Windsor Road – priority T-junction;
9. A653 Leeds Road / Owl Lane – signal controlled junction;
10. B6128 John Ormsby V C Way / B6128 Owl Lane / Horace Waller V C Parade – priority roundabout.

6.11 The industry-standard TRICS trip rate database and Office for National Statistics (ONS) 2011 Census data have been interrogated in order to identify potentially suitable trip rates and mode splits for any future development at the site. This trip generation assessment suggests that the indicative masterplan proposals would be expected to generate approximately 1,873 vehicular trips in the AM peak and approximately 1671 vehicular trips in the PM peak.

6.12 Proposed trip rates were initially set out in the WYG Interim TA Scoping Note (dated 21 April 2016). These trip rates were subsequently reviewed by KC Highways and comments were received by WYG on 23 May 2016. Revised trip rates, reflecting comments from KC Highways officers, were presented to KC Highways on 9 June 2016. These have been considered acceptable by KC officers and used for the purpose of this assessment.

6.13 Census 2011 Origin-Destination Travel to Work data was interrogated in order to identify likely trip distribution of trips being generated as well as attracted by/to the site. Background traffic growth for the future year, in the form of committed development traffic, was extracted from the existing KC Saturn strategic traffic model in order to inform WYG's standalone junction capacity assessments.

6.14 Junction capacity assessments for both a typical neutral weekday AM and PM peak hour periods have been carried out on the following scenarios as agreed with KC Highways:

- Base Year – 2016 observed traffic flows
- Future Base (2020 and 2030) – Observed traffic flows plus growth (identified as committed development traffic)
- Future Year 2020 and 2030 with Development – Observed traffic flows plus growth and proposed development traffic

6.15 In addition to the proposed site-related junctions, as part of the highway capacity assessment the following off-site junctions have also been modelled to identify the potential traffic impact of the indicative masterplan proposals:

1. M1 Junction 40 (Flushdyke Interchange) – signal controlled junction;
2. M62 Junction 28 (Tingley Interchange) – signal controlled junction;
3. A653 Leeds Road / Heybeck Lane – signal controlled junction;
4. A653 Leeds Road / Chidswell Lane – priority T-junction;
5. A653 Leeds Road / B6128 Challenge Way / B6128 John Ormsby V C Way (Shaw Cross Junction) – signal controlled junction;
6. B6128 Owl Lane / Windsor Road – priority T-junction; and
7. A638 Wakefield Road / A638 Chancery Road / B6128 Owl Lane / B6128 Leeds Road – priority roundabout

6.16 Signal controlled junctions (either roundabouts or crossroads) have been modelled and assessed utilising industry standard LinSig software version 3.2.27.0; whilst priority junctions have been modelled and assessed using industry standard PICADY software version 5.1. Priority roundabouts have been modelled and assessed using industry standard ARCADY software roundabout module version 9 (Junctions 9 V.9.0.1.4646). All models, where possible, were validated against existing queuing data gained from the 2016 traffic surveys, which included queuing results for the surveyed junctions.

6.17 The results of the highway impact assessment indicate that the majority of the off-site junctions included within the exercise have the potential to operate at or within capacity levels (less than 100% DoS and less than 90% DoS on all lanes respectively) in all scenarios as well as in the future year 2030, once the estimated development traffic and background growth has been added to the 2016 observed flows (the worst-case).

6.18 These junctions include the M1 Junction 40 (Flushdyke Interchange), the M62 Junction 28 (Tingley Interchange), the Leeds Road / Heybeck Lane signalised junctions and the Leeds Road / Chidswell Lane priority T-junction. In order for these junctions to achieve these results, they would require certain mitigation to be undertaken, which would involve optimisation/re-validation of the signals (including slight alterations to the inter-green times) to maximise the vehicle throughput. The M62

Junction 28 (Tingley Interchange) would also require small alterations to the signage and markings on the M62 west slip-off approach to allow traffic travelling on lane 2 (middle lane) to also travel to the A653 Dewsbury Road (south).

6.19 The results of the assessment of the three junctions along Owl Lane suggest that, generally, these junctions would operate at capacity until the future year 2020 (with and without development traffic). However, in the future year 2030 scenarios, these junctions would become over saturated even without development traffic, which would be a result of the projected background growth in the area. This indicates that there will be a lack in capacity irrespective of whether the indicative masterplan proposals are brought forward, and that the addition of the future development traffic would only contribute to an underlying issue. The expected future operation of these junctions should be discussed further with KC as well as other relevant parties/stakeholders in order to investigate potential mitigation measures that could be implemented.

6.20 The results from the junction capacity assessments show that all proposed site accesses would operate well within capacity (less than 90% DoS or 0.85 RFC on all lanes) in both future year scenarios, 2020 and 2030, once the estimated development traffic and background growth has been added to the 2016 observed flows.

Appendices

Appendix A

WYG Accessibility and Connectivity Review Technical Note (21 December 2015)

Appendix B

WYG Interim Transport Assessment (TA) Scoping Note (21 April 2016)