Appendix 8.2

UPDATED TRANSPORT ASSESSMENT (AND APPENDED TRAVEL PLAN)

Fort Halstead

Updated Transport Assessment

On behalf of **Merseyside Pension Fund**

Project Ref: 41250/5503 | Rev: AA | Date: May 2020

Registered Office: Buckingham Court Kingsmead Business Park, London Road, High Wycombe, Buckinghamshire, HP11 1JU
Office Address:
T: E:

Document Control Sheet

Project Name: **Fort Halstead**

Project Ref: **41290**

Report Title: **Updated Transport Assessment**

Doc Ref: **8219**

Date: **May 2020**

	Name	Position	Signature	Date
Prepared by:	Felicity Mott	Assistant Engineer		28 May 2020
Reviewed by:	Jason Lewis	Director		28 May 2020
Approved by:	Jason Lewis	Director		28 May 2020
For and on behalf of Stantec UK Limited				

Revision	Date	Description	Prepared	Reviewed	Approved

Contents

Figures

Tables

Appendices

1 Introduction

1.1 Overview

1.1.1 Stantec, formerly Peter Brett Associates (PBA), has been commissioned by Merseyside Pension Fund (MPF) to provide transport planning and highways advice in support of a Hybrid Planning Application (HPA) for the redevelopment of Fort Halstead, with a total site area of circa 130 hectares (ha), in the District of Sevenoaks.

1.1.2 In December 2015 Sevenoaks District Council (SDC) granted outline planning permission (subsequently referred to as the 'OPP') for the regeneration of the Site by an employment led, mixed use development with up to 27,000 sqm of B1/B2 employment uses, up to 450 houses and a hotel. This application has since been implemented by way of demolition, but no development has so far been built out or occupied pursuant to reserved matters application. The reference for the OPP is SE/15/00628/OUT.

1.1.3 A planning application (19/05000) was submitted in August 2019 for an additional 300 dwelling units on the site, in addition to the 450 dwelling units already with planning permission. The Transport Assessment and Travel Plan, by PBA, was issued with the application.

1.1.4 Following consultation comments by a number of statutory consultees the decision was taken to revise the planning application. Within this revised planning application, the number of dwelling units proposed for the site has been reduced to an additional 185 dwelling units (over and above the 450 already permitted), which will be addressed within this Transport Assessment Update. Revisions include modifications to internal access arrangements and the package of transport measures supporting travel, and a number of additional assessment items as set out later within this report.

1.1.5 Whilst the majority of the development will still be in outline, based upon parameters including an Access and Movement Parameter Plan, a small area within the centre of the site, which includes key listed buildings is subject to a full detailed application. Access will be in detail.

1.2 Site Location and Uses

1.2.1 The Site is located within the Metropolitan Green Belt and the Kent Downs Area of Outstanding Natural Beauty (AONB). Whilst it is situated in a predominantly rural area, it is just 5 km to the north west of Sevenoaks and 7.5 km south east of Orpington. The villages of Halstead and Knockholt Pound are located respectively approximately 2 km to the north and 1.5 km to the north west of the site.

1.2.2 The Site is predominantly surrounded by woodlands, which in the east and south-east border the A224 Polhill and M25 corridors. Star Hill Road runs to the south and west of the site. Figure 1 1 shows the site location in relation to the wider surrounding area.

1.2.3 The Site is currently occupied by the Ministry of Defence (MoD) and operated as a major centre for defence research and science. As such, the site is occupied by both the Defence Science and Technology Laboratory (Dstl) and QinetiQ, a private sector defence research organisation. At its peak during the 1970s, at least 4,000 people were employed on site.

1.2.4 Immediately adjacent to the Site and accessed from the A224 Polhill, is a small residential development of 72 homes, which is not in the ownership of MPF.

1.2.5 In 2011, Dstl announced it would be vacating Fort Halstead and since then, has been undergoing phased relocation to Portsdown West and Porton Down. QinetiQ has remained on site and the development proposals within this application have allowed for retention and

potential future expansion of the QinetiQ research facility. Further details on how QinetiQ facilities will be incorporated into the new development is detailed within Chapter 4.

1.2.6 It is understood that at the time of the OPP submission there were approximately 1,200 people on-site and historically, more than 4,000 people were based at the establishment. A Certificate of Lawfulness of Existing Use or Development (CLEUD) was issued in 2004 for 82,168 sqm of employment space (footprint) for the site. As such, the site is capable of accommodating a much higher number of employees and consequently a significantly higher demand on the transport network than present levels. The approved development anticipates that total future employment levels on-site would be maintained at around 1,483 (1,322 Full-time Equivalent (FTE)) positions. Further consideration of the effect of the CLEUD, treated as an alternative baseline, is given in this report.

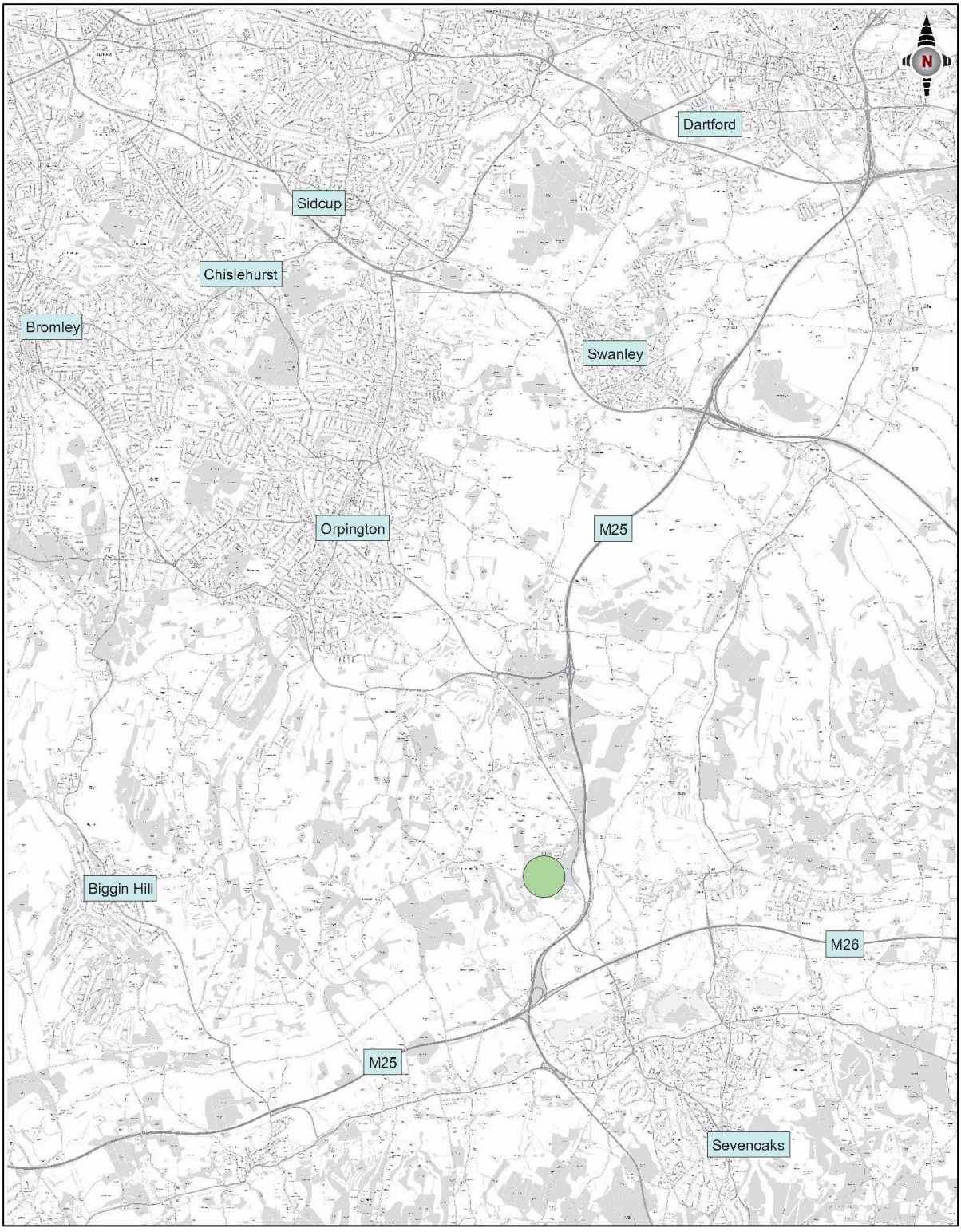

Figure 1-1 Strategic Site Location

1.3 Application Proposals

1.3.1 Since the OPP was granted for the site, MPF has acquired the site and took the decision to review the planning position with regard to the masterplanning of the site, alongside the emerging Sevenoaks District Local Plan as well as changes to the National Planning Policy

Framework. MPF is seeking to optimise the site's future development and provide a deliverable and viable development.

1.3.2 Following extensive consultations with the local community and Sevenoaks District Council (SDC), an initial development plan for the site was established.

1.3.3 This plan originally allowed for QinetiQ to remain on site in a secure enclave. It also provides sufficient serviced land and accommodation to allow a substantial level of employment to be maintained (and enhanced) on site (around 1,400 jobs) and also allows for a residential development of 750 homes, a primary school and other community uses including a village centre with shops / cafés, early years facilities and some B1a, b and c space, and a historic interpretation centre within the existing scheduled monument. There will be an element of D1, D2, A1 and A3 use classes associated with the Village Centre. This proposal has since reduced to 635 homes within this revised application.

1.3.4 This TA has therefore been commissioned to evaluate the impacts of the new proposed development, detailed within Chapter 4 of this TA, which include the removal of B2 uses, proposed as part of the OPP, that would generate significant volumes of HGV vehicles.

1.3.5 Additional consideration will be made to the Certificate of Lawfulness for an Existing Use and Development (CLEUD), and the forthcoming plans for the site access security restrictions to be removed once Dstl vacate the site.

1.4 Pre-Application Discussions

1.4.1 A series of pre-application meetings have been held with Kent County Council (KCC) and SDC during which the scope of work, main principles of assessment and design were discussed and subsequently agreed. The meetings minutes and subsequent correspondence with KCC have been included within Appendix A.

1.4.2 A summary of the previous work undertaken at the proposed site has been collated within the Transport Scoping Report, prepared by PBA and submitted to KCC in September 2018. The Transport Scoping Report (2018) is contained within Appendix A of this report in order to provide an understanding of the extensive background data previously collated and to outline previous in-principle agreements with SDC, KCC, London Borough of Bromley (LBB) and Highways England (HE) relating to trip rates, extent of impacts, traffic surveys and mitigation measures.

1.4.3 Pre-application discussions initially focused primarily on the access and traffic effects of the development, both on and off site, with further discussion latterly in respect of ensuring sustainable access provides the necessary means for future residents and employees to travel to and from the site sustainably.

1.4.4 Regarding the impacts of the development on the public realm, public transport network and pedestrian and cycle routes, this TA sets out the existing transport conditions and their relevance to the development in Chapter 2 and also uses information and work undertaken as part of the OPP TA, including an audit of pedestrian and cycle networks (included within Appendix B of this TA), for the development of the mitigation strategy and the proposed improvement measures.

1.5 Report Scope and Structure

1.5.1 This Transport Assessment (TA) sets out the anticipated transport impacts of the proposed development, and forms part of a collection of documents accompanying the planning application. It has been prepared in accordance with Kent County Council's Guidance on Transport Assessments and Travel Plans dated 2008.

1.5.2 Since the site is located within the Kent Downs Area of Outstanding Natural Beauty (AONB), the traffic impacts of the proposed development have also been considered in the context of the statutory purposes of the Kent Downs AONB.

1.5.3 The remainder of the report is structured as follows:

- Chapter 2 describes the existing transport conditions;
- Chapter 3 reviews the relevant transport policies;
- Chapter 4 presents the development proposals;
- Chapter 5 outlines the calculations of the trips generated by the proposed development and their distribution on the local transport network;
- Chapter 6 describes the impact of the proposed development on the local highway network;
- Chapter 7 addresses the impacts of the proposed development during construction;
- Chapter 8 outlines the strategy for sustainable transport; and
- Chapter 9 summarises and concludes the Transport Assessment.

2 Existing Transport Conditions

2.1 Introduction

2.1.1 This chapter provides a detailed review of the predominant transport conditions within the vicinity of the site. This will include the existing use of the site, the local and strategic networks providing access to the site and a personal injury collision review.

2.1.2 As such it provides the context for the detailed assessment of the likely impact of the proposed development and of the potential enhancements that may be required in order to deliver a development that is sustainable in transport terms.

2.1.3 This chapter considers the following elements:

- Site Location and Current Use;
- Local amenities;
- Site access arrangements;
- Pedestrian and cycle facilities;
- Public transport provision;
- Local highway network performance; and
- Personal Injury Collision Review;

2.2 Site Locations

2.2.1 The site is located in Kent, approximately 2km south of the village of Halstead, within the Metropolitan Green Belt and the Kent Downs Area of Outstanding Natural Beauty (AONB). Whilst the development site is located within a predominantly rural area, Sevenoaks is located approximately 5km south-east of the site and Orpington is located 7.5km to the north-west.

2.2.2 The site is predominantly surrounded by woodlands, which in the east and south-east border the A224 Polhill and M25 corridors. Star Hill Road runs to the south and west of the site.

2.2.3 Figure 2-1 shows the site location in relation to the wider surrounding area.

2.3 Exiting Site Users

2.3.1 The existing site has comprised some 97,600 sqm of defence-related research space and currently accommodates 750 jobs on site, across Dstl and QinetiQ. The existing uses already generate a substantial transport demand on the local transport network. There is a Certificate of Lawfulness for an Existing Use and Development (CLEUD) for 82,168 sqm (footprint area) of employment space of which approximately 66,150 sqm relates to B1 Use Class and 8,650 sqm relates to B8 Use Class. The remainder of the footprint area mostly relates to ancillary uses to B1 and B8 Use Classes.

2.3.2 Adjacent to the site but outside the application boundary, there are 72 homes, which also generate some traffic along Crow Drive. The traffic generated by this residential development is inevitably captured in the traffic surveys but has been subtracted to provide an assessment based solely on the site within the application boundary.

2.3.3 In June 2011, when Dstl announced that they were to vacate the site by early 2018, there were some 1,200 employees located on the site. At the time of the OPP submission, it was understood that there were some 1,000 jobs onsite.

2.3.4 Historically, many more people worked at the site and at its peak during the 1970s it is understood that more than 4,000 people were based at the establishment. Over the last 20 years numbers have fluctuated but, based upon information provided by Dstl, are understood to have been as high as 2,000.

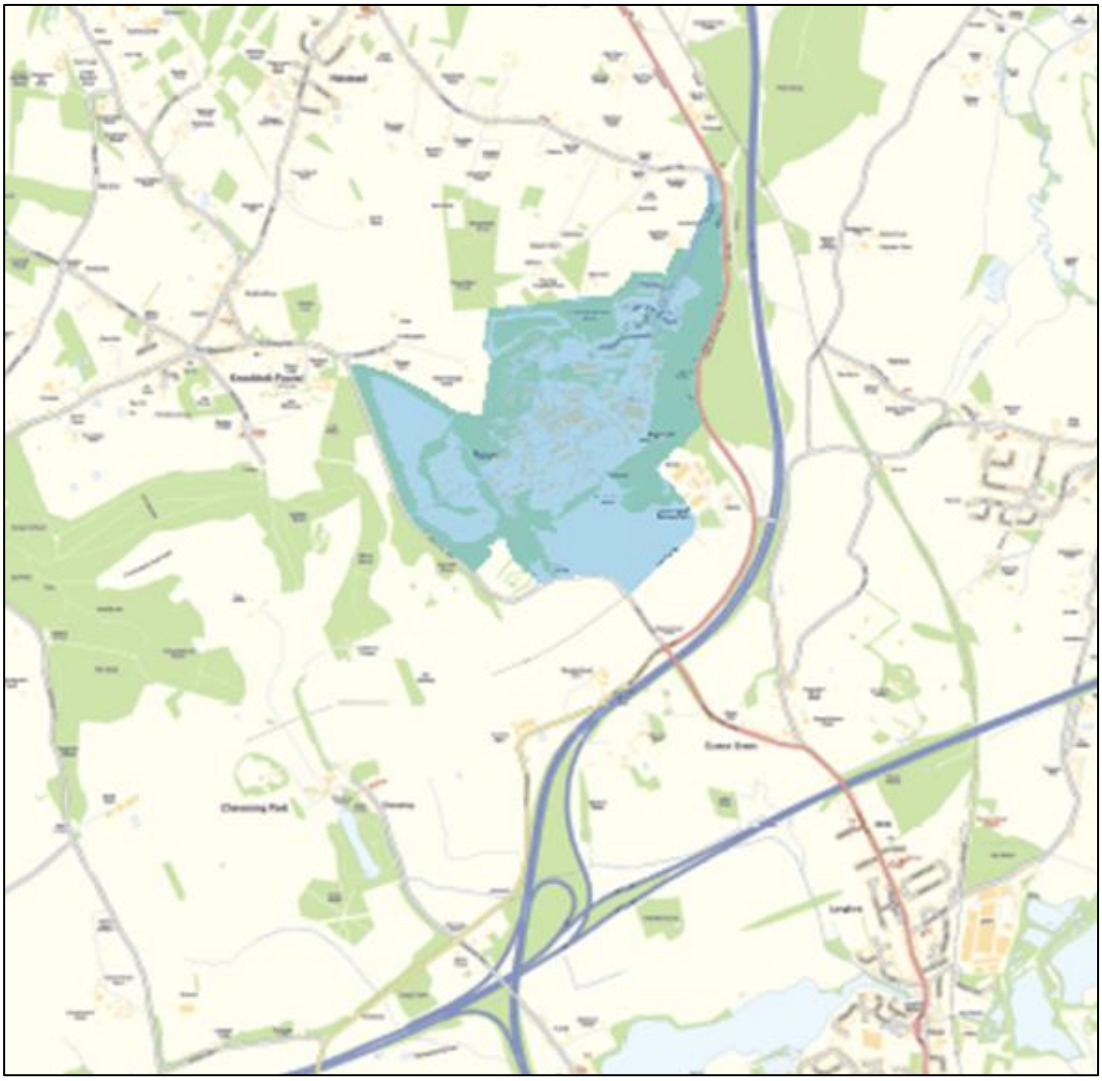

Figure 2-1 Site Location

2.3.5 It is understood that within the next two years the current site security arrangements are to be modified, with the removal of the security gate at the Star Hill access and the transition to security at the front door of each building and compound on the site. This will result in Crow Drive being opened to the public, allowing for general public traffic to travel through the site between Star Hill and Polhill. Whilst this potential scenario is not analysed in detail on its own, it does support the analysis that is carried out of the alternative baseline including the CLEUD assessment.

2.4 Location Amenities

2.4.1 The two established villages closest to the site are Halstead to the north, accessed via Otford Lane, and Knockholt Pound to the west, accessed via Star Hill Road. The following lists the local facilities, by location, in close proximity to the site:

- Knockholt: provides a convenience store, a pub, community facilities, Coolings Garden Centre, shop and café and a place of worship. There is also a primary school to the west of the village.
- Halstead: primary school, local shop/post office, pub, places of worship;
- Otford: local shops, public houses/restaurants, primary school, medical facilities, and a large Sainsbury's food store plus small retail park; and
- Dunton Green/Riverhead: local shops, including a Tesco superstore, nursery and primary schools.

2.4.2 Figure 2-2 provides an overview of local facilities within the vicinity of Fort Halstead.

2.4.3 The two established villages closest to the site are Halstead to the north, accessed via Otford Lane, and Knockholt Pound to the west, accessed via Star Hill Road. The following lists the local facilities, by location, in close proximity to the site:

- Knockholt: provides a convenience store, a pub, community facilities, Coolings Garden Centre, shop and café and a place of worship. There is also a primary school to the west of the village.
- Halstead: primary school, local shop/post office, pub, places of worship;
- Otford: local shops, public houses/restaurants, primary school, medical facilities, and a large Sainsbury's food store plus small retail park; and
- Dunton Green/Riverhead: local shops, including a Tesco superstore, nursery and primary schools.

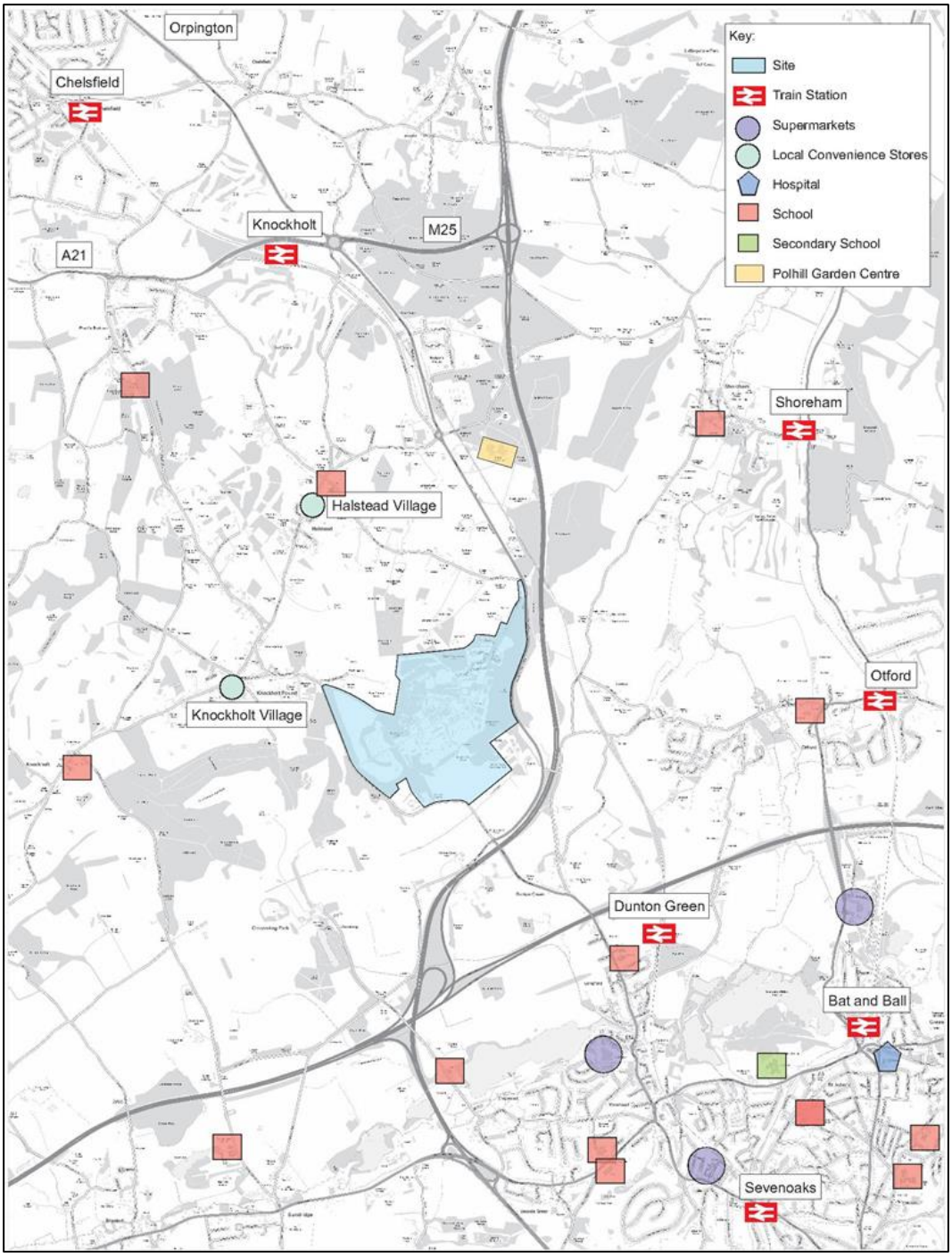

Figure 2-2 Location of Existing Facilities within the Vicinity of the Site

2.4.4 The nearest towns are Sevenoaks to the south east and Orpington to the north west of the site. The towns provide a wider range of facilities and services including retail, leisure, employment and education opportunities. Orpington's offer includes another large Tesco superstore.

2.4.5 In addition to the above, Polhill Garden Centre, which is situated approximately 2 km to the north of the site, offers a wide range of retail facilities as well as local employment.

2.4.6 Secondary education facilities are mainly offered to the south at the Knole Academy, Trinity School and Weald of Kent Grammar school in Sevenoaks. There are additional grammar schools within Tonbridge and Tunbridge Wells. Currently, school buses provide access to

schools in Sevenoaks, Tonbridge and Tunbridge Wells. It is anticipated, that in the future a higher proportion of secondary school children will attend schools in Sevenoaks. This is due to the recently established Trinity school and Weald of Kent Grammar school, both of which are intended to be located on the site of the former Wildernesse School in Sevenoaks. It is also reported that a further Grammar School annex may join Weald of Kent at the Wildernesse site. It is possible for these schools to be reached by bus from Polhill where a school service (S34) provides a school service which ends at the Knole Acadamy. Additional School buses such as the S12 service can be caught to access Trinity School and the Weald of Kent School in Sevenoaks. Although there are additional grammar schools in Tunbridge Wells and Tonbridge, it is expected that the majority of Secondary education aged children would travel to Sevenoaks, which can be undertaken by public transport.

2.4.7 A proportion of children will also attend private schools. There are junior schools in Otford, Sevenoaks, Sundridge and Orpington; and senior schools in Sevenoaks, Sundridge and Tonbridge.

2.5 Site Access

2.5.1 The site comprises two established points of vehicular access, as shown in Figure 2-3.

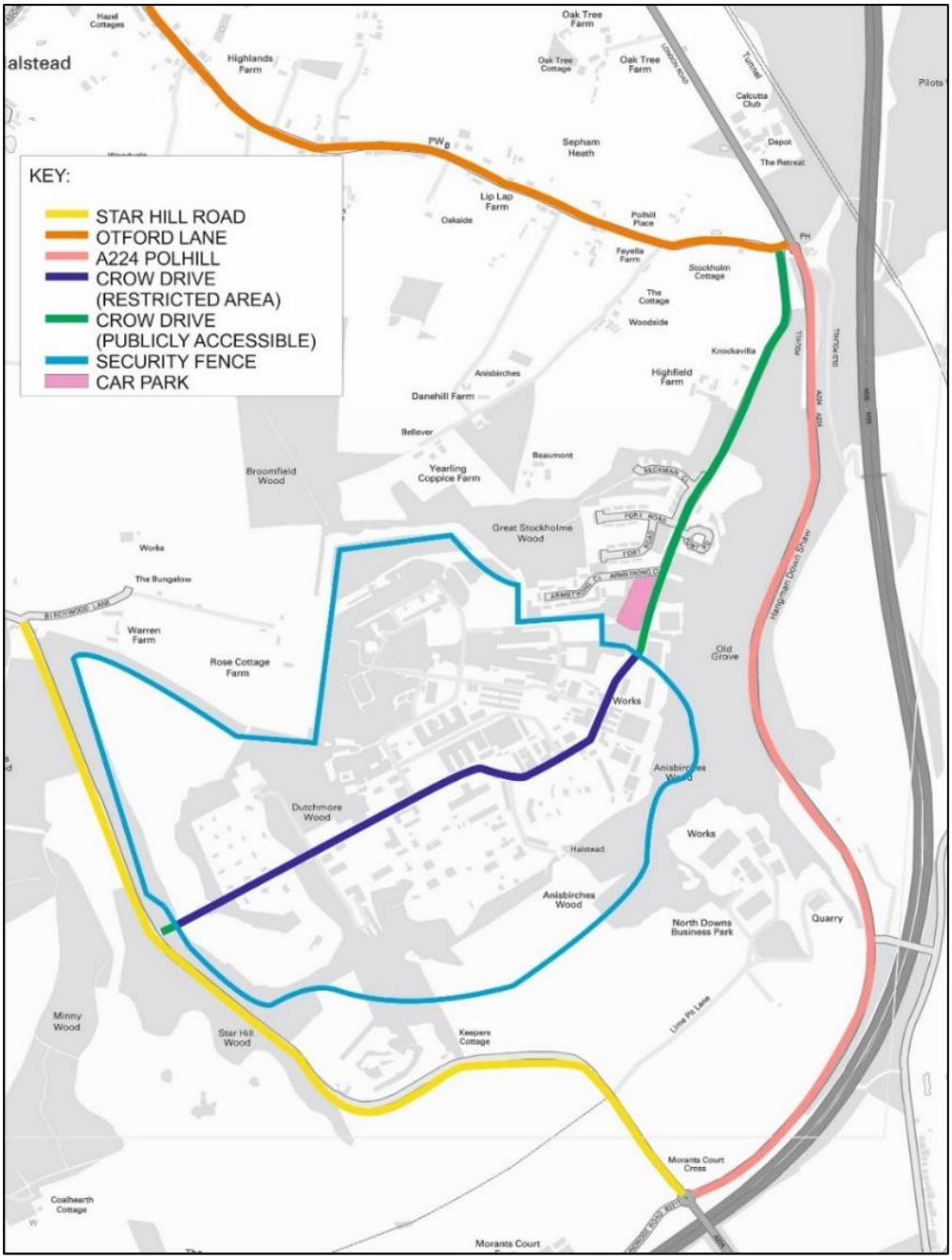

Figure 2-3 Vehicular Access in to Proposed Site

2.5.2 The site has two established points of highway access. Figure 2-4 shows the main access is from the A224 London Road / Polhill via Otford Lane and Crow Drive (Polhill access). This is a priority junction with a right-turn lane facility on the A224. Currently Crow Drive, the main site access road, which is a private road, is marked as two lanes out and one lane inbound to the site, gives way to Otford Lane also at a priority junction. The speed limit on the A224 has recently been reduced to 50 mph. Crow Drive is signed as 30 mph. There are limited pedestrian facilities at this junction: there is a pedestrian refuge on the A224 that assists pedestrians to cross the road and that links the footway on the east side of Polhill with one on the south east side of Crow Drive;

2.5.3 Figure 2-5 shows the secondary access is onto Star Hill Road (Star Hill access). This is also a priority junction. Star Hill Road is an unlit rural lane with no pedestrian facilities and is subject to the national speed limit. The access is currently used only during the morning and evening

peak periods, these controls being enforced by security and barrier control. The priority access onto Star Hill Road has limited visibility on exit, approximately 43 metres by 2.4 metres to the left and 74 meters by 2.4 metres to the right. Mirrors are provided on Star Hill Road to provide for safer exit and the junction is lit from a lighting column within the site. There are also signs warning of a concealed entrance to the south on Star Hill Road.

Figure 2-4 Main Access onto A224 Polhill from Otford Lane

Figure 2-5 Star Hill Site Access

2.5.4 The Star Hill access is currently used solely during the morning and evening weekday peak periods. Since the defence uses are still present on site, the access remains strictly controlled, resulting in no unrestricted movement between these two access points. Although employees of Dstl and QinetiQ are able to use either access point to enter/leave the site, visitors are restricted to use the Polhill access. A visitor car park is provided outside of the security barrier of the access point via the A224.

2.5.5 A review of the two access points has shown that the majority of the traffic uses Polhill access, and most of the traffic turns in and out to/from the north, whereas at the Star Hill access most of the traffic enters to/from the south. As of 2018 when it is understood that 750 people were employed across the site, traffic surveys undertaken at both site access points (which also capture the traffic generated by the 72 homes within the wider area but outside the application boundary), showed that approximately 90% of the traffic to/from the site used the Polhill

access during both the AM and PM peak hours. It is noted that due to the current security restrictions of the Star Hill Road access the existing distribution is skewed towards the Polhill access. However, by 2022 the Dtsl will have left the site and therefore the security restriction on the Star Hill Road access will no longer be in place and public traffic would be able to utilise the Star Hill Road Access freely if desired.

2.6 Pedestrian and Cycle Network Public

2.6.1 The current level of pedestrian and cycle provisions surrounding the immediate site are relatively poor. There are a number of footpath links and rights of way in the vicinity of the site, providing a good network of leisure routes, but they are generally unsurfaced and unlit and therefore not suitable as commuter/school access routes.

2.6.2 Figure 2-6 identifies the existing pedestrian routes by type.

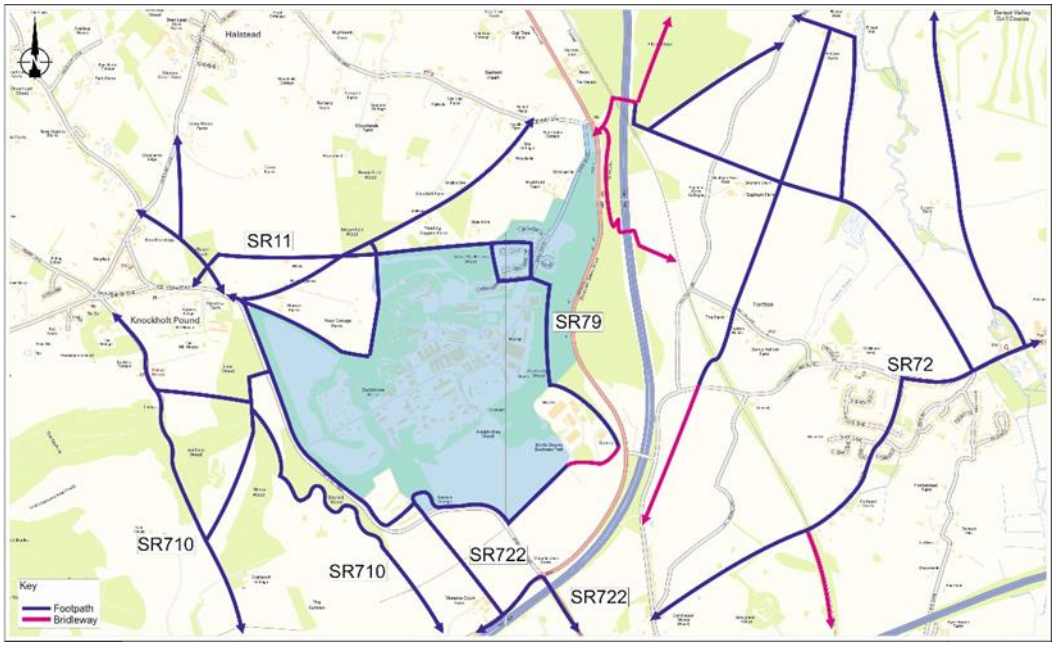

Figure 2-6 Pedestrian Routes in the Vicinity of the Site

2.6.3 The pedestrian site access routes are as follows below.

2.6.4 Access to Knockholt Pound is via Star Hill Road. This route measures approximately 6m wide, includes centre line markings but has no dedicated footways or lighting. There are, however, existing footpath links on the east side of Star Hill Road, between the road and the site boundary. There is also a footpath along the northern boundary of the site linking this to Star Hill Road at its junction with Birchwood Lane. Both footpaths are unlit and unsurfaced and therefore as currently laid out suitable as leisure routes.

2.6.5 Access to Halstead is via Otford Lane. This is also an unlit country lane measuring approximately 4.8m wide. Otford Lane is either accessed from Crow Drive or there is also a public footpath that runs alongside the ancient woodland and which connects to Otford Lane to the west of Crow Lane. This is not a particularly direct footpath link and is again only considered suitable as a leisure route.

2.6.6 The A224 London Road, to the north of Otford Lane, provides a footway on its east side (measuring approximately 1.8m wide) and this provides a safe pedestrian access to the existing restaurant facilities that are located along that road and to the Polhill Garden Centre further north.

2.6.7 There are various other footpath and bridleway links to the site as shown on the plan Figure 2.6, all of which can be considered as providing a good range of leisure opportunities rather than connections for day to day use to local facilities. These include existing bridleways accessed from the junction of A224 Polhill/Otford Lane.

2.6.8 There are limited existing cycle facilities in the area. Since the site is located on top of a chalk escarpment, there is a steep hill to negotiate in order to access the site from Sevenoaks. However, the cycle route to Knockholt station, approximately a 4km ride, is relatively flat and there are advisory cycle lanes on Old London Road, one of the few existing cycle facilities within the district. In addition, existing cycle parking facilities are available at Knockholt station numbering 8 storage spaces.

2.6.9 Within the site, Crow Drive has a footway on either side and there is a short cycle lane alongside the visitor car park. Currently, there is also a zebra crossing on Crow Drive, close to the junction with Fort Road, which provides access between the two existing small residential communities on either side of Crow Drive.

2.6.10 A photographic audit of the various pedestrian and cycle facilities which provide access to the site was undertaken as part of the OPP TA and included within Appendix B of the report.

2.6.11 Kent Count Council have requested that improvements are made to the pedestrian and cycle facilities and infrastructure within the locality of the site. The measures that have been considered by the developer have been explored within Chapter 4 outlining the development proposal.

2.7 Public Transport Network

2.7.1 Overall, the site is currently poorly connected to public transport services and facilities. This section details the available railway and bus services within the vicinity of the site.

Rail

2.7.2 The nearest railway stations are Dunton Green to the south (approximately 5 km from the site) and Knockholt to the north (approximately 4 km from the site). Both stations are on the Sevenoaks to London Charing Cross/Cannon Street line and are served by trains providing direct connections to London Bridge, Lewisham, Bromley and Orpington.

2.7.3 There are a number of other stations in the vicinity of the site that could potentially be attractive to people living or working on site. These are shown in Figure 2 7 and include:

- Shoreham (7km)
- Otford (6km)
- Bat and Ball (8km)
- Sevenoaks (7km)
- Chelsfield (7km)
- Eynsford (8km)
- Orpington (9km)

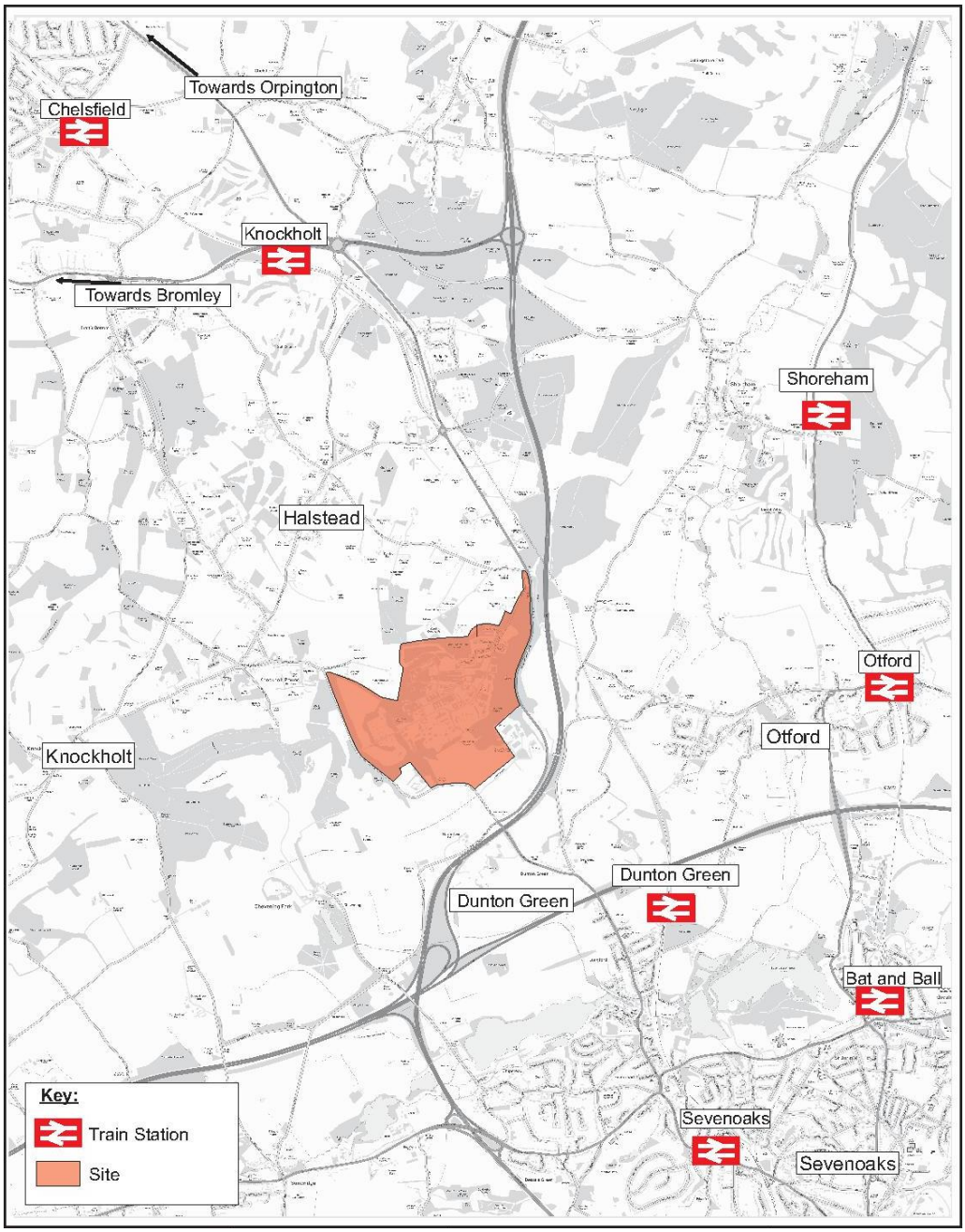

Figure 2-7 Railway Stations in the Vicinity of Fort Halstead

2.7.4 Within the villages surrounding Fort Halstead, the majority of people commuting to central London by train are likely to drive to one of the local stations due to the lack of adequate public transport connections and long walking distances. The choice of station will vary depending on personal preferences reflecting a variety of factors, including the ultimate destination within central London, price, and speed/frequency of service.

2.7.5 Stations including Knockholt and those towards London are within the TfL fare zone, which allow travel at roughly two thirds the cost of those stations further east and south east.

2.7.6 There are existing rail car parks at all the relevant stations, all subject to a charge. Parking at Chelsfield is at a premium and at Knockholt the small station car park is supplemented by on-street parking for which there is also a daily charge of £3.50 per day at the time of writing this report (source: Sevenoaks.gov.uk).

2.7.7 As part of the 2015 OPP, surveys were undertaken of parking usage at Knockholt station and these confirmed that there was sufficient capacity remaining to accommodate the likely increase in demand that would be generated by the proposed Fort Halstead development. This survey has been updated in February 2020 to observe the parking availability at Knockholt train station and along London Road and Old London Road. The survey extended from London Road at the A21 to Shacklands Roundabout and measured the length of areas suitable to park along within this stretch. The survey was undertaken at 11:00 and 14:30 hours to capture peak parking times. The results of this latest survey are compared to the prior survey in the table below:

Time	Paid On-Street			Unrestricted On-Street		
	No. parking spaces	**Occupied spaces (Absolute)**	**Occupied spaces (%)**	**No. parking spaces**	**Occupied spaces (Absolute)**	**Occupied spaces (%)**
11:30	144	118	82%	101	30	30%
14:40	144	116	81%	101	26	26%

Table 2-1: February 2020 parking survey result

2.7.8 The survey showed that the majority of parking either at the train station and along London Road is occupied during these times which would indicate that many of these cars are commuters. It is not proposed within this application to increase the parking available in this locality, rather provide sustainable options for services to the train station from the site, removing the need to provide additional parking.

2.7.9 The full results of the survey can be found in Appendix P .

2.7.10 Table 2-2 summarises the services (and season ticket prices) to and from London available from the main stations during the morning and evening peak periods.

Station	Parking spaces[1]	On Street Parking[4]	Distance[2]	Annual season ticket	Annual parking charge	Number of direct trains to London and journey time[3]	Number of direct trains from London and journey time[3]
Knockholt	39	144	3.2 km	£2140	£712.90	AM – 6 (40-47 min) PM – 4 (44-52 min)	AM – 4 (43-46 min) PM – 3 (43-46 min)
Dunton Green	26	-	4.6 km	£3080	£595.70	AM – 6 (45-52 min) PM – 4 (49-57 min)	AM – 4 (48-51 min) PM – 3 (48-51 min)
Sevenoaks	528	-	6.3 km	£3708	£1405.80	AM – 23 (32-74 min) PM – 21 (33-67 min)	AM – 18 (32-70 min) PM – 23 (28-69 min)
Otford	178	-	4.6 km	£3708	£801.90	AM – 11 (37-67 min) PM – 8 (40-60 min)	AM – 8 (33-64 min) PM – 11 (33-63 min)
Orpington	319	-	8.2 km	£2140	£1231.10	AM – 24 (34-59 min) PM – 25 (25-55 min)	AM – 26 (25-61 min) PM – 22 (24-57 min)
Chelsfield	37	-	6.0 km	£2140	£918.80	AM – 11 (30-44 min) PM – 4 (34-49 min)	AM – 5 (31-43 min) PM – 7 (26-43 min)

Table 2-2 Summary of Railway Services Near Fort Halstead

1 Excluding on-street parking
2 Drive distance from Polhill access
3 AM peak from 06:30 to 08:30, PM peak from 17:30 to 19:30
4 Based on Traffic Survey of paid for spaces

2.7.11 Shoreham station provides 10 car parking spaces, Eynsford 15 and Bat and Ball 21, and it is unlikely that these stations could accommodate any additional parking. As a result, it is considered very unlikely that commuters would risk driving to stations more than 7 km away from the site if they may not be able to find a parking space.

2.7.12 At Knockholt station, on-street parking is provided in the form of pay and display bays (£3.50 per day). These are located along London Road for a length of approximately 280m to the south and 280m to the north of the station access. The parking beat survey outlined above confirms there to be approximately 144 parking spaces at this location, plus a further 101 spaces if other areas outside of the 'paid for' section are utilised, albeit these sections do create issues with parking over the advisory cycle lane.

2.7.13 At Chelsfield, free on-street parking is available close to the station. However, this is already well utilised.

2.7.14 At the main morning commuter travel times (for trains to London), based on journey time surveys, site visits and queue data from key junctions, there is little evidence of congestion on any routes from the site to any of the aforementioned stations. At certain times of the day, mainly during the school run periods and during the evening peak, there is modest congestion on the routes to and from Sevenoaks and Orpington stations.

2.7.15 Based upon costs of travel, parking availability and convenience, it is considered that Knockholt and Orpington stations are likely to be the most attractive stations for those commuting to London. Whilst Sevenoaks has an excellent service, it is considered to be less

attractive due to higher rail travel costs, parking availability and costs and the fact that it is further away from central London.

2.7.16 For those cycling, Knockholt station is likely to be the most attractive station to use since it is the closest to the site and also the route is relatively flat and there are advisory on-carriageway cycle lanes along part of the route. Furthermore, the station has some sheltered cycle parking provided within a secured compound (see Figure 2-8) although the capacity is quite limited. KCC have suggested that additional cycle parking is required at Knockholt train station, potentially funded by the applicant via S106.

Figure 2-8 Cycle Parking at Knockholt Station

2.7.17 KCC Highways and Transportation, in their 19 December 2019 consultation response, requested consideration of an off-carriageway cycle link between Polhill and Knockholt station:

A cycle route is required between the site and Knockholt station and this should be kept free of parked vehicles. Additional cycle parking is required at the station. ……. Cycleways should be off road or segregated where possible.

2.7.18 A study has been undertaken by Stantec on behalf of the applicant to ascertain the feasibility of creating an off-carriageway cycle route between Polhill and Knockholt station. Further consideration is given to this later in this report.

Bus

2.7.19 During its heyday, workers at Fort Halstead were bussed into the site from the surrounding area. More recently the majority of people travelling to and from the site have done so using a private car.

2.7.20 Currently, there are no bus stops within the site. However, Dstl run a private peak period shuttle bus between the site, and, Knockholt and Orpington Stations. There are three buses during the morning peak and three during the evening peak, with the service operated by Go Coach. Go Coach have provided details regarding the shuttle operating for the Dstl which sees an average of 60 users per day and is free for both Dstl and QQ staff.

2.7.21 KCC requested within the consultation comments that details of usage and patronage of this bus would be helpful. This information has been provided by Dstl and confirms that 60 staff per day use the shuttle service, with no charge being made to users.

2.7.22 It has also been noted by KCC that the price for the bus would need to be cheaper than the parking at the station to encourage patronage. As is set out in the bus note (please see Appendix M) for the shuttle bus service to be viable on completion of the development a rate of approximately £4.00 per day would need to be charged for a return trip to Knockholt station. Whilst this is more expensive than on street parking at the current time, the price of parking is set by Sevenoaks Council and therefore to support sustainable travel choices going forward Sevenoaks Council could act to increase the price over time. This point is Highlighted to the Highway Authority for further discussion with Sevenoaks Council.

2.7.23 At the time of the OPP application, the 402 bus service operated between Bromley and Tunbridge Wells via Sevenoaks. Since the application was approved, the 402 bus service has been withdrawn and the 431 bus service introduced which operates between Orpington to Sevenoaks via Star Hill Road and Knockholt Rail Station. It provides 3 - 4 services daily, Monday to Friday. In January 2020 the 431 changed number to become the number 3 service, however the routing and the frequency has remained unchanged. KCC have expressed that they do not believe that 3-4 services a day is enough to cater for the site. However, a Demand Responsive Transport (DRT) scheme is being proposed with the introduction of 2 minibuses which will run to the train station, schools and local communities from the site. This DRT service will provide a flexible route and timing which can be adjusted rapidly to provide the greatest benefit to site occupiers/visitors, as well as other residents in nearby villages if capacity allows. The appended Bus Note outlines that the shuttle service would be expected to reach viability at the end of the 10-year build period, therefore sustaining the service without further pump-priming into the foreseeable future. Such a request to provide additional support to the 431 (now 3) service would act to reduce the viability of the shuttle service, and over time could potentially result in the loss of both. It is proposed by the applicant therefore that to achieve the most viable and responsive sustainable transport offer for the site, contributions should be focused on delivering and supporting the DRT community shuttle service, with the No.3 service being brought through the site to further increase patronage and be provided with high quality stops and passenger provisions within the site.

2.7.24 The R5/R10 service is a circular bus service providing access to Orpington Station with the nearest stop to the Fort Halstead site being at Knockholt Pound. Additionally, there are various school services (S31, S32, S33, T3 and TW6) operating one return trip on schooldays only. All of these services go past the Star Hill Road entrance to the site and can stop at the bus stop at the entrance. These services serve schools in Sevenoaks, Tonbridge and Tunbridge Wells. KCC have requested that distances from the site to the bus stops be presented however, it is not necessary as it is proposed that these bus services pull into the Star Hill Access of the site, for pick up and drop off providing a safe, off road point for school children to safely catch the bus from the site. It is proposed that a roundabout be placed inside the site back from Star Hill to provide convenient turning for the buses without needing to pass through the site, keeping the buses on route for their existing pick ups along Star Hill Road. An RSA for the bus drop off turning facility would be undertaken at a later stage as appropriate for the RMA stages. A drawing of this can be seen in Appendix G .

2.7.25 A map of the services in the vicinity of the site is provided in Figure 2-9.

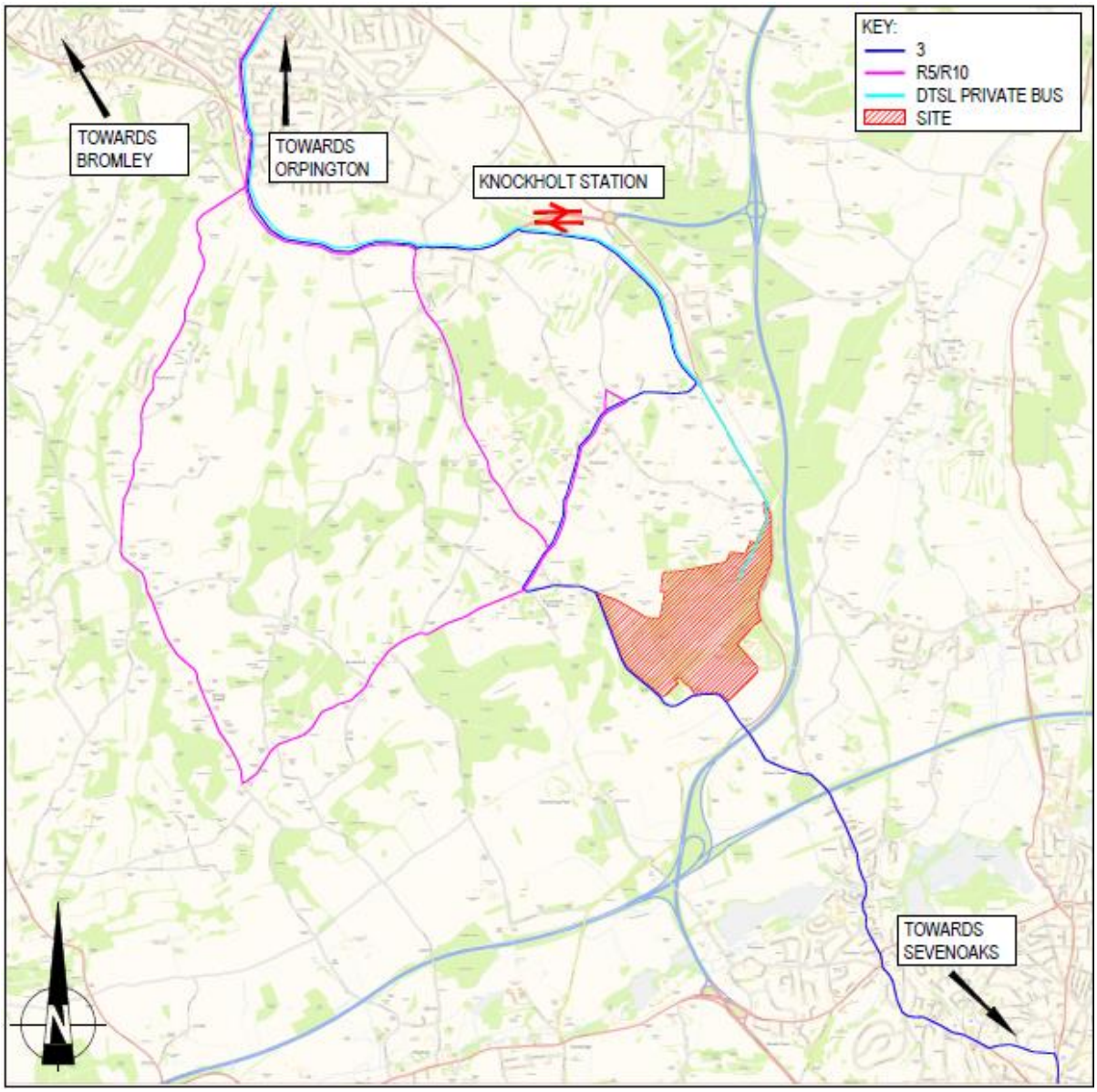

Figure 2-9 Bus Routes in the Vicinity of Fort Halstead

2.7.26 KCC have commented that the existing bus services are not sufficient to provide a sustainable choice in transport and that improvements should be sought to improve the facilities and services. As outlined briefly above, and as explored within Chapter 4 the application proposes a range of proposals to deliver viable sustainable transport choice.

2.8 Local Highway Network

2.8.1 Figure 2-10 illustrates the site's location in relation to its surrounding local highway network, to which it is well connected, including easy access to the National Motorway Network via the M25, junction 4.

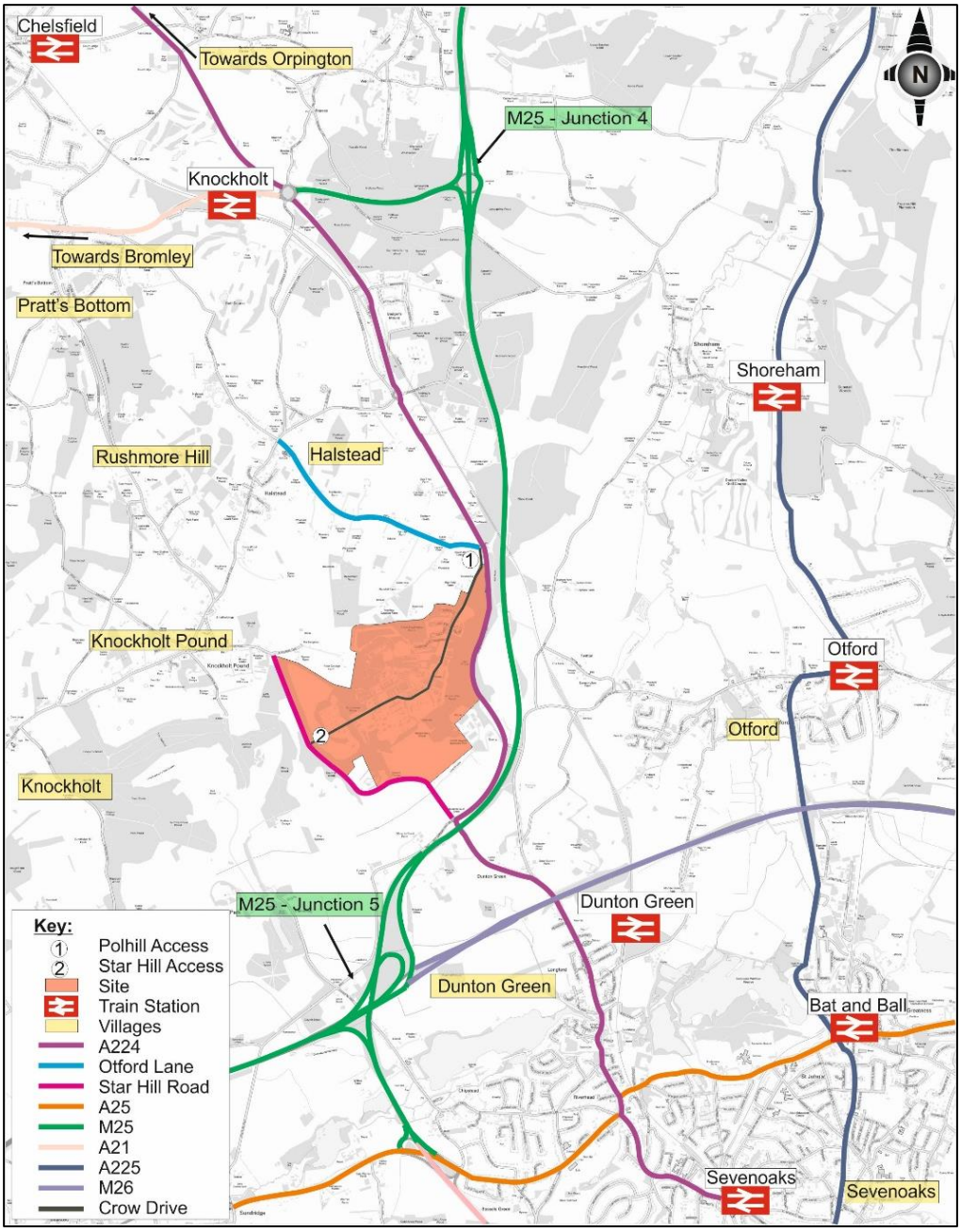

Figure 2-10 Site Location in the Local Highway Context

2.8.2 The characteristics of the immediate surrounding highway network are as follows:

- The A224 is a single carriageway road which, to the north, provides access to the M25 (junction 4), Orpington (via Badgers Mount), Bromley (via Old London Road), and the A21. To the south, it provides the main access route into Sevenoaks. Within the vicinity of the site, the A224 is subject to a 50 mph speed limit. Although the road is provided with lighting columns, the street lighting along the A224 corridor has recently been switched off as part of an energy saving experiment. Nonetheless, the lighting remains switched on at the main junctions, including the site access junction. The road has limited footway provision: to the north of the site there is a footway on the east side of the carriageway only; and to the south along Polhill there are no footways.

- Star Hill Road provides a convenient means of access to the local villages of Knockholt and Halstead and an alternative route towards Dunton Green and Sevenoaks. It is a

relatively narrow rural lane with no footway or street lighting and subject to the national speed limit of 60 mph. It is part of the route of the No.3 bus service.

- Otford Lane is a narrow rural lane with no lighting or footways and also subject to the national speed limit. It links the site and the village of Halstead.

- Crow Drive is a private road which provides access into the site from the A224. It has a speed limit of 30 mph. Whilst it generally has one single lane in each direction, at the junction with Otford Lane, for approximately 100 m, the northbound carriageway has two lanes, one for each turning movement onto the A224. The road has a footway on its south side. On the north side there is also a footway and also a short length of cycleway. The last section of the road as it approaches Otford Lane has no footway provision.

2.8.3 The main traffic 'hotspots' in the area have been highlighted by the Sevenoaks District Strategy for Transport 2010-2026 (dated July 2010), and are:

- A224 Dunton Green to Riverhead (2.4 miles/3.9 km drive distance from the site);

- A224/A25 Riverhead roundabouts (3.1 miles/5.0 km drive distance from the site); and

- A25 Bat and Ball traffic lights (4.2 miles/6.8 km drive distance from the site)

2.8.4 All these locations are all situated some distance away from the Fort Halstead site. The Transport Strategy also notes that congestion at the two A25 junctions is restricted to the peak hours, with no spreading of congestion to other time periods, and furthermore that traffic congestion at these junctions is, at least in part, related to the lack of east facing slip roads connecting the A21 and the M26. KCC have requested that details be provided of the traffic generation for the site that pass through these locations. As these locations are further from the site, the distribution end zones undertaken outlined in Chapter 5 do not reach these points and therefore an assumption has been made that all traffic leaving through Zones 8 and 10 pass through these points. It is considered that this assessment presents a worst-case scenario as it is assumed that all traffic leaves the study cordon area, whereas in reality a number of vehicle trips would remain within the cordon (i.e. making a visit to other trip attractors more locally) and not utilise junctions on the edges of the cordon. The trips passing through each point can be seen in the table below for both the AM and PM peak.

Hot Spot	AM Peak		PM Peak	
	Arrival	Departure	Arrival	Departure
A224 Dunton Green to Riverhead	37	27	26	35
A224/A25 Riverhead roundabouts	42	32	30	40
A25 Bat and Ball traffic lights	42	32	30	40

Table 2-3 Development Traffic Flows at 'Hotspots' Identified Within Sevenoaks District Strategy for Transport

2.8.5 As part of the 2015 submissions and earlier work at the site, extensive traffic surveys have been undertaken between 2008 to 2014 at a number of key junctions and routes to the site. At the pre-application meeting with KCC Highways, KCC requested that surveys undertaken before 2014 should not be used for the junction modelling assessments in the TA.

2.8.6 Additionally, new traffic surveys have been conducted in 2017 and 2018 as part of the current proposals, and this addresses an earlier query by KCC on the age of traffic survey data, which this confirms is within two years of the application date of 2019 and remain current and fit for traffic assessment purposes. Additional traffic surveys were undertaken in March 2020 for the M25 Junction 4 and the M25/A25/A21 junction. The data for a summary of the traffic surveys undertaken post-2014 is presented in Table 2-4 Summary of Traffic SurveysTable 2-4. The latest traffic surveys undertaken in 2018 are shown in Figure 2-11 below.

Location	Type	Survey year(s)
A21 (west of Hewitts roundabout)	ATC	2014
A224 Court Road	ATC	2014
Old London Road	ATC	2017
A224 Orpington By-Pass	ATC	2014, 2017
Crow Drive	ATC	2018
A224 London Road	ATC	2014 (Jun and Oct),2017,2018
A224 Polhill (south of Polhill Site access)	ATC	2014,2017,2018
Otford High Street	ATC	2014
Star Hill Road (south of Site access)	ATC	2014 (Jun and 2 locations in Oct), 2017
Star Hill Road (north of Site access)	ATC	2014, 2018
Rushmore Hill	ATC	2014,2017, 2018
Knockholt Main Road	ATC	2014
A224 London Road (north of Station Road)	ATC	2014, 2017
A224 London Road (south of Aisher Way)	ATC	2014
A21/London Road	Junction count	2014
Hewitts roundabout	Junction count	2014, 2018
Junction 4 on the M25	Junction count	2014, 2020
Shacklands roundabout	Junction count	2014, 2018
Otford Lane/A224 Site access	Junction count	2014, 2018
Pilgrims Way West/A224 Polhill	Junction count	2014, 2017, 2018
Morants Court Road roundabout	Junction count	2014, 2018
Star Hill Site Access	Junction count	2018
A25/Chevening Road	Junction count	2014
A25/A21/M25/Westerham Road	Junction Count	2020

Table 2-4 Summary of Traffic Surveys

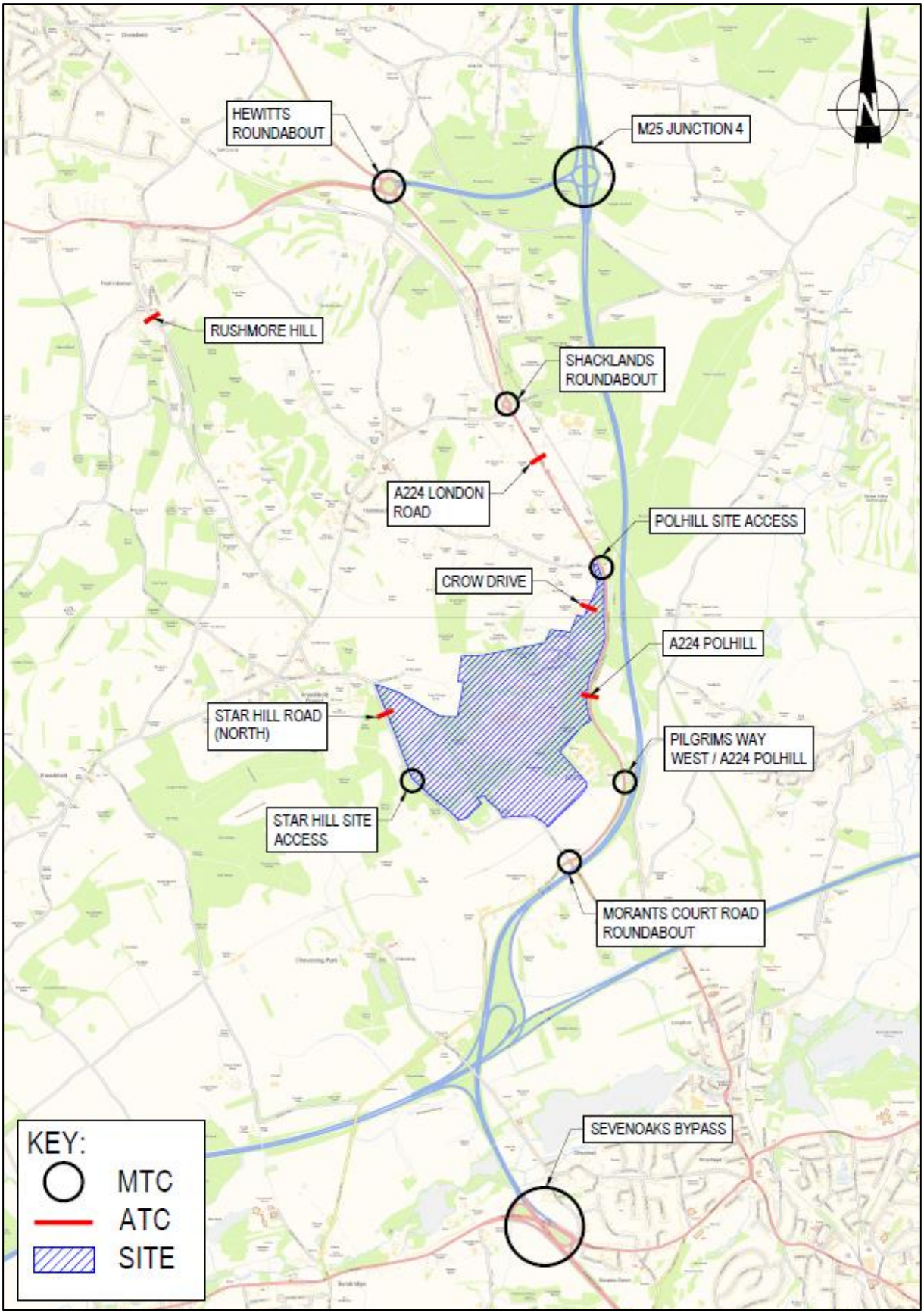

Figure 2-11 Traffic Survey Locations

2.8.7 In addition to classified automatic traffic counts (ATCs) and turning counts at the main junctions, queue length counts were also undertaken at the main intersections, the results are summarised in Table C1 within Appendix C. Overall, aside from short term queuing observed Hewitts Roundabout and the Pilgrims Way West (link road) junction, no queueing issues were observed at the junctions within proximity to the site.

2.8.8 The traffic surveys served to establish a 2018 baseline of peak hour flows on the network, which is based on the most recent 2018 surveys or older data where necessary. When older data have been used, they have been scaled up with traffic growth factors derived from the Trip End Model Presentation Program (TEMPRO), which is the industry standard for estimating local traffic growth factors.

2.8.9 Baseline flows for the main links, identified on the map in Figure 2-12, are presented in Table 2-5. Complete network diagrams can be found in Appendix D.

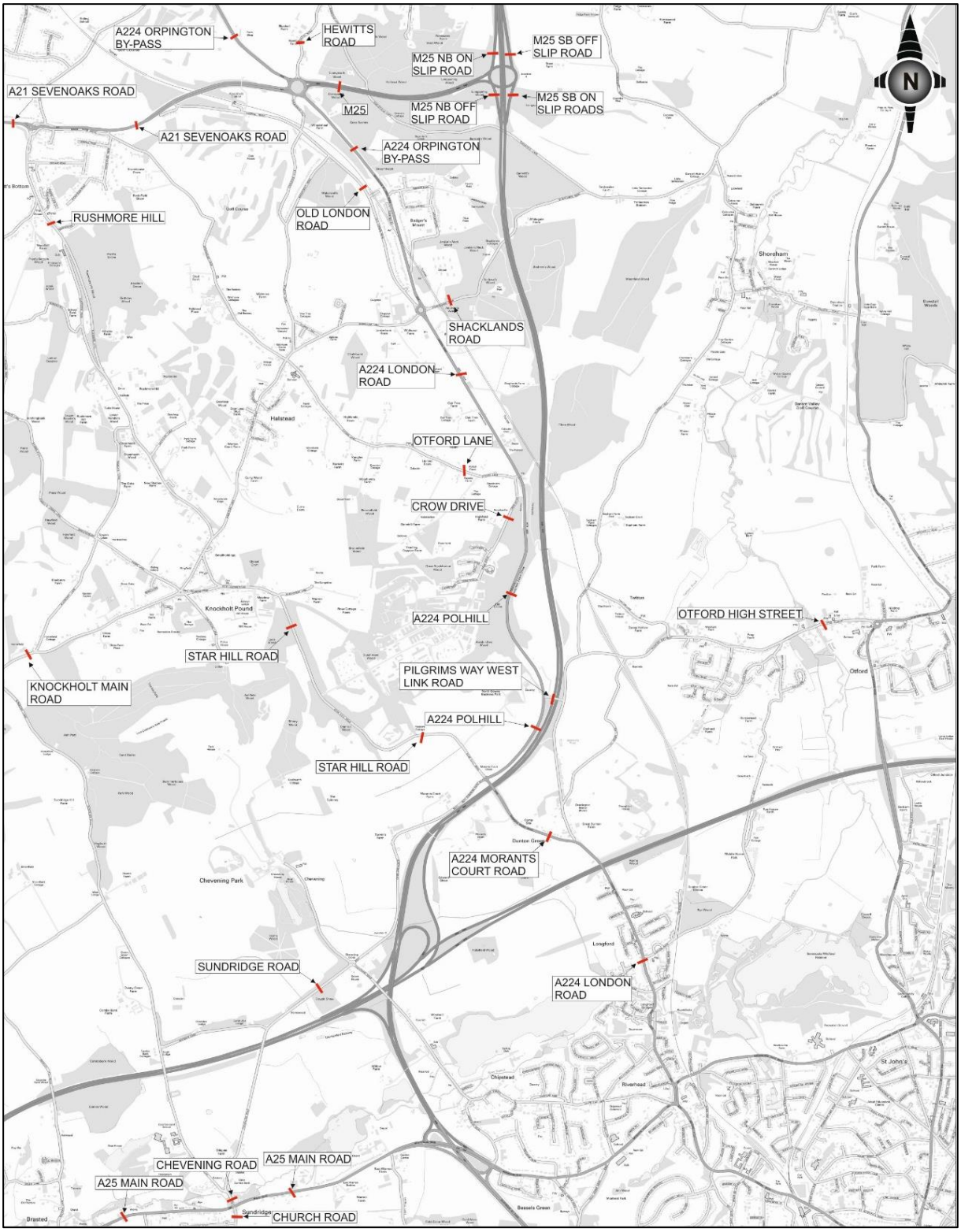

Figure 2-12 Main Assessed Links

Link and Survey Date	AM peak (veh/h)	PM peak (veh/h)
A21 Sevenoaks Road (west of Rushmore Hill) - 2014	2697	2783

Rushmore Hill - 2018	272	283
A21 Sevenoaks Road (east of Rushmore Hill, west of Old London Road) - 2014	2356	2553
A224 Orpington By-Pass (north of Hewitts roundabout) - 2014	1877	1746
Hewitts Road - 2014	107	93
M25 approach on Hewitts roundabout -2014	3480	3120
A224 Orpington By-Pass (north of Shacklands Rd roundabout) -2017	918	837
M25 northbound on slip road -2014	933	1229
M25 northbound off slip road -2014	585	467
M25 southbound on slip road -2014	471	519
M25 southbound off slip road -2014	1451	974
Old London Road -2017	443	480
Shacklands Road -2014	122	56
A224 London Road -2018	1144	1151
Otford Lane -2014	75	57
Crow Drive -2018	224	159
A224 Polhill (south of site access) -2018	1071	1078
Pilgrims Way West link road to A224 Polhill -2014	690	638
A224 Polhill (south of Pilgrims Way West link road) -2014	1082	1016
Otford High Street -2014	835	874
A224 Morants Court Road -2014	837	793
A224 London Road (at Station Road in Dunton Green) -2017	1042	1083
Sundridge Road -2014	726	539
Chevening Road -2014	563	435
A25 Main Road (east of Chevening Road) -2014	1389	1526
A25 Main Road (west of Chevening Road) -2014	1523	1605
Church Road -2014	249	210
Star Hill Road (south of site access) -2017	317	279
Star Hill Road (north of site access) -2018	255	245
Knockholt Main Road -2014	331	204

Table 2-5 Baseline Peak Hour Flows on the Main Links in the Local Transport Network

2.9 Personal Injury Collisions

2.9.1 Personal Injury Collision (PIC) data for the five-year period up to September 2019 has been obtained from KCC. This includes the most up-to-date data available at the time of request.

Additionally, five-year PIC data up to May 2019 has been obtained from TfL covering the immediate area surrounding Hewitts Roundabout within the London Borough of Bromley. Appendix E contains maps showing the location and severity for each recorded accident.

Fatal Personal Injury Collisions

2.9.2 Excluding the M25, there was 2 fatal collision within the local area. The first occurred on 06/8/2015 along Old London Road as a result of the driver not being able to follow the left-turn bend and colliding with a tree across the other side of the carriageway. This PIA indicates loss of control potentially from driver error. The second occurred on 13/04/2019 along Court Road near the junction with Goddington Lane. This collision involved a pedestrian and a drunk driver.

Personal Injury Collison Clusters

2.9.3 The accident clusters that have been identified are as follows:

- M25 Junction 4 and Hewitts Roundabout: There are small clusters of accidents recorded on the M25 Junction 4 slip roads and on Hewitts Roundabout. However, the accident rates are not excessive given the high flow of traffic through the junctions.

- Star Hill Road / Morants Court Road Roundabout: There were three recorded injury accidents over the five-year period, of which all three were of slight severity. All collisions involved motorists pulling out and hitting cyclists. Therefore, all accidents were resultant of driver failure to pay attention to other traffic/ road users. The main cycling demand that would be encouraged by the development would be to Knockholt train station which doesn't pass through this roundabout. No improvements are proposed for this roundabout as no mitigation was proposed with the OPA, and it is considered that 3 accidents within a 5 year period would not above expected levels, require interventions to be made.

- Star Hill Road: Four accidents have been recorded on Star Hill Road, three within close proximity to the junction between Star Hill/ Birchwood Lane/ Old London Road. Of the three collisions, two appear to be speed related. The third involved a drunk driver colliding with parked cars. The remaining collision on Star Hill Road occurred at the bend near Lime Pit Road and involved a motorcyclist who lost control while travelling around the bend.

- Polhill Road / Otford Lane Junction: Three recorded collisions occurred adjacent to the Polhill Road / Otford Lane junction, all of a slight severity. All accidents appear to be associated with loss of control or drivers not paying attention to other traffic.

- Main Road / Harrow Road / Chevening Lane Junction: No accidents have occurred at this junction between 2015-2019. However, slightly further west along Main Road a driver has suffered a medical emergency and crashed into some parked cars. However, this is not thought to be related to the junction layout itself.

2.9.4 There are no recorded injury accidents at either of the two site access junctions that can be directly attributed to traffic travelling through the junction. On Star Hill Road, there are no accidents in close proximity to the site access. At the A224 Polhill/Otford Lane junction there are only three collisions, all of slight severity and resultant of driver error.

2.9.5 Junction 5 of the M25 also has a high record of accidents but is considered to be too remote from the site for the development to have a material bearing on future accident rates.

2.9.6 Overall a clear correlation between accident rates and road surface/ lighting/ weather conditions was not observed.

Pedestrian and Cyclist Collisions

2.9.7 Of the 431 PICs recorded, 32 involved cyclists and 18 involved pedestrians. There were no obvious clusters of collisions involving pedestrians, however Shacklands roundabout on the A224 London Road has a small cluster of collisions involving cyclists. These occurred over a year apart and happened under different circumstances. The first occurred due to a driver not paying attention, the second was caused by uneven road surfaces with no vehicle involvement and the third was caused by a cyclist losing control due to a vehicle pulling out close in front of it. Therefore, it is concluded that there is no road safety issues at this roundabout that would be adversely impacted by the development proposals. KCC have stated that there is a high incident of crashes involving cyclists however, there were no common causes between the three accidents highlighted. It is also noted that all of these cycle incidents occurred outside of commuter period, and likely result from a high prevalence of competition and sports cycling (noted on one of the accident descriptions) and therefore it is not considered necessary for improvements to be made to rectify safety concerns not relating to the development.

2.10 Summary

2.10.1 This chapter has presented the existing transport and access conditions in and around the Fort Halstead site.

2.10.2 Although the site currently has poor accessibility by public transport Dstl has provided a private shuttle bus that operates during the morning and evening peak periods, providing a link for Dstl and QinetiQ staff to and from Knockholt and Orpington stations.

2.10.3 The site is well connected to the local and strategic road networks, with easy access to the M25 and also to the A21 for access towards Bromley.

2.10.4 There appear to be no major highway capacity issues on the immediate network serving the site. Some minor queueing has been recorded at the Hewitts roundabout on the A224 to the north of the site, and at the A224/Pilgrims Way junction to the south. The other main hotspots that have been identified in the area (A25 Riverhead roundabouts, A25 Bat and Ball junction and M25/A21/A25 junction) are considered to be too remote from the site for to be significantly impacted by the development.

2.10.5 There do not appear to be any major road safety issues on the local highway network. Small accident clusters have been identified at M25 Junction 5 and at Hewitts roundabout which are at some distance to the north of the Site. Locally, there are no identifiable accident clusters or themes indicating a need to consider safety improvements as a result of the development.

3 Policy Review

3.1 Introduction

3.1.1 The proposed development has been progressed taking account of policy and guidance at the national, regional and local level as set out under the headings below.

National Policy and Guidance

- National Planning Policy Framework (NPPF)
- National Planning Practice Guidance (NPPG)
- Manual for Streets 2

Regional Policy and Guidance

- Kent County Council Local Transport Plan 4
- Kent Downs AONB Management Plan
- Kent Design Guide Review: Interim Guidance Note 3 on Residential Parking
- Kent and Medway Structure Plan 2006: Mapping out the future – Supplementary Planning Guidance SPG4: Kent Vehicle Parking Standards
- Kent Design Guide

Local Policy and Guidance

- Sevenoaks District Council – Local Development Framework: Core Strategy
- Sevenoaks District Council – Allocations and Development Management Plan
- Sevenoaks District Strategy for Transport
- Sevenoaks District Council – Submission Draft Local Plan (2018)
- Sevenoaks District Cycling Strategy

3.2 National Planning Policy Framework (2019)

3.2.1 The NPPF aims to enable local people and their councils to produce their own distinctive local and neighbourhood plans, which should be interpreted and applied in order to meet the needs and priorities of their communities.

3.2.2 Section 9: Promoting Sustainable Transport, of the NPPF, paragraph 102 states that;

3.2.3 "transport issues should be considered from the earliest stages of plan-making and development proposals, so that:

a. the potential impacts of development on transport networks can be addressed;

b. opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;

c. opportunities to promote walking, cycling and public transport use are identified and pursued;

d. the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for mitigation and for net gains in environmental quality; and

e. patterns of movement, streets, parking and other transport considerations are integral to the design of schemes and contribute to making high quality places."

3.2.4 With regards to sites that may be allocated for development in plans, or specific applications for development, paragraph 108 states that;

"…it should be ensured that:

a. appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;

b. safe and suitable access to the site can be achieved for all users; and

c. any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree."

3.2.5 Paragraph 109-110 goes on to state that;

"Development should only be prevented or refused on highways grounds if the residual cumulative impacts on the road network or road safety would be severe.

3.2.6 Within this context, applications for development should:

a. give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas; and second – so far as possible – to facilitating access to high quality public transport, with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use;

b. address the needs of people with disabilities and reduced mobility in relation to all modes of transport;

c. create places that are safe, secure and attractive – which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards;

d. allow for the efficient delivery of goods, and access by service and emergency vehicles; and

e. be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations."

3.2.7 Paragraph 111 states that:

"All developments that will generate significant amounts of movement should be required to provide a travel plan, and the application should be supported by a transport statement or transport assessment so that the likely impacts of the proposal can be assessed."

National Planning Practice Guidance, 2018

3.2.8 The Planning Practice Guidance was launched in July 2018 and provides additional guidance to the Government's strategic policies outlined within the NPPF in a web-based resource. This is updated regularly.

3.2.9 Matters of relevance to the transport assessment include guidance on Transport Assessments (TAs) and Transport Statements (TS) and what they should contain. Local planning authorities must make a judgement as to whether a development proposal would generate significant amounts of movement on a case by case basis (i.e. significance may be considered at a lower threshold where road capacity is already stretched or a higher threshold for a development in an area of high public transport accessibility).

Manual for Streets 2

3.2.10 Manual for Streets 2 is a national design guidance document published in 2010 and explains how the principles within Manual for Streets 1 can be applied. Principles from within both Manual for Streets 1 and 2 have been applied within the proposed development such as consideration of current visibility guidance, shared space and pedestrian/cyclist design and general themes on quality urban realm and layout.

3.3 Regional Policy and Guidance

Kent County Council Local Transport Plan 4: Delivering Growth Without Gridlock 2016-2031

3.3.1 The Local Transport Plan (LTP) for Kent, covering a period from 2016 to 2031, is the County Council's fourth LTP and was adopted by KCC on 19th January 2017. It sets out a 15-year plan for the area and consists of five overarching policies that are targeted at delivering specific outcomes.

3.3.2 The outcomes are as follows:

Outcome 1: Economic growth and minimised congestion

- Policy: Deliver resilient transport infrastructure and schemes that reduce congestion and improve journey time reliability to enable economic growth and appropriate development, meeting demand from a growing population.

Outcome 2: Affordable and accessible door-to-door journeys

- Policy: Promote affordable, accessible and connected transport to enable access for all to jobs, education, health and other services.

Outcome 3: Safer Travel

- Policy: Provide a safer road, footway and cycleway network to reduce the likelihood of casualties, and encourage other transport providers to improve safety on their networks.

Outcome 4: Enhanced environment

- Policy: Deliver schemes to reduce the environmental footprint of transport, and enhance the historic and natural environment.

Outcome 5: Better health and wellbeing

- Policy: Provide and promote active travel choices for all members of the community to encourage good health and wellbeing, and implement measures to improve local air quality.

Kent Downs AONB Management Plan (2014)

3.3.3 The development site is situated within the Kent Downs Area of Outstanding Natural Beauty; although the main access to the site from the A224 lies outside the AONB boundary. The A224 to the north (London Road) lies outside the AONB, whilst to the south (Polhill) it is included within the AONB.

3.3.4 The Management Plan sets out a vision and clear aims and policies. The policies provided in the plan recognise and reflect the pressure from growth and development in the Kent Downs AONB. This includes securing mitigation measures to take advantage of the opportunities generated by this growth and to prevent a harmful impact on the AONB.

3.3.5 The Management Plan recognises the impact of all transport infrastructures on the quality of the landscape and the tranquillity of the area, but also acknowledges the key role of public transport connections to promote tourism in the area.

3.3.6 There is a chapter dedicated to access, which identifies the main issues with regard to transport. They include, among others:

- Estimated day visitor numbers are high and probably increasing. Pressure on the special characteristics and qualities of the AONB as well as particular countryside routes, sites and areas can be very high but unevenly distributed.
- Urban and growth areas in close proximity to the AONB will generate new opportunities for enjoyment, health and well-being but also pressure for travel and access.
- Differences in requirements and uses between rightful Public Rights of Way (PRoW) users (horse riders, cyclists, motorbikes walkers, and those with dogs) can result in conflicts.
- Conflicts between rightful PRoW users and illegal users, fly-tipping, dumping and path obstruction.
- The increasing popularity of horse riding and off-road cycling which is focused particularly on the AONB, putting pressure on the rights of way network. The need to enhance, extend, connect and improve fragmented bridleway links and secure higher rights on PRoW without harming the characteristics and qualities of the AONB.
- Need to ensure that the PRoW network is well signposted, way-marked and maintained using materials and equipment appropriate in design and sustainably sourced.
- Improving the rural road network for its landscape quality and to promote quiet countryside recreation by managing traffic pressures to provide quiet and safe access.
- The opportunity to promote the availability and use of safe non car-based countryside transport and recreation opportunities and seek integrated public transport initiatives.

3.3.7 Among the stated aims for a sustainable access there are:

- A legally defined, well maintained, connected and promoted Rights of Way network that provides safe, well designed and satisfying routes for walkers, cyclists and horse riders where conflicts between rightful uses are minimised.

- New routes and connections between public rights of way and a highway network which is increasingly available and safe for walkers, cyclists and horse riders.

- Access where illegal or damaging recreational activities are actively controlled.

3.3.8 Specific policies from the Management Plan that relate to transport are:

- SD 12: 'Transport and infrastructure schemes are expected to avoid the Kent Downs AONB as far as practicable. Essential developments will be expected to fit unobtrusively into the landscape, respect landscape character, be mitigated by sympathetic landscape and design measures and provide environmental compensation by benefits to natural beauty elsewhere in the AONB.'

- AEU2: 'Diversions and stopping up of PRoWs will be resisted unless it can be demonstrated that they will not have a detrimental impact on opportunities for access and quiet enjoyment of the AONB landscape and historic character.'

- AEU3: 'Investment to secure sustainable, high quality, low impact and easy access, multiuser routes from towns and growth areas to the AONB will be pursued.'

- AEU4: 'The sustainable and enhanced management and promotion of open access sites will be pursued.'

- AEU5: 'Mechanisms will be supported to resolve conflicts between rightful users of Public Rights of Way. Where there are irreconcilable conflicts from legal but damaging activities, quiet recreation will be supported above other activities.'

- AEU7: 'Improvements to the Rights of Way Network to provide and improve countryside access, health and well-being opportunities, including way-marking, signposting and maintenance, new routes and establishment of higher rights which conforms with AONB policies and design guidance, will be supported.'

- AEU11: 'A reduction in the need to travel by car will be supported through new and improved measures to provide integrated, attractive and affordable public transport in the Kent Downs. New business, community and other initiatives in support of the vision, aims and policies of the Management Plan will seek to relate to existing public transport links.'

- AEU12: 'Sustainable solutions to problems of rural traffic will be supported, particularly in rural settlements or where there is a conflict with landscape quality or walkers, cyclists and horse riders.

- AEU13: 'A strategic approach to the use of road signage, furniture, design and maintenance that conserves and enhances the local character and distinctiveness and encourages non-motorised access will be pursued through the adoption and implementation of the AONB Rural Streets and Lanes Design Handbook.'

Kent Design Guide

3.3.9 The Kent Design Guide is a series of guides for assisting with the design of a proposed development. It has been designed to be a supplementary planning document for Local Development Frameworks or Local Plans. The aim of this guide is to assist in promoting a common approach to the main design principles when assessing planning applications and encourage developments that have a community feel where people want to live and work. There are also supplementary guidance documents supporting the Kent Design Guide including one on Visibility splays and one for residential parking.

3.3.10 Consideration has been given to the Kent Design Guide through the scheme design and subsequent discussions and consultations with the Highway Authority.

Kent Design Guide Review: Interim Guidance Note 3 on Residential Parking (2008)

3.3.11 This Guidance Note reviews the factors to be considered when deciding an appropriate parking provision for residential areas and sets minimum and maximum numbers of parking spaces for different locations (city/town centre, edge of town, suburban, and suburban edge/village/rural) and different types of residential units.

Kent and Medway Structure Plan 2006: Mapping out the future – Supplementary Planning Guidance SPG4: Kent Vehicle Parking Standards (2006)

3.3.12 This Supplementary Planning Guidance provides standards for vehicle and cycle parking in Kent for those land uses that have not been superseded by the Kent Design Guide.

3.4 Local Policy and Guidance

Sevenoaks District Council – Local Development Framework: Core Strategy (2011)

3.4.1 The Core Strategy is a key part of the Sevenoaks District Council's (SDC) Local Development Framework (LDF) and was adopted on 22 February 2011. It sets out the council's objectives and overarching principles which will deliver necessary development needs of the district up to 2026.

3.4.2 The key objectives of the Transport Strategy have been developed into the following set of priorities in the Sevenoaks urban area:

- Improve public transport interchange facilities;
- Maintain and improve capacity on peak train services;
- Manage parking issues in the town centre and around train stations;
- Bring forward measures to alleviate congestion and tackle air quality issues at Riverhead, Bat & Ball and Sevenoaks Town Centre; and
- Improve facilities for walking and cycling.

3.4.3 For rural areas the priorities are defined as follows:

- Maintain and improve accessibility to jobs, shops and services by non-car means, including walking, cycling, public transport and community transport; and
- Bring forward measures to alleviate congestion and tackle air quality issues, including those along the A25 corridor, at Seal and Westerham, and on the Strategic Network.

3.4.4 The LDF notes that the dispersed rural nature leads to bus operators finding it difficult to run commercially viable bus services, resulting in many being subsidised by KCC. It suggests that limited development in rural areas is unlikely to provide a catalyst for improved bus services and therefore innovative public and community transport solutions are necessary, including dial-a-ride and car-pooling.

3.4.5 It goes on to state that loss of services and facilities from rural areas will be resisted where possible, but exceptions will be made where equivalent replacement facilities are provided or where it can be demonstrated that the continued operation of the service or facility is no longer financially viable.

Sevenoaks District Council – Allocations and Development Management Plan (2015)

3.4.6 The Allocations and Development Management Plan (ADMP), forms part of Sevenoaks District Local Development Framework (LDF) and was adopted in February 2015. The ADMP comprises proposals for the development of strategic sites and provides development management policies which are used, in combination with adopted core strategy policies, to determine planning applications.

3.4.7 The relevant policies for this assessment are:

- Policy EN1 – Design Principles, which in relation to transport infrastructure states that:

  'Where appropriate, new developments should include infrastructure that complements modern communication and technology needs and restricts the need for future retrofitting. Such infrastructure should include (…) provision of a power supply that would support green technology initiatives such as in-home electric car charging points.'

- Policy EMP3 - Redevelopment of Fort Halstead, which in relation to transport states that:

  'Redevelopment proposals (…) would be expected to:

  - Be sustainable in respect of the location, uses and quantum of development and be accompanied by a Travel Plan incorporating binding measures to reduce dependency of future occupants on car use;
  - Provide accessibility to jobs, shops and services by public transport, cycling or walking, including proposals for onsite provision proportionate to the proposed development; (…)
  - Confirm, by way of a Transport Assessment, that the development would not have an unacceptable adverse impact on the local and strategic road networks;
  - Improve the provision and connectivity of green infrastructure, including the protection, enhancement and management of biodiversity and the provision of improvements to the Public Right of Way network.'

- Policy T1 - Mitigating Travel Impact

  'New developments will be required to mitigate any adverse travel impacts, including their impact on congestion and safety, environmental impact, such as noise and tranquillity, pollution and impact on amenity and health. This may mean ensuring adequate provision is made for integrated and improved transport infrastructure or other appropriate mitigation measures, through direct improvements and/or developer contributions'

- Policy T2 - Vehicle Parking states that:

  'Vehicle parking provision, including cycle parking, in new residential developments should be made in accordance with the current KCC vehicle parking standards in Interim Guidance Note 3 to the Kent Design Guide (or any subsequent replacement)

  Vehicle parking provision, including cycle parking, in new non-residential developments should be made in accordance with advice by Kent County Council

as Local Highway Authority or until such time as non-residential standards are adopted.'

Notwithstanding the Council may depart from established maxima or minima standards in order to:

a. take account of specific local circumstances that may require a higher or lower level of parking provision, including as a result of the development site's accessibility to public transport, shops and services, highway safety concerns and local on-street parking problems;

b. ensure the successful restoration, refurbishment and re-use of listed buildings or buildings affecting the character of a conservation area;

c. allow the appropriate re-use of the upper floors of buildings in town centres or above shop units;

d. account for the existing parking provision (whether provided on or off-site) already attributed to the building's existing use when a redevelopment or change of use is proposed and for the use of existing public car parks outside of normal working/trading hours by restaurants and leisure uses.'

- Policy T3 - Provision of Electrical Vehicle Charging Points

'For all major non-residential development proposals, the applicant should set out within their Transport Assessment a scheme for the inclusion of electric vehicle charging infrastructure.

In considering whether a publicly accessible charging point is appropriate the Council will have regard to:

a. The accessibility of the location;

b. The suitability of the site as a long stay destination during charging;

c. The number of existing and proposed publicly accessible charging points in the surrounding area;

d. The potential impact of providing electric vehicle charging points on development viability.

3.4.8 Within new residential developments all new houses with a garage or vehicular accesses should include an electrical socket with suitable voltage and wiring for the safe charging of electric vehicles.

3.4.9 Schemes for new apartments and houses with separate parking areas should include a scheme for at least one communal charging point.

3.4.10 In non-residential developments where it is not appropriate to provide electric vehicle charging points, new development should be designed to include the electrical infrastructure in order to minimise the cost and disturbance of retrofitting at a later date.'

Sevenoaks District Strategy for Transport, 2010

3.4.11 The Sevenoaks District Strategy for Transport (SDST) was prepared by KCC with support from SDC and covers a period of 16 years from 2010 to 2026. It sets out following key initiative objectives:

- improve accessibility;
- tackle congestion;
- provide safer roads; and
- improve air quality

3.4.12 The impact of unsustainable transportation is acknowledged, including both the environmental and social issues, and a desire to promote 'green transport' is identified. Furthermore, the A25 is identified as a route experiencing issues with congestion.

3.4.13 The SDST states its vision for villages is for smaller scale development consistent with the size and relative sustainability of the settlement concerned.

3.4.14 The SDST sets out the aims of promoting an integrated transport network that:

- Improves accessibility to jobs and services for all sections of the community;
- Reduces congestion;
- Improves safety;
- Reduces the impact of transport on the natural and built environment; and
- Protects and enhances the district's position as an attractive location for business and investment.

3.4.15 In order to achieve these aims the following objectives have been set:

- Reduce the need to travel and the distance people need to travel
- Where there is a need to travel, enable people to be less dependent on cars for their travel needs
- Maximise the efficient use of existing infrastructure
- Divert traffic away from sensitive areas
- Encourage the integration of transport modes
- Reduce the effects of traffic and transport on air quality
- Improve road safety for all users
- Improve safety and security for all public transport users

3.5 Emerging Sevenoaks District Local Plan

3.5.1 The Submitted Local Plan has been the subject to a partial EiP with the Inspector finding that the Plan had not met the Duty to Co-Operate. The Inspectors decision on the Plan is now the subject of a High Court challenge. As such the Submission Plan can be afforded limited weight.

3.5.2 There is one policy (T1) within the Proposed Local Plan in relation to Transport. The policy states that the Local Plan will work with KCC and HE to ensure that adverse travel impacts created by new developments are mitigated. The policy also promotes safe and convenient

cycle routes which may include new routes, enhancements to existing routes or integrating new routes into PROW network.

3.5.3 The policy states that parking is to be in line with advice provided by KCC and the current KCC parking standards which are set out in the Interim Guidance Note 3 (as detailed above).

3.5.4 The policy also outlines the view on EV charging points in both residential and non-residential developments. For all non-residential development proposals there must be EV charging for use of employees and customers plus additional accessible rapid EV charging points where possible. For new residential schemes all houses with a garage or off-street parking must include an external electrical socket for EV charging. Communal parking much have communal charging points.

Sevenoaks District Cycle Strategy

3.5.5 The strategy has been developed with the aim of encouraging more people to cycle safely within the District to encourage a shift towards more sustainable travel choices. The main priorities of the strategy are:

- Creating New Routes and Linkages
- Safer Cycling
- Improvements to Cycle Parking
- Promotion and Encouragement
- Maintenance

3.5.6 The strategy highlights key areas which could use improvement within the District across all of the main priorities mentioned above. Although the strategy identifies that the proposed improvements are not an exhausted list and more improvements could be made should the funding be available, there is no mention of any improvements proposed or suggested within Halstead or at Knockholt train station within the document.

3.6 Implications for Fort Halstead

3.6.1 The key policy implications for the transport strategy at Fort Halstead are as follows:

- There is a need to promote more sustainable travel patterns to/from the site. Any public transport strategy needs to take account of the difficulty of providing traditional, commercially viable solutions in a rural environment and therefore there is a need to look at more innovative solutions;
- Where practical, there will be a need for the strategy to facilitate improvements to the pedestrian and cycle network which provide access to the site;
- There is a need to try to increase the integration of Fort Halstead with the existing village communities in the locality;
- The highway impacts on rural roads need to be minimised so there is no adverse impact on the tranquillity of the AONB;
- The highway impacts of the development need to be minimised, particularly in relation to existing congestion and air quality hotspots along the A25 corridor; and
- The strategy needs to take account of existing concerns regarding parking pressures at station car parks.

4 Development Proposals

4.1 Introduction

4.1.1 This chapter sets out the development proposals in terms of the development quantum, parking provision, phasing of the development and the access strategy.

4.1.2 The proposed application is for a Hybrid Planning Application (HPA).

The detailed element of the application will comprise:

- Demolition of existing buildings;
- Change of use and works to buildings Q13 and Q14 (including landscaping and public realm);
- Primary and secondary accesses.

The outline element of the application will compromise:

- Development of up to 635 residential dwellings;
- Development of business areas (use classes B1a/b/c) of up to 27,773 sqm GEA;
- Land safeguarded for the development of a one form entry primary school;
- Development of a mixed-use village centre (use classes A1/A3/A4/A5/B1a/D1/D2);
- Works within the 'X' enclave relating to energetic testing operations, including fencing, access, car parking;
- Change of use of Fort Area and bunkers to Historic Interpretation Centre (use class D1) with workshop space;
- Roads, pedestrian and cycle routes, public transport infrastructure, car parking, utilities infrastructure, drainage;
- Landscaping, land forming and ecological mitigation works.

4.1.3 In comparison to the OPP, the proposed development would result in an increase of 185 residential units over the consented figure of 450 units. The total employment numbers across the site remain similar, with the OPP having a figure of 1,483 jobs and the proposed development having a figure of 1,438 jobs. The proposed development includes land safeguarded for a primary school on site which was not included as part of the OPP. Lastly, the hotel originally as part of the OPP is no longer proposed.

4.2 Development Quantum

Residential Development

4.2.1 The proposed development allows for the provision 635 new residential units which will comprise a range of unit types and sizes. The residential development will include affordable accommodation.

4.2.2 The Indicative Masterplan included within Appendix F sets out the overall layout of the site. An Indicative Density Plan has also been included within Appendix F which highlights the location of the different residential parcels of the development and the respective indicative densities.

Commercial Development

4.2.3 The commercial element of the development will comprise a mix of B1a, b and c land uses and the retention of the existing QinetiQ facilities and jobs in a new enclave. There will also be an element of D1, D2, A1 and A3 use classes associated with the Village Centre.

4.2.4 The proposed mix of uses and floor spaces for the commercial element (with the provision of a school on site) is summarised in Table 4-1:.

Land use	Gross external area (GEA) (m2)
Total Employment Uses Including Village Centre (excl. QinetiQ)	20,409
Retained QinetiQ	6,016
Total	26,425

Table 4-1 Commercial Development Use Classes

4.2.5 The proposed commercial element of the development is expected to support approximately 1,438 total jobs onsite.

Primary School

4.2.6 The development proposals include the safeguarding of land for a one form entry primary school as part of the outline element of the HPA. The primary school will comprise a gross external area of 1,345sqm which will be of use class D1.

4.3 Access Strategy and Masterplan

4.3.1 The primary access point to the site is via Crow Drive and A224 Polhill to the north of the site. Additionally, the development proposals seek to utilise the access point from Star Hill Road to the south-western boundary of the site as a secondary vehicular access point. The main route through the site will be a bus route and will therefore be 6.75m wide in accordance with the requirements of the Kent Design Guide.

4.3.2 The use of the Star Hill access is in line both national (Manual for Streets) and local guidance (Kent Design Guide) which seek to ensure developments are permeable and linked effectively to the surrounding transport networks for all users and also for resilience. Furthermore, as part of the pre-application discussions, KCC highways officers have repeatedly stated that the proposed development would require two access points to be in line Kent Design policies.

4.3.3 Based on the work undertaken as part of the 2015 OPP, it is understood that both the local community and KCC councillors have expressed concern regarding the use of the access point from Star Hill which is perceived to generate a significant level of traffic on Star Hill Road. The development proposals and masterplan of the site have responded to such concerns by ensuring traffic flows at the Star Hill access are kept to minimum through the following measures:

- Locating the new commercial development away from the Star Hill access point and orientated more towards the Polhill access point;

- Designing the internal highway network such that the route to the Star Hill access point is more convoluted and hence journey times to the Star Hill access point would be slower and less desirable;

- Whilst retaining much of the Crow Drive/ Crow Road alignment, part of the route will be pedestrianised removing the direct vehicular through route;

- The stretch of road from the Star Hill access to the centre of the site would be re-designed to include multiple deviations from the current geometry which would result in traffic calming and longer journey times to the Star Hill access.

4.3.4 In addition to the above, the design of the internal highway network will be compatible with the requirements for designation as a 20mph zone. This has resulted in a number of traffic calming features within the internal site which have been agreed in concept with KCC. Further modifications have been made on the 'square' junction concepts utilising examples of schemes successfully delivered in Iwade near Sittingbourne. The internal highway network drawings have been included in Appendix G.

4.3.5 At the centre of the site, a new village centre would be created serving new and existing residents and including a range of mixed uses such as a shop, café, community use and early years provision.

4.3.6 The indicative masterplan seeks to prioritise the movement of pedestrians and cycles both by controlling traffic speeds and providing more direct routes for these modes for internal movements within the site. In addition, the masterplan seeks to create an attractive environment that will encourage people to walk and cycle.

4.3.7 The Access and Movement Parameter Plan, which has been included in Appendix F, identifies a number of key new pedestrian/cycle routes. These include a new east – west cycle route across the site linking the A224 Polhill and Star Hill Road, as well as a cycle route from the centre of the site to the north west corner which will provide a convenient access route between the site and Knockholt Pound.

4.3.8 The Access and Movement Parameter Plan also identifies the primary access road within the site which would be designed to allow for bus and heavy vehicle movements within the site and therefore would be 6.75m wide to accord with Kent Design Guide local distributor road preferred standards.

4.4 Parking Provision

4.4.1 The level of on-site vehicle and cycle parking in connection to the proposed development will reflect the current parking standards. Kent and Medway Structure Plan 2006 provides the Supplementary Planning Guidance 4 – Vehicle Parking Standards dated July 2006 for a range of land uses. More up to date residential parking standards are contained in the Kent Design Review: Interim Guidance Note 3, Residential Parking, dated November 2009. These detail the parking standards for the corresponding land uses. EV charging will also be provided across the site.

4.4.2 At this stage the masterplan is indicative only and so the detailed layout of the various phases of the development including the layout of parking will be agreed at the appropriate time.

4.5 Agreed OPP Mitigation Taken Forward

4.5.1 As part of the 2015 OPP, Various mitigation measures were agreed in order to manage the transport related impacts of the development and to minimise the environmental impacts and adverse effects on the local community. The list of agreed mitigation measures along with their relevance to the proposed development have been set put below.

Highway Mitigation

4.5.2 The mitigation measures were agreed in principle as part of the OPP on the highway network and the applicability to the current application have been set out below:

Star Hill Road Access

4.5.3 The agreed OPP improvement scheme included narrowing of the Crow Drive access carriageway to 6.0 meters and a considerable improvement to the existing visibility splays. It was also proposed to include anti-skid surfacing on the approaches in order to further enhance safety. The visibility splays on the exit from the access junction were improved to the following level:

- 2.4 x 90 metres to the left; and
- 2.4 x 90 metres to the right.

4.5.4 The visibility splay improvements were in line with residential access roads as set out in Manual for Streets and Kent Design IGN2 based on vehicle speed surveys undertaken at the time. The use of actual recorded speeds allows for the use of the visibility SSD formula in these two documents, which in this case have been applied to the scheme.

4.5.5 It is noted that vehicle speed surveys do not go out of date, unlike traffic flow surveys, and remain fit for purpose when considering this updated application.

4.5.6 For the current application, the following improvements are proposed:

- Improvement to the visibility splays compared to the OPP scheme;
- New warning signs on the northern and southern approaches to the junction;
- The addition of anti-skid surfacing on Star Hill Road to assist vehicle stopping performance;
- Tapers on the junction corner radii to help large vehicles to turn without overrunning the centreline of the major carriageway;
- An enlarged splitter island to separate inbound and outbound movements by large vehicles to remove the potential for conflicts; and
- Trimming back of foliage and raising of tree crowns to improve visibility splays in each direction.

4.5.7 The proposed junction improvement scheme is shown in Drawing 41290/5501/044 within Appendix H and the corresponding swept path analysis has been shown in Drawing 41290/5501/045 within Appendix H.

Otford Lane/A224 Junction

4.5.8 Various options for an improvement scheme at this junction were considered as part of the OPP including minor improvements, signalisation and reconfiguring the junction into a priority roundabout junction. The roundabout option was agreed with KCC which included provisions for pedestrians and cyclists.

4.5.9 For the current application, it is proposed that the agreed roundabout design which is shown in Drawing 41290/5501/041 within Appendix H is taken forward.

Star Hill Traffic Calming

4.5.10 As part of the OPP, a speed restriction of 40mph was proposed along Star Hill road between Birchwood Lane and where the road enters the village of Knockholt Pound. This was considered to improve the safety of all road users across this stretch of the road. Details of the proposed traffic calming measures which were agreed in principle with KCC were included in Appendix F of the OPP TA.

4.5.11 For the current application, it is proposed that the previously agreed 40mph speed restriction along Star Hill is maintained. It should be noted that as part of the pre-application discussions, KCC have indicated that a speed restriction along Star Hill Road would not be supported by them, and potentially the Police, based on the existing evidence on vehicle speeds and collision data, although it is of note that the recorded speeds in question do support a reduction in the limit to 40mph based on the approach taken by KCC on other schemes in Kent recently. Although it is desired to reduce the speed limit, this would be subject to a Traffic Regulation Order (TRO) that would be processed post planning permission and included as an informative to any grant of permission. A technical note has been prepared and included within Appendix O which sets out the correspondence between KCC and provides the rationale as to why the speed reduction should be taken forward as part of the current application.

4.5.12 It should be noted that irrespective of a formal speed restriction along Star Hill Road, warning and 'slow' signage and road markings will be provided on the approaches to the access junction, which would act to further reduce traffic speeds, and visibility at the access junction would be significantly improved compared to existing levels. The proposed location of signage on Star Hill Road and the visibility improvements have been shown in Drawing 41290/5501/044 within Appendix H.

Star Hill Road/Rushmore Hill

4.5.13 As part of the OPP, periodic monitoring of traffic flows along this link was proposed to be undertaken by the developer. This could be used, in conjunction with a defined trigger point, to inform if the developer should be required to design additional traffic calming measures.

4.5.14 It is proposed that the previously agreed monitoring is taken forward as part of the proposed application. KCC have requested that this monitoring also be done for traffic speeds.

Pedestrian and Cycle Mitigation

4.5.15 The proposed highway mitigation set out above will in itself provide benefits for cyclists and pedestrians through safety improvements along around the Star Hill Access and improved facilities at the A224/Otford Lane junction.

4.5.16 Furthermore, the development would provide enhanced connections to the existing rights of way and the development will also open up new access routes though the site for the benefit of the wider community. The Access and Movement Parameter Plan included in Appendix F, highlights the indicative shared footways/ cycleways which provide connections to existing footways and bridleways. This includes connections to the existing footways which provide access to Knockholt Village.

4.5.17 Following discussions with KCC as part of the OPP, it was agreed that the development would upgrade the existing bridleway between Polhill and Twitton. Details of the upgrade works would be submitted and agreed with KCC prior to the occupation of the development, however following a recent meeting with the KCC PRoW team there are ownership constraints on this PRoW which could limit contributions to only improvements to lighting within the M25 underpass. Lighting improvements at this location are therefore offered through a S106 contribution.

4.5.18 As part of the OPP, it was agreed with KCC that cycle access to the north would be improved through the provision of on-street cycle lanes on London Road to link Otford Lane with the

existing advisory cycle lanes on Old London Road which provide access towards the Knockholt Station. It has since been agreed with KCC that this improvement measure will also be provided as part of the current application. The improvement scheme has been shown in Drawing 41290/5501/046 in Appendix I.

4.5.19 KCC have since requested that cycle hubs (including e-bikes) and a car club should be provided to enhance the sustainability of the site. This is explored as part of the Travel Plan package further below.

4.5.20 It was also requested that an off road cycle route be explored between the site and Knockholt train station to encourage less experienced cyclist who may cycle to the station rather than take the DRT or drive. This request has been fully explored and it has been concluded that it is not possible for an off route cycleway to be provided due to a myriad of physical and land ownership constraints. These constraints can be found in Technical Note that accompanies this application, which can be seen in Appendix I. It is therefore concluded that the proposed additional advisory cycle lane on the A224 would provide suitable provision to allow commuter cyclists access to the nearest rail station.

4.5.21 KCC subsequently requested that consideration be given to the enhancement of the proposed cycle route to be formed from verge and some of the existing carriageway. This has been fully explored; however, it is deemed unfeasible to use existing highway due to various land and highway constraints along London Road shown in the Technical Note in Appendix I . It is considered that the provision of the proposed advisory cycle lanes along London Road and Old London Road provide an appropriate solution to enable and encourage cycling to the station and local facilities.

Public Transport Improvements

4.5.22 The proposed public transport strategy for the site has been set out in Chapter 8 of this report. This will be in line with the proposals agreed as part of the OPP which include the following main elements:

- Diversion of the 3 (previously 431) bus service into the site; and

4.5.23 Providing a new DRT minibus service from the site comprising initially one minibus and later a second bus as demand increases. This service would commence during the first phases of development and provide routeing that flexibly serves the most popular journeys as the development evolves. More details about the routing, frequency and how the service would run can be found within Chapter 8.Further details of the public transport improvements have been included in Chapter 8 along with any additional measures explored following on from KCC comments.

Other Mitigation Measures

4.5.24 Details regarding the Travel Plan for the site have been included within Chapter 8. This includes a package of car club and cycle hire measures promoted through the Enterprise sustainable transport scheme.

4.5.25 Details regarding mitigation of potential construction and demolition impacts have been included in Chapter 7.

5 Trip Generation and Distribution

5.1 Introduction

5.1.1 This chapter sets out the methodology that has been undertaken to estimate the likely trip generation, mode of travel and distribution of trips associated with the proposed development during the peak hour periods (weekday morning peak from 08:00 to 09:00 and weekday evening peak between 17:00 and 18:00). It subsequently outlines the number of trips generated by each of the development uses, their modal split, and the distribution of the vehicle trips over the local highway network.

5.1.2 This section of the TA has been updated following consultation responses from the Highway Authority in December 2019. Further consideration is given to trip assignment on Crow Drive in particular, taking into account the measures put in place to traffic calm Crow Drive at the south western aspect of the site.

5.1.3 The trip generation assessment focuses on the proposed new residential and commercial uses together with the proposed primary school, which account for the majority of the trips. The development includes a number of other minor uses that will be located within the small village centre or adjacent to the fort. This comprises local facilities including village shop, community facilities which could include healthcare and a Historic Interpretation Centre of the Fort. However, these are likely to generate only a small number of trips, most of which would be internal within the site, outside of the peak periods or at weekends.

5.1.4 The trip generation estimates have been based on a combination of onsite surveys undertaken as part of the Transport Assessment for the OPP and data from the TRICS database. Mode share estimates have been informed by local surveys, TRICS data and Census data for journey to work.

5.1.5 The vehicle trips have then been assigned to the local road network. The trip distribution is based on 2011 journey to work Census data, whilst the traffic assignment has been informed by an earlier catchment study and a journey time and routeing analysis that compares journey times to various destinations from either site access.

5.1.6 The detailed trip generation and distribution methodology has been set out in the Transport Assessment Scoping Note (05/09/18) and TN01 – Trip Generation Technical Note (18/01/19) and agreed with KCC through the pre-application discussions. Emails from KCC confirming this agreement have been provided in Appendix A. This latest assessment responds to KCC's December 2019 consultation response in respect of Crow Drive routeing to Star Hill.

5.1.7 Since there is some uncertainty regarding the delivery of the on-site primary school, only the worst-case "without" school scenario has been assessed for the highway impacts of the proposed development, as agreed with KCC at the pre-application stage.

5.1.8 In order to better understand the net impacts associated with the proposed development, the trip generation potential relating to the CLEUD which was issued in 2004 has been considered for comparison.

5.2 Overall Methodology

Residential Trip Generation

5.2.1 The TRICS database has been used to provide trip rates for the residential component of the proposed development. With regard to the previous trip generation assessment undertaken as part of the OPP, it has been agreed with KCC that the TRICS surveys used are likely to be outdated and should be updated to include surveys undertaken up to five years ago.

5.2.2 The detailed TRICS site selections and resulting output reports can be found in TN01 – Trip Generation Technical Note (18/01/19) included in Appendix J.

5.2.3 The person trip rates based on the agreed TRICS surveys have been set out in Table 5-1.

Time	Person Trip Rates (per unit)		
	Arrive	Depart	2-way
08:00 – 09:00	0.191	0.827	1.018
17:00 – 18:00	0.637	0.297	0.934

Table 5-1 Peak Hour Person Trip Rates Minus OGV Trip Rates

Commercial Development

5.2.4 The commercial vehicle trip generation has been calculated based on traffic surveys undertaken on site as part of the OPP TA work. Trip rates were calculated from the survey results by comparing against the 1,000 employees that were known to be employed at the time of survey. Since the surveys included the traffic associated with the small residential community (72 homes), the traffic associated with that use has been removed in order to provide a more accurate estimate of trips generated by the commercial development only. This was done by reference to appropriate TRICS data for residential sites.

5.2.5 A summary of the vehicle trip rates per job for the commercial development is displayed in Table 5-2 below. These are the same trip rates as the consented OPP commercial trip rates.

Commercial Trip Rates based on OPP 2014 Surveys (1,000 Employed on Site)	AM peak (08:00 to 09:00)		PM peak (17:00 to 18:00)	
	In	Out	In	Out
Vehicle trip rate per job	0.295	0.030	0.019	0.230

Table 5-2 Trip Rates for Commercial Development

Primary School

5.2.6 A high-level review of the trip generation associated with the on-site primary school proposals has been undertaken and set out in TN02 – Primary School Impacts (08/05/19), included in Appendix K.

5.2.7 Based on the findings which have been presented in TN02, a 'without-school' scenario would be the worst-case scenario in terms of trip generation and highway impacts. As such, it has been agreed with KCC that only the 'without-school' scenario, but with the maximum level of job provision for the commercial development, is assessed. The email from KCC confirming this agreement has been provided in Appendix A.

5.3 Modal Split

5.3.1 For the residential element of the proposed development, the modal splits associated with the consented OPP have been adopted. The OPP TA modal splits are based on a combination of 'journey to work' 2011 Census data, TRICS survey modal splits and knowledge of the local transport network characteristics. Particular consideration was given to the fact that the site currently has poor public transport connectivity and that vehicles are likely to be the dominant

mode choice in the absence of a transport strategy or travel plan measures. This is clearly a worst case scenario as it does not take into account the sustainable transport provision proposed which will have a positive impact on reducing car usage. It should be noted that the general level of public transport provision has remained similar compared to 2015.

5.3.2 The proposed modal split to be applied to the TRICS person trip rates has been presented in Table 5-3 below, and, the detailed methodology and assumptions are available in Appendix H of the OPP TA (2015). These mode share rates reflect the development scenario with no primary school on site and do not account for the proposed travel plan measures including the proposed DRT. As such, the mode shares and trip generation provide a worst-case assessment of the impacts associated with the proposed development. The data below is based of census data which is based on the "longest part of the journey by distance, of the usual journey to work".

Mode	AM		PM	
	In	Out	In	Out
Public transport (bus, coach and all rail)	1%	12%	3%	3%
Private car and taxis	91%	83%	84%	85%
Drivers (% of total mode split)	59%	51%	66%	64%
Passengers (% of total mode split)	32%	32%	18%	21%
Powered two-wheeler	2%	1%	2%	2%
Bicycle	2%	1%	3%	2%
Pedestrians (including 'others')	4%	3%	8%	8%
Total	100%	100%	100%	100%

Table 5-3 Proposed Mode Splits to be Applied to Residential Person Trips

5.4 Proposed Development Trip Generation

5.4.1 The peak hour total trip generation has been undertaken by applying the relevant trip rates set out in Section 5.2 to the development proposals which comprise:

- 635 Residential Units
- 1,438 Total Jobs
- No primary school provided on-site as a worst case scenario for external trip generation

5.4.2 The peak hour total trip generation for the residential and commercial proposals of the proposed development have been provided within Table 5-4.

Land Use/ Trip Type	AM (08:00 – 09:00)		PM (17:00 – 18:00)	
	Arr	Dep	Arr	Dep
Residential Use (635 units)				

Land Use/ Trip Type	AM (08:00 – 09:00)		PM (17:00 – 18:00)	
	Arr	Dep	Arr	Dep
Person trip rate per unit	0.191	0.827	0.637	0.297
Person trip Generation	121	525	404	189
Car Driver Share	59%	51%	66%	64%
Total Vehicle Trips	71	268	267	121
Commercial Use (1,438 jobs)				
Vehicle trip rate per job	0.295	0.030	0.019	0.230
Vehicle (driver) trips	424	43	28	331
Total Vehicle Trips				
Total Vehicle Trips	495	311	295	452
Uplift From OPP	15	168	125	18

Table 5-4 Peak Hour Residential Trip Generation Summary

5.4.3 The December 2019 consultation response by KCC queried drivers travelling to stations and their inclusion in the above vehicle trip data. Firstly, the majority of train users, particularly to London would be expected to travel from 6am to 7:30am if they are to be in London for the start of the working day, so would not be included in the above 08:00-09:00 data in any event. Likewise, the same applies for the modelled evening peak where a work finish in London at 5:30pm would result in a car journey at Knockholt for instance at 6:30 onwards. Secondly the trip data above corresponds to a morning peak hour trip rate of 0.53 vehicle trips per dwelling, and an evening rate of 0.61, which is not unexpected for such a location and should include drivers travelling to rail stations (albeit for a later work start than 9am). The above trip data is considered robust as a result.

5.5 Trip Generation Potential of Existing Site without Development

5.5.1 As set out within Chapter 2 of this report, there is a Certificate of Lawfulness for an Existing Use and Development (CLEUD) for the site and it is known that historically, the site employed approximately 4,000 people onsite during its peak. Therefore, it is evident that the site is capable of generating a significantly higher demand on the transport network than current levels. To explore this further, the following scenarios have been assessed in this section:

- CLEUD Footprint Area: The trip generation of the entire CLEUD footprint area broken down by Use Class;
- 4,000 Employed Onsite: Trip generation associated with having 4,000 people employed onsite similar to historic levels; and
- CLEUD Footprint Area Excluding Demolished and Unavailable Buildings: Trip Generation of CLEUD footprint area excluding buildings that have since been demolished or made unavailable.

5.5.2 The potential trip generation associated with each scenario has been set out below in turn.

CLEUD Footprint Area

5.5.3 The CLEUD includes the following approximate footprint areas (gross external area):

- B1: 69,675 sqm (of which 3,532sqm are ancillary B1 uses)
- B8: 8,839 sqm
- A3: 17,481 sqm
- Sui Generis: 272 sqm

5.5.4 A trip generation assessment of only the B1 and B8 Use Classes from the footprint areas above has been undertaken and presented in Table 5-5. The trip rates used are from TRICS sites with similar general characteristics. This assessment is based on the scenario where the existing floorspace were to be vacated by the MOD and QinetiQ and occupied by commercial business who would utilise the buildings under their current lawful use class. This approach is deemed reasonable given the existence of the CLEUD.

Land Use/ Trip Type	AM (08:00 – 09:00)		PM (17:00 – 18:00)	
	Arr	Dep	Arr	Dep
CLEUD B1 Use Class – 69,675 sqm				
Vehicle Trip Rate/100 sqm	1.641	0.209	0.157	1.274
Vehicle Trip Generation	1,143	146	109	888
CLEUD B8 Use Class – 8,839 sqm				
Vehicle Trip Rate/100 sqm	0.09	0.044	0.024	0.064
Vehicle Trip Generation	8	4	2	6
Total Vehicle Trips				
Total CLEUD Vehicle Trips	1,151	150	112	893
= (CLEUD) – (Proposed HPA)	656	-206	-183	441

Table 5-5 CLEUD Footprint Area Trip Generation

5.5.5 Based on the above, it is evident that the site could potentially generate significantly higher two-way vehicle trips during both the AM and PM peak hours compared to the proposed development, in the scenario that the floorspace is taken up by other commercial businesses. It should be noted that although the departing trips during the AM peak hour and arriving trips during the PM peak hour are higher in the proposed development due to the provision of residential development, the overall two-way flows are significantly lower for the proposed development scenario.

Historic Trip Generation Based on 4,000 Employed Onsite

5.5.6 As set out in Chapter 2, it is known that the site employed 4,000 people onsite at its peak, however this was a number of years ago and it is understood that bus transport was used more extensively to shuttle employees to and from the site. To understand the approximate level of trip generation associated with a higher level of 'at capacity' employment, assuming 2,000 staff total, trip rates calculated from onsite surveys as part of the OPP (as set out in Paragraph 5.2.4) have been used. This scenario would reflect typical employee densities based on 1 person per 30sqm for B1a and 48sqm for light industrial. The resulting trip generation has been set out in Table 5-6.

5.5.7 As can be seen from below, the level of trip generation based on 2,000 people employed onsite is similar to the trip generation based on the total B1 and B8 CLUED area and significantly higher than the trip generation associated with the proposed development.

Land Use/ Trip Type	AM (08:00 – 09:00)		PM (17:00 – 18:00)	
	Arr	Dep	Arr	Dep
Historic Peak Employment assumed of 2,000				
Vehicle Trip Rate/100 sqm	0.295	0.030	0.019	0.230
Vehicle Trip Generation	590	60	38	460
= (Historic 2,000 assumed Emp. Flows) - (Proposed HPA)	95	-251	-257	8

Table 5-6 Historic Trip Generation Based on 4,000 Employed Onsite

CLEUD Footprint Area Excluding Demolished and Unavailable Buildings

5.5.8 A third trip generation scenario based on the CLEUD footprint area excluding any buildings that have been demolished or made unavailable since, has been assessed in order to ascertain the potential level of trip generation that could materialise should the site be occupied by third party commercial operators under the existing Use Classes. The remaining CLEUD footprint area includes:

- B1: 55,005 sqm
- B8: 5,681 sqm

5.5.9 The trip generation assessment for this scenario has been presented in Table 5-7.

5.5.10 As with the previous scenarios, the remaining CLEUD area would result in a higher level of two-way trip generation during the AM compared to the proposed development. During the PM peak hour, the proposed development would result in 26 additional vehicle movements (two-way) compared to the remaining CLEUD area.

5.5.11 Overall, it is evident that the proposed development would have a very minor level of net impact when compared to the historic levels of trip generation or the potential level of trip generation based on the remaining CLEUD area.

Land Use/ Trip Type	AM (08:00 – 09:00)		PM (17:00 – 18:00)	
	Arr	Dep	Arr	Dep
CLEUD B1 Use Class – 55,005 sqm				
Vehicle Trip Rate/100 sqm	1.641	0.209	0.157	1.274
Vehicle Trip Generation	903	115	86	701
CLEUD B8 Use Class – 5,681 sqm				
Vehicle Trip Rate/100 sqm	0.09	0.044	0.024	0.064
Vehicle Trip Generation	5	2	1	4
Total Vehicle Trips				
Total CLEUD Vehicle Trips	908	117	88	704
= (CLEUD) – (Proposed HPA)	413	-194	-207	252

Table 5-7 CLEUD Footprint Area Trip Generation Excluding Demolished and Unavailable Buildings

5.6 Trip Distribution and Assignment

5.6.1 A detailed trip distribution and assignment analysis has been undertaken with full details and outcomes provided in TN01 – Trip Generation Technical Note (18/01/19) included within Appendix J. Consideration is also given to comments received from KCC in December 2019. The methodology and key outcomes are summarised below:

5.6.2 The distribution of the vehicle trips generated by the development during the peak hours has been based on journey to work origin-destination data from the 2011 National Census.

5.6.3 Only the car/van driver mode of travel to work has been used to account for the impact on the highway network. Most of the other modes have negligible numbers of trips according to the census with the notable exception of train, which is dominant for commuter trips to/from London. However, as noted previously such trips will mainly occur outside the morning and evening peak hours.

5.6.4 For the residential element, the proportions that apply are those referring to residents in the geographic area of Sevenoaks 008 who work elsewhere. The site boundary in relation to Sevenoaks 008 is presented in Figure A1 of TN01 – Trip Generation Technical Note (18/01/19) included within Appendix J.

5.6.5 Seventeen feed points to the highway network were defined to represent the origin/ destination of all journeys to/from the site within the surrounding highway network under consideration. The number of trips feeding from each point from/ to each MSOA has been based on journey to work origin-destination data from the 2011 National Census. The location of the feed points has been shown in Figure 5-1.

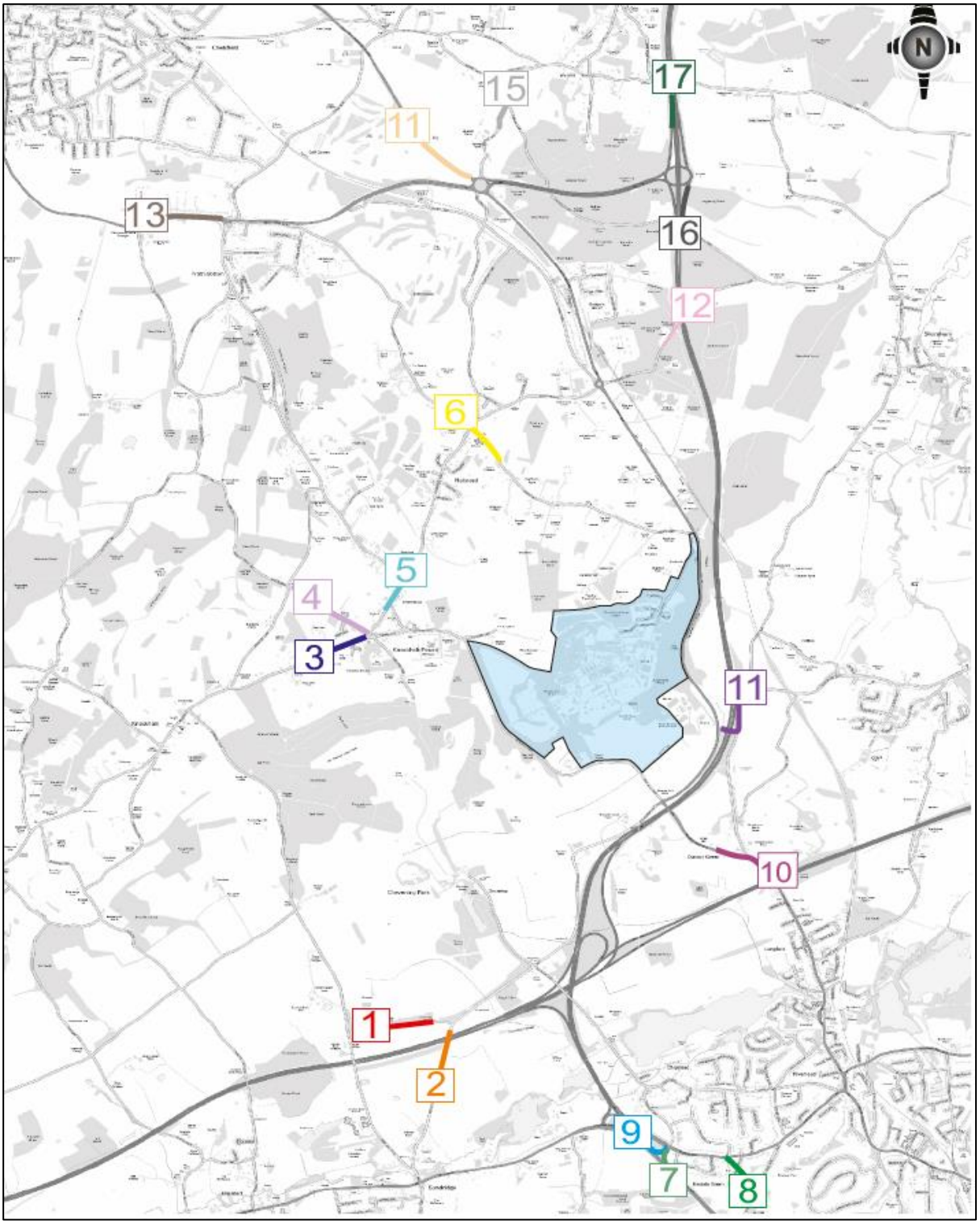

Figure 5-1 Location of the Feed Points used for Traffic Assignment

5.6.6 The assignment of vehicle trips to the local highway network, and hence each feed point, has been based on GIS journey time data for the for the AM and PM peak hours to and from the site access points.

5.6.7 GIS data is not available for the highway network within the site and so journey times for the internal element of trips has been estimated based on the proposed speed limit for the different links/ proposed traffic calming measures. Given the size of the site, the masterplan

area has been disaggregated into 22 zones and journey times have been estimated from each zone's internal access point to each of the two site access points based on the current masterplan.

5.6.8 No consideration was made within the previous planning application for the constraints which may reduce the attractiveness of using the Star Hill Road Access, and the effects this would have on traffic assignment. The main constraints are; the unattractive nature of the Star Hill Road in comparison to Polhill, the proposed alignment of the internal road system along Crow Drive to the west of the site is such that would discourage use. In addition, it would be more attractive to use the Polhill access as this will be a roundabout, rather than a priority T junction, and therefore a roundabout would be considered more desirable as it is typically faster to join as all approaching traffic is travelling slowly. To replicate the unattractiveness of the routing through site and along Star Hill Road, a penalty has been added to the traffic spreadsheet model equating to 1.25 minutes, which is considered reasonable given the proposed road alignment and traffic calming, resulting in a reduction in the number of trips using this access by approximately half. The time penalty applied also takes account of driver perception and discouragement away from traffic calming and priority junctions.

5.6.9 It was requested by KCC that a sensitivity test be undertaken to address concerns about how the penalty would be enforced and therefore penalty values between no penalty and 1.25 minutes penalty. The table below demonstrates the penalty values and the number of two way development trips experienced as a result of the penalty.

Penalty Value (Minutes)	AM		PM	
	Number of Two Way Trips	Percentage of Total Development Trips	Number of Two Way Trips	Percentage of Total Development Trips
0	269	33%	257	34%
0.25	223	28%	217	29%
0.50	215	27%	208	28%
0.75	180	22%	173	22%
1.00	151	19%	143	19%
1.25	135	17%	126	17%

Table 5-8 Comparison between Penalty Values in Minutes

5.6.10 The table above demonstrates that the development traffic would decrease with the penalty increasing.

5.6.11 A comparison has also been made between the penalties on key junctions within the vicinity of the site. These can be seen below.

Link	AM Peak			PM Peak		
	Baseline	Baseline with Development (No Penalty)	Net Difference (Proposed HPA – Baseline)	Baseline	Baseline with Development (No Penalty)	Net Difference (Proposed HPA – Baseline)

Hewitts roundabout	5496	5442	-54	5399	5338	-61
Shacklands roundabout	2301	2248	-53	1779	1720	-59
M25/A25/A21 Junction	6097 (Movements through all parts of junction)	6323	226	5309 (Movements through all parts of junction)	5515	206

Table 5-9 Net Difference of Through Flows at Key Junctions between Baseline and With Development (No Time Penalty)

5.6.12 As can be seen from the table above, the junctions to the north of the development see a reduction in traffic throughput as a result of the development with no time penalty. This is due to the fact that the OPA planning application had all development traffic using the northern access to Fort Halstead. As a result, the M25/A25/A21 junction see an increase in traffic, however this junction was not assessed in the OPA and therefore no previous development traffic passed through the junction and therefore the impact appears higher than in reality.

5.6.13 However as explained earlier within the report a penalty would be applicable to apply to the traffic using the Star Hill access as there will be traffic calming in place which will deter people using this route. As a result, a comparison has been undertaken for a penalty of 0.75 minutes to demonstrate the impact on key junctions.

Link	AM Peak			PM Peak		
	Baseline	Baseline with Development (0.75 minute Penalty)	Net Difference (Baseline) – (Proposed HPA)	Baseline	Baseline with Development (0.75 minute Penalty)	Net Difference (Baseline) – (Proposed HPA)
Hewitts roundabout	5496	5486	-10	5399	5380	-19
Shacklands roundabout	2301	2297	-4	1779	1766	-13
M25/A25/A21 Junction	6097 (Movements through all parts of junction)	6247	150	5309 (Movements through all parts of junction)	5448	139

Table 5-10 Net Difference of Through Flows at Key Junctions between Baseline and With Development (0.75 Minute Time Penalty)

5.6.14 As can be seen from the table above, the junctions to the north of the development see a reduction in traffic throughput as a result of the development with a small-time penalty. There is an increase in cars travelling to the north of the site as a result of the time penalty however the development still has fewer trips passing through them than the baseline. The trips through the M25/A25/A21 has seen a reduction as a result of the penalty as more traffic is directed to the north.

5.6.15 It is considered that the traffic calming measures will deter use of the southern access along with the nature of Star Hill and therefore the following information below has been provided on the 1.25 minute penalty as requested by KCC. This has been reduced to 17%.

5.6.16 The final assignment of trips to/from each internal zone from/to each feed point is subsequently determined by considering both the journey time from each internal zone to the site access points and the journey time from the site access points to the 17 feed points.

5.6.17 The expected number vehicle trips to/from each feed point and the site access used has been shown in Table 5-11 for the AM peak hour and Table 5-12 for the PM peak hour

5.6.18 The distributed vehicle trip generation has been shown within Appendix D for the AM and PM peak hours respectively.

Feeder Point	IN		OUT	
	North Access	South Access	North Access	South Access
1	5	3	4	2
2	14	8	13	6
3	0	13	0	7
4	0	4	0	3
5	0	9	0	6
6	4	0	3	0
7	48	29	33	15
8	3	2	3	1
9	18	11	17	7
10	36	1	25	3
11	42	1	23	3
12	14	0	4	0
13	36	0	17	1
14	53	0	29	0
15	5	0	3	0
16	0	0	0	0
17	137	0	83	0
Total	**415**	**81**	**256**	**54**

Table 5-11 Total Vehicle Trip Generation to/from Each Feed Point (AM Peak Hour)

Feeder Point	IN		OUT	
	North Access	South Access	North Access	South Access
1	2	4	4	3
2	12	5	13	8
3	0	7	0	12
4	0	3	0	4
5	0	6	0	8
6	3	0	4	0
7	32	14	44	26
8	3	1	3	2
9	17	7	18	10
10	24	3	34	1
11	22	3	38	1
12	4	0	12	0
13	16	1	31	0
14	28	0	47	0
15	3	0	5	0
16	0	0	0	0
17	79	0	124	0
Total	378	75	244	51

Table 5-12 Total Vehicle Trip Generation to/from Each Feed Point (PM Peak Hour)

5.6.19 Similar tables to the above have been produced following a request from KCC to demonstrate the use of the North and South access for the CLEUD traffic numbers. These tables show the AM and PM peak distribution. Although the CLEUD may have shift working patterns, there will be a number of trips generated within the AM and PM peaks. To compare these trips against the proposed development, the CLEUD distribution for each feeder point can be seen below. Please note this assumes all remaining buildings on the site following historic demolitions.

5.6.20 The vehicle trip distribution for the CLEUD can be seen in Appendix D.

Feeder Point	IN		OUT	
	North Access	South Access	North Access	South Access
1	5	8	1	1
2	14	23	2	3
3	0	24	0	3
4	0	8	0	1
5	0	15	0	2
6	7	1	1	0
7	52	90	7	12
8	3	5	0	1
9	18	31	2	4
10	39	26	5	3
11	48	31	6	4
12	26	2	3	0
13	63	6	8	1
14	99	0	13	0
15	10	0	1	0
16	0	0	0	0
17	253	0	33	0
Total	**637**	**270**	**82**	**35**

Table 5-13 Total Vehicle Trip Generation to/from Each Feed Point (AM Peak)

Feeder Point	IN		OUT	
	North Access	South Access	North Access	South Access
1	0	1	4	6
2	1	2	11	18
3	0	2	0	19
4	0	1	0	6
5	0	1	0	12
6	1	0	5	0
7	5	9	41	69
8	0	0	2	4
9	2	3	14	24
10	4	3	31	20
11	5	3	37	24
12	3	0	20	2
13	6	1	49	4
14	10	0	77	0
15	1	0	8	0
16	0	0	0	0
17	24	0	196	0
Total	**62**	**26**	**495**	**208**

Table 5-14 Total Vehicle Trip Generation to/from Each Feed Point (PM Peak)

5.6.21 The tables below show a comparison on key links and throughput traffic between the CLEUD development and the proposed development for both the AM and PM peaks. For each link that is considered the traffic will be two way movements.

Link	AM Peak			PM Peak		
	CLEUD	Development	Net Difference (CLEUD) – (Proposed HPA)	CLEUD	Development	Net Difference (CLEUD) – (Proposed HPA)
Crow Drive (At Northern Access)	719	671	48	556	622	-56
Crow Drive (At Southern Access)	306	135	171	236	252	-16
Star Hill (North of Access)	60	44	16	47	41	6
Star Hill Road (South of Access)	245	91	154	190	85	105
Otford Lane	8	7	1	6	7	-1
A224 London Road	592	497	95	457	458	-1
A224 Polhill	125	167	-42	97	157	-60
A224 Orpington By-Pass	489	426	63	378	396	-18
Rushmore Hill	24	16	18	18	16	2
Old London Road	71	52	19	55	47	8
Main Road / Halstead Lane	0	0	0	0	0	0
Shoreham Lane / Knockholt Road	0	0	0	0	0	0
A21 Sevenoaks Road	71	52	19	55	47	8
Otford High Street	89	68	21	69	63	6
A 224 London Road (Bullfinch Lane)	74	65	10	57	61	-4
A 224 London Road (Station Road)	74	65	10	57	61	-4
M25 Northbound Onslip	33	83	-50	196	124	72
M25 Southbound Onslip	9	50	-41	55	62	-7
M25 Northbound Offslip	71	66	5	7	48	-41
M25 Southbound Offslip	253	137	116	24	79	-55

Table 5-15 Net difference between CLEUD traffic and Proposed Development traffic on key links

Link	AM Peak			PM Peak		
	CLEUD	Development	Net Difference (CLEUD) – (Proposed HPA)	CLEUD	Development	Net Difference (CLEUD) – (Proposed HPA)
Hewitts roundabout	489	426	63	378	396	-18
Shacklands roundabout	592	497	95	457	458	-1
Otford Lane/A224 junction	722	672	50	558	622	-64
A224 Polhill junction/ Pilgrims Way West Link road	161	171	-10	124	161	-37
Morants Court Road roundabout	314	193	121	243	182	61
Star Hill Road access junction	306	135	171	236	252	-16
M25 Junction 4	365	336	29	282	313	-31
M25/A25/A21 Junction	145	72	73	112	66	46

Table 5-16 Net difference between CLEUD traffic and Proposed Development traffic at key junctions

5.6.22 The tables above (Table 5-15 and Table 5-16) illustrates the net difference between CLEUD traffic and proposed worst case development traffic on key links and at key junctions. The general trend at these links and junctions suggest that in the AM peak the vast majority of junctions and links would see a reduction in vehicle trips comparing the proposed development to the CLEUD, while in the PM there is seen to be a modest increase in vehicle trips on a number of links, although looking at individual junctions this is a result of change in tidal flow with the impact on junctions as a whole being small.

5.6.23 Whilst it is acknowledged that this is a theoretical exercise it is clear that the current built floorspace on the site would have the potential to generate a comparable number of vehicle trips compared to the proposed development. It is further the case that on vacation of the site by Dstl in the next two years the current site security arrangements will be removed, thus opening the site to public traffic and giving full access to the currently restricted Star Hill priority junction.

5.6.24 With respect to Star Hill Road north and south of the Crow Drive access, the analysis shows that the CLEUD would be expected to generate a greater number of trips compared to the proposed development. This reflects the opening of the route and removal of the security gate and the existing straight, non-calmed alignment of Crow Drive.

5.7 Star Hill Access Flows

5.7.1 Based on the trip generation assessment presented, two-way traffic flows at the Star Hill Access is forecasted to be 135 vehicles during the AM peak hour and 252 in the PM peak hour. This represents a slight decrease in the AM peak and a modest increase in the PM peak compared to the 2015 OPP TA flows at the Star Hill Access which were forecasted to be 145 vehicles during the AM peak hour and 175 during the PM peak hour. The level of total flow at

the Star Hill access equates to less than 3 vehicles per minute in the morning peak, again a worst case scenario not taking into account public transport mitigation.

5.7.2 It should be noted that the level of traffic using the Star Hill access outside of the peak hours would be significantly less than the figures provided in Table 5-11 and Table 5-12. This is because the major sources of vehicle trip generation would be peak hour commuter trips associated with residents of the development and those employed within the site.

5.7.3 From Table 5-6 it is evident that the proposed development would result in a lower level of two-way trip generation in the AM peak hour when compared to the potential trip generation from the remaining CLEUD footprint area, under the scenario where the existing site floorspace is occupied by general commercial operators. During the PM peak hour, the proposed development only results in 26 additional vehicles compared to the remaining CLEUD footprint area as a whole. Therefore, in assessing the net level of traffic increase at the Star Hill access and surrounding links, it should be noted that the potential level of trip generation from the existing site without any development could match and exceed the levels predicted with a comprehensive development of the site. There should not therefore be any significant intensification in traffic use of the junction compared to the CLEUD base case. Of the total CLEUD trips it is predicted that 30% would utilise the south access to Star Hill, which is a larger total number of trips than the 33% predicted by the proposed development. This is demonstrated in Table 5-6. However, the 33% of the proposed development has not been penalised to account for the traffic calming and attractiveness of Polhill. Once this factor has been applied it is demonstrated that the 30% of CLEUD traffic has a larger proportion of trips using the Star Hill access and therefore the proposed development is a betterment on the CLEUD.

5.7.4 As set out in Chapter 6, the forecasted flows at the Star Hill junction will not have any impacts on the link capacity of Star Hill road or the junction capacity of the access junction.

5.7.5 Lastly, the trip distribution and highway impact assessments are based on the assumption that no restrictions are placed on the routing of vehicles associated with the commercial elements of the development. In practice, occupiers of the development could place restrictions on the routing of vehicles, in particular heavy goods vehicles, should that be necessary. This could be achieved through a Delivery Management Plan, which can be a condition of planning permission.

5.8 Summary

5.8.1 A trip generation analysis has been undertaken for the proposed development which will accommodate up to 1,438 jobs as well as 635 homes and modest local support facilities.

5.8.2 The trip generation methodology has been agreed with KCC and updated following their consultation response dated December 2019. The residential trip generation has been based on selected data from the TRICS database and the commercial use trip generation has been based on onsite surveys undertaken as part of the TA for the consented OPP.

5.8.3 The trip generation assessment provide a **worst-case scenario** as they reflect a development scenario with no primary school on site and do not account for the proposed travel plan measures including the proposed DRT bus service. The trip generation also does not take into account the mixed nature of the site and that some workers may live and work on site and therefore would not utilise the highway network for journeys to work. Taking Kings Hill as an example where approximately 15% of residents live and work within the same community, outside of the home (i.e. at a separate place of employment at Kings Hill), the same pattern could be expected at Fort Halstead and this would reduce peak vehicle trips by around 51 vehicles in the AM and 58 in the PM peak hour.

5.8.4 Initial estimates at the current time are that post pandemic around 20% of all employees who previously travelled daily to a place of work would subsequently work at home all or part of the

time, or would change the timing of their journey, therefore resulting in significant changes to both peak background traffic levels and trips to and from the site both for residential and commercial uses.

5.8.5 Trips have been distributed onto the highway network based on journey to work origin-destination data from the 2011 National Census. The assignment of traffic and hence the choice of site access for each separate trip generated from/ to the site has been based on expected journey times.

5.8.6 An assessment of commercial trips that could be generated under the site's existing Certificate of Lawfulness for an Existing Use and Development (CLEUD), assuming the remaining buildings standing on the site, confirms that the development proposals should not lead to an increase in vehicle trips onto the highway network or the site's two points of access.

6 Highway Impact Assessment

6.1 Introduction

6.1.1 This section outlines the impact of the forecasted net increase in vehicular trip generation of the site on its surrounding local highway network, during the peak hour periods.

6.1.2 This assessment considers both the proposed development effects and that from the Certificate of Lawfulness for an Existing Use and Development (CLEUD) case, as an alternative baseline. The assessment is therefore considered to be very robust.

6.2 Assessment Methodology

6.2.1 The overall assessment methodology has been agreed with KCC as part of the pre-application discussions and the TA Scoping Report which have been included within Appendix A. It also considers the CLEUD assessment, as agreed at a recent meeting with KCC (February 2020).

6.2.2 KCC have requested for the highway impact assessment to be undertaken for the 2035 future forecast year in line with the emerging Sevenoaks Local Plan. It is expected that the whole development will be complete and fully occupied by this date.

6.2.3 Overall, the agreed assessment, worst case without public transport, scenarios comprise the following:

- 2018 Baseline, which represents the existing conditions. This has been undertaken to ensure that the models adequately reflect observed baseline conditions;
- 2035 'Future Baseline', which accounts for background traffic growth and committed developments which include the West Kent Cold Store development and the consented Fort Halstead development;
- 2035 Alternative Baseline (CLEUD); and
- 2035 'With Development', which takes into account the traffic generated by the proposed development in its completion year.

6.2.4 The Future Baseline scenario has been constructed based on uplifting the 2018 traffic counts (net of the existing development traffic) using DfT's TEMPro software and including the committed developments that are relevant for the present application. The committed developments include the West Kent Cold Store and the consented OPP.

6.2.5 The net development flows have been added to the Future Base scenario to obtain the 'With Development' scenario.

6.2.6 Net impacts on key links which provide access to the local highway network have been identified based on percentage impacts with respect to the 2035 Future Baseline scenario.

6.2.7 Additionally, it has been agreed that the highway impacts at key junctions would be assessed based on local junction modelling using Junction 9 software. The operation of the following junctions has been assessed as agreed with KCC:

- Hewitts roundabout
- Shacklands roundabout
- Otford Lane/A224 junction

- A224 Polhill junction/ Pilgrims Way West Link road
- Morants Court Road roundabout
- Star Hill Road access junction

6.2.8 The following junctions have been considered following the most recent consultation response from Highways England:

- M25 Junction 4
- M25/A25/A21 Junction

6.3 Net Impact on Links

2035 Baseline vs With Development

6.3.1 A percentage impact assessment has been undertaken which provides a comparison between the 2035 With Development flows and the 2035 Future Base flows.

6.3.2 The two-way percentage impacts at key links within proximity of the site has been provided in Table 6-1. The corresponding network diagrams for each of the peak hours are presented in Appendix D.

Link	AM Peak			PM Peak		
	2035 Base	2035 With Dev.	% Impact	2035 Base	2035 With Dev.	% Impact
Crow Drive (At Northern Access)	787	734	-6.7%	796	745	-6.4%
Star Hill (North of Access)	333	337	1.2%	311	311	0.0%
Star Hill Road (South of Access)	333	384	15.3%	311	355	14.1%
Otford Lane	70	71	1.4%	57	57	0.0%
A224 London Road	1811	1828	0.9%	1765	1776	0.6%
A224 Polhill	1580	1511	-4.4%	1519	1457	-4.1%
A224 Orpington By-Pass	1402	1612	15%	1370	1374	0.3%
Old London Road	619	625	1%	467	472	1.1%
Shoreham Lane / Knockholt Road	175	175	0.0%	114	114	0.0%
A21 Sevenoaks Road	2631	2632	0.0%	2624	2625	0.0%
Otford High Street	998	1006	0.8%	980	991	1.1%
A 224 London Road (Bullfinch Lane)	1156	1162	0.5%	1090	1098	0.7%

A 224 London Road (Station Road)	1156	1162	0.5%	1090	1098	0.7%
M25 Northbound Onslip	1084	1117	3.0%	1584	1605	1.3%
M25 Southbound Onslip	704	701	-0.4%	774	740	-4.4%
M25 Northbound Offslip	800	763	-4.6%	733	729	-0.5%
M25 Southbound Offslip	2088	2098	0.5%	1231	1252	1.7%

Table 6-1 Percentage Impact Assessment on the Local Highway Network – Base vs Dev

6.3.3 As can been seen from Table 6-1, the majority of links assessed have no or very minor percentage impacts across both time periods except for links within the immediate vicinity of the site.

6.3.4 Negative percentage impacts denote links where the 2035 With Development flows are lower compared to the 2035 Future Base flows. This is because the 2035 Future Base scenario contains flows from the 2015 OPP consent for the site based on a single access from Polhill whereas the current proposed development includes Star Hill as a secondary access. As such, a single access point results in higher flows across various links and junctions as the flows are not distributed depending on origin and destination and all development flows would have to route via the north of the site. Having a secondary access point from Star Hill results in lower flows across the links shown despite the 2015 consent for the site having a lower quantum of residential development.

6.3.5 The highest percentage impacts are on Star Hill Road (south of the site access) which is because the baseline traffic on this link is relatively low and the proposed development utilises the Star Hill access as a secondary access point. The additional traffic in the AM peak for example is less than one vehicle per minute on average, which would be imperceptible to existing users of the route. The two-way peak hour flows on this link in the 2035 With Development scenario are still under 600 vehicles and within the link capacity of a single carriageway road.

6.3.6 Crow Drive which acts as the primary access road to the site is the link with the highest level of development traffic despite the negative percentage impacts recorded. However, for the 'With Development' scenario, peak hour two-way flows on Crow Drive are in the region of 500 - 600 vehicles, which is well within the link capacity of a single carriageway road and which will permit most pedestrians to cross the road quite easily even without the aid of formal pedestrian facilities.

6.3.7 Overall, it is evident that almost all of the links assessed have negligible or minor percentage impacts associated with the proposed development and that all links assessed will operate within capacity. Notwithstanding this, local junction modelling has been undertaken at key junctions within close proximity to the site.

2035 Alternative Baseline (CLEUD) vs With Development

6.3.8 A percentage impact assessment has also been undertaken which provides a comparison between the 2035 With Development flows and the 2035 Alternative Baseline (CLEUD) flows.

6.3.9 The two-way percentage impacts at key links within proximity of the site has been provided in Table 6-2Table 6-1. The corresponding network diagrams for each of the peak hours are presented in Appendix D.

Link	AM Peak			PM Peak		
	2035 Alt Base (CLEUD)	2035 With Dev.	% Impact	2035 Alt Base (CLEUD)	2035 With Dev.	% Impact
Crow Drive (At Northern Access)	782	734	-6.1%	679	745	9.7%
Star Hill (North of Access)	353	337	-4.5%	317	311	-1.9%
Star Hill Road (South of Access)	538	384	-28.6%	459	355	-22.7%
Otford Lane	71	71	0.0%	52	57	9.6%
A224 London Road	1866	1828	-2.0%	1598	1776	11.1%
A224 Polhill	1468	1511	2.9%	1396	1457	4.4%
A224 Orpington By-Pass	1661	1612	-3.0%	1347	1374	2.0%
Old London Road	643	625	-2.8%	480	472	-1.7%
Shoreham Lane / Knockholt Road	175	175	0.0%	114	114	0.0%
A21 Sevenoaks Road	2631	2632	0.0%	2624	2625	0.0%
Otford High Street	1027	1006	-2.0%	997	991	-0.6%
A 224 London Road (Bullfinch Lane)	1171	1162	-0.8%	1094	1098	0.4%
A 224 London Road (Station Road)	1171	1162	-0.8%	1094	1098	0.4%
M25 Northbound Onslip	1067	1117	4.7%	1676	1605	-4.2%
M25 Southbound Onslip	660	701	6.2%	733	740	1.0%
M25 Northbound Offslip	768	763	-0.7%	688	729	6.0%
M25 Southbound Offslip	2213	2098	-5.2%	1198	1252	4.5%

Table 6-2 Percentage Impact Assessment on the Local Highway Network – CLEUD vs Dev

6.3.10 As can been seen from Table 6-2, the majority links experience a reduction in traffic between the CLEUD and the proposed development, and therefore it is considered that the proposed development does not have a significant effect given that the CLEUD would have a higher impact on the majority of links in the highway network assessed.

6.4 Junction Assessments

6.4.1 Local junction models have been set up for the major intersections within close proximity to the site which include the junctions set out in Paragraph 6.2.7 . The scenarios which have

been assessed are set out in Paragraph 6.2.3. Models have been validated to queues observed at the time of traffic surveys, unless specified otherwise.

6.4.2 DfT approved Junctions 9 software has been used to assess the capacity of the various junctions as follows: ARCADY has been used to model the roundabouts, whereas PICADY has been used to model the priority intersections. Full modelling reports for all assessments, including origin and destination matrices with the traffic flows for each scenario, are provided within Appendix L. Queue validation has also been carried out for each modelled junction. These results are provided within Appendix Q.

Hewitts Roundabout

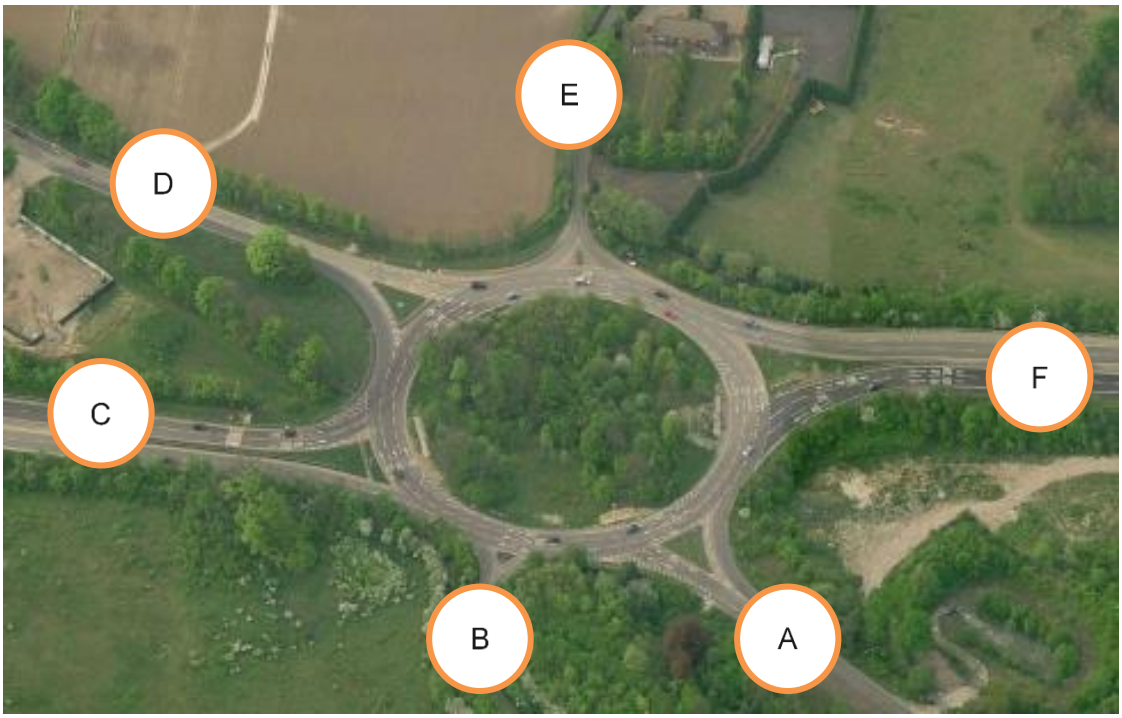

Figure 6-1 Hewitts Roundabout

6.4.3 Hewitts Roundabout has six arms and three circulating lanes and is located along the A21 Sevenoaks Road. It provides a link to the M25 in the east, and to Farnborough and then Bromley via the A21 to the west. To the north, the A224 provides access to Orpington town centre.

6.4.4 The various arms have the following characteristics:

- Arm A A224 Orpington By-Pass (south) is a wide single carriageway road but with an extended two lane entry flare. Previously there was further flaring to provide a three lane entry but this has been removed as part of a low cost accident remedial scheme;
- Arm B Wheatsheaf Hill is a single carriageway, local access road with very local flaring to provide two lane entry;
- Arm C A21 Sevenoaks Road is a wide single carriageway road but with an extended two lane entry flare. Previously there was further flaring to provide a three lane entry but this has been removed as part of a low cost accident remedial scheme;
- Arm D A224 Orpington by pass (north) is a wide single carriageway road but with an extended two lane entry flare. Previously there was further flaring to provide a three lane entry but this has been removed as part of a low cost accident remedial scheme;

- Arm E Hewitts Road is a single carriageway, local access road with very local flaring to provide two lane entry; and
- Arm F M25 Link Road is a high capacity two-lane dual carriageway which flares to provide a three-lane entry to the roundabout including a dedicated access lane to the A224 south.

6.4.5 Table 6-3 sets out the ARCADY results for the Hewitts Roundabout junction.

Arm	AM peak (08:00-09:00)				PM peak (17:00-18:00)			
	RFC	Queue (PCU)	Delay (s)	LOS	RFC	Queue (PCU)	Delay (s)	LOS
2018 Baseline								
A – Orpington By-Pass	0.4	0.7	6.18	A	0.39	0.7	4.68	A
B – Wheatsheaf Hill	0.58	1.4	46.03	E	0.16	0.2	8.95	A
C – A21 Sevenoaks Road	0.37	0.6	2.42	A	0.46	0.9	2.47	A
D – A224 Court Road	0.53	1.2	4.69	A	0.75	3.0	10.29	B
E – Hewitts Road	0.11	0.1	8.32	A	0.25	0.3	18.01	C
F – M25	0.74	3	4.28	A	0.53	1.2	2.27	A
2035 Future Base								
A – Orpington By-Pass	0.75	3	17.89	C	0.72	2.6	11.52	B
B – Wheatsheaf Hill	1E+10	64.2	1667.58	F	0.32	0.5	18.76	C
C – A21 Sevenoaks Road	0.44	0.8	2.89	A	0.58	1.4	3.44	A
D – A224 Court Road	0.66	2	6.92	A	1.08	57.9	145.43	F
E – Hewitts Road	0.19	0.2	12.72	B	1.64	14.6	585.37	F
F – M25	0.93	11.8	14.31	B	0.65	1.9	3.08	A
2035 With Development								
A – Orpington By-Pass	0.79	3.8	21.62	C	0.70	2.4	10.79	B
B – Wheatsheaf Hill	1E+10	64.3	1689.04	F	0.31	0.4	18.00	C
C – A21 Sevenoaks Road	0.45	0.8	2.94	A	0.57	1.4	3.39	A
D – A224 Court Road	0.67	2.1	7.14	A	1.07	55.1	138.07	F
E – Hewitts Road	0.20	0.3	13.23	B	1.49	12.8	510.43	F
F – M25	0.92	10.8	13.15	B	0.66	1.9	3.16	A
2035 Baseline Sensitivity CLEUD								
A – Orpington By-Pass	0.62	1.7	11.65	B	0.79	3.6	14.80	B
B – Wheatsheaf Hill	5.06	48.0	5239.30	F	0.35	0.5	21.73	C
C – A21 Sevenoaks Road	0.43	0.8	2.70	A	0.59	1.4	3.59	A
D – A224 Court Road	0.68	2.1	6.94	A	1.11	70.1	173.28	F
E – Hewitts Road	0.20	0.3	12.41	B	1.75	13.8	658.29	F
F – M25	0.97	22.2	26.08	D	0.62	1.7	2.86	A

Table 6-3 Hewitts Roundabout ARCADY Results

6.4.6 The results show that in the 2018 Baseline Scenario, during both and AM and PM peak hours, the junction operates well within the desirable capacity threshold which is generally defined as a ratio of flow to capacity (RFC) of 0.85. Except for queuing on Sevenoaks Road during the PM peak hours, the results are in line with the observed queuing data which does not show long term queuing during the AM or PM peak hours. Modest queueing was observed on the

A21 Sevenoaks Road during the peak hour which was generally static and likely attributed to platoons of cars arriving at the stop line.

6.4.7 In the 2035 Future Base scenario, the junction operates over maximum capacity during both the AM and PM peak hours. During the AM peak hour, Wheatsheaf Hill operates above capacity with significant delays and queues of 64 PCUs and the M25 operates above the maximum desirable capacity at an RFC of 0.93. During the PM peak hour, both A224 Court Road and Hewitts Road operate over maximum capacity with queues of 58 PCUs and 15 PCUs respectively.

6.4.8 In the 2035 With Development scenario, the junction also operates over maximum capacity across both the AM and PM peak hours with the same arms operating over capacity as those in the 2035 Future Base scenario. However, the maximum RFCs recorded are lower in the 2035 With Development scenario compared to the 2035 Future Base Scenario since the flows are slightly lower in the former scenario. This is because the 2015 OPP consent for the site (which is included in the 2035 Scenario) is for a single site access from Polhill whereas the proposed development also utilises the Star Hill access as a secondary access point which subsequently results in reduced flows to the north of the site and at Hewitts Roundabout. This is due to the routing choice of people wanting to access the M25 Westbound/Southbound movement who may now use the southern access and join the M25 via the A25/A21/M25 junction to the south of the site. Before when there was 1 access, the quickest route onto the southbound movement was via the M25 Junction 4.

6.4.9 In the 2035 Alternative Baseline CLEUD scenario the junction also operates over maximum capacity across both the AM and PM peak hours with the same arms operating over capacity as those in the 2035 Future Base scenario. However, the RFC is higher than that in the with development scenario. Therefore, the development proposal discussed in this TA is more desirable in terms of capacity at Hewitts roundabout.

Shacklands Roundabout

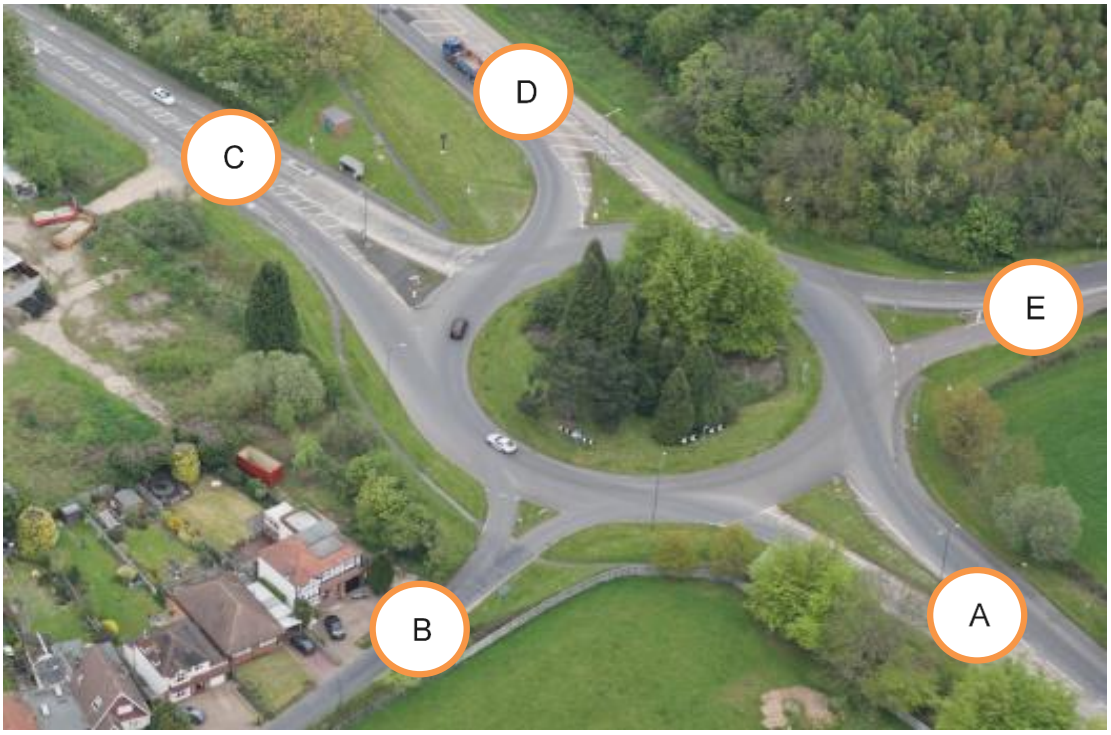

Figure 6-2 Shacklands Roundabout

6.4.10 The Shacklands roundabout is a five-arm roundabout providing main links to the A21 (via arm D Orpington By-Pass and arm C Old London Road) and the A224 (arm A). All approaching arms have single lanes which flare on the approach to the give way line, and all contain a central kerbed island which separates entry/exiting vehicles. Arms A A224 London Road and C Old London Road both have central hatched markings which extend quite a long way back from the stop lines.

6.4.11 Table 6-4, summarises the ARCADY model results for the existing traffic conditions, which show that the junction operates well within capacity and with the maximum level of service (LOS) of A on all arms during both peak periods.

6.4.12 Similarly, in the future scenarios, the results show that the there are no capacity issues at the Shacklands roundabout with the junction operating at the maximum level of service on all arms during both periods.

Arm	AM peak (08:00-09:00)				PM peak (17:00-18:00)			
	RFC	Queue (PCU)	Delay (s)	LOS	RFC	Queue (PCU)	Delay (s)	LOS
2018 Baseline								
A – A224 Polhill	0.33	0.5	3.67	A	0.33	0.5	3.51	A
B – Shoreham Lane	0.11	0.1	5.87	A	0.07	0.1	5.40	A
C – Old London Road	0.29	0.4	3.92	A	0.16	0.2	3.18	A
D – Orpington By-Pass	0.49	1.0	4.50	A	0.25	0.3	2.83	A
E – Shacklands Road	0.07	0.1	3.63	A	0.04	0.0	2.72	A
2035 Future Base								
A – A224 Polhill	0.5	1.1	4.98	A	0.56	1.3	5.32	A
B – Shoreham Lane	0.14	0.2	7.07	A	0.09	0.1	6.87	A
C – Old London Road	0.35	0.6	4.68	A	0.23	0.3	3.88	A
D – Orpington By-Pass	0.71	2.5	8.11	A	0.40	0.7	3.61	A
E – Shacklands Road	0.11	0.1	4.68	A	0.06	0.1	3.12	A
2035 With Development								
A – A224 Polhill	0.53	1.2	5.24	A	0.55	1.2	5.17	A
B – Shoreham Lane	0.14	0.2	7.27	A	0.09	0.1	6.79	A

Arm	AM peak (08:00-09:00)				PM peak (17:00-18:00)			
	RFC	Queue (PCU)	Delay (s)	LOS	RFC	Queue (PCU)	Delay (s)	LOS
C – Old London Road	0.36	0.6	4.78	A	0.23	0.3	3.86	A
D – Orpington By-Pass	0.70	2.4	7.72	A	0.42	0.7	3.72	A
E – Shacklands Road	0.11	0.1	4.62	A	0.06	0.1	3.17	A
2035 Baseline Sensitivity CLEUD								
A – A224 Polhill	0.44	0.8	4.44	A	0.63	1.7	6.38	A
B – Shoreham Lane	0.13	0.2	6.63	A	0.10	0.1	7.49	A
C – Old London Road	0.37	0.6	4.63	A	0.23	0.3	4.04	A
D – Orpington By-Pass	0.82	4.7	13.24	B	0.34	0.5	3.29	A
E – Shacklands Road	0.15	0.2	5.50	A	0.06	0.1	2.97	A

Table 6-4 Shacklands Roundabout ARCADY Results

6.4.13 As shown in Table 6-4 Shacklands Roundabout ARCADY Results, Shacklands Roundabout operates within maximum desirable capacity across all scenarios and time periods tested. There are slight reductions in RFC values on several arms from the 2035 Future Base scenario to the 2035 with Development scenario for the same reason as that set out in Paragraph 6.3.4.

6.4.14 In the 2035 Alternative Baseline CLEUD scenario the Shacklands Roundabout would also operate within maximum desirable capacity with similar RFC, queue and delay values to those given in the 2035 with Development scenario.

Otford Lane/A224 Junction

Figure 6-3 Otford Lane/A224 Junction

6.4.15 This is a priority intersection where the major arm is the A224 (Polhill – arm A to the south and London Road – arm C to the north. It is a single carriageway road with a single lane approach and a hatched central reserve stretching over 200 metres to the south along arm A. On arm C, it has also a single lane plus a right turning lane stretching back 150 metres, beyond which a hatched central reserve stretches another 110 metres.

6.4.16 The minor arm B Otford Lane is also a single carriageway with one lane per direction which is flared and contains an extended give way line of around 140 metres. The results of this analysis are included in Table 6-5.

Movement	AM peak (08:00-09:00)				PM peak (17:00-18:00)			
	RFC	Queue (PCU)	Delay (s)	LOS	RFC	Queue (PCU)	Delay (s)	LOS
2018 Baseline								
Otford Lane – London Road	0.07	0.1	6.79	A	0.17	0.2	7.47	A
Otford Lane – Polhill	0.14	0.2	12.40	B	0.217	0.2	12.01	B
London Road – Otford Lane	0.25	0.3	8.07	A	0.06	0.1	6.55	A
2035 Future Base								
Otford Lane – London Road	0.5	1	17.91	C	1.01	13.2	129.56	F
Otford Lane – Polhill	0.73	2.4	63.51	F	0.98	8.7	162.26	F
London Road – Otford Lane	0.7	2.2	21.66	C	0.42	0.7	11.56	B
2035 With Development								
Otford Lane – London Road	0.49	1.0	14.68	B	0.71	2.4	25.76	D
Otford Lane – Polhill	0.59	1.4	42.38	E	0.61	1.5	42.47	E
London Road – Otford Lane	0.64	1.8	18.16	C	0.48	0.9	12.86	B
2035 Baseline Sensitivity CLEUD								
Otford Lane – London Road	0.22	0.3	9.21	A	0.92	7.9	63.49	F
Otford Lane – Polhill	0.50	0.9	58.63	F	0.80	2.9	91.93	F
London Road – Otford Lane	1.06	43.2	193.34	F	0.21	0.3	8.26	A

Table 6-5 Otford Lane/A224 Junction PICADY Results

6.4.17 The results show that the junction operates well within maximum desirable capacity in the 2018 Baseline scenario, across both AM and PM peak hours, with minimal queuing across all arms. This is in line with the observed queuing data which does not show any queuing issues on any of the arms.

6.4.18 In the 2035 Future Base scenario, the junction operates within maximum desirable capacity during the AM peak hour. During the PM peak hour, the junction operates over maximum capacity with the Otford Lane to London Road movement having an RFC of 1.01 and the Otford Lane to Polhill movement having an RFC of 0.98. This is attributed to the flows associated with 2015 OPP consent which are based on a single access from Polhill.

6.4.19 In the 2035 With Development scenario, the junction operates well within the maximum desirable capacity with minimal queuing and minor delays across all arms during both the AM and PM peak hours. The junction performs significantly better compared to the 2035 Future Base scenario since the proposed application utilises the Star Hill access as a secondary access which results is reduced flows at this junction.

6.4.20 In the 2035 CLEUD scenario in the AM and PM peaks the junction operates over maximum capacity. In the AM peak the London Road to Otford Lane movement has an RFC of 1.06, while in the PM peak the Otford Lane to London Road movement has an RFC of 0.92. This demonstrates that the development proposal discussed in this TA is more desirable in terms of capacity than the CLEUD scenario.

Proposed Otford Lane/A224 Junction/Crow Drive

6.4.21 As part of the consented OPP, various improvement options were considered for the Otford Lane/ A224 junction which included minor layout changes, signalisation of the junction and a roundabout design. The four-arm roundabout option connecting A224 London Road/ A224 Polhill/ Crow Drive/ Otford Lane was subsequently agreed with KCC. The approved roundabout design which also includes provisions for pedestrians and cyclists has been included in Appendix H.

6.4.22 The 2035 Future Base scenario results show that the junction operates within maximum capacity across both AM and PM peak hours with minimal queuing and delays across all arms except from the Crow Drive arm. During the PM peak hour, the Crow Drive arm operates with an RFC of 0.86 with modest queues of 6 PCUs and delays of 40s.

6.4.23 In the 2035 With Development scenario, all arms operate within the maximum desirable capacity as inclusion of the Star Hill access as a secondary access results in an improvement to the operation of the junction.

6.4.24 In a 2035 CLEUD scenario in the AM peak the A224 London Road arm operates over maximum desired capacity with an RFC of 0.88 and in the PM peak the Crow Drive arm operates over maximum desired capacity with an RFC of 0.92. This demonstrates that the development proposal discussed in this TA is more desirable for capacity at the site access than the CLEUD scenario.

Movement	AM peak (08:00-09:00)				PM peak (17:00-18:00)			
	RFC	Queue (PCU)	Delay (s)	LOS	RFC	Queue (PCU)	Delay (s)	LOS
2035 Future Base								
A - A224 Polhill	0.71	2.6	11.96	B	0.67	2.2	9.68	A
B - Crow Drive	0.48	1.0	11.34	B	0.86	5.7	40.26	E
C - Otford Ln	0.07	0.1	7.18	A	0.06	0.1	9.68	A
D - A224 London Rd	0.77	3.6	11.40	B	0.60	1.6	6.61	A
2035 With Development								
A - A224 Polhill	0.66	2.1	10.04	B	0.68	2.3	10.16	B
B - Crow Drive	0.51	1.1	11.91	B	0.72	2.7	21.94	C
C - Otford Ln	0.07	0.1	7.29	A	0.06	0.1	8.75	A
D - A224 London Rd	0.75	3.2	10.34	B	0.60	1.6	6.51	A
2035 Baseline Sensitivity CLEUD								
A - A224 Polhill	0.76	3.3	15.80	C	0.59	1.6	7.43	A
B - Crow Drive	0.22	0.3	7.54	A	0.92	8.9	58.40	F
C - Otford Ln	0.06	0.1	6.18	A	0.06	0.1	10.13	B
D - A224 London Rd	0.88	7.6	20.94	C	0.50	1.1	5.21	A

Table 6-6 Proposed Otford Lane/A224 Junction/Crow Drive Roundabout ARCADY Results

A224 Polhill Junction/Pilgrims Way West Link Road Junction

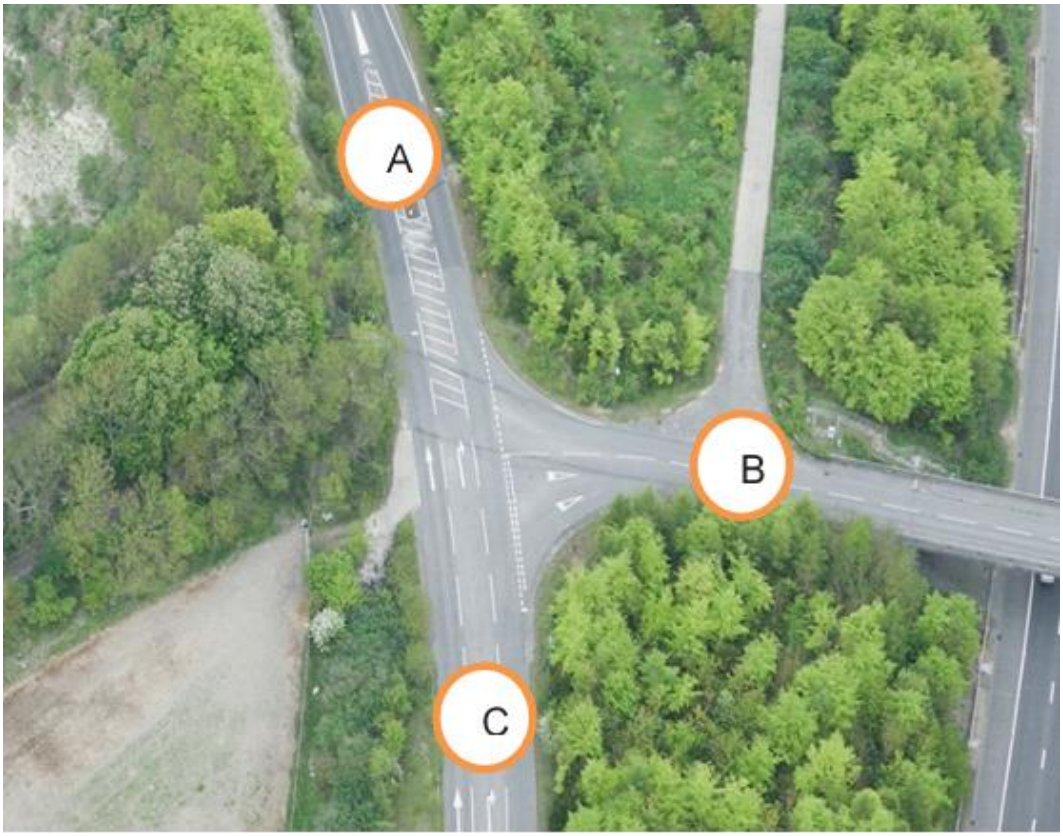

Figure 6-4 Pilgrims Way West/A224 Polhill Priority Junction

6.4.25 In this priority junction, all arms are single carriageway. Arm A A224 Polhill has a hatched central reserve and one lane per direction. Arm C has one lane per direction as well but includes a separate right turning lane of 95 metres.

6.4.26 The minor arm B Pilgrims Way has a flared approach where two vehicles can fit comfortably at the give way line, and a single lane on the other direction.

6.4.27 Table 6-7 below summarises the PICADY model results for the A224 Polhill junction/ Pilgrims Way West Link Road junction.

Movement	AM peak (08:00-09:00)				PM peak (17:00-18:00)			
	RFC	Queue (PCU)	Delay (s)	LOS	RFC	Queue (PCU)	Delay (s)	LOS
2018 Baseline								
Pilgrims Way – Polhill (south)	0.46	0.9	17.45	C	0.27	0.4	11.7	B
Pilgrims Way – Polhill (north)	0.67	2.0	32.95	D	0.61	1.5	25.11	D
Polhill (south) – Pilgrims Way	0.19	0.2	8.31	A	0.25	0.3	8.41	A
2035 Future Base								
Pilgrims Way – Polhill (south)	1.08	13.4	237.12	F	0.96	5.2	142.87	F
Pilgrims Way – Polhill (north)	1.07	17	220.47	F	0.94	8.1	112.73	F
Polhill (south) – Pilgrims Way	0.24	0.3	9.72	A	0.32	0.5	10.2	B
2035 With Development								
Pilgrims Way – Polhill (south)	1.05	11.5	203.51	F	0.95	4.9	128.52	F
Pilgrims Way – Polhill (north)	1.04	14.5	188.52	F	0.93	7.3	98.79	F
Polhill (south) – Pilgrims Way	0.24	0.3	9.63	A	0.31	0.5	9.83	A
2035 Baseline Sensitivity CLEUD								
Pilgrims Way – Polhill (south)	1.08	15.1	229.75	F	0.62	1.5	42.40	E
Pilgrims Way – Polhill (north)	1.07	17.5	219.11	F	0.87	5.0	73.96	F
Polhill (south) – Pilgrims Way	0.24	0.3	9.37	A	0.36	0.6	10.49	B

Table 6-7 A224 Polhill Junction/Pilgrims Way West Link Road Junction PICADY Results

6.4.28 The results show that in the 2018 Baseline scenario, the junction operates within maximum desirable capacity across both the AM and PM peak hours with minimal queuing and delays except for minor delays on the Pilgrims Way to Polhill (north) movement. This is in line with the observed queuing data which shows short-term queuing on the Pilgrims Way West link road across both the AM and PM peak hours.

6.4.29 In the 2035 Future Base scenario, the junction operates over maximum capacity during the AM peak hour with the Pilgrims Way West link road arm having a maximum RFC of 1.08 and maximum queues of 17PCUs. During the PM peak hour, the junction operates within maximum capacity but over the desirable capacity of 0.85 RFC. Similar to the AM peak hour, the worst performing arm is the Pilgrims Way West link road arm with a maximum RFC of 0.96 and maximum queues of 8.1 PCUs.

6.4.30 In the 2035 With Development scenario, the junction operates at 100% capacity with the Pilgrims Way West link road arm operating at a maximum RFC of 1.05 and maximum queues of 15 PCUs. During the PM peak hour, the junction operates at a maximum RFC of 0.95 on the Pilgrims Way West link road arm with maximum queues of 7PCUs. As can be seen, there is an improvement in the performance of the junction compared to the 2035 Future Base scenario due to the use of the Star Hill secondary access which results in lower flows at this junction.

6.4.31 In the 2035 CLEUD scenario, the junction operates at 100% capacity in the AM peak with the Pilgrims Way West link road arm operating at a maximum RFC of 1.08. In the PM peak Pilgrims Way West link road arm going north operates above maximum desired capacity with an RFC of 0.87.

Morants Court Road Roundabout

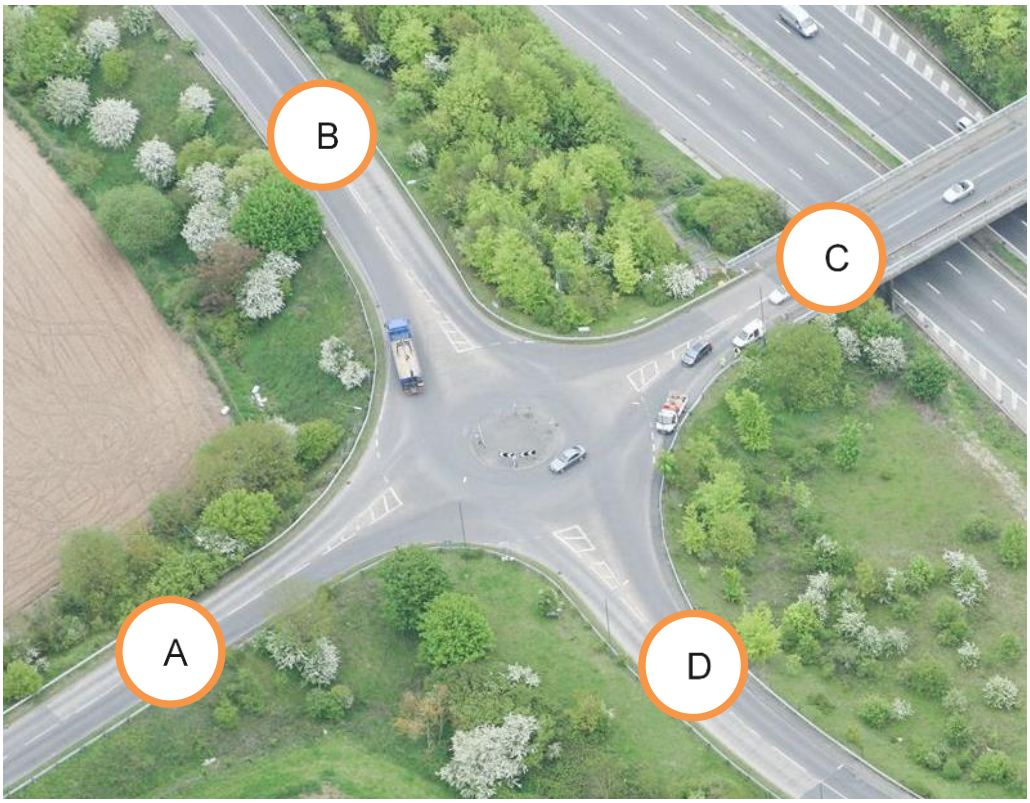

Figure 6-5 Morants Court Road Roundabout

6.4.32 This roundabout has four single carriageway arms. There is a single lane approach from all arms, each of which contains a 15-metre hatched central island separating the on/off traffic.

6.4.33 The ARCADY model results for the junction are presented in Table 6-8 and show that the roundabout operates well within capacity and within the desirable RFC of 0.85 across all scenarios and time periods tested.

Movement	AM peak (08:00-09:00)				PM peak (17:00-18:00)			
	RFC	Queue (PCU)	Delay (s)	LOS	RFC	Queue (PCU)	Delay (s)	LOS
2018 Baseline								
A - Star Hill Rd	0.14	0.2	4.02	A	0.19	0.2	4.24	A
B - A224 Polhill	0.53	1.2	6.44	A	0.38	0.6	4.82	A
C - A224 Morants Court Rd	0.39	0.7	5.27	A	0.27	0.4	3.95	A
D - Sundridge Rd	0.28	0.4	4.50	A	0.27	0.4	4.20	A
2035 Future Base								
A - Star Hill Rd	0.21	0.3	4.78	A	0.25	0.3	5	A
B - A224 Polhill	0.69	2.3	9.82	A	0.55	1.2	6.72	A
C - A224 Morants Court Rd	0.53	1.2	7.22	A	0.38	0.6	4.87	A
D - Sundridge Rd	0.37	0.6	5.4	A	0.36	0.6	5.11	A
2035 With Development								
A - Star Hill Rd	0.21	0.3	4.75	A	0.30	0.4	5.33	A
B - A224 Polhill	0.68	2.2	9.70	A	0.51	1.0	6.32	A
C - A224 Morants Court Rd	0.53	1.2	7.25	A	0.39	0.6	4.92	A
D - Sundridge Rd	0.40	0.7	5.61	A	0.38	0.6	5.24	A
2035 Baseline Sensitivity CLEUD								
A - Star Hill Rd	0.20	0.3	4.71	A	0.42	0.7	6.32	A
B - A224 Polhill	0.68	2.1	9.47	A	0.53	1.1	6.89	A
C - A224 Morants Court Rd	0.56	1.3	7.77	A	0.38	0.6	5.09	A
D - Sundridge Rd	0.52	1.1	7.30	A	0.34	0.5	4.91	A

Table 6-8 Morants Court Road Roundabout ARCADY Results

Star Hill Road Access Junction

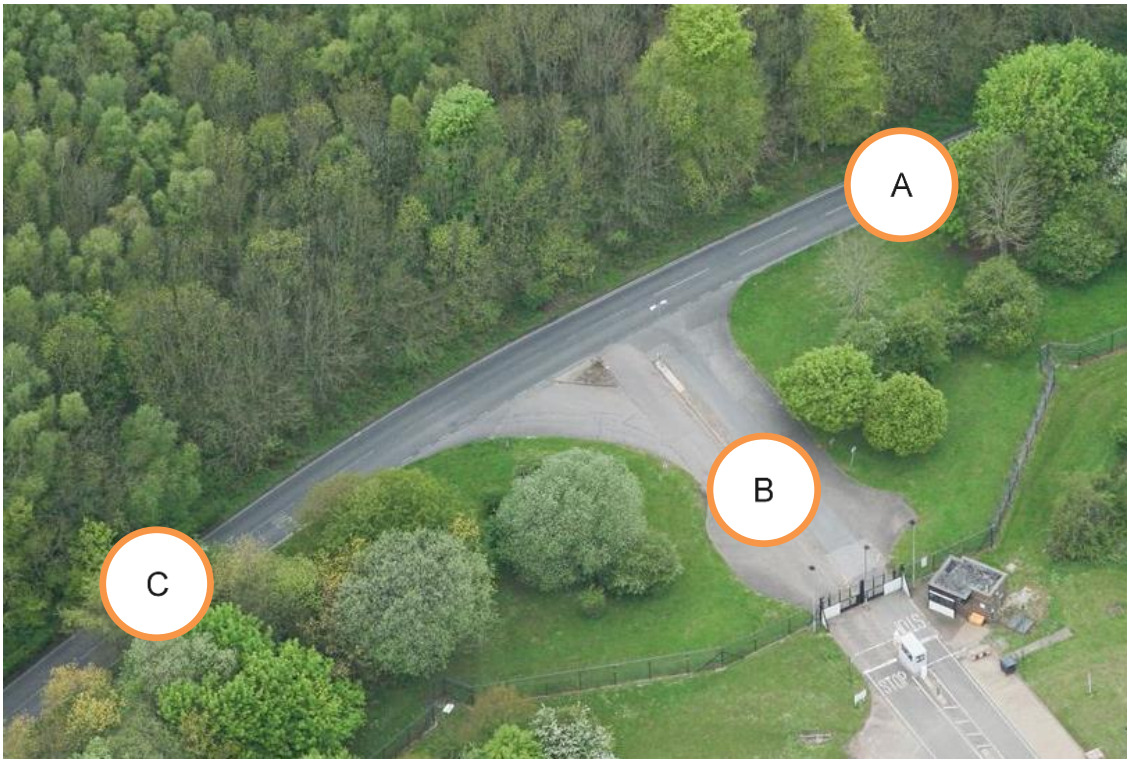

Figure 6-6 Star Hill Road access junction

6.4.34 Star Hill Road is a single carriageway local distributor with one lane per direction and with no turning bays or central reserves.

6.4.35 The minor arm B (site access) is flared and provides sufficient room to accommodate at least two vehicles within the left turn flare lane. Exit visibility to the left and to the right is restricted and this is reflected in the model.

6.4.36 The PICADY model results in Table 6-9 show the junction to be operating well within maximum desirable capacity across all scenarios and time periods tested. No results have been shown for the 2035 Future Base scenario since the 2015 OPP consent was based on a single access point from Polhill with no use of the Star Hill access for general traffic.

Movement	AM peak (08:00-09:00)				PM peak (17:00-18:00)			
	RFC	Queue (PCU)	Delay (s)	LOS	RFC	Queue (PCU)	Delay (s)	LOS
2018 Baseline								
Site – Star Hill Road (south)	0.00	0.00	0.00	A	0.02	0.00	5.33	A
Site– Star Hill Road (north)	0.00	0.00	0.00	A	0.00	0.00	7.61	A
Star Hill Road (south) – Site	0.04	0.1	5.73	A	0.00	0.00	0.00	A
2035 Future Base – No Star Hill Access Restriction								
Site – Star Hill Road (south)	-	-	-	-	-	-	-	-
Site– Star Hill Road (north)	-	-	-	-	-	-	-	-
Star Hill Road (south) – Site	-	-	-	-	-	-	-	-
2035 With Development								
Site – Star Hill Road (south)	0.06	0.1	5.64	A	0.08	0.1	5.85	A
Site– Star Hill Road (north)	0.04	0.0	8.32	A	0.05	0.1	8.29	A
Star Hill Road (south) – Site	0.11	0.2	6.03	A	0.07	0.1	5.96	A
2035 Baseline Sensitivity CLEUD								
Site – Star Hill Road (south)	0.04	0.0	5.58	A	0.27	0.4	7.45	A
Site– Star Hill Road (north)	0.02	0.0	9.73	A	0.10	0.1	8.72	A
Star Hill Road (south) – Site	0.46	1.0	9.97	A	0.04	0.1	5.84	A

Table 6-9 Star Hill Road Access junction PICADY Results

M25 Junction 4

6.4.37 The M25 Junction 4 is a roundabout interchange located to the north of the site. The junction has been modelled using ARCADY. The results can be seen below.

Movement	AM peak (08:00-09:00)				PM peak (17:00-18:00)			
	RFC	Queue (PCU)	Delay (s)	LOS	RFC	Queue (PCU)	Delay (s)	LOS
2020 Observed								
M25 North	0.97	19.8	38.51	E	0.93	10.7	36.0	E
M25 South	0.98	13.1	68.20	F	0.92	8.5	48.73	E
M25 West	0.47	0.9	2.03	A	0.60	1.5	2.66	A
2035 Future Base								
M25 North	1.25	240.7	397.41	F	1.35	186.1	519.21	F
M25 South	1.29	103.3	679.53	F	1.10	28.1	171.28	F
M25 West	0.56	1.3	2.46	A	0.74	2.9	4.08	A
2035 With Development (2 Access)								
M25 North	1.25	244.7	404.92	F	1.32	174.1	465.54	F
M25 South	1.24	75.8	495.47	F	1.18	46.1	292.18	F
M25 West	0.57	1.4	2.5	A	0.73	2.8	3.97	A
2035 Baseline Sensitivity CLEUD								
M25 North	1.28	283.3	473.10	F	1.25	137.4	349.53	F
M25 South	1.40	140.9	1061.78	F	1.00	15.9	113.83	F
M25 West	0.54	1.2	2.34	A	0.75	3.1	4.29	A

Table 6-10: M25 Junction 4 ARCADY Results

6.4.38 In the 2020 observed scenario in both the AM and PM peaks the junction operates above desired capacity but below maximum capacity with a maximum of 0.98 RFC in the AM peak and 0.93 in the PM peak.

6.4.39 In the 2035 baseline scenario the junction operates above maximum capacity in the AM peak and PM peak with a maximum RFC of 1.29 and maximum queue length of 241 PCUs in the AM and a maximum RFC of 1.35 and a maximum queue length of 186 PCUs in the PM.

6.4.40 In the 2035 baseline + development scenario the junction operates above maximum capacity in both the AM and PM peaks. There is a maximum RFC of 1.24 in the AM peak on the south arm and 1.25 on the north arm in the PM peak. In both peak periods the queue length is much higher on the north arm of the interchange with 245 PCUs in the AM peak and 174 PCUs in the PM peak, but in the AM peak delay is much higher on the south arm at 496 seconds, despite the shorted queue length.

6.4.41 In the 2035 baseline CLEUD scenario the junction also operates above maximum RFC in the AM and PM peaks. However, in the AM peak the results are worse than the 2035 with development scenario with a maximum RFC of 1.40, a maximum queue of 293 PCUs and a maximum delay of 1062 seconds.

M25/A25/A21 Junction

6.4.42 The M25/A25/A21 junction is an interchange where the M25 and A21 join with the A25 passing overhead, located to the south of the site. The junction has 2 interchanges with on

and off slips. The eastern most part of the junction is a priority crossroad whilst the western junction is a signalised junction. The junctions have been modelled together in the TRANSYT capacity software program. Figure 6-7 illustrates the layout of the model while **Error! Reference source not found.** is a reference table to allow an easy comparison between the TRANSYT Arm / Traffic Stream number and an understandable road or junction name. The TRANSYT results for Degree of Saturation (DoS), Mean Max Queue and Mean Delay per Vehicle are shown in Table 6-12, **Error! Reference source not found.** and **Error! Reference source not found.** respectively.

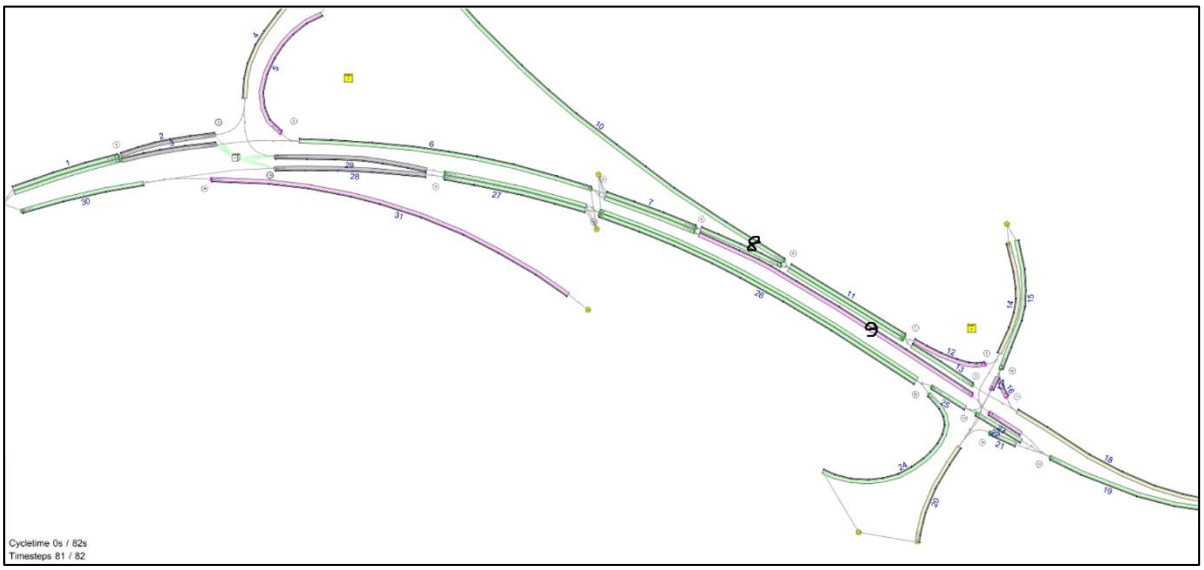

Figure 6-7: TRANSYT model layout

TRANSYT Arm / Traffic Stream No.	Road / Junction Name
1/1	A25 (EB) left turn lane for M25 (NB)
1/2	A25 (EB)
2/1	A25 (EB) left turn lane for M25 (NB)
3/1	A25 (EB)
4/1	Link road between A25 (EB) and M25 (NB)
5/1	Link road between A21 (NB) and A25 (EB)
6/1	A25 (EB)
7/1	A25/A21/Westerham Rd crossroad - A25 (EB) straight on and left turn lane
7/2	A25/A21/Westerham Rd crossroad - A25 (EB) right turn lane for A21 (SB)
8/1	A25/A21/Westerham Rd crossroad - A25 (EB) straight on and left turn lane
9/1	A25/A21/Westerham Rd crossroad - A25 (EB) right turn lane for A21 (SB)
10/1	Link road between M25 (SB) and A25 (EB)
11/1	A25/A21/Westerham Rd crossroad - A25 (EB) straight on and left turn lane
12/1	A25/A21/Westerham Rd crossroad - A25 (EB) to Westerham Rd
13/1	A25/A21/Westerham Rd crossroad – stay on A25 (EB)
14/1	Westerham Rd (NB)
15/1	Westerham Rd (SB)
16/1	A25/A21/Westerham Rd crossroad – Westerham Rd left turn flare
17/1	A25/A21/Westerham Rd crossroad – Westerham Rd right turn and straight on
18/1	A25 (EB)
19/1	A25 (WB)
20/1	Link road between A25 (WB) and A21 (SB)
21/1	A25/A21/Westerham Rd crossroad – A25 (WB) diverge towards A21 (SB)
22/1	A25/A21/Westerham Rd crossroad – stay on A25 (WB)
23/1	A25/A21/Westerham Rd crossroad – A25 (WB) right turn lane for Westerham Rd
24/1	Link road between A21 (SB) and A25 Westerham Rd (WB)
25/1	A25 (WB)
26/1	A25 (WB)
27/1	A25 (WB)
27/2	A25 (WB) right turn lane for M25
28/1	A25 (WB)
29/1	A25 (WB) right turn lane for M25
30/1	A25 (WB)
31/1	Link road between A21 (NB) and A25 (WB)

Table 6-11: TRANSYT Arm / Traffic Stream number matched with a road / junction name

Junction/Arm	Degree of Saturation (DoS)							
	2020 Observed		2035 Baseline		2035 Alt Baseline (CLEUD)		2035 Baseline + Development (2 accesses)	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
1/1	12%	17%	13%	18%	13%	18%	13%	18%
1/2	28%	34%	30%	38%	30%	38%	30%	38%
2/1	23%	27%	30%	37%	30%	36%	30%	38%
3/1	58%	58%	77%	79%	76%	77%	77%	80%
4/1	0%	0%	0%	0%	0%	0%	0%	0%
5/1	70%	29%	77%	32%	92%	34%	82%	35%
6/1	49%	43%	53%	47%	57%	48%	54%	48%
7/1	31%	29%	33%	31%	38%	31%	35%	32%
7/2	18%	15%	20%	16%	20%	16%	20%	16%
8/1	30%	28%	33%	31%	37%	31%	34%	31%
9/1	76%	56%	87%	65%	87%	65%	87%	65%
10/1	32%	23%	35%	25%	35%	25%	35%	25%
11/1	31%	25%	33%	28%	36%	28%	34%	28%
12/1	50%	18%	55%	19%	68%	19%	59%	21%
13/1	47%	47%	51%	52%	51%	52%	51%	52%
14/1	0%	0%	0%	0%	0%	0%	0%	0%
15/1	6%	5%	7%	5%	8%	11%	8%	8%
16/1	4%	5%	5%	5%	5%	7%	6%	6%
17/1	70%	39%	111%	55%	132%	126%	139%	84%
18/1	0%	0%	0%	0%	0%	0%	0%	0%
19/1	53%	46%	57%	50%	57%	50%	57%	51%
20/1	0%	0%	0%	0%	0%	0%	0%	0%
21/1	13%	9%	14%	10%	14%	10%	14%	10%
22/1	39%	36%	42%	39%	42%	39%	42%	39%
23/1	5%	4%	6%	4%	7%	4%	7%	5%
24/1	18%	11%	20%	12%	21%	12%	20%	13%
25/1	42%	38%	45%	41%	45%	42%	45%	42%
26/1	28%	23%	31%	25%	31%	26%	31%	26%
27/1	36%	24%	39%	26%	40%	26%	39%	26%
27/2	25%	22%	27%	23%	27%	24%	27%	24%
28/1	38%	25%	41%	27%	43%	27%	41%	28%
29/1	73%	90%	80%	81%	79%	77%	80%	80%
30/1	38%	34%	41%	37%	43%	37%	42%	37%
31/1	0%	29%	0%	33%	0%	33%	0%	33%

Table 6-12: TRANSYT Results for Degree of Saturation for M25/A25/A21 Junction

6.4.43 Table 6-12 illustrates the results for DoS for the M25/A25/A21 junction.

6.4.44 In a 2020 observed scenario all links within the junction operate within the desired capacity threshold in the AM peak. In the PM peak all links operate within desired capacity other than link 29/1 (A25 Westerham Rd (WB) M25 right turn lane). This operates at 90% DoS which is above desired capacity but below maximum capacity.

6.4.45 In the 2035 baseline scenario in the PM peak all links within the junction operate within capacity. However, in the AM peak link 17/1 (A25/A21/Westerham Rd crossroad – right turn and straight on from Westerham Rd) operates over maximum capacity at 111%.

6.4.46 In the 2035 baseline + development scenario link 17/1 (A25/A21/Westerham Rd crossroad – right turn and straight on from Westerham Rd) continues to operate above maximum capacity in the AM peak with a DoS 139%.

6.4.47 In the 2035 alternative baseline (CLEUD) scenario link 17/1 (A25/A21/Westerham Rd crossroad – right turn and straight on from Westerham Rd) operates over maximum capacity in both the AM and PM peaks at 132% and 126% respectively.

Junction/Arm	Mean Max Queue (PCU)							
	2020 Observed		2035 Baseline		2035 Alt Baseline (CLEUD)		2035 Baseline + Development (2 accesses)	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
1/1	0	0	0	0	0	0	0	0
1/2	0	0	0	0	0	0	0	0
2/1	3	4	2	4	2	5	2	4
3/1	11	10	9	11	9	14	9	12
4/1	0	0	0	0	0	0	0	0
5/1	4	0	4	0	10	0	5	0
6/1	4	0	0	0	0	5	0	1
7/1	0	0	0	0	0	0	0	0
7/2	0	0	0	0	0	0	0	0
8/1	0	0	0	0	0	0	0	0
9/1	8	2	7	3	7	5	7	3
10/1	0	0	0	0	0	0	0	0
11/1	0	0	0	0	0	0	0	0
12/1	0	0	0	0	1	0	0	0
13/1	0	0	0	0	0	0	0	0
14/1	0	0	0	0	0	0	0	0
15/1	0	0	0	0	0	0	0	0
16/1	0	0	0	0	0	0	0	0
17/1	2	1	8	1	16	21	19	3
18/1	0	0	0	0	0	0	0	0
19/1	0	0	0	0	0	0	0	0
20/1	0	0	0	0	0	0	0	0
21/1	0	0	0	0	0	0	0	0
22/1	0	0	0	0	0	0	0	0
23/1	0	0	0	0	0	0	0	0
24/1	0	0	0	0	0	0	0	0
25/1	0	0	0	0	0	0	0	0
26/1	0	0	0	0	0	0	0	0
27/1	0	0	0	0	0	0	0	0
27/2	0	0	0	0	0	0	0	0
28/1	0	0	0	0	0	0	0	0
29/1	13	13	9	9	9	10	9	9
30/1	0	0	0	0	0	0	0	0
31/1	0	0	0	0	0	0	0	0

Table 6-13: TRANSYT Results for Mean Max Queue for M25/A25/A21 Junction

6.4.48 Table 6-13 presents the results for Mean Max Queue (number of PCUs) for the M25/A25/A21 junction. In all scenarios the majority of links see a Mean Max Queue length of 0. There is only one link where the Mean Max Queue length is significantly worsened in a 2035 baseline + development scenario, which is link 17/1 (A25/A21/Westerham Rd crossroad – right turn and straight on from Westerham Rd). In the 2020 observed scenario this had a Mean Max Queue of 2 PCUs in the AM peak and 1 PCU in the PM peak. In the 2035 baseline scenario this queue length increased to 8 PCUs in the AM peak. In 2035 baseline + development (2

accesses) scenario in the AM peak the queue length further increases to 19 PCUs. This increase in Mean Max Queue length is likely the result of more traffic using this junction and high traffic flows on the A25 resulting in a lack of gap seeking opportunities for right turners and vehicles travelling straight on to join the A21.

Junction/Arm	Mean Delay per Veh (seconds)							
	2020 Observed		2035 Baseline		2035 Alt Baseline (CLEUD)		2035 Baseline + Development (2 accesses)	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
1/1	0.12	0.18	0.13	0.21	0.13	0.21	0.13	0.21
1/2	0.34	0.46	0.38	0.53	0.38	0.53	0.38	0.53
2/1	13.81	8.51	11.04	10.26	11.30	12.47	11.04	10.79
3/1	19.18	12.22	20.25	18.77	20.31	21.02	20.25	20.09
4/1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/1	7.85	1.32	11.34	1.58	33.07	1.70	15.20	1.77
6/1	0.86	0.68	1.00	0.80	1.20	0.84	1.07	0.83
7/1	0.40	0.37	0.46	0.41	0.55	0.41	0.49	0.43
7/2	0.19	0.15	0.21	0.16	0.21	0.16	0.21	0.16
8/1	0.39	0.35	0.44	0.40	0.53	0.40	0.47	0.41
9/1	13.67	4.30	25.41	6.66	24.93	7.43	25.21	6.70
10/1	0.44	0.28	0.50	0.31	0.50	0.31	0.50	0.31
11/1	0.20	0.15	0.23	0.17	0.25	0.17	0.23	0.17
12/1	2.58	0.55	3.07	0.61	5.26	0.61	3.65	0.69
13/1	0.83	0.85	0.98	1.01	0.98	1.01	0.98	1.01
14/1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15/1	0.07	0.05	0.08	0.06	0.09	0.13	0.09	0.09
16/1	0.16	0.18	0.19	0.20	0.19	0.25	0.23	0.25
17/1	36.66	8.96	280.70	22.28	482.55	416.31	545.91	67.52
18/1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19/1	1.01	0.78	1.21	0.93	1.23	0.93	1.22	0.93
20/1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21/1	0.14	0.10	0.16	0.11	0.16	0.11	0.16	0.11
22/1	0.57	0.51	0.65	0.58	0.65	0.58	0.65	0.58
23/1	0.17	0.12	0.21	0.15	0.27	0.15	0.25	0.18
24/1	0.21	0.12	0.23	0.13	0.26	0.13	0.24	0.14
25/1	0.65	0.56	0.75	0.64	0.74	0.66	0.74	0.65
26/1	0.17	0.13	0.19	0.15	0.20	0.15	0.19	0.15
27/1	0.48	0.26	0.55	0.29	0.57	0.29	0.55	0.30
27/2	0.28	0.23	0.32	0.26	0.32	0.27	0.32	0.27
28/1	0.55	0.30	0.63	0.33	0.66	0.33	0.63	0.34
29/1	30.72	55.19	23.08	28.79	22.88	29.24	23.23	27.51
30/1	0.55	0.46	0.63	0.52	0.67	0.52	0.64	0.53
31/1	0.00	1.24	0.00	1.47	0.00	1.46	0.00	1.47

Table 6-14 TRANSYT Results for Mean Delay for M25/A25/A21 Junction

6.4.49 Table 6-14 illustrates the mean vehicle delay in seconds for the M25/A25/A21 junction.

6.4.50 Similarly, to the afore mentioned tables the majority of links in this junction produce minimal driver delays. The only link that sees significant increases in mean vehicle delay is 17/1 (A25/A21/Westerham Rd crossroad – right turn and straight on from Westerham Rd). In the observed 2020 scenario this link sees delays of approximately 37 seconds in the AM peak and 9 seconds in the PM peak. In the 2035 baseline scenario this link sees delays of approximately 281 seconds in the AM peak and 22 seconds in the PM peak. In the 2035 baseline + development (2 accesses) scenario the AM peak sees a large increase in driver delay to approximately 546 seconds. As mentioned previously this is likely the result of more traffic using this junction and high traffic flows on the A25 resulting in a lack of gap seeking opportunities for right turners and vehicles travelling straight on to join the A21.

Summary

6.4.51 The results of the TRANSYT modelling indicates that the majority of links within the junction operate within desired capacity. The only link where capacity, queueing and delay may become an issue is link 17/1 which is the Westerham Rd arm of the A25/A21/ Westerham Rd crossroad. These capacity issues are likely the result of increased traffic using this junction and high traffic flows on the A25 resulting in a lack of gap seeking opportunities for right turners and vehicles travelling straight on to join the A21. It is considered that this is a worse case scenario as the OPA development was not requested to consider this junction when the development was 1 access which means that there is no OPA assessed development trips passing through the junction and therefore the baseline is an underestimate. It is also considered that as the Westerham Road movement is difficult to make due to crossing two lanes of east bound traffic, more traffic from the development travelling south is in reality likely to use the Sundridge crossroads reducing the impact on the Westerham Road arm of the junction. The CLEUD scenario however sees excess queueing and delay in both the morning and evening peaks, suggesting that the alternative baseline in overall terms is more detrimental than the proposed development.

6.5 M25 Junction 4 Slip Roads

6.5.1 The net development flows and percentage impacts at the M25 Junction 4 slip roads have been set out in Table 6-15 below. The data for the M25 mainline flows is added as this inputs to the Merge/Diverge assessment further below in section 6.6.

Link	AM Peak				PM Peak			
	2035 Base	2035 With Dev.	Net Dev. Flows	% Impact	2035 Base	2035 With Dev.	Net Dev. Flows	% Impact
M25 Northbound Onslip	958	925	-33	-3%	1287	1297	10	1%
M25 Southbound Onslip	673	627	-46	-7%	771	737	-34	-4%
M25 Northbound Offslip	825	839	14	2%	833	829	-4	0%
M25 Southbound Offslip	1692	1703	11	1%	1185	1206	21	2%
M25 Northbound south of junction	3730	3744	14	0%	4546	4541	-5	0%

M25 Northbound north of junction	3863	3830	-33	-1%	4999	5008	9	0%
M25 Southbound south of junction	4477	4432	-45	-1%	4254	4221	-33	-1%
M25 Southbound north of junction	5416	5427	11	0%	4597	4618	21	0%

Table 6-15 Percentage Impacts on the M25 Junction 4 Slip Roads – 2035 Base vs Base + Dev

6.5.2 The flows from the 2035 Alternative Baseline (CLEUD) and compared to the 2035 With Development flows in Table 6-16. This scenario is not assessed for the Merge Diverge assessment.

Link	AM Peak				PM Peak			
	2035 Base (Including CLEUD)	2035 With Dev.	Net Dev. Flows	% Impact	2035 Base (Including CLEUD)	2035 With Dev.	Net Dev. Flows	% Impact
M25 Northbound Onslip	932	925	-7	-1%	1367	1297	-70	-5%
M25 Southbound Onslip	629	627	-2	0%	730	737	7	1%
M25 Northbound Offslip	793	839	46	6%	788	829	41	5%
M25 Southbound Offslip	1818	1703	-115	-6%	1152	1206	54	5%

Table 6-16 Percentage Impacts on the M25 Junction 4 Slip Roads

6.5.3 The summary of development and CLEUD flows against Baseline confirm that the CLEUD scenario would result in higher volumes of traffic using the junction offslips in the AM peak and higher volumes of traffic using the onslips in the PM peak. With the development mainly comprising residential this finding is not surprising given the alternative baseline would exhibit different tidal traffic flow patterns.

6.6 Merge Diverge Assessment

6.6.1 A Merge/Diverge assessment has been undertaken for the future baseline scenario and the 2035 with development scenarios for the M25 Junction 4 and the M25/A25/A21 junction using the DMRB CD122. For the baseline scenario WebTRIS data from Highways England has been used for all junction at M25 J4 and the majority of junctions at the M25/A25/A21 junction. Where there is missing WebTRIS data on the southbound junction between the A25 and A21 traffic survey data has been used. Graphs showing the results of the assessment for each junction can be seen below and the flow diagrams used to execute the assessment can be found in Appendix R .

M25 Junction 4

Northbound Diverge

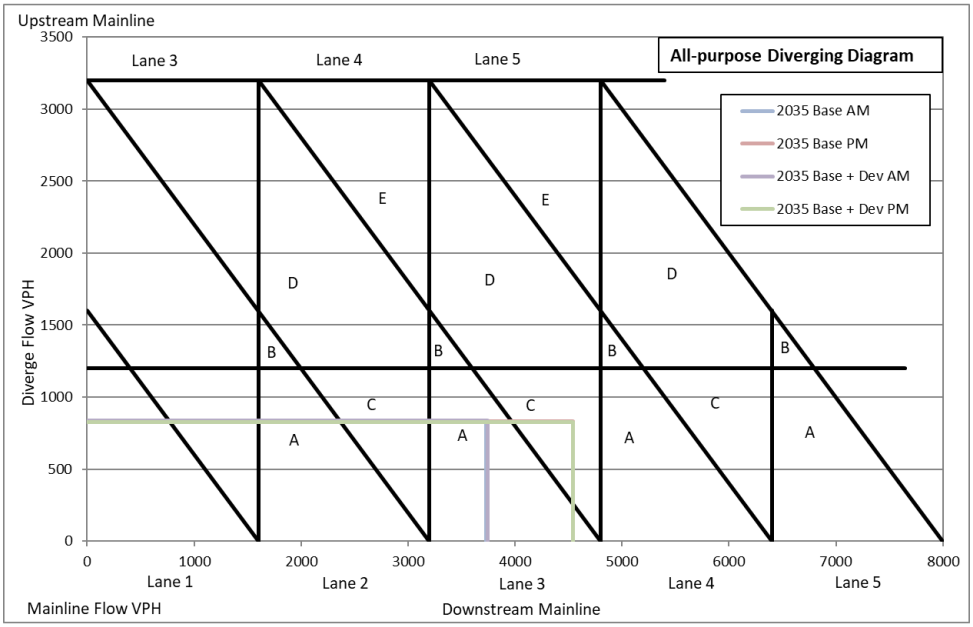

Figure 6-8: M25 J4 Northbound Diverge

6.6.2 Currently at the M25 J4 northbound diverge there is a DMRB Layout B option 2 (two lane auxiliary diverge). Figure 6-8 shows that the development flows have minimal impacts on the overall traffic flows through the junction. During the AM peak in both the base and base + development scenarios a Layout A will provide sufficient capacity. While, during the PM peak in both scenarios a Layout C is required to sustain traffic flows. A Layout B can cope with higher volumes of diverging traffic than a Layout A or C, therefore the northbound diverge will continue to operate within capacity with the addition of the development flows.

Southbound Diverge

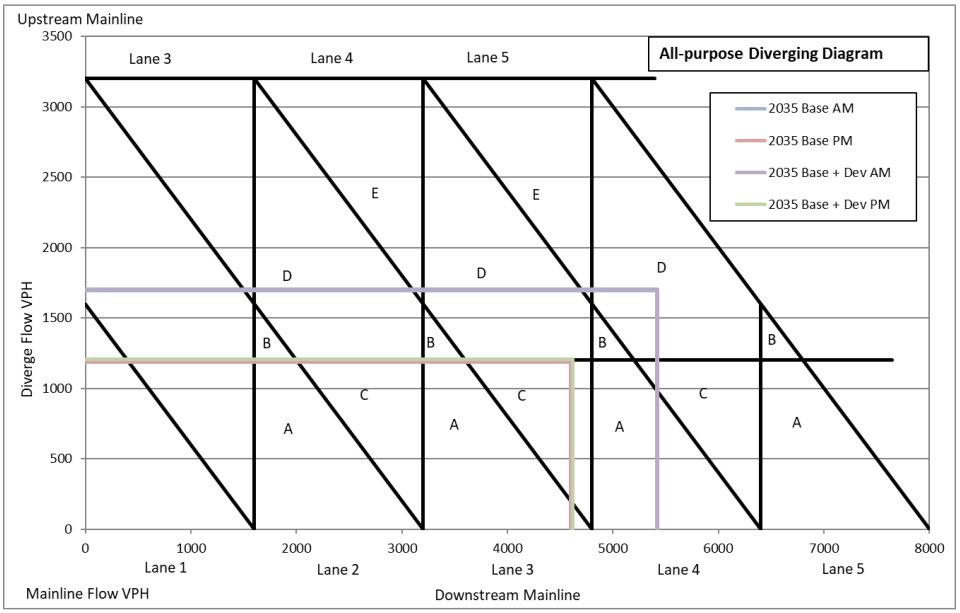

Figure 6-9: M25 J4 Southbound Diverge

6.6.3 Currently at the M25 J4 southbound diverge there is a DMRB Layout B option 2 (two lane auxiliary diverge). Figure 6-9 shows the development traffic will have little to no impact on the capacity of the junction. The AM peak in both the base and base + development scenarios requires a Layout D (lane drop), while the flow volumes in the PM peak in both the base and base + development scenarios requires a Layout C. Although the AM peak requires a junction that can cope with higher volumes of diverging traffic than what is currently in place, as the base scenario is in the same bracket as the base + development scenario no action is required by the developer.

Northbound Merge

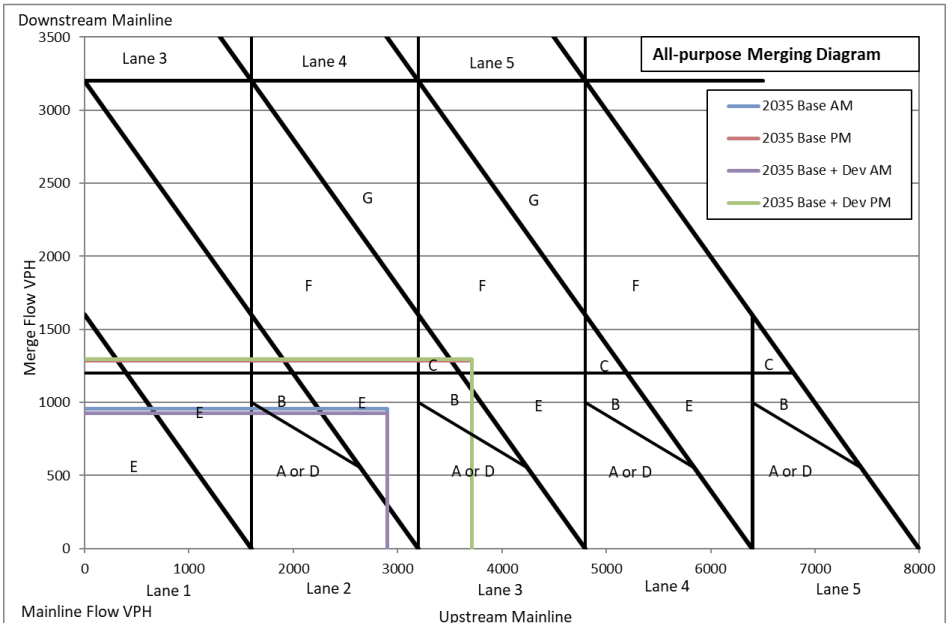

Figure 6-10: M25 J4 Northbound Merge

6.6.4 Currently at the M25 J4 northbound Merge there is a DMRB Layout C (ghost island merge). shows that in the proposed development flows have a minimal impact on the junction in the AM and PM peak. Therefore, although the graph illustrates that the junction may need upgrading to cope with a higher volume of merging traffic in the future, this is not caused by the proposed development in this TA.

Southbound Merge

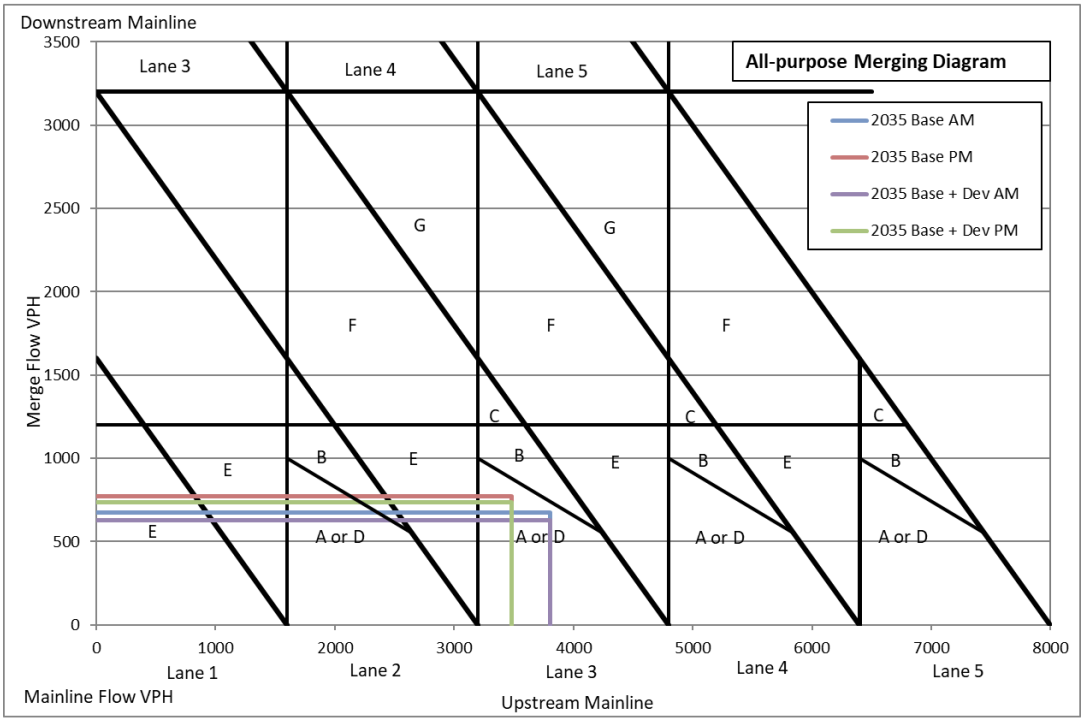

Figure 6-11: M25 J4 Southbound Merge

6.6.5 Currently at the M25 J4 southbound merge there is a DMRB Layout C (ghost island merge). shows that in both the AM and PM peaks with and without the development site a DMRB Layout A or D is required. A Layout C can cope with a higher level of merging traffic than a Layout A or D, therefore the southbound merge will continue to operate within its current design capacity with the proposed development flows.

M25/A25/A21 Junction

A21/M25 Northbound Diverge (towards A25 west)

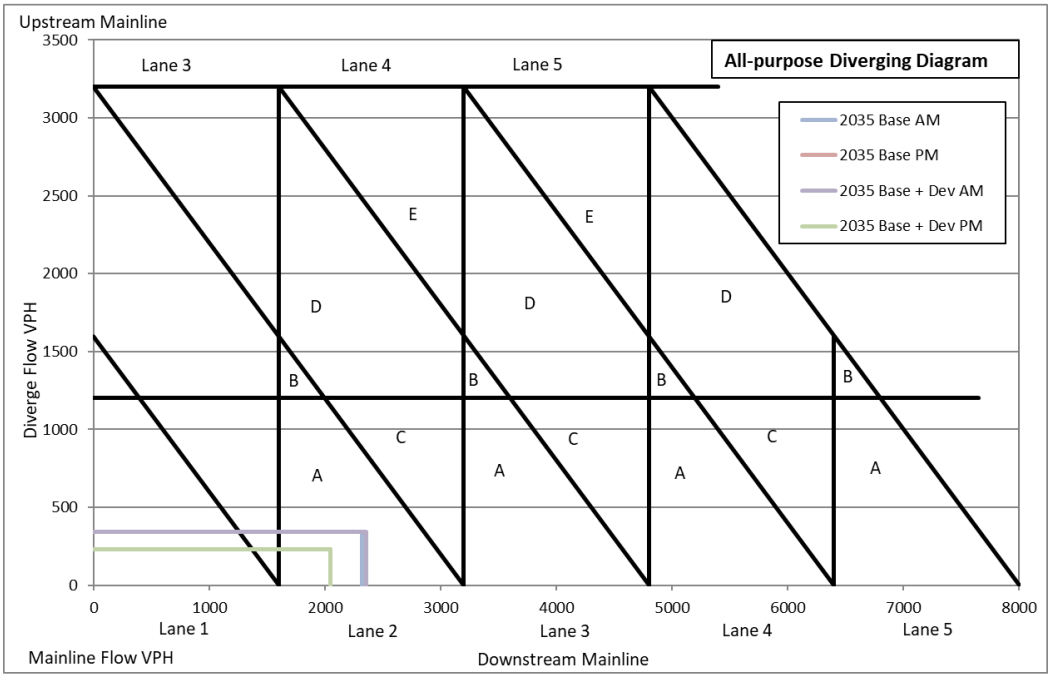

Figure 6-12:A21/M25 Northbound Diverge (towards A25 west)

6.6.6 Currently this diverging junction has a DMRB diverge Layout A (option 1 – taper diverge). Figure 6-12 shows that in 2035 the development traffic will have very little impact on the volume of traffic passing through the diverging junction. Thus, the layout that is currently in place will continue to operate within the capacity of its design in a 2035 + development scenario.

A21/M25 Northbound Diverge (towards A25 east)

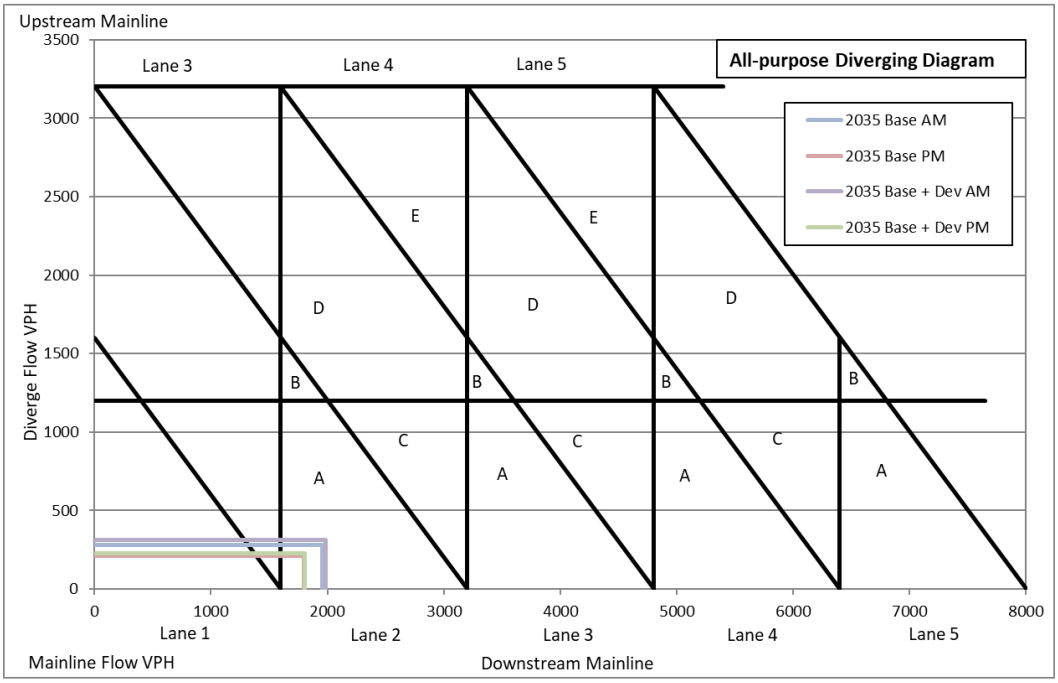

Figure 6-13: A21/M25 Northbound Diverge (towards A25 east)

6.6.7 Currently this diverging junction has a DMRB diverge Layout A (option 1 – taper diverge). Figure 6-13 shows that in 2035 the development traffic will have very little impact on the volume of traffic passing through the diverging junction. Thus, the layout that is currently in place will continue to operate within the capacity of its design in a 2035 + development scenario.

A21/M25 Southbound Diverge (towards A25 east)

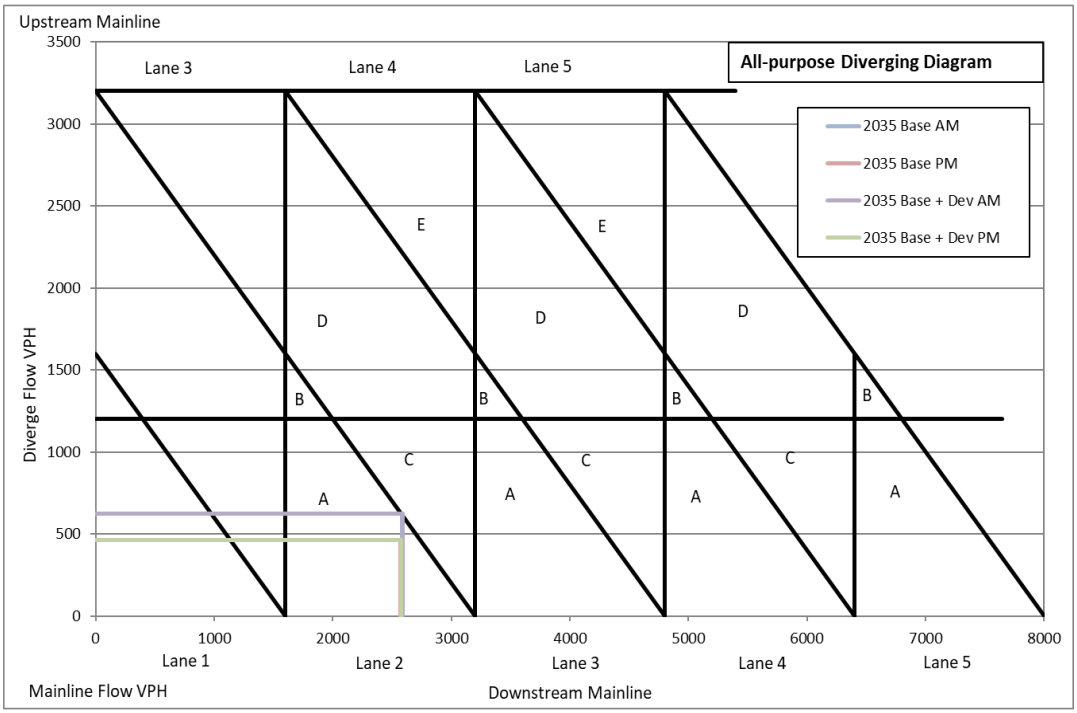

Figure 6-14: A21/M25 Southbound Diverge (towards A25 east)

6.6.8 Currently this diverging junction has a DMRB diverge Layout A (option 1 – taper diverge). Figure 6-14 shows that in 2035 the development traffic will have little to no impact on the volume of traffic passing through the junction. Thus, the layout that is currently in place will continue to operate within the capacity of its design in a 2035 + development scenario.

A21/M25 Southbound Diverge (towards A25 west)

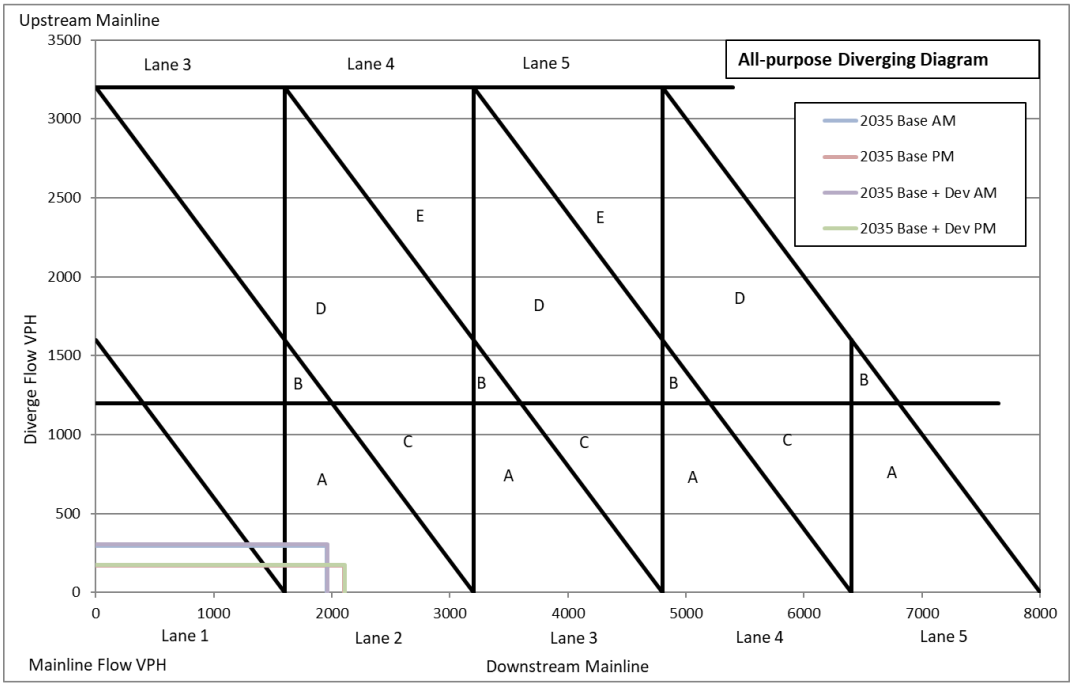

Figure 6-15: A21/M25 Southbound Diverge (towards A25 west)

6.6.9 Currently this diverging junction has a DMRB diverge Layout A (option 1 – taper diverge). Figure 6-15 shows that in 2035 the development traffic will have little to no impact on the volume of traffic passing through the junction. Thus, the layout that is currently in place will continue to operate within the capacity of its design in a 2035 + development scenario.

M25 Northbound Merge

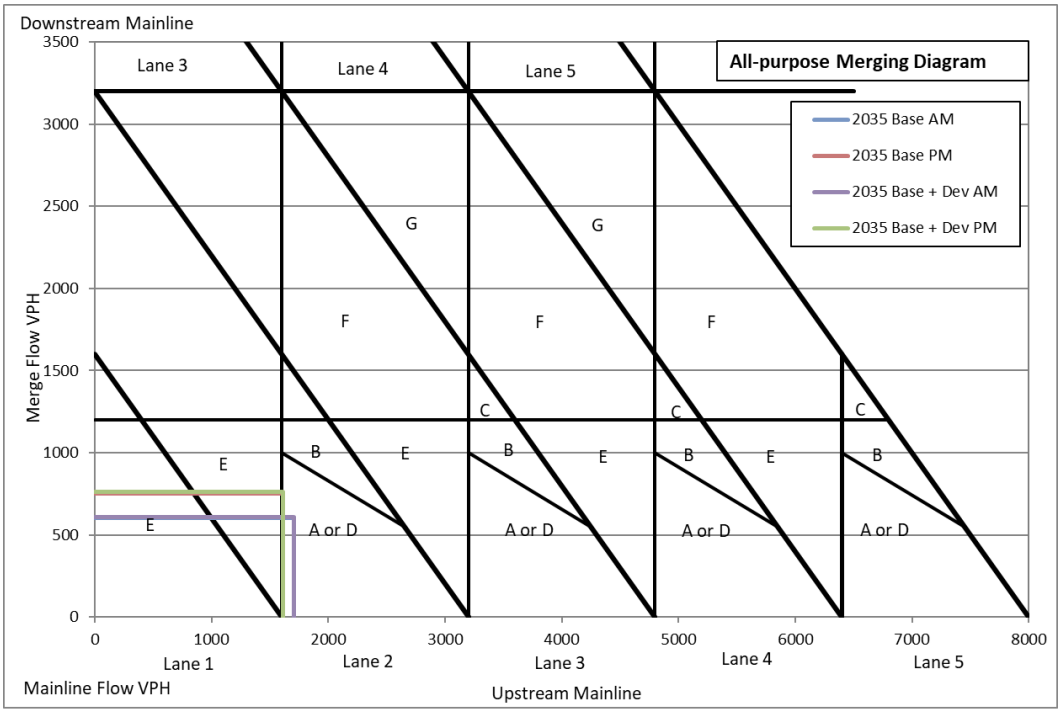

Figure 6-16: M25 Northbound Merge

6.6.10 Currently this merging junction has a DMRB merge Layout A (option 1 – taper marge). Figure 6-16 shows that in 2035 the development traffic will have little to no impact on the volume of traffic passing through the junction. Thus, the layout that is currently in place will continue to operate within the capacity of its design in a 2035 + development scenario.

A21/M25 Southbound Merge

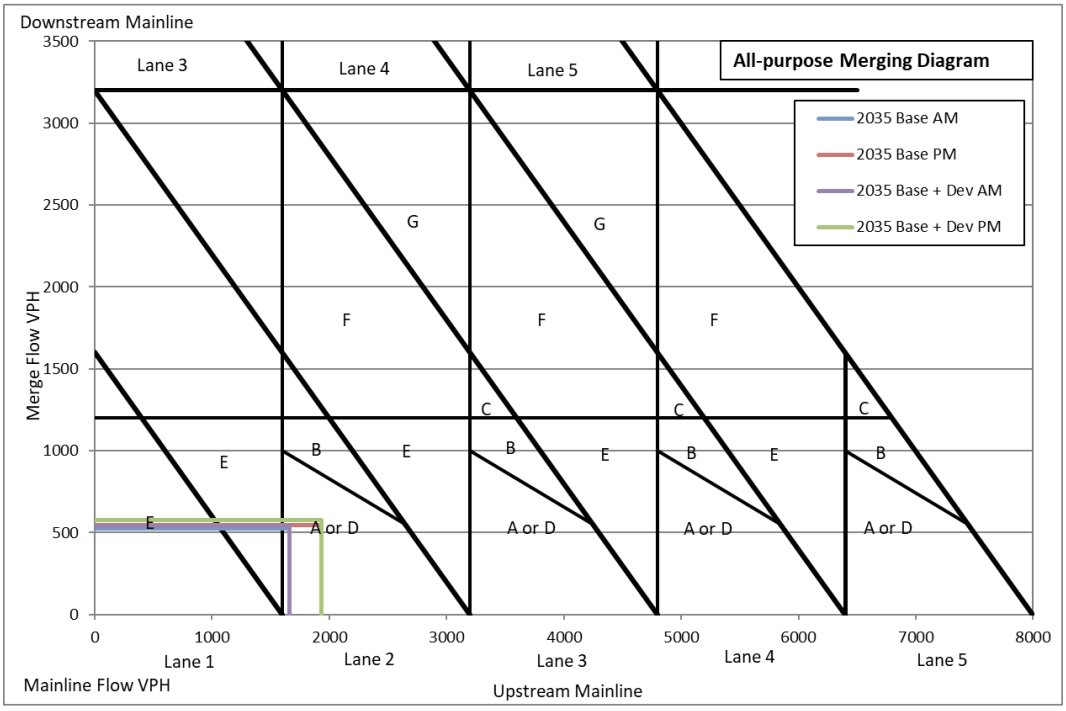

Figure 6-17: A21/M25 Southbound Merge

6.6.11 Currently this merging junction has a DMRB merge Layout A (option 1 – taper marge). Figure 6-17 shows that in 2035 the development traffic will have little to no impact on the volume of traffic passing through the junction. Thus, the layout that is currently in place will continue to operate within the capacity of its design in a 2035 + development scenario.

6.7 Impact on Otford

6.7.1 It has been requested by KCC that the impact of the development on Otford be considered. This consideration has been made based on the full 635 units however, previously no request was made for the impact on Otford for the 450 units.

6.7.2 In the AM peak there are 68 two way trips as a result of the 635 units and 63 two way trips in the PM peak. As previously stated this is a worse case scenario as 450 units have been permitted with no contribution to improvements in Otford, and it does not take into account use of public transport improvements and other benefits from living and working on the same site etc. As such these trips have been reduced by 71% (450/635). The trips are now 14 two way trips in the AM peak and 13 two way trips in the PM peak as a result of the 185 units. These trips would be approximately 1 car every 4 minutes in both the AM and PM peak. These trips are considered to not be perceptible in practice.

6.8 Summary

6.8.1 A percentage impact assessment of key links within close proximity of the site has been undertaken which has shown that all of the links assessed have negligible or minor percentage impacts associated with the proposed development and that all links assessed will operate within capacity.

6.8.2 Local junction modelling of 8 key junctions including both site access junctions have been undertaken which has shown that all junctions except Hewitts Roundabout and the A224 Polhill junction/ Pilgrims Way West Link Road junction would operate comfortably within the maximum desirable capacity.

6.8.3 At both Hewitts Roundabout and the A224 Polhill junction/ Pilgrims Way West Link Road junction, the development proposals result in reduced flows and improved junction performance compared to the Without Development scenario. The reduction in flows is due to the use of the Star Hill access as a secondary access point which results in better distribution of flows for the low level of traffic routing via areas to the south of the site. As such, the use of the Star Hill access results in highway capacity improvements even when compared to the Without Development Scenario.

6.8.4 The proposed Otford Lane/A224/ Crow Drive roundabout design which was agreed as part of the 2015 OPP has been tested and found to operate within capacity and with minor levels of queuing and delay.

6.8.5 It has been shown that the net development flows on the M25 Junction 4 slip roads are low and that the flow increases are within the ranges of daily variation in flows.

6.8.6 Lastly, these capacity assessments consider the traffic offsets available from a commercial reuse of the existing buildings on the site under the Certificate of Lawfulness for an Existing Use and Development (CLEUD). This scenario testing shows that the existing buildings on the site could potentially generate a number of trips and vehicle movements similar in scale and effect to that being proposed with the new development.

6.8.7 It should be noted that these modelling assessments are a worst case scenario as they do not factor in the fact that there is a primary school on site, the shift of trips utilising the proposed public transport measures and also that people living on site may also work on site.

7 Construction Impacts

7.1 Introduction

7.1.1 This chapter summarises the expected construction programme, how it has informed trip generation, and the distribution and assignment of construction trips onto the local transport networks.

7.1.2 Transport impacts related to the demolition and construction phase of the development have been assessed based on previous experience of similar developments and professional judgement. At the time of writing, no contractor has been appointed and there is no detailed construction programme. Before construction starts a Construction Management Plan (CMP) would need to be written to support the construction phase. This will likely be secured through a relevant planning condition. It has been requested by KCC that no construction traffic use Star Hill Road to access the site. This would be detailed within the CMP document.

7.1.3 The assessment presented in this chapter primary focuses on the peak month of construction in terms of vehicle trip generation.

7.2 Construction Programme

7.2.1 An indicative phasing and construction programme has been developed and presented in Table 7-1 and Table 7-2 respectively.

Phase	Timescale	Description
0	2020-2021	Securing QQ in X-enclave and fence
1	2021	Securing and protecting buildings to be retained and trees/landscape
2	2021-2023	Demolition of existing buildings and asbestos removal
3	2021-2023	Remediation and cut & fill and landscape management
4	2021-2023	Installation of services, roads, footpaths, accesses
5	2023-2024	Village Centre
6	2023-2025	Refurbished Buildings in employment zone (A1, A3, A10, A11, A13, A14)
7	2023-2025	Employment Zone new build and serviced plots (inc. school plot)
8	2024-2026	Residential parcel (c. 200 units)
9	2026-2027	Residential parcel (c. 150 units)
10	2027	Fort refurbishment
11	2028-2029	Employment Zone new build
12	2028-2030	Residential parcel (c. 250 units)
13	2029-2031	Residential Hamlets (c. 100 units) and bunker refurbishment

Table 7-1 Indicative Demolition and Construction Phasing

	Infrastructure			Construction		
	Clearance	Utilities	Roads	Commercial	Residential	School
2020 – S1	♦					
2020 – S2	♦					
2021 – S1	♦	♦		♦		
2021 – S2	♦	♦		♦		
2022 – S1	♦					
2022 – S2	♦	♦				
2023 – S1		♦	♦	♦		
2023 – S2			♦	♦	♦	
2024 – S1				♦	♦	♦
2024 – S2				♦	♦	♦
2025 – S1				♦	♦	
2025 – S2				♦	♦	
2026 – S1					♦	
2026 – S2					♦	
2027 – S1				♦	♦	
2027 – S2				♦	♦	
2028 – S1				♦	♦	
2028 – S2				♦	♦	
2029 – S1				♦	♦	
2029 – S2				♦	♦	
2030 – S1					♦	
2030 – S2					♦	

Table 7-2 Indicative construction schedule

7.3 Construction Trip Generation

7.3.1 A first principles spreadsheet model has been developed to provide estimates of likely construction traffic during the peak periods of the demolition and construction phase of the Development. This spreadsheet takes as input data regarding the quantities of material that may need to be taken off the site during the demolition and construction phases, assumptions regarding average lorry loads based on industry norms and assumptions regarding the number of lorry movements likely to be associated with the different elements of the construction phases.

7.3.2 It is anticipated that the working hours for the demolition and construction phases will be Monday to Friday from 08:00 to 18:00 and Saturday from 08:00 to 14:00, with no work on Sundays or bank holidays.

7.3.3 The likely traffic flows and HGV content have been estimated based upon the following assumptions:

- For the clearance works, it is known that about 87,000 m3 of contaminated material would need to be removed and some 26,500 m2 of buildings would need to be demolished.
- The number of HGVs required for demolition has been calculated assuming 1 ton of demolition material per square metre demolished, an average of 17 tonne load per HGV, and 15% extra HGVs for other demolition contingency.
- For the 87,000 m3 of contaminated material, the number of HGVs has been calculated as an average of the calculations made by volume (assuming a bulk factor of 1.3 and 14 m3 of HGV capacity) and by weight (assuming 1.4 kg/m3 density and 17 ton load per HGV). It is further assumed that the clearance works progress linearly over the clearance period.
- The number of HGVs required for all other works (utilities, roads, and construction) has been based on rates from previous experience.
- In addition to the HGV movements, there will also be car and light goods vehicles movements during the demolition and construction phases, mainly associated with workers coming onto the site and other deliveries. The number of workers per day at any given time for each of the different works (clearance, utilities, roads, and construction) has again been derived from previous project experience and professional judgement. It has been further assumed that all worker movements are by car/van with an occupancy factor of 1.5.
- All construction-related vehicles have been also assigned two trips a day (outbound and return).
- For the demolition and construction works, 269.5 working days a year have been considered (49 weeks of 5.5 days of work per week).
- Construction of new residential development at a rate of approximately 100 units per annum from 2023.
- Construction of the commercial development would be undertaken over a 6- year period as a worst-case assumption, over the phases identified in Table 7-1.

7.3.4 An analysis of the construction schedule shows that there are two phases, each lasting approximately one year, when traffic associated with construction/demolition is likely to be greatest. These periods have been highlighted in red in Table 7-1 and are as follows:

- 2023, when the utilities' works much of the development would be under way along with the major road works, refurbishment of the retained buildings and construction of new commercial and residential phases. It has been assumed that the retained QinetiQ operations would be occupied along with 50 residential units.
- 2024,In terms of occupation in addition to what has been stated above for 2023, it has been assumed that there would be an update of 200 jobs and 100 additional residential units would be occupied.

7.3.5 The results obtained for these periods under the above assumptions, in terms of annual average weekday traffic (AAWT) and their corresponding HGV content, are summarised in Table 7-3.

Period	AAWT	HGVs	% HGV
2023	230	109	47%
2024	132	15	12%

Table 7-3 Demolition and construction traffic flows and HGV content

7.3.6 As can be seen, the highest volume of construction/demolition traffic is generated in 2023, when the most intensive construction works (mainly roads and utilities) take place. A total of 230 construction related vehicle movements are generated per day, of which 109 are HGVs. This represents approximately 11 HGVs per hour on an average weekday if these trips are assumed evenly distributed over the ten working hours (08:00 to 18:00). This represents a negligible impact on the local highway network. Furthermore, the Construction Management Plan will ensure that these trips are spread out and avoid the peak hours.

7.3.7 The above analysis is based solely on construction flows. However, if the occupation of completed early phases of the development is taken into account, then the busiest period would be in 2030 just prior to the completed and fully occupied stage of the development. However, the impacts associated with this final phase of construction are not considered to merit further assessment as the majority of traffic generated would relate to the occupied elements of the development and not the construction activity. Additionally, once the development is fully occupied, there will be a higher level of trip generation compared to 2030 just prior to full occupation.

7.4 Construction Trip Distribution and Assignment

7.4.1 In the absence of more detailed plans, a proposed construction route has been assumed from the M25 (junction 4) along the A224 London Road and into the site through Polhill access. Furthermore, it is considered that no construction traffic will be allowed to use the Star Hill access but would be required to use the main access onto A224 Polhill. The construction phasing programme has taken this likely requirement into account. These arrangements are intended to minimise the impact of HGV traffic during the demolition and construction period on the rural lanes that are served by the Star Hill access (in particular Star Hill Road) and on other local and secondary roads, by ensuring that the construction vehicles use the most direct route to the strategic road network (M25) and A21.

7.5 Construction Management Plan

7.5.1 A Construction Management Plan (CMP) will be prepared and implemented prior to the construction stages of the development to ensure that construction is undertaken in a way that will minimise its impacts as far as is practical upon the local community. Generally, this can be achieved by:

- Encouraging construction workers to travel by non-car modes to the site;
- Promoting smarter operations that reduce the need for construction travel overall or that reduce or eliminate trips, particularly those in peak periods;
- Encouraging greater use of sustainable freight modes;
- Encouraging use of greener vehicles;
- Managing the ongoing development and delivery of the CMP with construction contractors;
- Communication of site servicing/delivery facilities (through dissemination of information) to workers and suppliers; and
- Encouraging the most efficient use of construction freight vehicles.

7.5.2 It is proposed that the following principles that were agreed as part of the OPP are also included as part of the proposed development and incorporated in the CMP:

- In order to reduce the effect of construction traffic, bulk transit trips (such as muck away and steelwork delivery) will be undertaken during off-peak periods only. It is not anticipated at this stage that any lane closures will be required, but if they were to take place, they would be minimised and would not occur during peak periods.
- The hours of work are likely to be 08:00 to 18:00 Monday to Friday, 08:00 to 14:00 on Saturday; and no working on Sundays or bank holidays. Night-time (23:00 - 08:00) or out-of-hours works are not envisaged to be required.
- The principal contractor will co-ordinate all deliveries and collections to/from the site, and ensure that:
  - All delivery and collection vehicles are aware of the proposed routing;
  - Prior to a delivery or collection, hauliers will notify the relevant authorities in accordance with the Road Vehicles Authorisation of Special Types General Order 2003 if required;
  - Liaison will be undertaken with occupants of adjacent buildings to avoid delays to service deliveries due to construction vehicles; and
  - Deliveries will be made on a 'just in time' basis and to designated areas within the site. If for any reason it is necessary to load and unload outside the site boundary, the details and procedure for this will be agreed in advance with the relevant authorities.
- A construction route is proposed along Crow Drive, to the north along the A224 London Road to Hewitts roundabout and then either west towards Bromley along the A21, north towards Orpington along the A224 or east towards the M25. This is designed to minimise the impacts on the rural lanes served by Star Hill Road and to the Kent Downs AONB. No construction vehicles will be permitted to use the Star Hill access.
- A construction staff travel plan will be prepared and implemented prior to commencement of any construction activities on site. This will highlight how construction staff can access the application site by sustainable modes of transport. The aim of the construction staff travel plan is to minimise the need to access the site via private car.

7.5.3 The Construction Management Plan will be offered as a Planning Condition.

7.6 Summary

7.6.1 The indicative construction programme and resulting trip generation during the peak periods of construction have been shown in this section.

7.6.2 Based on the assumptions and methodology adopted, the peak year of construction is expected to be 2023 when 230 (AAWT) vehicles and 109 HGVs are expected daily. This level of traffic is expected to have a negligible impact on the highway network.

7.6.3 A Construction Management Plan (CMP) will be prepared and implemented prior to the construction stages of the development to mitigate any potential impact. A CMP is offered as a Planning Condition to be outlined in the planning permission when granted.

8 Sustainable Transport Strategy

8.1 Introduction

8.1.1 Overall, the transport strategy for the site will be in line with key policy objectives and will focus on the following key challenges for the site:

- Limiting the highway impacts of the proposed development
- Manage the impact of the proposed development on the Kent Downs AONB;
- Provision of realistic alternatives to private vehicles for a range of journey purposes; and
- Improving the integration of the site with the surrounding community.

8.2 Walking and Cycling

8.2.1 The design of the proposed development prioritises the movement of pedestrians and cycles within the site so as to ensure that the majority of internal trips are made on foot or by bicycle.

8.2.2 The Access and Movement Parameter Plan included within Appendix F, highlights the key pedestrian and cycle routes through the site. This includes a cycle route through the site to link the two site access points (Polhill and Star Hill) as well as a further pedestrian / cycle route towards Knockholt Pound linking the centre of the site to Birchwood Lane. The latter proposal was discussed with the KCC PRoW team at a meeting and would take the form of a walk/cycleway that sits alongside PRoW SR172.

8.2.3 Local facilities will be provided within the Village Centre which is within easy walking distance to all parts of the development. The maximum walking distance to the centre will be approximately 5 minutes and therefore it is anticipated that most if not all trips to the centre would be made by foot or by cycle.

8.2.4 The detailed design of the site layout will be in accordance with best design principles as set out in Manual for Streets and Kent Design. All roads within the residential parts of the development will be designed to allow the implementation of a 20 mph zone.

8.2.5 It will also be important for the developer to work closely with KCC in order to improve external connections, where possible. This includes the provision of on-street cycle lanes on London Road to link Otford Lane with the existing advisory cycle lanes on Old London Road. KCC requested the exploration of an off road cycle route between the site and Knockholt Train station with a cycle hub requested between the station and the site and at the station. The request is for both traditional and electric cycles. It has been requested by KCC that consideration be made to stop cars parking across the cycle route on Old London Road. It is suggested that double yellow lines be implemented along sections of Old London Road to ensure that the cycle route is kept clear from parked cars. This matter would be dealt with through a TRO process following grant of planning permission.

8.2.6 As set out earlier in this report (please see paragraph 2.7.17) KCC has requested consideration of the feasibility of a new cycle route between Polhill and Knockholt station.

8.2.7 This feasibility study can be found in the Stantec Technical Note at Appendix I . The following conclusions are drawn from the assessment:

It is concluded that an off carriageway two-way cycle route between the development site and Knockholt rail station, running along the A224 and Old London Road, is constrained by land and physical features that would unfortunately render the proposal undeliverable. Review of

PIA data confirms that cyclists are not significantly impacted at commuting times, with anecdotal information suggesting that the majority of accidents involve fast traveling sports and competitive cyclists, where online evidence shows they frequently use the locality.

8.2.8 The route currently includes advisory cycle lanes on Old London Road, and the development includes proposals to include further advisory cycle lanes on the A224 between Shacklands roundabout and the Polhill site access. These advisory cycle lanes appear to be functioning safely at the current time and would include a range of signage and other marking to ensure they operate safely. Signage warning vehicle drivers of cyclists is recommended to cater for the demand from the development and also existing cyclist users.

8.2.9 In addition, cycle use would be encouraged through the provision of excellent cycle parking facilities on site and a cycle hire scheme being developed with the sustainable transport initiatives provider Enterprise, who have been approached to put together a package of measures for the site. These details will be provided to the authorities in due course.

8.2.10 Using the trip generation rate and modal split outlined within the report, it is expected that for the 185 units (additional to the 450 units already with permission) that the following trips would be generated for cyclists.

Time	Person Trip Rates (per unit for 185 Units)		
	Arrive	Depart	2-way
08:00 – 09:00	1	2	3
17:00 – 18:00	4	1	5

Table 8-1 Cyclist Trip Generation for 185 Units

8.2.11 As can be seen there is predicted to be approximately 3 additional two way cycle trips in the AM peak and 5 in the PM peak. Although this does not account for the number of people who could be cycling to the train station and then travelling by train to their destination. As the addition 185 units is predicted to generate 18 two way people travelling by train in the AM peak and 6 in the PM peak, it is anticipated that a small percentage of these would cycle to the station.

8.2.12 It is not considered that the cost associated with providing an off road cycle route is justified for the small numbers of cyclist anticipated to be generated from the additional units. Given the OPA for 450 units is to provide an on road cycle route (the advisory road marking cycle scheme) it is considered that it is not necessary to provide an off road route for a small increase in residential development. As such the on road advisory routes in place and proposed along Old London Road is considered to be sufficient.

8.3 Public Transport Strategy

8.3.1 The poor public transport connectivity of the existing site has been highlighted in Chapter 2 of this report. Based on the findings presented, it is evident that the key opportunity for the provision of sustainable public transport would be a viable bus service to and from the site which would provide a favourable alternative than using a car to access rail services and other local facilities. It is also important for the strategy to be financially viable in the long term to ensure the service does not fall away once the developer 'pump priming' is exhausted.

8.3.2 As part of the OPP, various options for the provision of bus services were considered and it was agreed that the preferred strategy would be to provide the new community with access to the 402-bus service and also provide a new independent DRT service.

8.3.3 As part of the application lodged in 2019, further discussions had taken place between KCC's public transport team and Go Coach who are the operators of the existing 431 (now service 3)

bus service, the existing shuttle bus link to Fort Halstead. Consequently, it has been agreed by all parties that the best strategy would be:

- Diversion of the existing No. 3 bus service into the site; and
- Providing a new DRT service from the site.

8.3.4 The diversion of the No. 3 bus service has been fully supported by both KCC's public transport team and Go Coach. The bus service would route through the internal site via the primary road, as highlighted in the Access and Movement Parameter Plan included within Appendix F.

8.3.5 In relation to the DRT bus service, the proposed service consists of two minibuses operating on Monday to Friday, providing timetabled links to local railway stations for commuters and a demand responsive flexible service in the inter-peak period. There is no commitment at this stage to what exactly the demand responsive flexible service would provide. It is possible for the service to be amended to popular routes as demand changes, providing flexibility in the service but there is no concrete service for this service at this stage of the application. It has been left deliberately flexible to be able to meet the demands that come at a later stage, to fix this service now, could lead to provision of a service that is not required and therefore become unviable. As such this would provide a key service for the development and would be beneficial as offers flexibility to be decided later in the planning process. It is accepted that a condition may be sought to ensure this service is provided.

8.3.6 Prior to the delivery of a primary school on the site (which will be led by KCC), the DRT bus service would provide links to local primary schools. It is not unreasonable to see primary school aged children offered a bus service to get to school given that the Government and KCC offer free travel for children of both primary and secondary school age. The buses used for school children would only be available for passengers related to the school to ensure that parents feel comfortable sending their children to school on this service.

8.3.7 Once the school is open, these journeys would no longer be required and the hours of operation of the flexible demand responsive service could be extended, and potentially include a service to bring other children to the new primary school, depending upon demand and other uses in which the shuttle service is employed. It is noted that school services currently route via Star Hill Road, and these could play a role in the movement of school children to and from the site.

8.3.8 Initially, during the early stages of build-out, when demand is low the service could be provided by a single minibus. The timetable for this service would be able to react to the needs of occupiers of the development, so as the development is built out changes can be made to destinations and timing so that the maximum number of journeys can be catered for sustainably. It is envisaged that a Management Plan is put forward prior to the commencement of the service, setting out how demand will be monitored and changes agreed. This role could be carried out as part of the role of a Community Management Organisation (CMO), which is common on new developments (CMO's are in place in Ashford for instance associated with the Chilmington Green development, and at Kings Hill near West Malling).

8.3.9 The proposed indicative timetables are included in Appendix M. The timetable has been developed to align commuter train times with the drop off at Knockholt station to limit wait times, providing a comfortable, reliable and frequent service that would be more attractive compared to public bus provisions. This would provide a realistic and attractive alternative to driving to the station, therefore reducing single car occupancy trips below that forecast as a worst-case assessment earlier in this report.

8.3.10 A financial viability assessment of the proposed DRT bus service has been undertaken and included within Appendix M. This sets out the forecasted demand for the bus service and the total support required to run the bus service until the service is self-sufficient. Overall, it has

been forecasted that the service would make a surplus of £24k per year on completion of build out. In terms of funding for the bus service, an appropriate trigger in relation to the level of occupation will be agreed with KCC to ensure that funds are used effectively.

8.3.11 It should be noted that the highway impact assessments undertaken within Chapter 6 do not include the bus mode share uplift associated with the DRT, and is therefore overly robust. In practice, it is expected that the bus service would significantly increase the public transport mode share for the commercial development.

8.3.12 A scheme such as the Enterprise sustainable hub would be explored for the site, which could provided additional sustainable travel options for users of the site. This could include a car club, car and van hire, cycle hire and app based Mobility as a Service (MaaS) solutions. Further detail is given in the Travel Plan. Such solutions make travel by means other than the private car much simpler and efficient by providing access to a package of measures, all operated under one provider within a simple monthly payment package. Users are able to craft their own package in accordance with their needs, making it possible to change services month by month, much like other internet based subscription services. The benefit of this would be the potential for much greater use of the shuttle bus for instance, and a reduction in the number of private vehicles owned. The service is fully flexible into the future therefore allowing for new technologies to be introduced under the one umbrella.

8.4 Travel Plan

8.4.1 Travel Plans aim to encourage sustainable forms of transport and minimise reliance on single occupancy car journeys through measures which typically include:

- Public transport initiatives such as the proposed DRT;
- Facilities to encourage walking and cycling;
- Car sharing initiatives; and
- Parking management strategy including initiatives to encourage car sharing.

8.4.2 A site-wide Framework Travel Plan (FTP) was prepared as part of the OPP. This OPP FTP has been updated to reflect the current development proposals and has been included within Appendix N. The FTP sets out the overarching principles that will guide the development of the more detailed Travel Plan that will be provided and agreed with the Planning Authority prior to the occupation of any part of the new development. The overall principles of the FTP have been re-iterated in this section.

8.4.3 The Travel Plan will be managed by the overall site wide Travel Plan Coordinator (TPC). He/she will also be responsible for the management and review of the site wide car park management strategy. This will include the management of any yellow line regulations that may be required within the site and any on-site parking bays. At this stage it is proposed that the majority of streets will be adopted and therefore what role the Highway Authority may have in enforcing any on-street regulations. It is proposed that the whole estate be designed to adoptable standards and it is anticipated that, as a minimum, the main spine road linking the two access points and which will be adopted.

8.4.4 Figure 8-1 below sets out the likely structure of the Travel Plan.

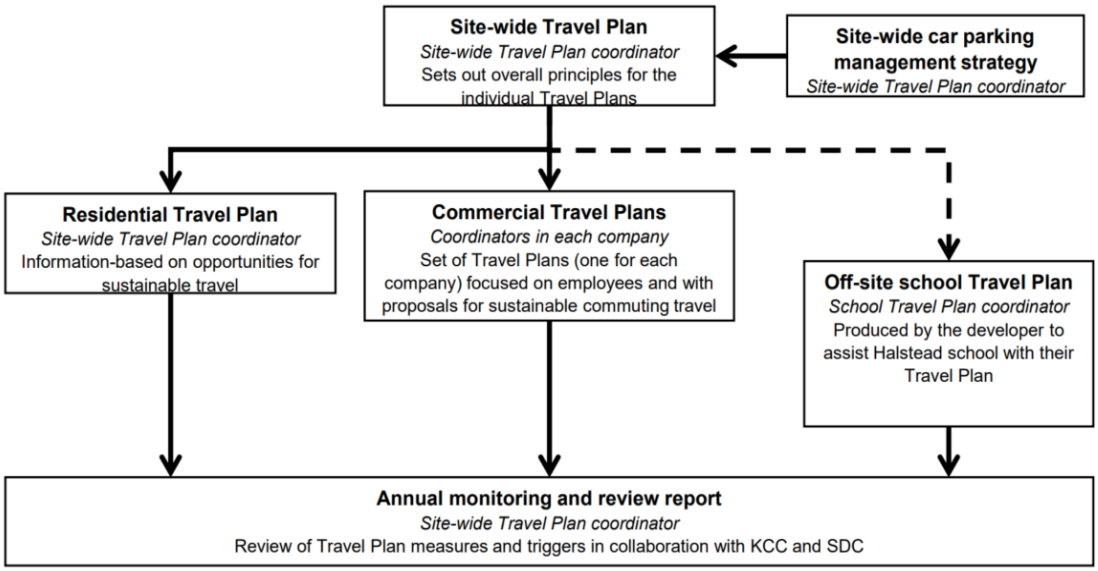

Figure 8-1 Indicative Travel Plan Structure

8.4.5 The site-wide Travel Plan will be based on the following principles:

- The subsequent stages of masterplanning and detailed design would continue to encourage the use of active modes (walking and cycling) and adoption of sustainable travel patterns.
- Within the residential development, the masterplan is designed to meet the criteria of a 20 mph zone. Furthermore, safe and direct walking and cycling routes are provided within the site, including good quality crossings, to ensure pedestrian and cycle permeability and encourage these modes.
- Realistic alternative means of access to the car will be provided. This includes the provision of new bus services which include a DRT through the development and the diversion of the 431 (now No. 3 service) bus service through the site.
- A comprehensive parking management strategy that prioritises and promotes more sustainable vehicles. For instance, cycling parking with be provided at least to the minimum standards and will be conveniently located to promote its use. In terms of car parking, provision would be restricted to maximum standards and electric vehicle charging facilities would be provided.
- Information about sustainable transport options tailored to the occupants for each of the different elements of the development.
- A firm implementation and monitoring strategy. The developer will appoint an overall site wide Travel Plan Co-ordinator to establish monitoring and review dates, including surveys and data collection where necessary, which should be applied and further detailed on the land use specific travel plans, which also will need a coordinator and interim reviews.

8.4.6 Beneath the site wide plan, individual plans will be prepared for the residential element of the development, the primary school on site and by individual businesses which will need to confirm the principles set out in the overarching plan. KCC have requested that the new primary school should produce a separate School Travel Plan (in co-ordination with the “Jambusters” website) prior to opening. This would outline key principles for the school in line with the Framework Travel Plan for the whole site.

8.4.7 More detail for specific measures can be found within the Framework Travel Plan.

8.4.8 The site wide TPC will also be responsible for preparing an annual Monitoring and Review Report. This will set out the outcomes of the measures including the actual mode share achieved by each land use against the targets set in the initial Travel Plan. The targets would be agreed with KCC prior to the occupation of the site.

9 Summary and Conclusion

9.1 Summary

9.1.1 Stantec has been commissioned by Merseyside Pension Fund to support a Hybrid Planning Application (HPA) for the redevelopment of Fort Halstead, to provide development of up to 635 residential units; 27,659 sqm of commercial space for B1a/b/c uses accommodating approximately 1,438 jobs; a one-form primary school onsite; a mixed-use village centre (use classes A1/A3/A4/A5/B1a/D1/D2); and a Historic Interpretation Centre (use class D1).

9.1.2 The existing site has comprised some 97,600 m2 of defence-related research space and currently accommodates 750 jobs for the Defence Science and Technology Laboratory (Dstl) and QinetiQ. At its peak during the 1970s, at least 4,000 people were employed on site and in more recent times by about 2,000 staff.

9.1.3 A Certificate of Lawfulness of Existing Use or Development (CLEUD) was issued in 2004 and based upon this, the development could have accommodated a much higher level of employment than is currently proposed. Furthermore, assessments carried out in this TA show that the existing floorspace, if utilised by commercial operators, could generate significant levels of vehicle trips onto the highway network via the existing access points at Polhill and Star Hill. This scenario is set out as an Alternative Baseline within this assessment, with the effects carried through the trip and traffic modelling impacts report sections for comparison purposes.

9.1.4 In December 2015 Sevenoaks District Council (SDC) granted outline permission (subsequently referred to as the OPP) for the regeneration of the Site by an employment led, mixed use development with up to 27,000 sqm of B1/B2 employment uses, up to 450 houses and a hotel. This application has since been implemented by way of demolition, but no development has so far been built out or occupied pursuant to reserved matters application.

9.1.5 The site is currently less well connected to public transport services and facilities. In recent years, Dstl has provided a private shuttle bus service that operates during the morning and evening peak periods only which provides a link to and from Knockholt and Orpington stations. The site is well connected to the local and strategic road networks, with easy access to the M25 at Junction 4 and also to the A21 for access towards Bromley.

9.1.6 The scope of works, methodology and principles of assessment for this TA have been determined through ongoing engagement and detailed pre-application discussions with KCC and SDC officers. This approach has ensured that this development scheme accords with relevant national, regional and local guidance and policy.

9.1.7 The development proposals have been determined with careful consideration on the extensive public consultation that was undertaken as part of the 2015 OPP. The TA has shown that the impacts of the highway network would be negligible or minor and has identified a proposed a range of mitigation measures to manage any residual minor effects.

9.1.8 As part of the 2015 OPP, various mitigation measures were agreed in order to manage the transport related impacts of the development and to minimise the environmental impacts and adverse effects on the local community. These measures have mostly been taken forward for the current application or improved upon. The list of mitigation measures include:

- Star Hill Road Access - This includes improvements to visibility splays, junction geometries and warning signs and anti-skid surfacing placed in appropriate locations;
- Otford Lane/A224 Junction - The roundabout improvement scheme that was approved as part of the 2015 OPP.

- Star Hill Traffic Calming - It is proposed that the previously agreed 40mph speed restriction along Star Hill is maintained. As stated above, there will be junction warning signage provided on Star Hill Road and there will be an improvement to visibility splays related to the Star Hill access junction.

- Star Hill Road/Rushmore Hill - Periodic monitoring of traffic flows along this link is proposed to inform if the developer should be required to design additional traffic calming measures.

- Pedestrian and Cycle Mitigation - The development would provide enhanced connections to the existing rights of way and will have new access routes though the site for the benefit of the wider community. This includes connections to the existing footways which provide access to Knockholt Village. The development would also improvements to the existing bridleway between Polhill and Twitton. In terms of cycle access, on-street cycle lanes on London Road would be provided to link Otford Lane with the existing advisory cycle lanes on Old London Road which provide access towards the Knockholt Station.

- Public Transport Improvements – The main public transport improvements include the Diversion of the existing No.3 bus service into the site and provision of a new DRT minibus service from the site.

9.1.9 A detailed site-wide Travel Plan will be submitted and agreed with the Planning Authority prior to the occupation of any part of the new development. This will aim to encourage sustainable forms of transport and minimise reliance on single occupancy car journeys.

9.2 Conclusions

9.2.1 The trip generation analysis undertaken for the proposed development highlights that the proposed development would result in a modest increase in the trip generation compared to the consented OPP. However, in comparison to historic levels of trip generation and the potential of the existing site based on the available CLEUD footprint area, the proposed development would not lead to a trip increase during the AM or PM peak hour.

9.2.2 Based on the traffic assignment, there will be a modest increase in flows at the Star Hill access compared to the levels reported within the OPP TA. The traffic assignment method is likely to under-estimate the number of trips using the main Polhill access as it does not consider the deterrence factors associated with routing via narrow country lanes other than speed. Additionally, the trip generation analysis based on the available CLEUD footprint area has shown that the potential level of trip generation from the existing site without any development could match and exceed the levels predicted with a comprehensive development of the site. It is also the case that the removal of security from the Star Hill access, scheduled to happen in 2022, would allow unfettered public access through the site and for any current site users to utilise any access point. Under this scenario the effect of the site redevelopment would be considered de minimis. It should be noted that these modelling assessments are a worst case scenario as they do not factor in the fact that there is a primary school on site, the shift of trips to public transport and also that people living on site may also work on site.

9.2.3 A percentage impact assessment has been undertaken on links on the local highway network. This has shown that almost all of the links assessed have negligible or minor percentage impacts associated with the proposed development and that all links assessed will operate within capacity.

9.2.4 Local junction modelling of 8 key junctions including both site access junctions have been undertaken which has shown that all junctions except Hewitts Roundabout and the A224 Polhill junction/ Pilgrims Way West Link Road junction would operate comfortably within the maximum desirable capacity.

9.2.5 At both Hewitts Roundabout and the A224 Polhill junction/ Pilgrims Way West Link Road junction, the development proposals result in reduced flows and improved junction performance compared to the Without Development scenario. The reduction in flows is due to the use of the Star Hill access as a secondary access point which is not used in the without development scenario due to the 2015 OPP restriction. This results in better distribution of flows for the low level of traffic routing via areas to the south of the site. As such, the use of the Star Hill access results in highway capacity improvements when compared to the Without Development Scenario.

9.2.6 The proposed Otford Lane/A224/ Crow Drive roundabout design which was agreed as part of the 2015 OPP has been tested and found to operate within capacity and with minor levels of queuing and delay.

9.2.7 It has been shown that the net development flows on the M25 Junction 4 slip roads are low and that the flow increases are within the ranges of daily variation in flows. A Merge and Diverge Assessment has been carried out to assess the viability of the current road layout with the addition of the development traffic flows at M25 J4 and M25/A25/A21. At M25 J4 both the northbound and southbound merges have layouts designed to cope with a higher volume of flows than the proposed development would generate. This is replicated in the northbound diverge.

9.2.8 Overall, it has been shown that the proposed development at Fort Halstead would not have significant residual impacts on the transport network during either construction or once the site is fully occupied. Based upon the proposed mix of uses and the improvements measures that have been outlined in this TA, the proposed development would be sustainable in transport terms and in accordance with policy at a national and local level.