9. Sustainable Transport Strategy

9.1 Introduction

9.1.1 Planning policy and wider travel trends all point towards the need and potential to reduce car-dependency and increase the uptake of sustainable transport in the context of not only the 'climate emergency', but also in terms of healthier lifestyles and management of existing highway networks. This has informed the STS for the proposed development, which aims to minimise the level of traffic generated by the development, and to achieve a substantial reduction in existing traffic through encouraging mode shift to offset traffic generated by the proposed development, the effects of which are accounted for in the travel demand forecasting for the proposed development at **Chapter 10**, and changes in background traffic levels at **Chapter 12**.

9.1.2 This chapter sets out how the STS will ensure that the need to travel in the first instance is greatly reduced and a range of sustainable measures are available to residents and visitors.

9.1.3 The strategy will integrate the development into the local area and connect with planned interventions which are being delivered by third parties, in accordance with the TTS.

9.1.4 The STS adopts a hierarchal approach to transport mitigation, consistent with the requirements set out in Paragraph 110 of the NPPF, specifically:

- Reducing the need to travel through providing high quality local facilities (including education and commercial uses);
- Enabling and enhancing the opportunities for travel by sustainable modes, including walking, cycle and public transport; and
- Providing infrastructure to meet the needs of existing communities and accommodate economic growth in a coordinated and strategic fashion.

9.1.5 Paragraph 110 of the NPPF also references the need for development to *"be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations."* This forms a key component of the STS.

9.2 Mode Share

9.2.1 This scheme will be constructed on the basis of sustainable development, encompassing a range of complementary land uses. Pedestrian and cycle routes have been designed into the masterplan and bus services will penetrate through the site. Mode share will therefore be considered based upon the following interventions:

- Working from home / within hubs / smart working to remove the need to travel at all;
- Design of cycle and pedestrian routes intrinsic to the development to follow key desire lines between land uses;
- Cycle schemes;
- TP interventions;
- Implementation of strategic bus routes and infrastructure;
- Car Clubs and associated infrastructure; and
- Mobility hubs, which will provide a recognisable place with an offer of different and connected transport modes supplemented with enhanced facilities and information features to both attract and benefit the traveller (discussed further in this chapter).

9.2.2 It is anticipated that the level and type of intervention proposed will reduce the number of car trips generated by the development and enable some existing car journeys to transfer to sustainable modes. Furthermore, additional benefits in terms of mode shift will be delivered by third parties and / or the Council as part of desired interventions for the wider area such as potential improvements to sustainable routes or changes to the local highway network. This will be considered in the future year scenarios where appropriate.

9.3 Aim of the Sustainable Transport Strategy

9.3.1 The aim of the STS is to minimise the level of traffic generated by the development, and to achieve a substantial reduction in existing traffic through encouraging mode shift to offset traffic generated by the proposed development. This will be achieved through on-site deliverable measures and potential improvements to the local highway network as planned for delivery within the TTS.

9.4 Reducing the Need and Length of Travel

9.4.1 The primary approach to the STS is to reduce the need to travel off-site for future occupiers and users of the development. This includes all forms of travel. Additionally, locating facilities in close proximity reduces travel distances which increases the opportunity for those journeys to be made by active travel modes.

Trip Internalisation

9.4.2 The development will provide a substantial level of complementary land uses and facilities which will mean that many trips which would otherwise take place on the external highway network will occur solely within the development and will have greater opportunity to be made on foot or by cycle. Examples of this are primary school trips which are expected to occur almost exclusively within the development.

9.4.3 The various land uses will also benefit the surrounding communities and whilst trips from the local area to / from the site will be external to the site, the journey distance will be reduced and the walking, cycling and public transport infrastructure proposed will provide the opportunity for these trips to be undertaken by non-vehicle modes.

9.4.4 The internalisation factors applied to each of the proposed land uses and the rationale for this is shown in **Chapter 10** of this TA.

Location of Specialist / Key Worker Dwellings

9.4.5 The masterplan includes specialist and key worker dwellings positioned to the east of the development site to be within easy walking / cycling distance of RCHT. This will reduce the requirement for key / specialist workers to travel by car owing to the short journey times available via walking or cycling. These movements will be supported by walking / cycling routes between the development and RCHT.

9.4.6 The internal walking / cycling routes will provide convenient journeys by non-vehicle modes for residents who also work at the proposed office development, or the employment opportunities available at Threemilestone. No specific reduction has been applied to account for this in the STS.

Home Working

9.4.7 The development will provide the necessary telecommunications infrastructure to allow for remote working for many future residents, for some or all of the time. This will reduce the number of commuting journeys via private vehicles during the AM and PM peak hours. It is anticipated that this will reduce traffic generation for the office and professional / financial services sectors; this has been accounted for in the relevant land uses and is discussed further at **Chapter 10**.

9.5 Enabling Sustainable Travel

9.5.1 The second stage of the STS is enabling the update of sustainable modes of transport amongst future occupiers of the site. The measures seek to reduce the prevalence of trips made via private vehicle modes and replace them with journeys via walking, cycling and public transport.

Walking and Cycling Infrastructure

9.5.2 The proposed development will provide walking and cycling infrastructure across the development site and connecting to the surrounding areas. Internal infrastructure will include footways, cycleways and other dedicated routes to provide accessibility between land uses within the site and promote walking and cycling for internal journeys. The internal highway network will be designed to accommodate pedestrians and cyclists through measures such as traffic calming and speed reduction features on primary vehicle routes, and elements of shared space in residential areas. The on-site walking and cycling network will connect with the wider network surrounding the site, together with potential improvements to the existing network, as discussed below.

9.5.3 The NAR will be an 'avenue' style of road incorporating trees, on-street parking, continuous footways and a segregated cycleway rather than a standard estate road. The road network will be pedestrian friendly, with a 20mph speed limit wherever possible. The aim will be to provide walkable neighbourhoods, connected by sustainable transport measures.

9.5.4 The cycling network will need to cater for the growing demand of e-bikes. The development will include suitable charging and docking stations throughout. Home charging will be considered with details to be agreed during the RMAs.

Public Transport Infrastructure

9.5.5 A new bus service will be provided to connect the proposed development with key destinations in Truro including RCHT, NCH, Truro Railway Station and the City Centre. This will be pump-primed during the build-out of the development to ensure that an appropriate and attractive service is available to users of the development at all phases. Analysis has identified that provision of five services per hour (i.e. service frequency of every 12 minutes) is likely to be commercially viable at the full build-out of the development and will accommodate passenger demand generated by the proposed development.

9.5.6 In order to kick-start development, a temporary access road will be constructed from the A390 into the development (the ILR).

9.5.7 Upon opening of the NAR, the section of the ILR to the south of the western development plot access will be restricted to buses only (controlled by a bus gate, providing bus priority onto the A390), with the ILR to the north of this location retained as vehicular access to the adjoining development plots. A bus gate can stop vehicular rat-running and provides a direct and prioritised desire line for buses and cyclists, thus improving reliability and attractiveness of public transport services.

9.5.8 The proposed development includes an extension (600 spaces) to the existing Langarth P&R, increasing capacity to 1,809 spaces in total. This will enable increased usage of the P&R facility, reducing onward car travel to key destinations. This will be funded through financial contributions secured under a Section 106 agreement.

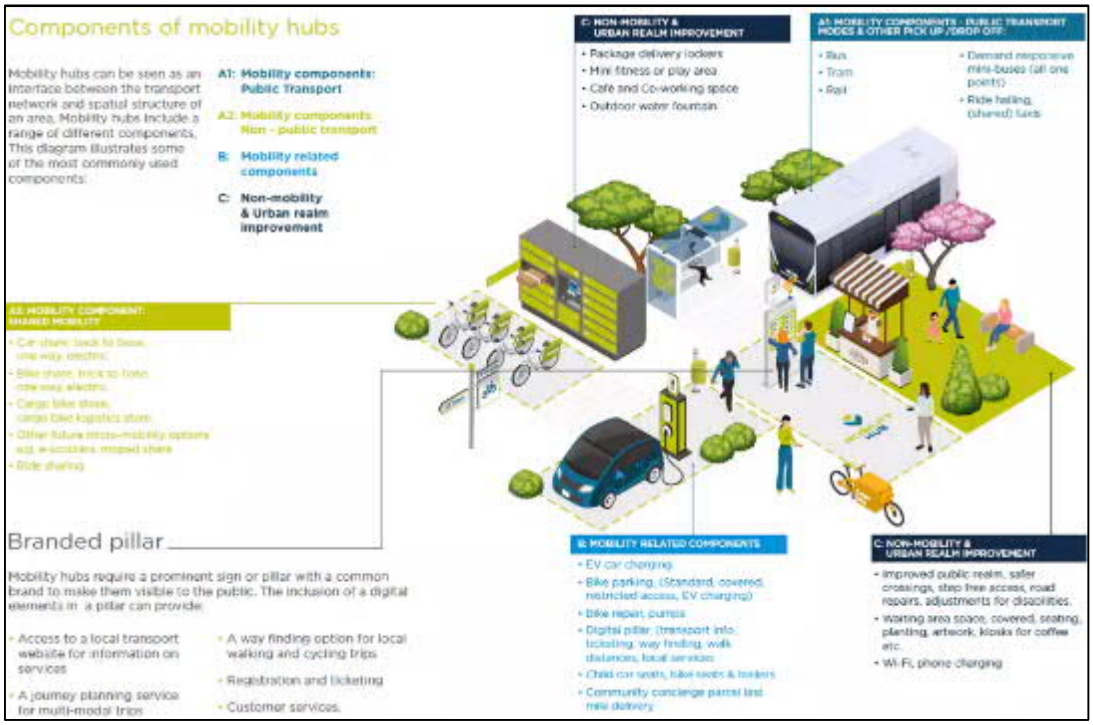
Mobility Hubs

9.5.9 A mobility hub is designed and is spatially organised in an optimal way so as to facilitate access to and between transport modes, including human-powered and shared modes, as well as providing extra transport-related and digital services. Key characteristics include:

- Co-location of public and shared mobility modes;
- Design of space to reduce private car space and enhance the surrounding public realm; and
- A pillar or sign which identifies the space as mobility hub which is part of a wider network and ideally provides digital travel information.

9.5.10 The general concept and features of a mobility hub are shown in **Figure 9-1**. The proposed development will include provision of mobility hubs within the site, to include Car Club provision, and parking and charging facilities for EVs and e-bikes. This is likely to include a combination of larger hubs at key centres of the development and smaller hubs at satellite locations, as shown in **Figure 8-2** and at **Appendix B**, with details to be determined through RMAs.

Figure 9-1: Mobility Hub Concept



Travel Planning

9.5.11 The proposed development is supported by a FTP, which sets an overarching strategy for the adoption of sustainable transport across the entire development and forms the basis for subsidiary TPs to be prepared for each portion of the development as they are occupied. Residential, employment and education TPs will be prepared in full and submitted to CC within three months of first occupation of each of those land uses.

9.5.12 The core aim of the FTP is to have a positive influence on the travel behaviours of all users of the development by maximising opportunities for trips to be made using sustainable modes. Indicative mode share targets are:

- To reduce residual residential single-occupancy vehicle trips by 6% over five years, 10% over the life of the FTP;
- To reduce residual employment (staff) single-occupancy vehicle trips by 10% over five years; and
- To reduce residual primary school staff single-occupancy vehicle trips by 10% over five years.

9.5.13 Full information regarding the monitoring, delivery, funding and the measures are included in the FTP, which is submitted as part of this planning application.

9.5.14 Pool cars and bikes can be a valuable asset for essential journeys. Commercial and employment uses will be encouraged, through TP initiatives, to provide pool vehicles as appropriate.

9.5.15 Demand-led transport, such as private taxi hire, can be promoted to reduce the need for car drivers to travel to and from the development site. App based booking can be investigated and advertised where appropriate.

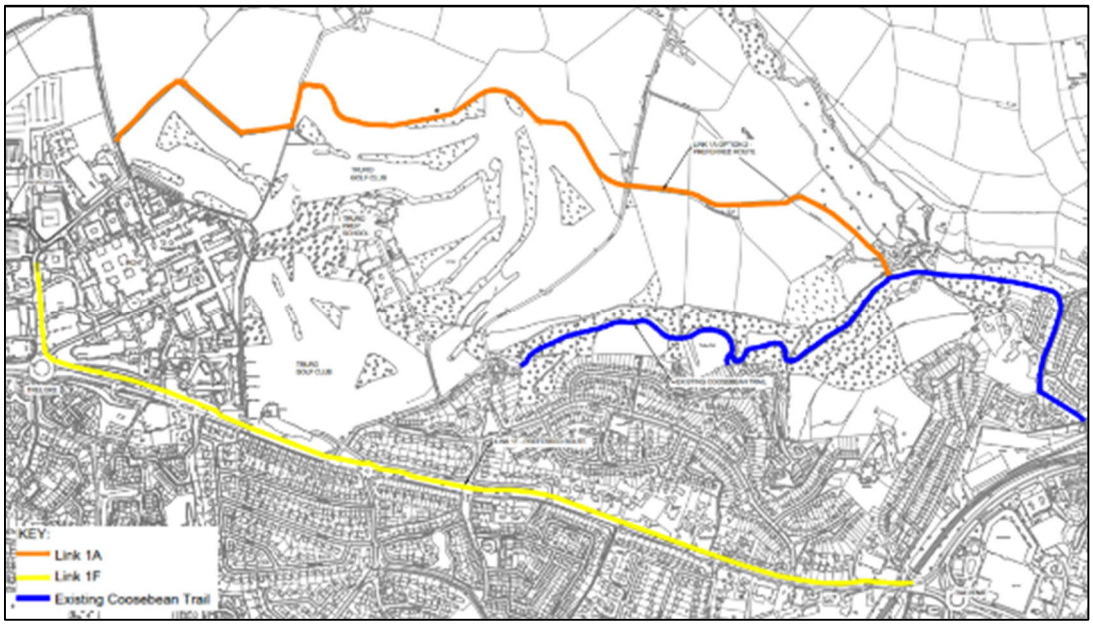
Off-Site Measures

9.5.16 A number of potential off-site measures have been identified that would encourage a shift towards sustainable travel. These include potential enhancements to walking and cycling routes in the local area and provision of facilities at key / end destinations at a similar to those provided within the proposed development. The potential measures could include:

- Controlled crossing facilities on the A390 at Threemilestone (incorporating potential bus priority measures) to provide walking and cycling links to existing community and local facilities;

- Continuous shared footway / cycleway on the north side of the A390, between Threemilestone and Maiden Green junctions;
- On-road cycle route enhancement between Penventinnie Lane (eastern end of the NAR) and Dalvenie Roundabout (NCH) via the A390, incorporating uphill cycle lane on A390 Highertown and eastbound bus gate at Penwerris Road. This is shown as Route 1F in **Figure 9-2**;
- Wider contributions to LCWIP walking and cycling proposals being delivered by CC. This could include an off-road cycle route from Penventinnie Lane (eastern end of the NAR) to St George's Road, Truro, shown as Route 1A in **Figure 9-2** or other walking / cycling improvements in central Truro. This would improve opportunities for future users of the development to use Active Travel;
- Leisure walking and cycling route linking the proposed development and the existing Quiet Lane network to the north of the site, together with permanent restrictions on the Quiet Lane network to reduce 'rat-running' on inappropriate routes and provide additional, safe, leisure routes for walking, cycling and horse riding adjacent to the proposed development;
- Contribution towards provision of e-bike hire system, bikes and docking facilities at off-site locations such as Threemilestone Village Centre, Truro Railway Station and the City Centre (Lemon Quay and Victoria Square). It is anticipated that this would be part of a Mobility Hub Strategy for the wider area and could be delivered through the TTS;
- Contribution towards public realm and transport improvements at Threemilestone Village Centre; and
- Use of future VIP stadium car park for 'Park & Stride' to manage traffic associated primary school drop-off / pick-up.

Figure 9-2: Route Options for Potential Cycle Route between Penventinnie Lane and St George's Road



9.5.17 The level of provision of off-site measures and their delivery will be subject to further discussions and agreement with the LHA. Measures could either be directly delivered by the proposed development or be subject to a financial contribution. Many of these measures are identified as potential interventions within the emerging TTS refresh (discussed below) and could be delivered by CC, with developer contributions sought as appropriate.

9.6 Managing Private Vehicle Use

Parking Supply Management

9.6.1 The proposed development will seek to reduce vehicle movements by managing and limiting parking supply at the residential and office developments. An overarching parking strategy has been developed as part of the Design Codes for the proposed development, so as to establish a consistent approach to the parking provision and management of spaces throughout the development.

9.6.2 The RMAs will determine robust measures for both the residential and office developments to ensure that any supressed demand does not relocate to other locations for example on-street parking or parking on the external highway network. The measures will ensure that this mitigation remains an effective measure to reduce travel by private vehicle.

9.6.3 The trip generation forecasts at **Chapter 10** include reductions in traffic associated with parking supply for the proposed B1 Office use. This is to account for differences in the levels of parking provision for donor sites within TRICS compared with the parking standards for Cornwall.

Car Clubs and Car Share Scheme

9.6.4 The proposed development will provide facilities for car clubs across the internal highway network, with specific details to be agreed during the RMAs. As discussed above, it is envisaged that provision would be incorporated as part of the mobility hubs and other locations within the development, as shown in **Figure 8-2**.

9.6.5 The *England & Wales Car Club Annual Survey* (2017/18) states that a Car Club car will generate on average 33 users with each user reducing their total car trips by 9%. It also states that each Car Club car replaces 6.1 private cars amongst its 33 users, with each private car completing 2.7 trips per week. This evidence has been used to inform reductions in traffic associated with provision of Car Club cars at **Chapter 10**.

9.6.6 It is also proposed that a car share scheme will be promoted within the TP, with specific details to be provided at the RMAs. However, it is anticipated that it will include a system to organise car sharing to key destinations (for example via 'Liftshare' or similar services such as 'BlaBlaCar'). Infrastructural improvements such as car share lanes or parking spaces may be considered as part of RMAs.

Electric Private Vehicles

9.6.7 In compliance with policy requirements, and taking account of climate change, charging infrastructure for private vehicles will be provided throughout the site with suitable infrastructure for the new homes.

9.6.8 Charging hubs will be considered throughout the development with particular attention paid towards the commercial / retail units.

9.6.9 The level and type of EV charging infrastructure will be in line with planning policy requirements at the time of the relevant RMAs.

Home Delivery Services

9.6.10 Delivery collection or drop-off facilities offers flexibility for users and can avoid the need for journeys to be undertaken. Such facilities offer flexible hours of use which discourages individual trips, specifically to deliver / collect goods. Multiple deliveries can be collected or deposited at a single location thus reducing the amount of individual movements that would normally be required.

9.6.11 Provision of such facilities will be made within the proposed development as part of the mobility hubs and other community buildings. This could include provision of 'last-mile' delivery services within the development itself (i.e. between mobility hubs and recipient), such as by cargo bike, or Connected and Autonomous Vehicles (CAVs), depending on the optimal solution at the time of the RMAs.

9.7 External Influences

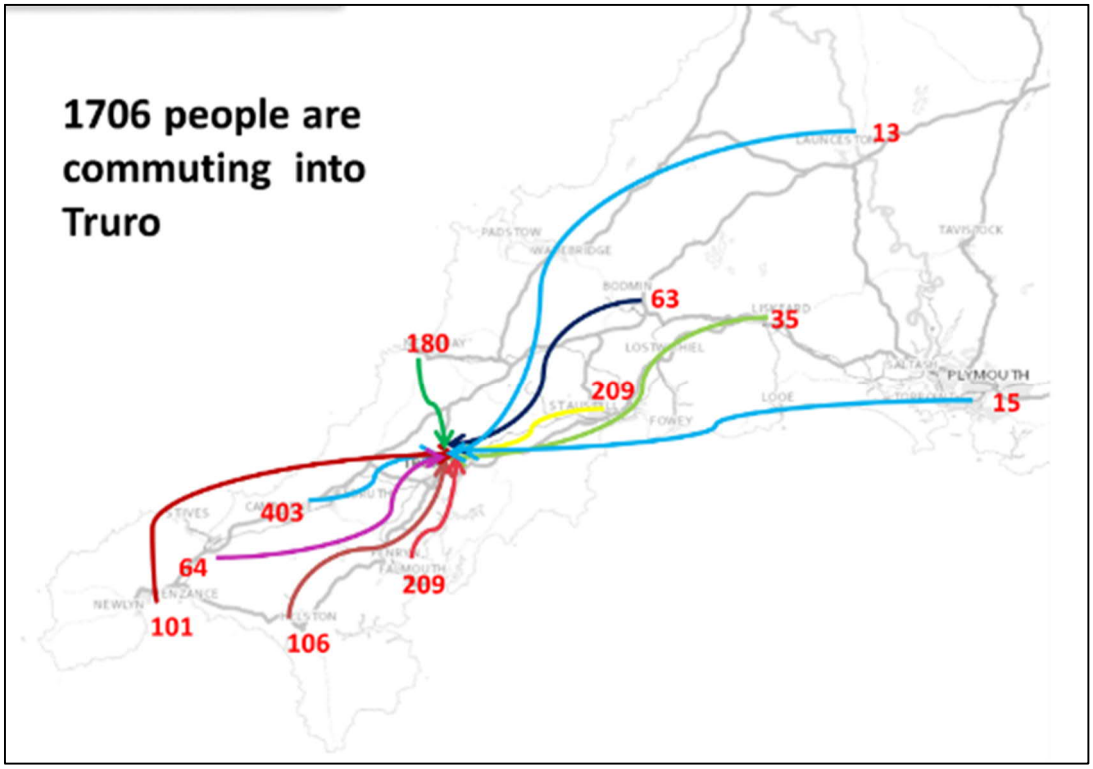
9.7.1 There are a number of other external influences which will have an impact on the site and the wider area, these include TP initiatives across Truro, specifically CC and local policy refresh documents. These are detailed in this section.

Public Sector Travel Plan

9.7.2 CC is committed to initiating measures in the Truro area to reduce traffic and to encourage sustainable travel choices.

9.7.3 CC has undertaken survey work to understand the origins of staff that work in Truro. This has identified that there are approximately 1,700 CC staff who work in Truro but live elsewhere, as presented in **Figure 9-3**. In order to ensure that shoppers can park, and that CC staff have options to get to work, CC is investigating several measures which will be implemented to reduce the number of commuters especially by vehicle with single occupant and reduce the demand for parking by council officers within Truro.

Figure 9-3: Distribution of Cornwall Council Staff that Work in Truro and Live Elsewhere



9.7.4 The proposed measures will also help with the 'climate emergency' and air quality issues by helping staff move towards more sustainable transport.

9.7.5 A number of TP measures are set out in **Table 9-1**, some of the measures are currently in place, others need to go through a governance process.

Table 9-1: Proposed Cornwall Council Travel Planning Measures

Measure	Justification
Flexible working	▪ Local working – Working in a local office rather than undertaking a long commute can reduce the number of vehicles coming into Truro. CC is looking to implement this early on, with forecasts that could result in a reduction of 112 cars in Truro.
E-bikes	▪ Advertise the "Bikes to work" scheme and the fact that electric cycles can be purchased on this scheme. ▪ Implement e-bikes between offices (May 2020). ▪ E-Bikes on a wider scale for pubic and staff at strategic location around Truro, this is a medium-term project.
Reducing need for cars	▪ Increased pool car availability including electric cars will help with the need to bring a private car to work. ▪ Car Club in Truro to allow for staff to reduce the need to bring cars into Truro, research suggest that one car club car results in 20 cars being taken off the road (or not being parked in the car park).
Lift share	▪ Promote and encourage car sharing. Car Share Cornwall currently has 376 members in CC alone.
Public transport	▪ Looking to subsidise P&R for staff. ▪ Reduced fare pilot will allow for staff to use buses for cheaper prices. This will also be available for the public further driving down the numbers driving in. ▪ New routes (more direct buses for Bodmin – Truro, Bude – Truro, Truro – St Mawes, Airport to Truro as of April 2020). ▪ 600 extra spaces in P&R at Langarth allowing for reduced parking in Truro. ▪ Additional train services meaning that the mainline now has ½ hourly services has seen a recent increase in numbers using the trains and therefore reduced cars coming into Truro.
Active travel	▪ Active travel support and advice from Sustrans plus working on lots of new cycle routes in and around Truro
Measures to ensure that parking is reduced and kept free for shoppers	▪ Looking to reinforce previously agreed '4 go 1' parking as a minimum with enforcement. ▪ Software solutions are being developed to ensure parking is monitored, managed and enforced.
Parking	▪ A reduced amount of parking at Pydar will be part-mitigated by staff being allowed to park at Moorfield, although the priority will be to use alternatives listed above where possible.

Truro Transport Strategy Refresh

9.7.6 The TTS was approved by CC in 2012 and had the following aims:

- To increase the proportion of travel into and out of Truro by sustainable modes;
- To increase walking and cycling;
- To reduce the need to travel; and
- To ensure that the transport network operates effectively with future development growth.

9.7.7 In the years since its approval, the overriding principles of the strategy are still relevant, but much has also changed in that time – most significantly CC's commitment to be carbon neutral by 2030, alongside the delivery of new transport provision for Truro and opportunities emerging from new technology.

9.7.8 Many of the aspirations of the original strategy have been delivered. Including the Tregurra P&R, Threemilestone bus gate, Coosebean cycle route, Threemilestone and Treliske roundabout signalisation and TPs for RCHT and Truro and Penwith College.

9.7.9 CC is currently working to refresh this strategy detailing several potential interventions going forward. The refresh of this strategy will undoubtedly have an impact on the highway network across Truro and it surrounds. Potential interventions to be incorporated within the refresh include:

- Langarth P&R car park extension – additional 600 parking spaces;
- Langarth P&R bus service capacity increase – larger buses / more frequent services at peak times and extended hours of operation for RCHT traffic;

- Bus priority measures on A390 – should post-COVID traffic volumes remain similar to or higher than pre-COVID traffic volumes then additional bus priority measures may be required on the A390 between the Langarth P&R, Threemilestone Village and Dalvenie Roundabout, adjacent to NCH;
- Rail service enhancements, particularly on Falmouth branch line to provide greater capacity to / from Truro and mainline rail connections;
- Seamless electronic ticketing and travel app so that using public transport is more efficient;
- E-bike network in Truro and other key locations across Cornwall – requires consistent system throughout and coordination / booking through travel app;
- Secure cycle parking at key locations (as e-bikes and conventional bikes are high value assets that need to be protected from theft);
- Taxi booking integration into travel app so that all modes of public / sustainable transport are easily available when required;
- Public Sector TP for CC staff to allow flexible working and reduce the need to travel;
- Wider Community TP to encourage large employers and locations with high visitor numbers a range of safe, affordable and attractive options to travel, if travel is required. Key foci need to be RCHT, Truro and Penwith College, Threemilestone Industrial Estate and larger employers in the City Centre; and
- Parking strategy review – this needs to retain the viability of the City Centre as Cornwall's principal service centre. This could include a reduction of long-stay parking and transfer to lower priced short-stay parking to ensure people can still visit the City Centre if they cannot travel by alternative means.

9.8 Summary

9.8.1 The aim of the STS is to minimise the level of traffic generated by the development, and to achieve a substantial reduction in existing traffic through encouraging mode shift to offset traffic generated by the proposed development. This will be achieved through on-site measures and improvements to the local transport network.

9.8.2 This chapter has identified a range of measures that will be integral to the proposed development and will reduce traffic, both from the development itself but also in regard to other (background) traffic. This includes measures that will reduce the need to travel, reduce the distances that people need to travel (supporting active travel), embed sustainability into the design of the development, and support people's opportunity to travel sustainably.

9.8.3 Furthermore, CC is delivering a range of initiatives in Truro which will benefit existing and future residents. This includes the public sector TP and TTS refresh.

10. Trip Generation, Distribution and Assignment

10.1 Introduction

10.1.1 This chapter of the TA outlines the methodology used to derive multi-modal trip generation for the proposed development at Langarth Garden Village as well as the methodology and assumptions for development traffic distribution and assignment to the local highway network. The principles of deriving trip generation, traffic distribution and assignment have been agreed with CC during pre-application scoping discussions. The forecasting takes account of the STS for the proposed development, which aims to minimise the level of traffic generated by the development, and to achieve a substantial reduction in existing traffic through encouraging mode shift to offset traffic generated by the proposed development.

10.2 Assessment Development Quanta

10.2.1 The land uses proposed at Langarth Garden Village are outlined in **Table 10-1**, along with the quanta to be considered for trip generation purposes.

10.2.2 The assessment considers a residential development of up to 3,800 dwellings, which comprises the following:

- 3,550 dwellings for private / market (65%) and affordable (35%) housing;
- 200 extra-care dwellings; and
- 50 specialist / key worker dwellings (for use by student health workers and other key workers).

10.2.3 The forecast is based on the full quanta of residential development (i.e. 3,800 dwellings) being a mix of private and affordable dwellings. Extra-care dwellings will be expected to have a lower trip generation compared to private / affordable dwellings, particularly during weekday peak hours, given they will be occupied by people that travel less (i.e. retired and those with mobility impairments). This approach is therefore considered to provide an appropriate assessment.

Table 10-1: Development Land Uses and Assessed Quanta

Land Use		Use Class		Quanta
		Up to 31/08/2020	From 01/09/2020	
Retail		A1	E	1,600sqm GIA
Financial and Professional Services		A2	E	500sqm GIA
Food and Beverage		A3	E	500sqm GIA
		A4	Sui generis	
		A5	Sui generis	
Office		B1a	E	15,500sqm GIA
Dwellings (Private / Market and Affordable)		C3	C3	Up to 3,550 dwellings, plus 200 extra-care dwellings 50 specialist / key worker dwellings (for use by student health workers and other key workers).
Primary School		D1	F.1	1,140 pupils
Local Care Health Centre		D1	E	3,000sqm GIA
Community Hall / Library		D1	F.1	300sqm GIA
Community Farm		D1	F.1	100sqm GIA
Additional Community (within local centres)		D1	F.1	2,400sqm GIA
Ambulance Station / Blue Light Service		D1	E	1,700sqm GIA
Leisure		D2	F.2	6,380sqm GIA
Heath and Sport Quarter	Retail	A1	E	1,960sqm GIA
	Food and Beverage	A3	E	1,040sqm GIA
		A5	Sui generis	
	Microbrewery	A4	Sui generis	1,500sqm GIA

Notes: For most land uses, the development quantum has been provided as Gross Internal Area (GIA) which has been used as a reasonable proxy for Gross Floor Area (GFA) for the purposes of this assessment.

10.2.4 The development masterplan includes an ambulance / blue light service station which will be expected to generate ambulance trips throughout the day in addition to staff trips at the beginning and end of shift times. For the purposes of this assessment, weekday peak hour ambulance trips to / from the proposed development are considered to be immaterial compared to the traffic generation from the rest of Langarth. Furthermore, based on typical shift patterns, staff trips are generally anticipated to occur outside of peak hour periods, and therefore have not be included within the calculations.

10.2.5 The application also includes for 4,500sqm of E / sui generis use class development within a 'Health and Sport Quarter'. These developments will be ancillary to the proposed stadium (which does not form part of the current application) and therefore have not been included in the trip generation exercise. It is considered that trips to / from these units will be either linked to the stadium scheme, or internal to the development.

10.2.6 The proposed development includes an extension (of 600 spaces) to the Langarth P&R. This will result in a reassignment of background traffic on the highway network, with the P&R capturing eastbound car trips in the AM peak, and the reverse movements in the PM peak. The effects of this are considered in the assessment and discussed at **Chapter 11**.

10.3 Development Trip Generation – Without Trip Internalisation and Sustainable Transport Strategy

10.3.1 This section sets out the first steps of the process to derive the trip generation of the proposed development. The forecasts presented are 'interim' and are refined further in **Section 10.4** to take account of the effects of internalisation of trips (i.e. trips between land uses within the development) and mode shift associated with the STS.

10.3.2 Multi-modal trip generation for each of the proposed land uses has been calculated by applying a mode share to 'Total People' trip rates extracted from the TRICS database. TRICS is an industry-standard database of travel surveys from various sites in the UK and Ireland. TRICS provides trip rates representative of a development based on a user-defined sample.

10.3.3 The sample surveys extracted from TRICS have been carefully filtered to ensure that the trip rates are representative of this development site. Where possible, surveys outside of town / city centres and with limited public transport infrastructure have been selected to provide 'full' trip rates which do not include inherent reductions for internalisation, linked trips or for sustainable travel measures and infrastructure.

10.3.4 The TRICS categories used for each of the proposed land uses are shown in **Table 10-2**. The daily person trip rates used for this analysis are shown in the full TRICS output reports included at **Appendix F**.

Table 10-2: TRICS Categories Used for Proposed Land Uses

Land Use	TRICS Category	Rationale
Retail	01 - Retail O - Convenience Store	Retail proposed as individual units of under 1,500sqm, indicative of this TRICS category.
Financial and Professional Services	02 – Employment A – Office	Lack of suitable sites under 'Retail' in TRICS. Main trip attractor is staff so has been treated as a workplace for trip generation purposes.
Food and Beverage	06 – Hotel, Food and Drink B – Restaurant	There are no multi-modal surveys in TRICS for 'Hot Food / Takeaway' land uses. 'B-Restaurant' has been chosen over 'C-Pub/Restaurant' as the pub element is not considered to be characteristic of the proposed development.
Office	02 – Employment A – Office	Proposals consistent with definition of TRICS category.
Dwellings	03 – Residential M – Mixed Private / Affordable Housing	TRICS land use suitable for private, affordable, key worker and extra-care dwellings. TRICS land use definition confirms that only sites with more than 25% affordable dwellings are included in surveys.
Primary School	04 – Education A – Primary	Proposals consistent with definition of TRICS category.
Local Care Health Centre	05 – Health G – GP Surgeries	No specific minor injury unit sites in TRICS. This is considered to be the most appropriate alternative.

Land Use	TRICS Category	Rationale
Community Hall / Library	07 – Leisure V – Library	Library is the most appropriate category for this land use as Library trip rates are higher compared to Community Centre (the next best alternative).
Community Farm	07 – Leisure Q – Community Centre	Community Centre has been used to provide a robust analysis of trip generation to this unit.
Additional Community	07 – Leisure Q – Community Centre	Community Centre is considered to be the most appropriate category to provide general trip rates for an unspecified community use within a local centre.
Leisure	07 – Leisure C – Leisure Centres	Exact leisure uses to be confirmed, however this TRICS category is considered to be representative of eventual uses.

Note: Land use categories are as per development schedule.

10.3.5 Multi-modal trip generation for the proposed development has been derived by applying a mode share to the person trip rates. Mode shares for each of the land uses have been derived as follows:

- Residential: A mode share has been derived from 2011 Census 'Method of Travel to Work' data, with the 'Cornwall 043' Middle Super Output Area (MSOA) as the 'place of residence'. This has been applied to the 'Dwellings' land use.
- Workplace: A mode share has been derived for the from 2011 Census 'Method of Travel to Work' data, with the 'Cornwall 043' MSOA as the 'place of work'. This has been applied to the 'Office' land use.
- Education: A mode share has been derived using National Travel Survey (NTS) 2018 data (Table NTS0614 'Trips to school by main mode, trip length and age: England, 2002 onwards'). A weighted average has been applied to the distance bands to reflect the likely distances future pupils will travel to / from the primary schools, based on the outline masterplan. It is envisaged that the proposed schools will primarily accommodate demand for primary education from pupils residing within the development. For the purposes of the assessment, the applied weighting is 60% within one mile, 35% within one to two miles and 5% within two to five miles. These assumptions ensure appropriate coverage in terms of likely distance most pupils will travel to the schools, whilst including an allowance for any potential for pupils that travel from areas external to the site. The mode share assumes 0% car share for the purposes of deriving vehicle trip generation. This assumes that all vehicle trips to / from the school developments, both pupils and staff, will be undertaken with one pupil / staff member per vehicle. This provides a robust assessment of traffic generation. In practice, there will be an element of 'car-sharing' as escorting adults accompany more than one child to / from school (for example with siblings).
- Retail, Health, Community and Leisure: Mode shares have been derived from NTS 2018 data (Table NTS0409a 'Average number of trips (trip rates) by purpose and main mode: England, from 2002'). The retail mode share derives from the 'shopping' trip purpose, the leisure mode share from the 'leisure' trip purpose and the health mode share from the 'personal business' mode share. The leisure mode share has been used for the community land uses.

10.3.6 The nearest railway station is Truro Railway Station located in the City Centre, between 2km and 5km from the development site (dependent on location within the development site). As such, all trips shown to be undertaken by rail modes in the Census and NTS datasets will in practice be required to use another mode of transport to travel to / from railway station. Therefore, across all land uses, the rail mode share has been split proportionally between the vehicle, car share, public transport and cycle modes. Walking has not been included as no railway stations are within maximum acceptable walking distances of the site.

10.3.7 The mode shares applied for each development land use are shown in **Table 10-3**. These do not take account of mode shift associated with the STS.

Table 10-3: Applied Mode Share by Land Use – Without Sustainable Transport Strategy

Mode	Land Use					
	Residential	Workplace	School	Retail	Leisure	Health
Vehicles	59%	79%	41%	46%	42%	46%
Car Share	6%	5%	0%	19%	33%	24%
Walk	24%	8%	55%	27%	17%	23%
Bicycle	3%	3%	2%	1%	2%	1%
Public Transport	7%	5%	2%	7%	5%	6%
Rail	0%	0%	0%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Note: 'Vehicles' mode share includes drivers / riders of cars / vans, taxis and motorcycles.

10.3.8 Multi-modal trip rates have been calculated by applying the mode share for each land use to the person trip rates derived from TRICS. When applied to the development quanta, it is identified that the highest person and vehicle trip generation during the weekday AM and PM peak periods occurs during the hours commencing 08:00 and 17:00 respectively. These have been used as the peak development traffic hours for the purposes of this TA.

10.3.9 The weekday AM and PM peak hour traffic generation for each land use is presented in **Table 10-4**. Peak hour multi-modal trip generation for the proposed development is summarised in **Table 10-5**. The forecasts presented show the 'Garden Gate' generation with no consideration for internalisation of trips within the development area (with the exception of the proposed ambulance station and 'Health and Sport Quarter' development which are assumed to generate no peak hour traffic or generated trips entirely within the development respectively) and mode shift associated with the STS.

Table 10-4: Peak Hour Vehicle Generation – Without Trip Internalisation and Sustainable Transport Strategy

Land Use	AM Peak Hour (08:00-09:00)			PM Peak Hour (17:00-18:00)		
	Arr.	Dep.	Two-Way	Arr.	Dep.	Two-Way
Retail	146	140	286	174	165	339
Financial and Professional Services	13	0	13	1	12	12
Food and Beverage	0	0	0	6	1	8
Office	685	18	703	38	616	654
Dwellings	379	1,424	1,803	1,138	678	1,816
Primary School	569	185	754	15	32	47
Local Care Health Centre	87	38	126	30	56	85
Community Hall / Library	0	0	0	3	4	7
Community Farm	0	0	0	1	0	1
Additional Community	6	2	8	13	9	22
Leisure	17	5	22	55	42	97
Total	**1,902**	**1,813**	**3,715**	**1,474**	**1,615**	**3,088**

Notes:

1. *Traffic generation for Ambulance Station and 'Heath and Sport Quarter' developments are assumed to be internal to the development site or to occur outside of development peak traffic hours.*
2. *Summation errors are due to rounding.*

Table 10-5: Multi-Modal Trip Generation – Without Trip Internalisation and Sustainable Transport Strategy

Mode	AM Peak Hour (08:00-09:00)			PM Peak Hour (17:00-18:00)		
	Arr.	Dep.	Two-Way	Arr.	Dep.	Two-Way
Vehicles	1,902	1,813	3,715	1,474	1,615	3,088
Car Share	215	235	450	270	259	529
Walk	1,127	928	2,056	632	533	1,165
Bicycle	79	89	168	70	64	134
Public Transport	150	211	361	181	160	341
Rail	0	0	0	0	0	0
Total	**3,473**	**3,276**	**6,749**	**2,627**	**2,631**	**5,257**

Note: Summation errors are due to rounding.

10.3.10 Based on the multi-modal analysis, the proposed development is forecast to generate around 6,750 two-way person trips during the AM peak hour, and around 5,250 two-way person trips during the PM peak hour.

10.4 Development Trip Generation – With Trip Internalisation and Sustainable Transport Strategy

Trip Internalisation

10.4.1 The proposed development will provide for a wide mix of complementary land uses which will significantly reduce the need for future site users to travel externally to the development site. It is therefore reasonable to assume that a proportion of the development trip generation will occur only within the site area (i.e. 'internal trips').

10.4.2 Internal trips are likely to be undertaken by all modes and the masterplan includes an extensive network of walking and cycling infrastructure to maximise the opportunity for internal trips (and trips to the surrounding areas, including RCHT to be undertaken by active travel modes.

10.4.3 The trip generation set out in the previous section considered each of the proposed land uses in isolation, without any reductions to account for internal journeys between land uses (i.e. 'Garden Gate' generation). Where possible, the surveys extracted from TRICS to calculate trip generation were selected to be in out of town / city centre or less well-connected location (i.e. edge of town, suburban, free-standing). Therefore, the forecasts presented in the previous section are not considered to include any inherent discounting for internal trips.

10.4.4 It is therefore appropriate to apply reductions to the trip generation to derive a more appropriate forecast of trip generation external to the development. The percentage reduction applied to each development land use to account for internalisation (and associated rationale) is set out in **Table 10-6**. The principles and scale of reduction in trip generation have been agreed with CC during pre-application scoping discussions.

Table 10-6: Reduction in Trip Generation to Account for Internal Trips

Land Use	Percentage Reduction Applied	Rationale
Retail	90%	Proposed retail units are small scale and will primarily serve local demand from within the development. A proportion of external trips has been retained to allow for demand from the surrounding area.
Financial and Professional Services	50%	Land use will likely include local demand from customers / for employment from within the development but will also draw a similar level of demand from the surrounding area. These will form part of the local high street functions and retail type uses and therefore it is considered that these will be local businesses, and therefore a higher internalisation factor has been applied than for B1 Office.
Food and Beverage	90%	These are likely to be small small-scale cafés / restaurants that will primarily serve local demand from within the development. A proportion of external trips has been retained to allow for demand from the surrounding area.

Land Use	Percentage Reduction Applied	Rationale
Office	20%	Analysis of the 2011 Census (specifically the 'Location of usual residence and place of work' dataset for the 'Cornwall 042', Cornwall '043' and 'Cornwall 044' MSOAs) has identified that, on average, 26% of people in Truro live and work in the same MSOA. This compares with 27% for St Austell ('Cornwall 039' MSOA) and 22% for Falmouth (average of 'Cornwall 062' and 'Cornwall 063' MSOAs). A level of 20% is below the average of these settlements. Further analysis of the 2011 Census (specifically the 'QS702EW – Distance travelled to work' dataset for the 'Cornwall 043' MSOA) has identified that, of people residing within the 'Cornwall 043' MSOA, 35% commute within a 2km distance of their place of work. 2km is a reasonable representation of commuting journeys internal to the proposed development. This provides further evidence that the assumption that a level of 20% is appropriate. CC has agreed that 20% is appropriate.
Dwellings	11%	The report *Modelling future commuting patterns from the impact of the Langarth development*, prepared by Atlantic Arc Planning (AAP) in July 2020, identifies that, in the 2011 Census, 10% of Truro residents worked from home. It is reported that this is now higher, with forecasts that a level of 20-25% could be realised, particular within the proposed development based on the expected demographics and supporting infrastructure. The 10% reduction therefore accounts for an increase in homeworking from 10% current to 20% in the future. This is considered reasonable to account for measures to enable working from home such as high quality internet connectivity and provision of key worker / specialist dwellings (which are included in the 3,800 dwellings assessed) located at the eastern end of the site to encourage walking to / from RCHT. A 1% reduction has been applied to take account of the effects of the proposed Car Club. This has been derived from analysis of the *England & Wales Car Club Annual Survey 2017/18*. This measure forms part of the STS, but its effects are primarily a reduction in car use rather than mode shift, and therefore been accounted for at this stage of the forecasts.
Primary School	90%	Proposed schools will primarily accommodate demand for primary education from pupils residing within the development and provide employment opportunities for residents. A proportion of external trips has been retained to allow for demand associated with pupils / staff from the surrounding area.
Local Care Health Centre	75%	This will primarily serve local demand from the within the development but will also accommodate some demand from the surrounding area. There is currently no similar centres in Truro. Patients are currently required to make an appointment at the RCHT Emergency Department or travel further afield to Minor Injuries Units (MIUs), the nearest being at Camborne and Falmouth. The provision of facility within Truro will reduce the need to travel further distances / trips on the network.
Community Hall / Library	50%	This will serve local demand from within the development but will also draw demand from the surrounding area.
Community Farm	90%	This will primarily serve local demand from within the development. A proportion of external trips has been retained to allow for demand from the surrounding area.
Additional Community	90%	This will primarily serve local demand from within the development. A proportion of external trips has been retained to allow for demand from the surrounding area.
Leisure	75%	This will primarily serve local demand from within the development but will also accommodate some demand from the surrounding area.

10.4.5 The majority of reductions for non-residential land uses will, in practice, originate from a dwelling within the development. The internalisation factor has been applied to the destination land use to avoid double counting and is not included in the 10% reduction applied to residential land uses.

Sustainable Transport Strategy

10.4.6 The proposed development includes a range of measures which will promote sustainable modes of transport amongst future site users as part of the STS for the site. As detailed at **Chapter 8**, these measures include travel planning, walking and cycling infrastructure, public transport provision, parking supply management, car clubs and car share scheme, and an electric bike network.

10.4.7 It is therefore appropriate to account for a shift towards sustainable modes as a result of these measures. The principles and scale of mode shift associated with each category of measure have been agreed with CC during pre-application scoping discussions. These have been applied as a percentage reduction to the vehicle trip generation and reassigned to other modes as appropriate to create an 'adjusted' mode share for each land use.

10.4.8 The rationale for reductions in traffic generation associated with each category of measure is set out in **Table 10-7**. The percentage reduction associated with each category of measure by development land use is shown in **Table 10-8**.

Table 10-7: Rationale for Reductions in Traffic Generation

Category of Measure	Rationale	Reassignment to Non-Car Modes
Travel Planning	DfT Smarter Choices report 'Changing the way we travel' (2004) identifies that standard TPs can achieve a 6-10% reduction in car use. A robust TP has been prepared for the proposed development and therefore a 10% reduction is considered achievable.	Reassigned vehicle mode share reduction equally amongst the walking, cycling, public transport and car share modes.
Walking Infrastructure	The proposed development will include high-quality walking infrastructure which will connect with existing off-site infrastructure, therefore enhancing opportunities for walking. This is reflected through reasonable reductions in traffic generation, primarily assigned to those land uses where most demand will come from within the proposed development.	Reassigned vehicle mode share reduction to walking mode.
Cycling Infrastructure	The 'Propensity to Cycle Tool' identifies varying levels of cycling by location and level of investment in cycle infrastructure. Levels are provided for both commuting and school trips. Given most trips associated with the school are internalised, it is considered appropriate to refer to levels associated with commuting trips (these generally show a lower level of cycling than for school trips). The tool identifies a range in cycle mode share from 4-24%, based on levels of investment. The development proposes significant improvements to infrastructure, making a substantial contribution to the delivery of the LCWIP, and e-bike measures designed to make cycling an accessible mode of travel for a wider range of people and address challenges with topography for some trips. Based on this, a 10% mode share is considered appropriate, albeit potentially an underestimation, for the proposed and this has been achieved through adjustments to each land use as appropriate.	Reassigned vehicle mode share reduction to cycling mode.
Public Transport Infrastructure	The proposed development will be served by a high-quality bus service, accessed via bus stops equipped with RTPI. The level of reduction has been agreed with CC.	Reassigned vehicle mode share reduction to public transport mode.
Parking Supply	The TRICS sites used in the assessment are all outside of Cornwall. The level parking provision at the TRICS sites has been identified and compared against CC's adopted parking standards for B1 Office use. The reduction applied directly relates to the difference in provision based on CC standards compared with the TRICS provision.	Reassigned vehicle mode share reduction equally between the walking, cycling, public transport and car share modes.
Lift Share	A 1% reduction is considered reasonable and has been applied to the residential development only to avoid double counting.	Reassigned vehicle mode share reduction to car share mode.

Table 10-8: Reduction in Traffic Generation to Account for Sustainable Transport Strategy

Land Use	Travel Planning	Infrastructure			Parking Supply	Lift Share	Total
		Walking	Cycling	Public Transport			
Retail	10%	3%	1%	10%	0%	0%	24%
Financial and Professional Services	10%	3%	5%	10%	0%	0%	28%
Food and Beverage	10%	1%	1%	10%	0%	0%	22%
Office	10%	1%	5%	10%	37%	0%	63%
Dwellings	10%	2%	2%	10%	0%	1%	25%
Primary School	10%	7%	5%	10%	0%	0%	32%
Local Care Health Centre	0%	2%	1%	10%	0%	0%	13%
Community Hall / Library	0%	1%	1%	10%	0%	0%	12%
Community Farm	0%	2%	2%	10%	0%	0%	14%
Additional Community	0%	2%	2%	10%	0%	0%	14%
Leisure	0%	2%	2%	10%	0%	0%	14%

Note: Summation errors are due to rounding.

10.4.9 The 'adjusted' mode share following the reductions in traffic generation and reassignment to other modes for each development land use is shown in **Table 10-9**.

Table 10-9: Applied Mode Share by Land Use – With Sustainable Transport Strategy

Land Use	Mode Share						
	Vehicles	Car Share	Walk	Bicycle	Public Transport	Rail	Total
Retail	22%	22%	32%	4%	19%	0%	100%
Financial and Professional Services	18%	22%	32%	8%	19%	0%	100%
Food and Beverage	24%	22%	30%	4%	19%	0%	100%
Office	16%	17%	21%	19%	27%	0%	100%
Dwellings	34%	10%	28%	8%	20%	0%	100%
Primary School	9%	3%	64%	10%	14%	0%	100%
Local Care Health Centre	33%	24%	25%	2%	16%	0%	100%
Community Hall / Library	30%	33%	18%	3%	15%	0%	100%
Community Farm	28%	33%	19%	4%	15%	0%	100%
Additional Community	28%	33%	19%	4%	15%	0%	100%
Leisure	28%	33%	19%	4%	15%	0%	100%

Note:

1. 'Vehicles' mode share includes drivers / riders of cars / vans, taxis and motorcycles.

2. Mode shares are pre-internalisation.

10.4.10 The 'adjusted' mode shares have then been applied to the person trip rates for the respective land uses to derive 'adjusted' multi-modal trip rates. A breakdown of the 'adjusted' multi-modal trip rates is provided at **Appendix G**.

10.5 External Trip Generation

10.5.1 The 'adjusted' multi-modal trip rates, together with the application of factors to account for internalisation, have been applied to the development quanta for the respective land uses to derive the external trip generation of the proposed development.

10.5.2 The weekday AM and PM peak hour external traffic generation for each land use is presented in **Table 10-10**; these are the values used in the traffic impact assessment of the proposed development. Peak hour multi-modal external trip generation for the proposed development is summarised in **Table 10-11**. The peak hour mode share is shown in **Table 10-12**.

Table 10-10: Peak Hour External Traffic Generation

Proposed Land Use	AM Peak Hour (08:00-09:00)			PM Peak Hour (17:00-18:00)		
	Arr.	Dep.	Two-Way	Arr.	Dep.	Two-Way
Retail	7	7	14	8	8	16
Financial and Professional Services	3	0	3	0	2	2
Food and Beverage	0	0	0	0	0	0
Office	111	3	114	6	100	106
Dwellings	195	733	928	586	349	935
Primary School	13	4	17	0	1	1
Local Care Health Centre	16	7	23	5	10	15
Community Hall / Library	0	0	0	1	1	2
Community Farm	0	0	0	0	0	0
Additional Community	0	0	1	1	1	2
Leisure	3	1	4	9	7	16
Total	**347**	**755**	**1,102**	**618**	**479**	**1,097**

Note: Summation errors are due to rounding.

Table 10-11: Peak Hour External Multi-Modal Trip Generation

Mode	AM Peak Hour (08:00-09:00)			PM Peak Hour (17:00-18:00)		
	Arr.	Dep.	Two-Way	Arr.	Dep.	Two-Way
Vehicles	347	755	1,102	618	479	1,097
Car Share	202	226	428	199	234	433
Walk	424	658	1,082	521	454	975
Bicycle	194	173	367	142	203	344
Public Transport	334	445	778	365	386	751
Rail	0	0	0	0	0	0
Total	**1,501**	**2,256**	**3,757**	**1,845**	**1,756**	**3,601**

Note:

1. *'Vehicles' mode share includes drivers / riders of cars / vans, taxis and motorcycles.*
2. *Summation errors are due to rounding.*

Table 10-12: Peak Hour External Mode Share

Mode	AM Peak Hour (08:00-09:00)			PM Peak Hour (17:00-18:00)		
	Arr.	Dep.	Two-Way	Arr.	Dep.	Two-Way
Vehicles	23%	33%	29%	33%	27%	30%
Car Share	13%	10%	11%	11%	13%	12%
Walk	28%	29%	29%	28%	26%	27%
Bicycle	13%	8%	10%	8%	12%	10%
Public Transport	22%	20%	21%	20%	22%	21%
Rail	0%	0%	0%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Note:

1. *'Vehicles' mode share includes drivers / riders of cars / vans, taxis and motorcycles.*
2. *Summation errors are due to rounding.*

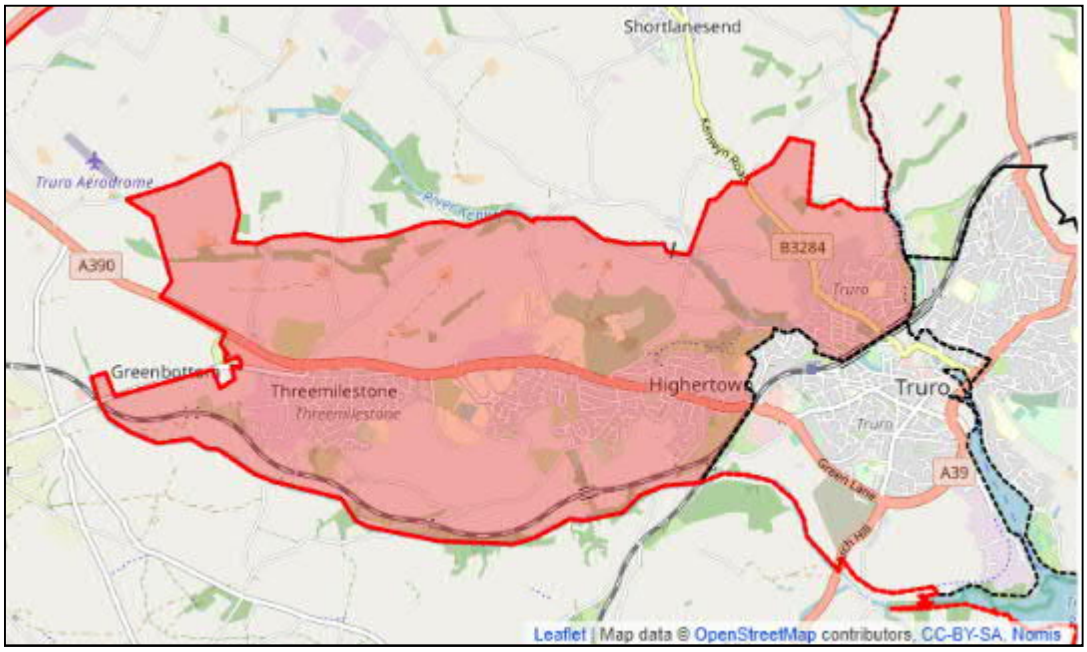
10.5.3 Overall, the proposed development is forecast to generate around 3,800 two-way external person trips during the weekday AM peak hour, of which around 1,100 are forecast to be vehicle trips. During the weekday PM peak hour, the proposed development is forecast to generate around 3,600 two-way external person trips, of which around 1,100 are forecast to be vehicle trips. Vehicles (as a driver) generally account for the highest mode share (29% in the AM peak hour, 30% in the PM peak hour), followed by walking (29% in the AM peak hour, 27% in the PM peak hour) and public transport (21% in the AM peak hour, 27% in the PM peak hour). Car share and cycling have similar mode shares, at around 10%. In summary, around 60% of peak hour trips are forecast to be undertaken by sustainable modes, and 40% by private vehicles.

10.6 Development Traffic Distribution and Assignment

10.6.1 The external traffic generation presented in **Table 10-10** has been distributed across the local highway network based on 2011 Census data (the 'Location of usual residence and place of work' dataset for the 'Cornwall 043' MSOA).

10.6.2 The use of this data is considered appropriate for peak hour assessments, considering that trips for commuting and business purposes make up a significant proportion of trips during these time periods. The 'Cornwall 043' MSOA is also appropriate considering that the site is located within this MSOA as well as other existing land uses at Threemilestone and Highertown (including residential, employment, industrial and commercial development) which provide a reasonable proxy for the proposed development. The 'Cornwall 043' MSOA is shown in **Figure 10-1**.

Figure 10-1: 'Cornwall 043' Middle Super Output Area



Source: Nomis, 2020.

10.6.3 Separate distributions have been derived for the residential land uses and the non-residential land uses. The residential distribution has been derived with the 'Cornwall 043' MSOA as the 'place of residence'. The non-residential distribution has been derived using the 'Cornwall 043' MSOA as the 'place of work'.

10.6.4 All MSOAs representing the residence / workplace for 1% or more of the residents / employees of the 'Cornwall 043' MSOA have been included in the analysis. Where necessary, owing to the size of the MSOA, proximity of the MSOA to the development site or where multiple route choices are available, a further breakdown of the workplace MSOAs has been undertaken to the Lower Super Output Area (LSOA) or Output Area (OA) level.

10.6.5 The likely routeing of development traffic between the development site and the various output areas (i.e. origins / destinations) has been established using an online route planning application for a neutral weekday peak hour period. Where more than one route between the development site and Census output area has been provided by the software, the route weighting has been based on a generalised cost formula, using values for distance and time from the *TAG Data Book* (July 2020). The values for distance and time costs are based on average of 'Car Commuting' and 'Car Non-work' values for an average weekday in 2023 (the earliest assessment).

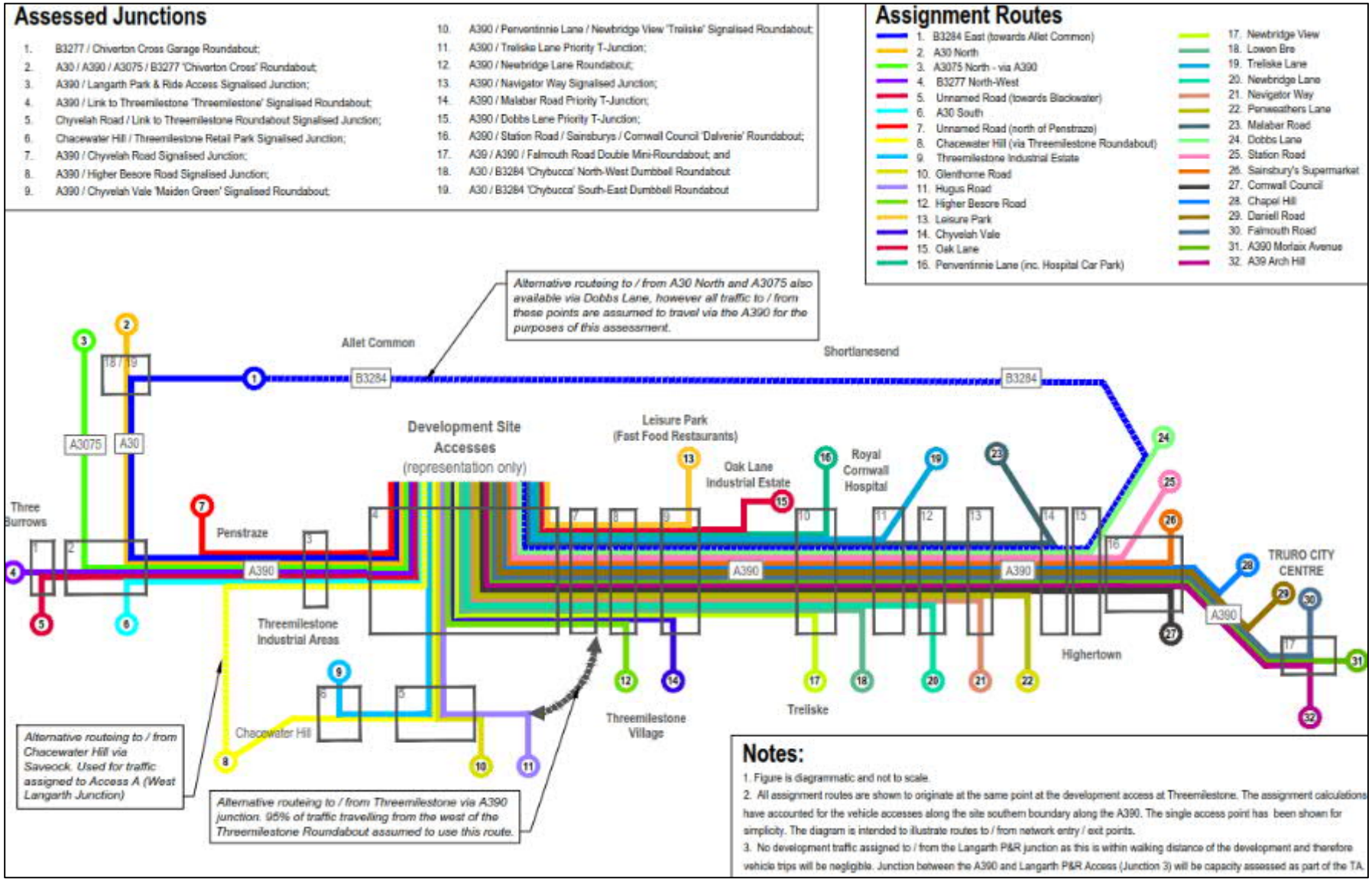
10.6.6 Development traffic has then been assigned to the local highway network in accordance with the residential and non-residential distribution. For the purposes of assignment, some assumptions have been required as follows:

- It has been assumed that all traffic arriving / departing from the development will use the A390 and will not use the existing lanes which connect the A390 with Tregavethan, Allet Common and Shortlanesend to the north. This is considered reasonable given the characteristics of these lanes and to ensure an appropriate assessment of the A390.
- For route planning and weighting calculations it has been assumed that all journeys will be to / from the Threemilestone Roundabout (acting as proxy for the development as whole as it is approximately midway along the A390 corridor at the site's southern boundary) However, in practice traffic will access the site across a number of vehicle connections to the A390, including connections to the NAR. Therefore, the assignment to each study area entry / exit point has been apportioned between the development vehicle accesses, based on the masterplan layout and resultant likely proportions of traffic using each access.
- For trips to / from the B3284 East (towards Allet Common), the A30 north and the A3075 (Routes 1-3), the online route planning software indicated different route choices are available between the western end of the development and the eastern end. For the purposes of traffic assignment, the distribution to / from the A30 and A3075 is assumed to use the A390 and trips to / from the B3284 East towards Allet Common split equally between the A390 and Dobbs Lane routes.
- For trips to / from Chacewater Hill to the south of the development site, it has been assumed that development traffic using the A390 east of the Threemilestone Roundabout will use the roundabout and signalised junction to the south to access / depart from Chacewater Hill. Traffic from the west of the Threemilestone Roundabout is assumed to use the route via Saveock (located between Penstraze and Chacewater).

10.6.7 The development traffic assignment between the proposed development and the entry / exit points of the study network are included at **Appendix H** for both the residential and non-residential distributions. This also shows the assignment by access. The routes between the development site and the study area entry / exit points are illustrated in **Figure 10-2**, which also shows the alternative assumptions described above.

10.6.8 Traffic flow diagrams showing the final development traffic assignment during the AM and PM peak hours are included at **Appendix H**.

Figure 10-2: Development Traffic Assignment Routes



10.7 Development Traffic to / from Falmouth and Neighbouring Areas

10.7.1 As part of pre-application scoping discussions, CC, in its role as LHA, requested that the TA include details of the level of development traffic routeing to / from Falmouth and associated neighbouring areas. This has been extracted for the appropriate MSOAs / LSOAs from the distribution and assignment analysis; these areas are shown at **Appendix I**.

10.7.2 **Table 10-13** summarises the level of development traffic to / from Falmouth and associated neighbouring areas by route, being the point at which development traffic enters / exits the study area network. This is provided for the full area examined in this analysis, with a breakdown by MSOA / LSOA included at **Appendix I**.

Table 10-13: Development Traffic to / from Falmouth and Associated Neighbouring Areas

Route	AM Peak Hour			PM Peak Hour		
	Arrivals	Departures	Two-Way	Arrivals	Departures	Two-Way
Chacewater Hill	28	56	84	46	37	83
Hugus Road	1	1	2	1	1	2
A39 Arch Hill	10	22	32	18	14	32
A30 South	1	1	1	1	1	1
Total	**39**	**80**	**119**	**66**	**52**	**118**

Note: Summation errors are due to rounding.

10.7.3 **Table 10-13** shows that most development traffic routeing to from MSOAs / LSOAs associated with Falmouth and associated neighbouring areas to the south will do so via Chacewater Hill.

10.8 Summary

10.8.1 Multi-modal trip generation forecasts have been prepared for the proposed development. The forecasts for the new housing have been prepared on the basis of the full quanta of residential development being a mix of private and affordable dwellings, which is considered to provide an appropriate assessment.

10.8.2 The scheme masterplan includes an ambulance service station and 4,500sqm of ancillary stadium E / sui generis use class development within the 'Health & Sport Quarter' (associated with the stadium). The stadium itself does not form part of the application. These land uses have not been included in the trip generation as trips to / from these land uses will be either linked, internal to the Langarth development, or occur outside of the assessed peak hours. This has been agreed with CC. The proposed development includes an extension (600 spaces) to the Langarth P&R. This will result in a reassignment of background traffic on the highway network, the effects of which are considered in the assessment and discussed at **Chapter 11**.

10.8.3 The principles of deriving trip generation, traffic distribution and assignment have been agreed with CC during pre-application scoping discussions. The following approach has been taken in terms of trip generation:

- Total person trip rates have been extracted from the TRICS database for each of the land uses to derive the total person trip generation of the proposed development. The sample surveys extracted from TRICS have been carefully selected to provide 'full' trip rates which do not include inherent reductions for internalisation, linked trips or for sustainable travel modes. A mode share for each type of land use has been derived using a combination of 2011 Census 'Method of Travel to Work' data and NTS data. These have then been applied to the person trip rates to derive multi-modal trip rates for each land use. The multi-modal trip rates have then been applied to development quanta, from which it was identified that the highest person and vehicle trip generation during the weekday AM and PM peak periods occurs during the hours commencing 08:00hrs and 17:00hrs respectively. These have been used as the peak development traffic hours for the purposes of this TA.
- The forecasts derived from this methodology have been refined to take account of the effects of internalisation of trips (i.e. trips between land uses within the development) and mode shift associated with the STS. Appropriate levels of internalisation and mode shift associated with the STS have been identified, based on discussions with CC. In regard to the former, these have been

applied as a reduction in external trip generation. With regards to the latter, the adjustments in traffic mode share have been reassigned onto other modes to derive 'adjusted' multi-modal trip rates. The 'adjusted' multi-modal trip rates, together with the internalisation factors, have been applied to the development quanta for the respective land uses to derive the external trip generation of the proposed development.

- Overall, the proposed development is forecast to generate around 3,800 two-way external person trips during the AM peak hour, of which around 1,100 are forecast to be vehicle trips. During the PM peak hour, the proposed development is forecast to generate around 3,600 two-way external person trips, of which around 1,100 are forecast to be vehicle trips. Vehicles (as a driver or rider) generally account for the highest mode share (29% in the AM peak hour, 30% in the PM peak hour), followed by walking (29% in the AM peak hour, 27% in the PM peak hour) and public transport (21% in the AM peak hour, 27% in the PM peak hour). Car share and cycling have similar mode shares, at around 10%. In summary, around 60% of peak hour trips are forecast to be undertaken by sustainable modes, and 40% by private vehicles.

10.8.4 External development traffic has been distributed and assigned to the local highway network using a spreadsheet model based on 2011 Census data (the 'Location of usual residence and place of work' dataset for the 'Cornwall 043' MSOA). Residential development traffic has been assigned based on a distribution with the 'Cornwall 043' MSOA as the 'place of residence' and all other MSOAs representing 1% or more of the 'place of work' included in the analysis. Non-residential development traffic has been assigned based on a distribution with the 'Cornwall 043 MSOA' as the 'place of work', again with all other MSOAs representing 1% or more of the 'place of residence' included in the distribution.

10.8.5 The likely routeing of development traffic between the development site and the various output areas has been established using an online route planning application for a neutral weekday peak hour period. Where more than one route between the development site and Census output area has been provided by the software, the route weighting has been based on a generalised cost formula, using values for distance and time from the *TAG Data Book* (July 2020). The values for distance and time costs are based on average of 'Car Commuting' and 'Car Non-work' values for an average weekday in 2023 (the earliest assessment year). Development traffic has then been assigned to the local highway network between the site accesses in accordance with the residential and non-residential distribution. Traffic flow diagrams showing the development traffic assignment during the AM and PM peak hours are included at **Appendix H**.

10.8.6 Details of the level of development traffic routeing to / from Falmouth and associated neighbouring areas have been included, as requested by CC during pre-application scoping discussions. This information has been extracted for the appropriate MSOAs / LSOAs from the distribution and assignment analysis. It shows that most development traffic routeing to from MSOAs / LSOAs associated with Falmouth and associated neighbouring areas to the south will do so via Chacewater Hill.

11. Assessment Scenarios

11.1 Introduction

11.1.1 This chapter of the TA sets out the assessment scenarios for use in the traffic impact assessment and the methodology by which the associated traffic flow forecasts have been derived.

11.1.2 The assessment scenarios have been produced using a spreadsheet model informed by future baseline traffic flows derived from SATURN data and forecasts, with local adjustments to ensure sufficient level of detail for local impact assessment. This methodology is inherently based on forecasting using previous trends. Current and future trends in travel patterns have therefore been identified and adjustments made to the future year background traffic flows to provide a more realistic assessment of future traffic conditions. The methodology has been discussed and agreed in principle with CC and is detailed in the following sections.

11.2 Identification of Assessment Years, Time Periods and Scenarios

11.2.1 The Truro HIF SATURN model has been used to derive traffic flows for the production of the assessment scenarios. The model was originally used by CC to assess the A30 CtCC upgrade and was then developed further to include the NAR with regards to the development at Langarth Garden Village.

11.2.2 The SATURN model includes core forecasts for 2023 and 2038, with interim forecasts developed for 2028 and 2033. The forecasts include traffic growth and numerous local committed developments, including extant permissions on the proposed development site (to be discussed). The forecasts also include committed infrastructure changes, including those associated with the committed A30 CtCC scheme; this will result in significant changes in background traffic flows on the network upon opening (in 2023), and therefore it is considered appropriate for assessments to be informed by forecasts based on the future highway network. The forecasts from 2023 and 2038 have been utilised. 2023 is the earliest year of assessment available in the area-wide model (corresponding with the expected opening of the A30 CtCC scheme) and is anticipated to be the earliest year of occupation of the proposed development. 2038 is the latest year of assessment available in the model and is considered the most appropriate of the later forecast years in terms of build-out of the proposed development.

11.2.3 The SATURN model provides traffic flows for the three-hour weekday AM (07:00-10:00hrs) and PM (16:00-19:00hrs) time periods rather than specific hourly windows. An hourly average of the respective three-hour periods has therefore been extracted from the model to derive traffic flows for assessment of the AM and PM peak hours. For consistency with the peaks in person / vehicle trip generation of the proposed development, these are referred to as 08:00-09:00hrs and 17:00-18:00hrs respectively.

11.2.4 The suitability of use of an hourly average for assessment of the AM and PM peak hours has been informed by analysis of existing traffic flows in the study area network. The analysis has utilised data derived from ATC surveys undertaken on the A390 corridor (between the A30 and A39) from September 2019. **Table 11-1** compares the average and peak hour flows at the survey locations and includes the actual and percentage variance.

Table 11-1: Comparison of Average and Peak Hour Flows

Location	Time Period	Traffic Flows (Two-Way)			Variance	
		Average Hour	Peak Hour		No.	Percentage
A390, east of A30 (Penstraze)	AM	1,921	2,027	08:00-09:00hrs	106	6%
	PM	1,846	1,989	16:00-17:00hrs	142	8%
A390, between Lowen Bre and Treliske Lane	AM	1,962	2,012	08:00-09:00hrs	49	3%
	PM	1,970	2,075	17:00-18:00hrs	104	5%
A390, between Navigator Way and Malabar Road	AM	1,830	1,918	09:00-10:00hrs	88	5%
	PM	1,997	2,076	17:00-18:00hrs	79	4%
A390, between Daniell Road and A39 Arch Hill	AM	1,395	1,455	09:00-10:00hrs	60	4%
	PM	1,528	1,589	17:00-18:00hrs	60	4%

Notes:

1. *Summation errors due to rounding.*
2. *Traffic flows are 4-day average from Monday 16th September 2019 to Thursday 19th September 2019.*

11.2.5 **Table 11-1** shows that the level of variance between average hourly flows and the peak hour flows within the three-hour weekday AM (07:00-10:00hrs) and PM (16:00-19:00hrs) time periods is within 10% at all locations. It is also identified that there are variations in the peak hour periods at the examined locations. The use of an average hour for the network is therefore considered appropriate both in terms of the level of reported variance from the peak hour at individual locations and in capturing variations in peaks across the study area network.

11.2.6 The weekday AM and PM peak hours have been examined for each assessment year, both without ('Base' scenario) and with ('Base + Development') the proposed development. Both scenarios include traffic growth and numerous local committed developments. In summary, the assessment scenarios are as follows:

- 2023 Base;
- 2023 Base + Development;
- 2038 Base; and
- 2038 Base + Development.

11.3 Derivation of Future Background Traffic Flows – Without Adjustments for Future Trends

Extraction of Traffic Flows from SATURN Model

11.3.1 The first step in production of the assessment scenarios has been to extract traffic flows from the SATURN model for the assessment years, both without the NAR (for use in future 'Base' scenarios) and with the NAR (for use in future 'Base + Development' scenarios), and then apply to a spreadsheet model prepared specifically for the study area network.

11.3.2 Traffic in the model associated with the proposed development site has been removed; more refined development traffic forecasts, the production of which are discussed at **Chapter 10**, are added at a later stage of the process. It should be acknowledged that a significant number of dwellings are currently consented on the site of the proposed development through previous applications. Whilst these are technically 'committed development', it has been agreed with CC that the future baseline traffic flows will not include dwellings consented on site for the purpose of presenting a clear analysis of traffic conditions both with and without the proposed development. Details of wider committed development included in the future baseline traffic flows are provided at **Appendix J**. The traffic flows extracted from the SATURN model and applied to the spreadsheet model study area network are included at **Appendix K**.

11.3.3 A review of the SATURN model flows has been undertaken to ensure that appropriate level of detail for the study area network is provided. The review has identified the need to apply adjustments in some parts of the network to provide more granular detail, and to include additional land use zones not part of the SATURN model network and particular vehicle types. The adjustments and associated analysis are provided at **Appendix L** and the methodology set out in the following sub-sections.

Adjustments to Traffic Flows in Oak Lane / Penventinnie Lane Area

11.3.4 As is standard practice in strategic models, multiple land uses within an area will often be grouped and associated traffic loaded onto a single zone within the model. The review identified this approach in the SATURN model for land uses in the Oak Lane / Penventinnie Lane area, which includes numerous industrial and retail uses along with premises associated with RCHT. The Oak Lane / Penventinnie Lane area is of particular importance in terms of the site access strategy and background movements to / from the A390, and it has therefore been considered appropriate to apply adjustments to the SATURN model flows to provide additional detail for assessment.

11.3.5 The SATURN model flows have first been isolated in terms of the entry / exit points to this part of the study area network; these include the A390 (at its junctions with Oak Lane and Penventinnie Lane), Penventinnie Lane (north of existing land uses) and the NAR connections (in the 'Base + Development' scenarios only).

11.3.6 Analysis has then been undertaken of traffic survey data (collected on the "neutral date" of Monday 8th October 2018) to identify the proportions of traffic entering / exiting this part of the study area network associated with the various land uses. Specifically, data from MTC and ATC surveys has been utilised from the following locations:

- A390 / Oak Lane priority T-junction (LI / LO);
- Treliske Roundabout;
- Penventinnie Lane / RCHT car park access / Oak Lane staggered crossroads junction;
- Penventinnie Lane / RCHT car park egress priority T-junction; and
- Penventinnie Lane, north of existing land uses.

11.3.7 Zones have then been identified in terms of apportioning traffic entering / exiting the area to specific land uses. Surveyed traffic and associated proportions to / from these zones have been identified based on reasonable assumptions regarding turning movements. These zones are as follows:

- RCHT, northwest of Penventinnie Lane – premises associated with RCHT, accessed via a priority junction onto Penventinnie Lane (not surveyed) approximately 220m north of Treliske Roundabout, and will form part of the NAR connection in the future;
- RCHT car parks – car parks associated with RCHT (captured by the traffic surveys);
- Treliske Retail Park – numerous retail units, accessed from Penventinnie Lane (between Treliske Roundabout and Oak Lane) with egress onto Oak Lane; and
- Oak Lane – numerous retail and industrial units, accessed from the A390 and Penventinnie Lane.

11.3.8 The proportions of traffic to / from each zone have then been applied to the SATURN model flows entering / exiting the Oak Lane / Penventinnie Lane area to derive Origin-Destination (O-D) matrices for this part of the study area network. These have, in turn, been assigned onto the spreadsheet model network based on appropriate routeing assumptions, substituting the SATURN model flows for this area, as shown at **Appendix L**.

Addition of Other Land Uses

11.3.9 Some land use zones / junction arms not included in the SATURN model have been manually added to the spreadsheet model network using MTC survey data (collected on Monday 8th October 2018). The land uses / junction arms are as follows:

- West Truro Retail Park, served via a signalised junction with Chacewater Hill / Threemilestone Industrial Estate;
- Leisure Park (McDonald's and Pizza Hut restaurants), served via Maiden Green Roundabout;
- RCHT (emergency vehicle access), served via Treliske Roundabout; and
- Newbridge View served via Treliske Roundabout.

11.3.10 The traffic associated with these land uses / junction arms have been assigned onto the A390 at their respective junctions as per the MTC survey data. Beyond this, it has been assumed that all traffic to / from the east routes to the Dalvenie Roundabout, where it is has been distributed based on SATURN model turning proportions. Traffic routeing east of the Dalvenie Roundabout has been assumed to continue to the A39 / A390 / Falmouth Road Double Mini-Roundabout, and again distributed based on SATURN model turning proportions. All traffic to / from the west has been assumed to route to the Chiverton Cross and B3277 / Chiverton Cross Garage roundabouts and distributed based on SATURN turning proportions. Turning movements to / from certain origins / destinations have been excluded as appropriate.

11.3.11 The assignment of traffic from other land use zones / junction arms onto the spreadsheet model network is shown at **Appendix L**.

Addition of Buses

11.3.12 It has been important to identify bus traffic on the network for junction modelling purposes (i.e. for modelling of existing bus priority measures). The extracted flows from the SATURN model did not include an isolated layer for buses in terms of turning movements at junctions (due to model complexities) but allowed for removal of these vehicles to ensure the extracted flows could be solely attributed to non-bus traffic.

11.3.13 Bus traffic has been manually added back onto the SATURN model flows as an isolated layer, thus ensuring that total traffic flows are appropriate whilst allowing for more refined analysis at junctions with bus priority measures. The bus traffic on the study area network has been identified from timetable information pre-COVID to ensure forecasts are reflective of service provision under 'normal' conditions.

11.3.14 The assignment of bus traffic onto the spreadsheet model network is shown at **Appendix L**.

Future Background Traffic Flows – Without Adjustments for Future Trends

11.3.15 The SATURN model traffic flows at **Appendix K** have been combined with the traffic flows at **Appendix L** (i.e. adjustments to the Oak Lane / Penventinnie Lane area, addition of other land uses and bus traffic) to derive the future background traffic flows for the network (without adjustments for future trends) in 2023 and 2038, both without and with the NAR, as shown at **Appendix M**.

11.3.16 These traffic flows have formed the basis for examination of changes in background traffic associated with general transport trends and trends / measures associated with the proposed development itself, discussed in the following section.

11.4 Derivation of Future Background Traffic Flows – With Adjustments for Future Trends

Introduction

11.4.1 The methodology set out in the previous section is inherently based on forecasting using previous trends. Current and future trends in travel patterns have therefore been identified and adjustments made to the future year traffic flows to provide a more realistic assessment of future traffic conditions. The following sub-sections set out the future trends that have been identified and how they have been applied.

Working from Home

11.4.2 Homeworking is increasingly becoming a more viable option for employers / employees due to improvements in internet infrastructure, the introduction of flexible working policies and the costs of office accommodation. Whilst some employees may permanently work from home in the future, others may increase their time at home, with fewer days spent in the office.

11.4.3 AAP, in its report titled *Modelling future commuting patterns from the impact of the Langarth development* (July 2020), discusses existing levels of homeworking and projected increases in the future. It identifies that, based on the 2011 Census, 10% of Truro residents work from home, and forecasts that this could increase to 25% in the future. This does not account for any long-term effects of COVID in terms of changes to potential working patterns; much of the population has temporarily transitioned to working from home practices, with many employers now reviewing operational requirements in terms of provision of working space, the effects of which will not be known for some time.

11.4.4 An increase in homeworking will result in a reduction in travel demand for commuting and business purposes, and it has therefore been considered appropriate to incorporate this trend in the forecasts for future background traffic flows. Based on the AAP projections, it is considered reasonable to assume that there will be a 15% increase in home working (from 10% to 25%) in the future. This is assumed to occur in both 'Base' and 'Base + Development' scenarios.

11.4.5 Analysis has been undertaken of the NTS (Table NTS0502, 2018) to identify the proportion of commuting / business trips during the weekday AM and PM peak hours. This has established that trips for this purpose account for 39% and 31% of all trips during the AM and PM peak periods (based on an average of the periods 07:00-09:00 and 16:00-18:00). The 15% increase in homeworking has been applied to these proportions to derive the level of reductions in traffic on the network during the AM and PM peak hours; this results in a 6% and 5% reduction during the AM and PM peak hour future background traffic forecasts respectively. The reductions have been applied to all movements on the network and to light vehicle movements only, which is considered appropriate in providing a high-level examination of the effects of this future trend.

11.4.6 The analysis and resulting reductions in future background traffic flows on the network in 2023 and 2038, both without and with the NAR, as a result of an increase in working from home are shown at **Appendix N**.

Home Relocation

11.4.7 AAP's report identifies that Truro experiences a significant level of in-commuting, in part because increases in employment have been greater than increases in housing, albeit both are above the Cornwall average. It is envisaged that some households with a person that currently works in Truro but lives elsewhere will relocate to the proposed development. This has been set at a level of 10% of the proposed residential development, i.e. equivalent to 380 households.

11.4.8 The traffic generation of those relocated households, including the benefits of the STS measures and location closer to key facilities, has already been accounted for in the forecasts for the proposed residential development (set out at **Chapter 9**). Therefore, it is considered appropriate to account for this reduction in in-commuting by adjusting background traffic on the network in the 'Base + Development' scenarios (reductions are not appropriate for the 'Base' scenarios as home relocation will only occur with the proposed development).

11.4.9 Traffic generation forecasts have firstly been prepared for the number of dwellings that are envisaged to be occupied by households (that currently work in Truro and live elsewhere) that will relocate to the proposed development. Vehicle trip rates have been derived by applying a vehicle mode share to the person trip rates for residential land uses obtained from TRICS; the person trip rates used for this analysis are as per those extracted for the purposes of forecasting the trip generation of the proposed development. A vehicle mode share of 73% has been derived from analysis of the 2011 Census (the 'Method of travel to work' dataset) for Cornwall. The use of county level data is considered an appropriate proxy in terms of the locations from which households would relocate and existing modes used for travel to access employment, services and other key destinations. The mode share has been applied to the person trip rates and level of housing relocation. The resulting traffic generation forecasts associated with the housing relocation are included at **Appendix N**.

11.4.10 The traffic generation forecasts associated with the housing relocation have been assigned onto the network as traffic reductions. It is considered that these reductions will primarily occur on routes to / from the City Centre along the A390 corridor. The City Centre represents a significant attractor for trips in terms of employment and services, with the A390 corridor being the key route for access from the wider network. It has been agreed with CC to apply reductions to the A390 corridor, rather than other routes into Truro such as the A39 Arch Hill.

11.4.11 Station Road, Falmouth Road and the A39 Morlaix Avenue represent the extent of the study area network in terms of routes to the City Centre. The proportions of traffic routeing between the A390 and these routes to the City Centre have been identified through analysis of the SATURN model flows for the network with the NAR in 2023 and 2038. Reductions have therefore applied to the following movements:

- Between the A390 West and Station Road (at the Dalvenie Roundabout);
- Between the A390 West and Falmouth Road (at the A39 / A390 / Falmouth Road Double Mini-Roundabout); and
- Between the A390 West and A39 Morlaix Avenue (at the A39 / A390 / Falmouth Road Double Mini-Roundabout).

11.4.12 The combined reductions have then been applied westwards to through movements along the A390 corridor. At the Chiverton Cross and B3277 / Chiverton Cross Garage roundabouts, the reductions have been apportioned between arms based on turning movements in the SATURN model flows (for the respective assessment years with the NAR). The reductions have been applied to light vehicle movements only.

11.4.13 The analysis and resulting reductions in future background traffic flows on the network in 2023 and 2038 as a result of home relocation (for 'Base + Development' scenarios only) are shown at **Appendix N**.

Extension to Langarth P&R

11.4.14 The proposed development includes an extension (600 spaces) to the existing Langarth P&R (1,209 spaces). The extension to the P&R and increases in service capacity will result in a reduction in background traffic (light vehicles only) on the A390 corridor as existing traffic diverts from the A390 corridor and onto P&R services for part of the journey to key land uses / destinations.

11.4.15 The level of traffic that will transfer to P&R services (as a result of the extension and increase in service capacity) has been forecast by applying a trip rate (per space) to the P&R extension. The trip rate has been derived based on use of the existing P&R, identified through analysis of data at the access from the Threemilestone Roundabout (based on ATC survey from October 2018), supported by SATURN model proportions (an average of the 2023 and 2038 assessment years) to derive entry / exit movements at the access direct from the A390.

11.4.16 The destinations of P&R trips have been identified based on the *Truro P&R Interview Survey* report (June 2016). These destinations include Truro and Penwith College, RCHT, NCH, City Centre and Railway Station. The proportions identified in the survey have been adjusted to reflect targeted growth areas associated with specific employers / destinations (RCHT and NCH), where promotion of P&R can take place through travel planning. The proportions have then been applied to the traffic generation of the P&R extension to identify the level of traffic to each destination that will transfer onto the P&R.

11.4.17 The approach in terms of assignment of traffic onto the network is as per the approach to development traffic assignment, i.e. routes to each destination have been identified using an online route planning application for a neutral weekday peak hour period, with route weighting derived based on a generalised cost formula. The proportions to each route have then been applied to traffic generation of the P&R extension. These have then been applied to the network as reductions on the A390 corridor to the east of the P&R, with a reassignment of traffic at the P&R access (so as to enter / exit the P&R).

11.4.18 The analysis and resulting reductions / reassignment in background traffic flows on the network in 2023 and 2038 as a result of the P&R extension (for 'Base + Development' scenarios only) are shown at **Appendix N**.

Future Background Traffic Flows – With Adjustments for Future Trends

11.4.19 The traffic flows at **Appendix M** (i.e. future background traffic flows without adjustments for future trends) have been combined with the traffic flows at **Appendix N** (i.e. adjustments associated with the increase in homeworking, relocation of households to the proposed development, and the P&R extension) as appropriate. This has derived the future background traffic flows for the network (with adjustments for future trends) in 2023 and 2038, both without and with the NAR, as shown at **Appendix O**. The 'without NAR' flows have been used for the 'Base' scenarios and include the adjustments for homeworking only. The 'with NAR' flows are used as the future background traffic flows in production of the 'Base + Development' scenarios and include all future trends.

11.5 Traffic Flows for Assessment Scenarios

11.5.1 The traffic flows for each assessment scenario are included at **Appendix P**. The traffic flows for the 'Base' scenarios are as per the 'without NAR' flows at **Appendix O**. The traffic flows for the 'Base + Development' scenarios are as per the 'with NAR' flows' at **Appendix O**, combined with the proposed development traffic flows at **Appendix H**.

11.6 Comparison of Existing and Future Traffic Flows

11.6.1 The future traffic flow forecasts for the assessment have been compared with existing traffic flow data at locations in the study area to provide an indication of the changes in traffic flows between existing and future conditions.

11.6.2 Existing conditions are based on traffic data collected at locations surveyed in September 2019, which is the latest data available pre-COVID; the locations are consistent with those listed in **Table 11-1**. Future conditions are derived from the forecasts for 2023 for the 'Base' and 'Base + Development' scenarios for corresponding locations / locations in the vicinity. The comparison is provided in **Table 11-2**.

Table 11-2: Comparison of Existing and Future Traffic Flows

Location	Time Period	Traffic Flows (Two-Way)		
		2019	2023 Base	2023 Base + Development
A390, east of A30 (Penstraze)	AM	1,921	1,458	1,716
	PM	1,846	1,683	1,860
A390, between Lowen Bre and Treliske Lane	AM	1,962	1,718	1,893
	PM	1,970	1,871	2,069
A390, between Navigator Way and Malabar Road	AM	1,830	1,736	1,847
	PM	1,997	1,901	2,051
A390, between Daniell Road and A39 Arch Hill	AM	1,395	1,518	1,532
	PM	1,528	1,674	1,732

Note: Traffic flows for 2019 are as per the 'Average Hour' in Table 3-1.

11.6.3 **Table 11-2** shows that traffic flows are forecast to reduce between 2019 and the '2023 Base' scenario on the examined links, with the exception of on the A390, between Daniell Road and the A39 Arch Hill. The reductions are generally in the order 100-250 two-way movements. The reductions in traffic on the can primarily be attributed to the implementation of the A30 CtCC scheme in the '2023 Base' scenario; this committed scheme includes significant changes in infrastructure in terms of access to the A30 and level of provision on the A30 itself. Reductions in traffic along this corridor as a result of the scheme were reported in the materials submitted with the DCO application, with the opposite effect identified in Shortlanesend, which has an increase in traffic (see DCO Application Document Reference 7.5). It was concluded that this is due to the presence of the west-facing slips at Chybucca making the route via Shortlanesend more attractive for trips to access central Truro than via the A390. Reductions can also be attributed to increases in homeworking and flexible working practices (accounted for in future year forecasts); this will give rise to reductions in travel during peak hours as the need to travel is reduced / people travel outside traditional peak hours due to flexible working hours.

11.6.4 On comparison of the '2023 Base' and '2023 Base + Development' scenarios, it can be seen that the proposed development (and associated changes in background traffic) will result in an increase in traffic flows on the examined links generally in the order of 100-250 two-way movements. Further examination of the changes in traffic flows between the 'Base' and 'Base + Development' scenarios is provided as part of the Environmental Statement (Transport chapter).

11.7 Summary

11.7.1 The principles for the production of assessment scenarios have been agreed with CC during pre-application scoping discussions.

11.7.2 The assessment scenarios have been produced using a spreadsheet model informed by future baseline traffic flows derived from data and forecasts from the Truro HIF SATURN model, with local adjustments to ensure sufficient granularity for local impact assessment. The forecasts also include committed infrastructure changes, including those associated with the committed A30 CtCC scheme; this will result in significant changes in background traffic flows on the network upon opening (in 2023), and therefore it is considered appropriate for assessments to be informed by forecasts based on the future highway network.

11.7.3 Traffic in the model associated with the proposed development site has been removed. More refined development traffic forecasts, the production of which are discussed at **Chapter 9**, are added at a later stage of the process. It should be acknowledged that a significant number of dwellings are currently consented on the site of the proposed development through previous applications. Whilst these are technically 'committed development', it has been agreed with CC that the future baseline traffic flows will not include dwellings consented on site for the purpose of presenting a clear analysis of traffic conditions both with and without the proposed development.

11.7.4 The assessment has utilised forecasts from the SATURN model for 2023 and 2038. 2023 is the earliest year of assessment available in the model and is anticipated to be the earliest year of occupation for the proposed development. 2023 is the earliest year of assessment available in the area-wide model (corresponding with the expected opening of the A30 CtCC scheme) and is anticipated to be the earliest year of occupation of the proposed development. 2038 is the latest year of assessment available in the model and is considered the most appropriate of the later forecast years in terms of build-out of the proposed development.

11.7.5 Current and future trends in travel patterns have been identified and adjustments made to the future year traffic flows to provide a more realistic assessment of future traffic conditions. These trends include an increase in homeworking, reductions in longer distance in-commuting through rebalancing housing and jobs, and transfer of traffic to P&R services as a result of an extension to the existing Langarth P&R. A clear methodology has been identified for the application of each trend with reference to supporting evidence and incorporated into 'Base' and 'Base + Development' scenarios as appropriate. The resulting traffic flows for the assessment scenarios are presented at **Appendix P**.

11.7.6 The future traffic flow forecasts for the assessment have been compared with existing traffic flow data at locations in the study area to provide an indication of the changes in traffic flows between existing and future conditions. Traffic flows at examined locations on the A390 corridor are generally forecast to reduce between 2019 and the '2023 Base' scenario, generally in the order 100-250 two-way movements. This can generally be attributed to the implementation of the A30 CtCC scheme together with future trends, notably an increase in homeworking and flexible working practices. On comparison of the '2023 Base' and '2023 Base + Development' scenarios, it can be seen that the proposed development (and associated changes in background traffic) will result in an increase in traffic flows on the examined links generally in the order of 100-250 two-way movements. Further examination of the changes in traffic flows between the 'Base' and 'Base + Development' scenarios is provided as part of the Environmental Impact Assessment (Transport chapter).

12. Traffic Impact Assessment

12.1 Introduction

12.1.1 This chapter of the TA outlines the methodology and results of the traffic impact assessment for the proposed development at Langarth Garden Village. The impact assessment comprises junction capacity modelling of key junctions on the study network to demonstrate that the design and operation are suitable to serve the proposed development. The assessment methodology and junctions included in the assessment have been agreed with CC during pre-application scoping discussions.

12.1.2 The following off-site junctions have been assessed. The study network and the location of the capacity assessed junctions are included at **Figure 12-1**.

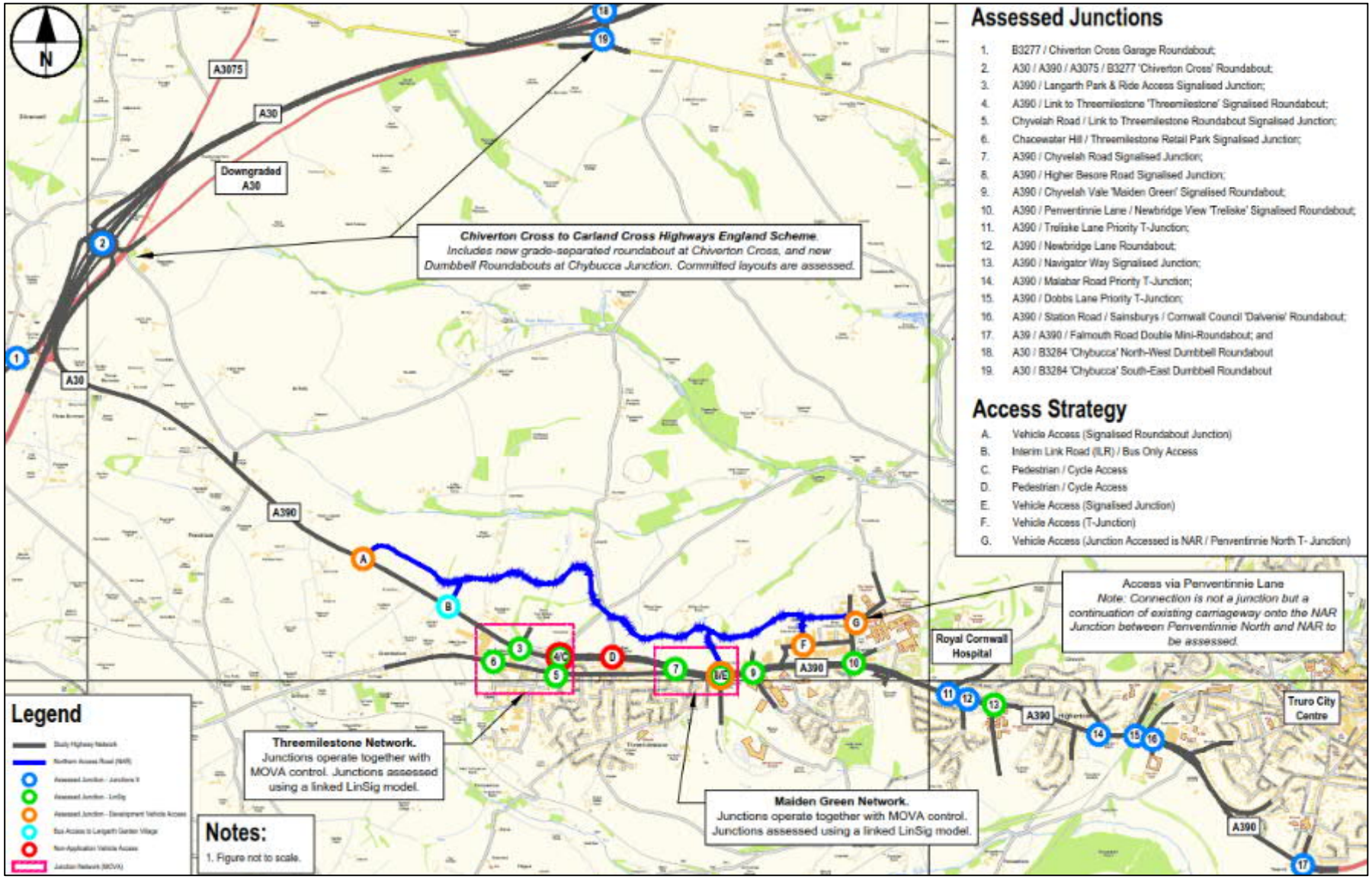
- Junction 1: B3277 / Chiverton Cross Garage Roundabout;
- Junction 2: A30 / A390 / A3075 / B3277 'Chiverton Cross' Roundabout;
- Junction 3: A390 / Langarth P&R Access Signalised Junction;
- Junction 4: A390 / Link to Threemilestone 'Threemilestone' Signalised Roundabout;
- Junction 5: Chyvelah Road / Link to Threemilestone Roundabout Signalised Junction;
- Junction 6: Chacewater Hill / Threemilestone Retail Park Signalised Junction;
- Junction 7: A390 / Chyvelah Road Signalised Junction;
- Junction 8: A390 / Higher Besore Road Signalised Junction;
- Junction 9: A390 / Chyvelah Vale 'Maiden Green' Signalised Roundabout;
- Junction 10: A390 / Penventinnie Lane / Newbridge View 'Treliske' Signalised Roundabout;
- Junction 11: A390 / Treliske Lane T-Junction;
- Junction 12: A390 / Newbridge Lane Roundabout;
- Junction 13: A390 / Navigator Way Signalised Junction;
- Junction 14: A390 / Malabar Road T-Junction;
- Junction 15: A390 / Dobbs Lane T-Junction;
- Junction 16: A390 / Station Road / Sainsburys / CC 'Dalvenie' Roundabout;
- Junction 17: A39 / A390 / Falmouth Road Double Mini-Roundabout; and
- Junctions 18 and 19: A30 / B3284 'Chybucca' Dumbbell Roundabout Junction.

12.1.3 Junction 2 (Chiverton Cross Roundabout) and Junction 18 (Chybucca Junction) have been assessed as per the committed layout for the Chiverton Cross to Carland Cross highway improvement scheme. The scheme entails the construction of a new dual-carriageway road to replace the existing A30 single-carriageway alignment as well as new grade-separated junctions at Chiverton Cross and Chybucca to replace the existing at-grade junctions. Further details of the committed junction layouts are provided with the relevant junction assessments.

12.1.4 In addition to off-site junctions, development access junctions have also been assessed to demonstrate suitability for the expected level of traffic at Langarth Garden Village. The following junctions have been assessed (the naming convention is consistent with the spreadsheet model):

- Access A – A390 / NAR 'West Langarth' Signalised Roundabout;
- Access E – A390 / Higher Besore Road / Development Access Signalised Junction (assessed as part of the off-site Junction 8);
- Access F – Oak Lane / NAR T-Junction; and
- Access G – Penventinnie Lane / NAR T-Junction.

Figure 12-1: Study Highway Network and Locations of Assessed Junctions



12.2 Assessment Methodology

Priority-Controlled Junctions

12.2.1 Priority controlled junctions have been modelled using the industry-standard junction modelling software package 'Junctions 9'. Junctions 9 incorporates both PICADY and ARCADY modules. PICADY has been used to assess priority T-Junctions, with ARCADY assessing priority roundabout junctions.

12.2.2 Junction models have been constructed and calibrated using desk-based measurements from a combination of aerial imagery and as-built drawings supplied by CORMAC. Junctions 9 requires information on the classification of vehicles within the total traffic matrix. For this assessment, the vehicle mix has been entered as a percentage of HGVs for each turning movement.

12.2.3 The results of Junctions 9 models are presented as 'Ratio Flow to Capacity' (RFC), 'Queue' in Passenger Car Units (PCUs), and 'Delay' in seconds per PCU. Movements / arms with an RFC above 0.85 are considered to exceed 'practical capacity', as this is the point above which 'Random Oversaturation Delay' can occur. An RFC of 1.00 denotes the 'absolute capacity' of the junction. Delay and queue length results have been rounded up to the next whole PCU. The results for Junctions 9 analyses are presented as a summary, for ease of reference, and represent the maximum values experienced by each movement / arm across the AM and PM peak hours.

Signal-Controlled Junctions

12.2.4 Signal-controlled junctions have been assessed using industry-standard junction modelling software package LinSig (Version 3.2.40.0). LinSig models have been constructed using desk-based measurements from a combination of aerial imagery and drawings provided by CORMAC. The models have been calibrated based on signal controller specifications provided by CORMAC. For some of the LinSig models, various adjustments or assumptions have had to be made against the information provided to facilitate an appropriate assessment. For example, where pedestrian to traffic phase intergreen times are set as zero in the controller specification (where in practice there is on-street extension detection) an appropriate intergreen has been derived for modelling purposes. Details of any specific adjustments or assumptions made to the models, have been described for each junction in the following sections.

12.2.5 The saturation flows for the signal models have been manually entered as 1,800 PCUs per hour for ahead lanes and 1,500 PCUs per hour for turning lanes. These are in accordance with average saturation flows for Cornwall based on CC surveys, which are typically lower than experienced elsewhere in the UK. For the purposes of this assessment, 'ahead lanes' are those with a turning radius of over than 40m and 'turning lanes' are those with a radius of less than 40m.

12.2.6 All of the assessed signal-controlled junctions operate using MOVA / Vehicle Activation (VA). This is where the stages called, and the amount of green time allocated to each stage is dependent on the demand for that stage, either in terms of pedestrian crossings, or the level of traffic on each arm. This works on a cycle-by-cycle basis and effectively means that the junction signal times operate as 'optimised'. Signal timings for all assessment scenarios have therefore been 'optimised for PRC' to reflect the operation of MOVA / VA at the junctions. This allows for direct comparison between scenarios to understand development traffic impact. Signal cycle times have been assumed based on the number of stages / streams present on a junction by junction basis.

12.2.7 Some of the assessed signal-controlled junctions operate as part of a MOVA network, meaning that the traffic signals are linked to provide efficient movement of vehicles through a series of junctions. These junctions have been modelled as LinSig networks to capture the effects of MOVA on junction operation. The model networks are outlined on **Figure 12-1** and discussed as appropriate in the following sections.

12.2.8 LinSig outputs from the assessment include 'Degree of Saturation (DoS)' in percentage terms, 'Mean Maximum Queue' (MMQ) in PCUs, and average delay (expressed in seconds per PCU). Lanes are considered to operate at 'practical capacity' when their DoS is at 90% and 'absolute capacity' where the DoS is at 100%. The Practical Reserve Capacity (PRC) of the whole junction is provided from the modelling results. A positive PRC percentage means that the junction is operating within practical capacity (i.e. DoS of under 90% on all arms), and a negative percentage means that the junction is operating above practical capacity (i.e. DoS of over 90% on one or more arms). A negative PRC value does not necessarily mean that the junction is operating in excess of absolute capacity.

12.2.9 Full output reports for both the Junctions 9 and LinSig models have been included at **Appendix Q** which include the full input parameters and results. The results of the junction capacity assessments are discussed in the following sections.

12.3 Junction 1: B3277 / Chiverton Cross Garage Roundabout

12.3.1 The B3277 / Chiverton Cross Garage roundabout is located to the west of Langarth Garden Village, 3.8km northwest of the Threemilestone Roundabout. It is currently located directly adjacent to the existing Chiverton Cross roundabout via the B3277 north-eastern arm; however, the distance will increase to approximately 820m following the construction of the committed grade-separated junction at Chiverton Cross. The results of the junction capacity modelling are summarised in **Table 12-1**.

Table 12-1: Summary of Junction Capacity Modelling – Junction 1

Scenario	Arm		AM Peak Hour			PM Peak Hour		
			RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base	A	B3277	0.15	1	4	0.27	1	5
	B	Garage Access	0.00	0	0	0.00	0	0
	C	Unnamed Road	0.12	1	4	0.14	1	4
	D	B4299	0.28	1	6	0.10	1	4
2023 Base + Development	A	B3277	0.17	1	4	0.29	1	5
	B	Garage Access	0.00	0	0	0.00	0	0
	C	Unnamed Road	0.12	1	4	0.14	1	4
	D	B4299	0.28	1	6	0.12	1	5
2038 Base	A	B3277	0.19	1	4	0.28	1	5
	B	Garage Access	0.00	0	0	0.00	0	0
	C	Unnamed Road	0.13	1	4	0.16	1	4
	D	B4299	0.32	1	6	0.14	1	5
2038 Base + Development	A	B3277	0.20	1	4	0.32	1	5
	B	Garage Access	0.00	0	0	0.00	0	0
	C	Unnamed Road	0.13	1	4	0.18	1	4
	D	B4299	0.32	1	6	0.14	1	5

12.3.2 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.3.3 The proposed development is forecast to result in marginal increases in RFC, of maximum 0.02 in 2023 (on the B3277 and B4299) and 0.04 in 2038 (on the B3277). These increases in RFC are forecast to result in negligible increases in queueing and delay.

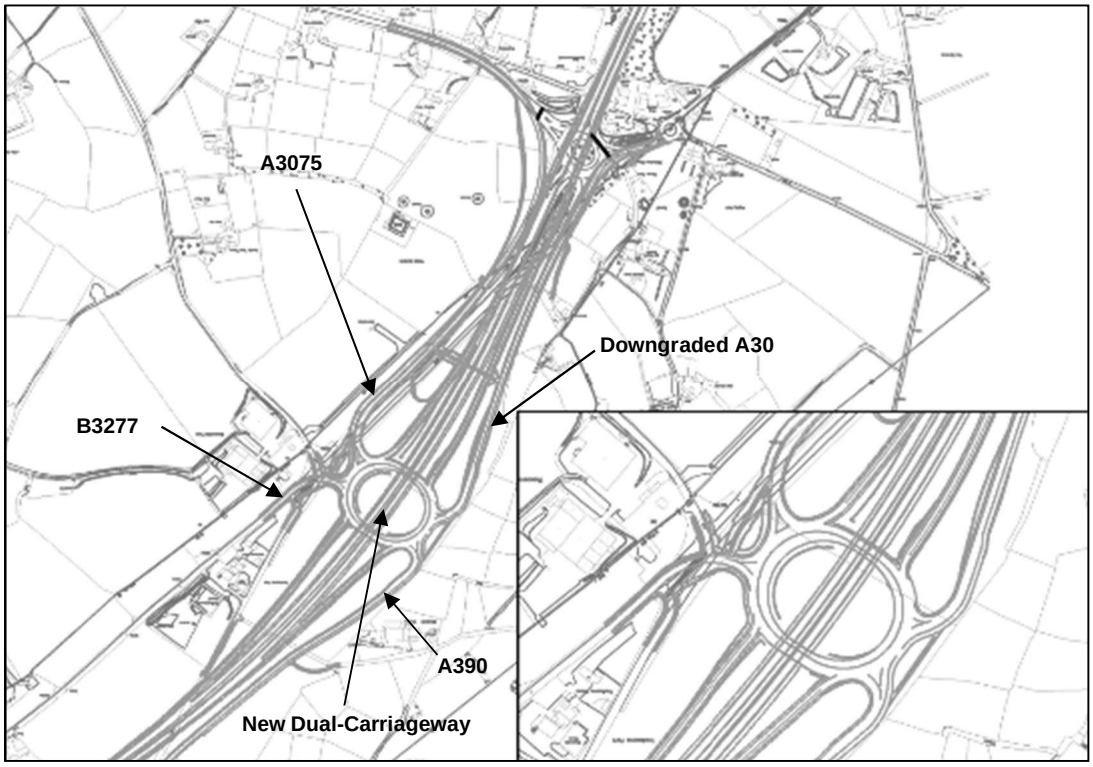
12.3.4 Overall, the impact of the proposed development on the operation of the junction is not severe.

12.4 Junction 2: Chiverton Cross Roundabout

12.4.1 The Chiverton Cross roundabout is the junction between the A30, A390, A3075 and the B3277 currently located 3.5km northwest of the Threemilestone Roundabout. The existing junction is an at-grade priority-controlled roundabout.

12.4.2 As part of the committed Chiverton Cross to Carland Cross highway scheme, the junction will be upgraded to a grade-separated junction between the new dual-carriageway, the downgraded A30, the A390, A3075 and B3277. The junction will be relocated circa 730m northeast of the existing junction. The committed layout of the Chiverton Cross junction is shown in **Figure 12-2**.

Figure 12-2: Chiverton Cross Roundabout Committed Layout



12.4.3 The grade-separated junction has been assessed as a 'large roundabout' using Junctions 9. The model geometric parameters are based on the committed junction layout supplied by CORMAC, with reasonable assumptions made regarding lane markings where they were absent from the design.

12.4.4 The results of the junction capacity modelling are summarised in **Table 12-2**.

Table 12-2: Summary of Junction Capacity Modelling – Junction 2

Scenario	Arm		AM Peak Hour			PM Peak Hour		
			RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base	A	A30 Southbound Off-Slip	0.38	1	6	0.26	1	4
	B	Downgraded A30	0.02	0	8	0.02	0	4
	C	A390	0.27	1	3	0.50	1	3
	D	A30 Northbound Off-Slip	0.34	1	4	0.34	1	4
	E	B3277	0.23	1	3	0.15	1	3
	F	A3075	0.24	1	3	0.20	1	3
2023 Base + Development	A	A30 Southbound Off-Slip	0.40	1	6	0.27	1	4
	B	Downgraded A30	0.00	0	0	0.01	0	6
	C	A390	0.34	1	3	0.57	2	4
	D	A30 Northbound Off-Slip	0.35	1	4	0.35	1	5
	E	B3277	0.23	1	3	0.15	1	3
	F	A3075	0.24	1	3	0.20	1	3
2038 Base	A	A30 Southbound Off-Slip	0.47	1	7	0.30	1	5
	B	Downgraded A30	0.00	0	0	0.01	0	7
	C	A390	0.32	1	3	0.57	2	4
	D	A30 Northbound Off-Slip	0.40	1	4	0.46	1	5
	E	B3277	0.26	1	3	0.19	1	3
	F	A3075	0.29	1	3	0.25	1	3

2038 Base + Development	A	A30 Southbound Off-Slip	0.51	1	8	0.31	1	5
	B	Downgraded A30	0.00	0	0	0.02	0	7
	C	A390	0.40	1	3	0.65	2	5
	D	A30 Northbound Off-Slip	0.43	1	5	0.48	1	6
	E	B3277	0.27	1	3	0.21	1	3
	F	A3075	0.29	1	3	0.25	1	3

12.4.5 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.4.6 The impact of the proposed development is forecast to be minor. In 2023 and 2038, the greatest impact during the AM and PM peak hours is forecast to occur on the A390 arm, with an increase in RFC of 0.07 and 0.08 in 2023 and 2038 respectively. These increases in RFC are forecast to result in negligible increases in queueing and delay.

12.4.7 Overall, the impact of the proposed development on the operation of the junction is not severe.

12.5 Junctions 3-6: Threemilestone Industrial Estate Network

12.5.1 The Threemilestone Industrial Estate Network includes the following:

- Pedestrian crossing over A390 between the Langarth P&R access and Threemilestone Retail Park;
- Junction 3 – A390 / Langarth P&R Access Junction (priority-controlled);
- Junction 4 – Threemilestone Roundabout;
- Junction 5 – Chyvelah Road / Link to Threemilestone Roundabout Signalised; and
- Junction 6 – Chacewater Hill / Threemilestone Retail Park Signalised Junction.

12.5.2 The controller specification for the Threemilestone Industrial Estate identifies a total of ten traffic signal stages, which effectively represent the configuration of a 'triple cycle' operation. The Chacewater Hill east to west movement and the right turn into the Industrial Estate are called on in each cycle (i.e. three times within the operation). The Industrial Estate approach is called on in two of the cycles and the pedestrian stage (all-red traffic phases) and Retail Park stage called once per cycle (albeit in separate cycles).

12.5.3 This stage sequence was initially configured in the LinSig network; however, initial modelling outputs reported significant queueing during both peak hour periods which was considered to be an inaccurate representation of observed on-street conditions.

12.5.4 From analysis of recent traffic data and an on-site observations of signal timings, it was identified that the Retail Park and pedestrian stages are not called as frequently as assumed by the signal stage sequence included in the controller specification. Additionally, the Industrial Estate right-turn is called less frequently in the PM peak. This is because the MOVA / VA control allows for demand-dependant stages and therefore the operation is not tied specifically to the representation in the controller.

12.5.5 To validate the junction network to observed conditions, analysis was undertaken to determine a set of peak specific 'bonus greens' to replicate the effect of on-street demand dependent stages within the LinSig network. This also enabled the staging to be reduced and simplified to a five-stage sequence.

12.5.6 The results for each junction within the network are discussed in the following sub-sections.

Junction 3: A390 / Langarth P&R Access Junction

12.5.7 The A390 / Langarth P&R access junction is located on the A390 corridor to the south of Langarth Garden Village approximately 150m to the west of the Threemilestone Roundabout. The results of the junction capacity modelling are summarised in **Table 12-3**.

Table 12-3: Summary of Junction Capacity Modelling – Junction 3

Scenario	Arm		Lane	AM Peak Hour			PM Peak Hour		
				DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base	1	A390 Eastbound Approach	NS	30.8	-	-	14.0	-	-
			Mid	30.8	3	4	14.0	2	4
			OS	35.9	5	6	25.2	3	5
	2	P&R Access Approach	-	0.0	0	0	13.4	1	4
	3	A390 Westbound Approach	-	38.1	5	6	71.6	15	10
	PRC (%)			**136.2**			**25.7**		
2023 Base + Development	1	A390 Eastbound Approach	NS	19.9	-	-	11.3	-	-
			Mid	19.9	1	2	11.3	1	4
			OS	21.5	3	5	18.4	2	5
	2	P&R Access Approach	-	0.0	0	0	0.0	0	0
	3	A390 Westbound Approach	-	35.6	5	6	51.3	8	7
	PRC (%)			**152.7**			**75.5**		
2038 Base	1	A390 Eastbound Approach	NS	34.2	-	-	18.1	-	-
			Mid	34.2	3	5	18.1	2	5
			OS	40.4	6	6	28.8	4	5
	2	P&R Access Approach	-	0.0	0	0	9.7	1	4
	3	A390 Westbound Approach	-	44.4	7	6	82.1	22	14
	PRC (%)			**102.8**			**9.7**		
2038 Base + Development	1	A390 Eastbound Approach	NS	20.6	-	-	14.2	-	-
			Mid	20.6	1	2	14.2	2	4
			OS	23.9	3	5	23.3	3	5
	2	P&R Access Approach	-	0.0	0	0	0.0	0	0
	3	A390 Westbound Approach	-	40.7	6	6	58.4	10	8
	PRC (%)			**120.9**			**54.1**		

12.5.8 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.5.9 The proposed development is forecast to result in an overall improvement in junction performance. In 2023, increases in PRC of 17% and 50% are forecast during the AM and PM peak hours respectively. In 2038, increases in PRC of 18% and 44% are forecast during the AM and PM peak hours respectively. During the AM peak hour, the greatest improvement in performance is shown on the A390 eastbound. This arm is forecast to experience reductions in DoS of 11-14% in 2023 and 14-17% in 2038, with associated reductions in queueing of 2-3 PCUs. During the PM peak hour, the greatest improvement in performance is shown on the A390 westbound. This arm is forecast to experience reductions in DoS of 20% in 2023 and 24% in 2038, with associated reductions in queueing of 7 and 12 PCUs respectively. Changes in delay are small, at under 10 seconds.

12.5.10 The improvements in performance are due to a reduction in total traffic entering the junction; this can be attributed to the reassignment of traffic onto the NAR in the 'Base + Development' scenarios together with a reduction in background traffic on the A390 corridor as part of future trends, namely home relocation associated with the proposed development (as discussed at **Chapter 11**).

Junction 4: Threemilestone Roundabout

12.5.11 The Threemilestone Roundabout is a signalised junction located on the A390 corridor to the south of Langarth Garden Village. The northern arm of the junction provides access to the P&R. The southern arm of the junction provides vehicle access to Threemilestone.

12.5.12 The results of the junction capacity modelling are summarised in **Table 12-4**.

Table 12-4: Summary of Junction Capacity Modelling – Junction 4

Scenario	Arm		Lane	AM Peak Hour			PM Peak Hour		
				DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base	1	A390 Eastbound Approach	NS	59.6	5	22	24.9	2	11
			Mid	59.0	5	18	30.1	3	9
			OS	59.0	-	-	30.1	-	-
	2	P&R Egress	NS	10.0	1	27	19.2	1	28
			OS	0.7	0	25	26.0	2	27
	3	P&R Bus Bypass Lane	-	0.0	0	0	0.0	0	0
	4	A390 Westbound Approach	NS	47.7	4	10	70.4	8	16
			Mid	21.2	2	7	55.7	6	11
			OS	18.3	-	-	55.5	-	-
	5	Threemilestone Approach	NS	54.6	5	12	60.8	5	24
			OS	31.1	3	9	43.2	4	19
	6	North Circulatory	NS	38.6	2	4	22.8	1	4
			Mid	56.8	2	5	41.9	2	4
			OS	12.0	1	3	15.9	1	5
	7	East Circulatory	NS	29.9	2	17	29.4	2	12
			OS	0.5	0	30	32.1	2	11
	8	South Circulatory	NS	23.2	2	13	27.8	3	11
			Mid	43.8	3	17	61.9	2	8
			OS	15.0	1	14	3.5	0	5
	9	West Circulatory	NS	45.1	3	10	30.0	2	10
			OS	43.5	1	8	48.8	4	13
	PRC (%)			**50.9**			**27.9**		
2023 Base + Development	1	A390 Eastbound Approach	NS	11.5	1	20	19.1	2	12
			Mid	36.1	3	18	23.6	2	11
			OS	28.4	-	-	23.6	-	-
	2	P&R Egress	NS	20.8	1	28	20.7	1	26
			OS	4.5	1	25	37.0	2	27
	3	P&R Bus Bypass Lane	-	0.0	0	0	0.0	0	0
	4	A390 Westbound Approach	NS	44.4	4	10	52.2	5	11
			Mid	18.4	2	7	36.7	4	9
			OS	15.7	-	-	36.8	-	-
	5	Threemilestone Approach	NS	54.4	5	11	58.7	5	19
			OS	33.9	3	9	41.0	4	15
	6	North Circulatory	NS	19.6	1	5	23.1	1	4
			Mid	42.7	2	5	40.6	2	4
			OS	13.0	1	3	7.2	1	5
	7	East Circulatory	NS	32.7	1	8	22.4	2	21
			OS	3.3	1	18	30.8	2	19
	8	South Circulatory	NS	21.6	2	18	15.3	2	14
			Mid	41.7	3	23	52.0	2	11
			OS	16.2	1	21	4.1	1	8
	9	West Circulatory	NS	38.2	3	7	32.0	1	8
			OS	40.7	1	4	49.2	1	7
	PRC (%)			**65.5**			**53.4**		

2038 Base	1	A390 Eastbound Approach	NS	50.0	4	14	30.9	3	11
			Mid	48.5	5	12	32.5	3	9
			OS	48.5	-	-	32.5	-	-
	2	P&R Egress	NS	11.3	1	27	29.2	2	30
			OS	0.7	0	25	38.2	2	29
	3	P&R Bus Bypass Lane	-	0.0	0	0	0.0	0	0
	4	A390 Westbound Approach	NS	54.7	5	11	72.6	8	16
			Mid	25.6	2	7	59.7	7	11
			OS	25.6	-	-	57.0	-	-
	5	Threemilestone Approach	NS	64.0	6	15	66.9	5	26
			OS	37.6	4	11	45.8	4	20
	6	North Circulatory	NS	41.7	2	5	26.2	2	5
			Mid	63.0	3	6	45.6	2	5
			OS	14.5	1	5	15.7	1	5
	7	East Circulatory	NS	35.9	2	18	37.2	3	20
			OS	0.5	0	10	39.5	3	18
	8	South Circulatory	NS	23.1	2	11	33.8	3	10
			Mid	46.5	4	15	69.8	3	10
			OS	13.3	1	12	3.6	1	5
	9	West Circulatory	NS	63.1	4	18	34.6	1	10
			OS	65.2	2	16	55.0	1	9
	PRC (%)				**38.1**			**23.9**	
2038 Base + Development	1	A390 Eastbound Approach	NS	11.0	1	16	21.7	2	11
			Mid	28.8	2	15	25.7	2	9
			OS	26.0	-	-	25.7	-	-
	2	P&R Egress	NS	21.7	1	28	17.0	1	26
			OS	4.5	1	25	37.0	2	27
	3	P&R Bus Bypass Lane	-	0.0	0	0	0.0	0	0
	4	A390 Westbound Approach	NS	52.3	5	11	66.1	7	14
			Mid	20.2	2	7	34.3	3	9
			OS	17.3	-	-	33.2	-	-
	5	Threemilestone Approach	NS	64.5	6	13	54.9	5	16
			OS	29.3	3	8	35.5	3	13
	6	North Circulatory	NS	24.6	1	4	26.3	1	4
			Mid	39.4	1	4	43.9	2	5
			OS	15.6	1	3	10.0	1	6
	7	East Circulatory	NS	38.5	1	11	27.0	2	18
			OS	3.3	1	17	28.6	2	29
	8	South Circulatory	NS	26.5	2	16	32.5	2	13
			Mid	45.9	3	19	56.7	3	15
			OS	17.4	1	16	4.9	1	11
	9	West Circulatory	NS	52.8	5	11	38.6	2	14
			OS	40.8	4	11	57.6	2	16
	PRC (%)				**39.6**			**36.2**	

12.5.13 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.5.14 The proposed development is forecast to result in an overall improvement in junction performance. In 2023, increases in PRC of 15% and 26% are forecast during the AM and PM peak hours respectively. In 2038, increases in PRC of 2% and 12% are forecast during the AM and PM peak hours respectively. During the AM peak hour, the greatest improvement in performance is shown on the A390 eastbound. This arm is forecast to experience reductions in DoS of 23-48% in 2023 and 7-25% in 2038, with associated reductions in queueing of 2-4 PCUs. During the PM peak hour, the greatest improvement in performance is shown on the A390 westbound. This arm is forecast to experience reductions in DoS of 18-19% in 2023 and 7-25% in 2038, with associated reductions in queueing of 2-4 PCUs. Some arms are forecast to experience minor increases in DoS of up to 11% (see P&R Egress) and queueing of up to 2 PCUs (see West Circulatory). Changes in delay are small, generally at under 10 seconds.

12.5.15 The improvements in performance are due to a reduction in total traffic entering the junction; this can be attributed to the reassignment of traffic onto the NAR in the 'Base + Development' scenarios together with a reduction in background traffic on the A390 corridor as part of future trends, namely home relocation associated with the proposed development and reassignment of traffic as a result of the extension to the P&R (as discussed at **Chapter 11**).

Junction 5: Chyvelah Road / Link to Threemilestone Roundabout Junction

12.5.16 The Chyvelah Road / Link to Threemilestone Roundabout junction is a signalised junction located immediately south of the Threemilestone Roundabout. This junction forms part of the Threemilestone Industrial Estate Network and has been assessed using a linked LinSig model. The results of the junction capacity modelling are summarised in **Table 12-5**.

Table 12-5: Summary of Junction Capacity Modelling – Junction 5

Scenario	Arm		Lane	AM Peak Hour			PM Peak Hour		
				DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base	1	Chyvelah Road Approach	NS	11.1	2	21	11.9	1	42
			OS	64.6	10	32	41.5	4	48
	2	Greenbottom Approach	NS	29.9	5	16	19.3	2	3
			OS	39.9	4	24	33.4	3	7
	3	Link to Threemilestone	-	65.2	11	29	57.6	10	13
		PRC (%)			**38.1**			**56.3**	
2023 Base + Development	1	Chyvelah Road Approach	NS	24.6	3	23	36.1	3	48
			OS	65.6	11	32	47.5	4	51
	2	Greenbottom Approach	NS	36.8	6	17	23.5	1	3
			OS	40.4	4	25	37.0	2	6
	3	Link to Threemilestone	-	66.4	11	30	50.4	8	11
		PRC (%)			**35.6**			**78.6**	
2038 Base	1	Chyvelah Road Approach	NS	12.5	2	22	19.0	2	49
			OS	75.3	13	37	58.1	4	61
	2	Greenbottom Approach	NS	30.1	5	16	19.8	1	3
			OS	50.4	5	28	32.6	1	6
	3	Link to Threemilestone	-	74.2	13	33	56.1	9	10
		PRC (%)			**19.5**			**54.9**	
2038 Base + Development	1	Chyvelah Road Approach	NS	26.7	4	24	35.2	3	47
			OS	76.4	13	38	50.7	4	51
	2	Greenbottom Approach	NS	37.8	6	16	25.5	4	4
			OS	44.9	4	30	36.9	4	8
	3	Link to Threemilestone	-	75.4	14	33	52.9	8	12
		PRC (%)			**17.8**			**70.3**	

12.5.17 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.5.18 The proposed development is forecast to result in a reduction in junction performance during the AM peak hour, with decreases in PRC of -3% in 2023 and -2%. During the PM peak hour, the proposed development is forecast to result in an overall improvement in junction performance, with increases in PRC of 22% in 2023 and 15% in 2038. Within these PRC values are localised improvements / worsening in performance of lanes. In terms of DoS, these range from a reduction of 7% (on Link to Threemilestone in 2023 PM) to an increase of 24% (on Chyvelah Road in 2023 PM). Whilst these changes are not insignificant, they result in fairly small changes in queueing of up to 3 PCUs. Changes in delay are small, generally at under 10 seconds.

12.5.19 The deteriorations in performance reported are not considered to be severe, with the junction continuing to operate within practical capacity with the proposed development.

Junction 6: Chacewater Hill / Threemilestone Retail Park Junction

12.5.20 The Chacewater Hill / Threemilestone Retail Park junction is a signalised junction which serves as the access to the Threemilestone Retail Park. The results of the junction capacity modelling are summarised in **Table 12-6**.

Table 12-6: Summary of Junction Capacity Modelling – Junction 6

Scenario	Arm		Lane	AM Peak Hour			PM Peak Hour		
				DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base	1	Greenbottom Approach	NS	47.8	5	14	41.1	6	28
			OS	47.8	-	-	41.1	-	-
	2	Retail Park	-	43.3	1	150	51.1	2	127
	3	Chyvelah Road Approach	-	45.2	4	8	88.8	12	44
	4	Threemilestone Industrial Park	-	38.7	2	62	74.2	12	38
		PRC (%)			**88.2**			**1.4**	
2023 Base + Development	1	Greenbottom Approach	NS	51.0	5	15	52.7	8	28
			OS	51.0	-	-	52.7	-	-
	2	Retail Park	-	43.3	1	150	51.1	2	127
	3	Chyvelah Road Approach	-	53.1	6	9	85.2	17	37
	4	Threemilestone Industrial Park	-	48.1	3	69	83.9	14	49
		PRC (%)			**69.5**			**5.7**	
2038 Base	1	Greenbottom Approach	NS	54.3	6	15	39.4	5	28
			OS	54.3	-	-	40.3	-	-
	2	Retail Park	-	43.0	1	150	51.1	2	127
	3	Chyvelah Road Approach	-	52.9	4	8	87.3	18	42
	4	Threemilestone Industrial Park	-	50.4	3	70	88.8	17	55
		PRC (%)			**65.8**			**1.4**	
2038 Base + Development	1	Greenbottom Approach	NS	57.3	6	17	50.4	7	30
			OS	57.3	-	-	50.4	-	-
	2	Retail Park	-	43.3	1	150	51.1	2	127
	3	Chyvelah Road Approach	-	60.2	7	10	89.9	14	47
	4	Threemilestone Industrial Park	-	55.6	3	73	89.7	18	56
		PRC (%)			**49.5**			**0.1**	

12.5.21 The results show that the junction is forecast to operate within practical capacity in all assessment scenarios and modelled time periods.

12.5.22 During the AM peak hour, the proposed development is forecast to result in a reduction in PRC of 19% in 2023 and 16% in 2038. Increases in DoS of up to 9% (on Threemilestone Industrial Park in 2023 AM) are forecast, resulting in increases in queueing of up to 3 PCUs (on Chyvelah Road in 2038 AM). Changes in delay are small, generally at under 10 seconds.

12.5.23 During the PM peak hour, the proposed development is forecast to result in an increase in PRC of 4% in 2023. This is due to a reduction in DoS of 4% on Chyvelah Road (the worst-performing arm), although an increase in queueing of 5 PCUs is forecast on this arm. Increases in DoS and queueing of up to 12% and 2 PCUs are forecast on other arms (on Greenbottom). In 2038, a reduction in PRC of 1% is forecast, with increases in DoS and queueing of up to 11% and 2 PCUs (on Greenbottom). Changes in delay are small, at under 10 seconds.

12.5.24 The deteriorations in performance reported are not considered to be severe, with the junction continuing to operate within practical capacity with the proposed development.

12.6 Junction 7: A390 / Chyvelah Road Junction

12.6.1 The A390 / Chyvelah Road signalised junction is located on the A390 corridor to the south of Langarth Garden Village, approximately 750m to the east of the Threemilestone Roundabout. The junction operates as a bus priority measure between the A390 and Chyvelah Road with bus-only movements permitted between Chyvelah Road to the A390. General traffic can only turn left onto Chyvelah Road from the A390; this movement is not delayed as it is undertaken via a slip-road.

12.6.2 The results of the junction capacity modelling are summarised in **Table 12-7**.

Table 12-7: Summary of Junction Capacity Modelling – Junction 7

Scenario	Arm		Lane	AM Peak Hour			PM Peak Hour		
				DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base	1	A390 Eastbound Approach	NS	47.1	5	7	31.3	3	6
			OS	47.1	5	7	31.3	3	6
	2	A390 Westbound Approach	NS	26.0	2	5	45.7	5	7
			OS	26.0	2	5	45.7	5	7
	3	Chyvelah Road (Bus Only)	-	9.3	1	38	8.0	1	38
	PRC (%)			**91.0**			**97.1**		
2023 Base + Development	1	A390 Eastbound Approach	NS	31.3	3	6	30.8	3	6
			OS	31.4	3	6	30.9	3	6
	2	A390 Westbound Approach	NS	24.9	2	5	33.5	3	6
			OS	24.8	2	5	33.5	3	6
	3	Chyvelah Road (Bus Only)	-	9.3	1	38	8.0	1	38
	PRC (%)			**186.7**			**168.8**		
2038 Base	1	A390 Eastbound Approach	NS	51.5	6	7	35.1	3	6
			OS	51.5	6	7	35.2	3	6
	2	A390 Westbound Approach	NS	30.1	3	6	49.8	6	7
			OS	30.2	3	6	49.8	6	7
	3	Chyvelah Road (Bus Only)	-	9.3	1	38	8.0	1	38
	PRC (%)			**74.8**			**80.8**		
2038 Base + Development	1	A390 Eastbound Approach	NS	32.2	3	6	33.3	3	6
			OS	32.2	3	6	33.3	3	6
	2	A390 Westbound Approach	NS	28.4	3	5	35.9	4	6
			OS	28.4	3	5	35.9	4	6
	3	Chyvelah Road (Bus Only)	-	9.3	1	38	8.0	1	38
	PRC (%)			**179.1**			**150.8**		

12.6.3 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.6.4 The proposed development is forecast to result in an overall improvement in junction performance. In 2023, increases in PRC of 96% and 72% are forecast during the AM and PM peak hours respectively. In 2038, increases in PRC of 104% and 70% are forecast during the AM and PM peak hours respectively. During the AM peak hour, the greatest improvement in performance is shown on the A390 eastbound. This arm is forecast to experience reductions in DoS of 16% in 2023 and 19% in 2038, with associated reductions in queueing of 2-3 PCUs. During the PM peak hour, the greatest improvement in performance is shown on the A390 westbound. This arm is forecast to experience reductions in DoS of 12% in 2023 and 14% in 2038, with associated reductions in queueing of 2 PCUs. Changes in delay are negligible.

12.6.5 The improvements in performance are due to a reduction in total traffic entering the junction; this can be attributed to the reassignment of traffic onto the NAR in the 'Base + Development' scenarios together with a reduction in background traffic on the A390 corridor as part of future trends, namely home relocation associated with the proposed development and reassignment of traffic as a result of the extension to the P&R (as discussed at **Chapter 11**).

12.7 Junctions 8-9: Maiden Green Network

12.7.1 The Maiden Green Network includes the A390 / Higher Besore Road (Junction 8) and Maiden Green Roundabout (Junction 9). It is a MOVA network and been modelled as a linked LinSig model. The network varies between the 'Base' and 'Base + Development' scenarios to include for access to the proposed development (discussed below). The results for each junction within the network are discussed in the following sub-sections.

Junction 8: A390 / Higher Besore Road Junction

12.7.2 The A390 / Higher Besore Road signalised junction is located on the A390 corridor approximately 1km east of the Threemilestone Roundabout. The junction is currently a three-arm junction which provides access to the Richard Lander School; it is modelled as such in the 'Base' scenarios. A northern arm will provide access into the development site (Access E), results for which are reported for the 'Base + Development' scenarios.

12.7.3 The results of the junction capacity modelling are summarised in **Table 12-8**.

Table 12-8: Summary of Junction Capacity Modelling – Junction 8

Scenario	Arm		Lane	AM Peak Hour			PM Peak Hour		
				DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base	1	A390 Eastbound Approach	NS	35.0	5	10	20.4	3	5
			Mid	63.1	12	14	36.9	5	10
			OS	63.1	-	-	38.9	-	-
	2	A390 Westbound Approach	NS	36.0	5	15	58.6	9	13
			OS	47.6	8	16	61.8	12	13
	3	Chyvelah Road (Bus Only)	NS	60.7	-	-	32.3	-	-
			OS	60.7	5	43	26.3	2	48
	PRC (%)				**42.7**			**45.6**	
2023 Base + Development	1	A390 Eastbound Approach	NS	59.0	7	35	56.9	7	31
			Mid	73.6	11	39	66.2	11	33
			OS	74.0	-	-	66.2	-	-
	2	A390 Westbound Approach	NS	54.4	6	35	65.6	9	35
			Mid	63.4	9	36	75.0	12	37
			OS	63.4	-	-	72.0	-	-
	3	Chyvelah Road (Bus Only)	NS	63.4	-	68	72.0	-	59
			OS	74.3	6	49	32.3	2	57
	4	Development Access E Approach	NS	40.2	3	43	27.8	2	36
			OS	43.3	4	57	23.7	2	53
	PRC (%)				**21.1**			**20.0**	
2038 Base	1	A390 Eastbound Approach	NS	38.0	6	10	23.3	3	5
			Mid	68.8	14	16	41.2	5	10
			OS	68.8	-	-	41.2	-	-
	2	A390 Westbound Approach	NS	44.2	6	16	64.3	11	14
			OS	53.9	10	17	67.8	14	14
	3	Chyvelah Road (Bus Only)	NS	68.4	-	-	33.8	-	-
			OS	68.4	6	46	27.8	2	49
	PRC (%)				**30.8**			**32.8**	

2038 Base + Development	1	A390 Eastbound Approach	NS	66.4	8	40	65.1	9	34
			Mid	78.5	12	43	73.1	12	36
			OS	74.4	-	-	73.1	-	-
	2	A390 Westbound Approach	NS	71.3	9	43	74.5	10	40
			Mid	77.9	11	44	81.3	14	42
			OS	77.9	-	-	81.3	-	-
	3	Chyvelah Road (Bus Only)	NS	77.9	-	70	81.3	-	59
			OS	78.0	6	48	33.8	2	58
	4	Development Access E Approach	NS	41.1	3	43	30.0	2	35
			OS	43.7	4	61	22.6	2	55
	PRC (%)				**14.4**			**10.7**	

12.7.4 The results show that the junction is forecast to operate within practical capacity in all assessment scenarios and modelled time periods, and that the junction can accommodate the additional development access point without an unacceptable impact on capacity.

12.7.5 The proposed development is forecast to result in a deterioration in performance. In 2023, reductions in PRC of 22% and 26% are forecast during the AM and PM peak hours respectively. In 2038, reductions in PRC of 16% and 22% are forecast during the AM and PM peak hours respectively. The addition of a fourth arm to provide access to the proposed development and incorporation into the model operation reduces green time allocation to existing arms of the junction and associated deterioration. During the AM peak hour, the greatest increases in DoS are forecast on the A390 eastbound (up to 24% in 2023 and 28% in 2038), although increases in queueing are small (no more than 2 PCUs). During the PM peak hour, the greatest increases in DoS are again forecast on the A390 eastbound (up to 37% in 2023 and 42% in 2038), with larger increases in queueing (of up to 7 PCUs). Increases in delay of 20-30 seconds are forecast on all arms.

12.7.6 The deteriorations in performance reported are not considered to be severe, with the junction continuing to operate within practical capacity with the proposed development.

Junction 9: Maiden Green Roundabout

12.7.7 The Maiden Green roundabout is a signalised junction on the A390 corridor, corridor approximately 600m west of the Treliske Roundabout. It comprises the A390, Chyvelah Vale and a Retail Park. The results of the junction capacity modelling are summarised in **Table 12-9**.

Table 12-9: Summary of Junction Capacity Modelling – Junction 9

Scenario	Arm		Lane	AM Peak Hour			PM Peak Hour		
				DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base	1	A390 Eastbound Approach	NS	61.7	5	14	40.2	3	11
			Mid	51.4	5	10	40.8	4	10
			OS	51.4	-	-	40.8	-	-
	2	Maiden Green Services Approach	-	25.9	1	26	28.5	2	23
	3	A390 Westbound Approach	NS	62.3	5	15	72.9	7	18
			OS	55.1	5	13	74.1	8	17
	4	Chyvelah Vale Approach	NS	31.5	2	20	59.3	4	26
			OS	24.2	2	18	35.2	2	20
	5	North Circulatory	NS	41.3	2	4	35.3	2	6
			Mid	46.6	1	4	41.5	2	5
			OS	27.6	1	3	13.3	1	3
	6	East Circulatory	-	62.8	5	32	38.5	2	21
	7	South Circulatory	NS	19.2	1	4	46.9	1	5
			Mid	48.5	1	4	66.8	2	6
			OS	2.9	0	3	6.1	0	3
	8	West Circulatory	-	32.1	1	13	50.3	2	14
	9	Eastbound Exit Pedestrian Crossing	NS	3.4	0	3	3.0	0	3
			Mid	46.3	2	5	38.0	1	5
			OS	52.2	1	4	43.2	1	4
	10	Chyvelah Vale Exit Pedestrian Crossing	-	50.2	4	6	23.9	1	4
	PRC (%)			**43.3**			**21.4**		
2023 Base + Development	1	A390 Eastbound Approach	NS	34.2	3	11	35.6	3	11
			Mid	37.1	3	9	44.7	4	11
			OS	37.1	-	-	44.7	-	-
	2	Maiden Green Services Approach	-	27.0	1	26	30.6	2	23
	3	A390 Westbound Approach	NS	58.3	5	14	47.9	4	12
			OS	40.9	4	11	50.8	5	12
	4	Chyvelah Vale Approach	NS	33.5	2	21	51.6	3	21
			OS	22.9	2	18	30.5	2	17
	5	North Circulatory	NS	23.1	1	5	31.8	2	5
			Mid	33.1	2	6	42.1	1	4
			OS	27.2	2	7	13.5	1	3
	6	East Circulatory	-	67.2	4	23	40.2	3	24
	7	South Circulatory	NS	16.7	1	4	27.5	1	5
			Mid	37.5	1	4	50.3	2	6
			OS	3.3	0	3	6.8	1	4
	8	West Circulatory	-	31.4	2	14	47.4	2	14
	9	Eastbound Exit Pedestrian Crossing	NS	3.4	1	3	3.0	0	3
			Mid	26.0	2	6	34.6	1	5
			OS	37.1	2	5	43.8	1	5
	10	Chyvelah Vale Exit Pedestrian Crossing	-	50.7	4	6	24.4	1	5
	PRC (%)			**34.0**			**74.3**		

2038 Base	1	A390 Eastbound Approach	NS	66.9	6	16	45.5	4	12
			Mid	55.3	5	10	45.5	4	10
			OS	55.3	-	-	45.5	-	-
	2	Maiden Green Services Approach	-	25.9	1	26	31.7	2	25
	3	A390 Westbound Approach	NS	70.4	7	18	80.9	9	22
			OS	62.3	6	14	80.9	10	20
	4	Chyvelah Vale Approach	NS	36.0	2	18	61.2	4	25
			OS	18.2	1	16	36.7	3	19
	5	North Circulatory	NS	44.7	2	5	39.0	2	6
			Mid	48.8	1	5	44.9	2	5
			OS	31.1	1	4	14.4	1	3
	6	East Circulatory	-	69.6	5	25	42.0	2	20
	7	South Circulatory	NS	24.1	1	3	53.7	2	6
			Mid	59.9	2	6	75.8	2	8
			OS	3.1	0	5	6.4	0	3
	8	West Circulatory	-	28.8	2	15	55.4	2	15
	9	Eastbound Exit Pedestrian Crossing	NS	3.4	0	3	3.0	0	3
			Mid	50.0	1	5	43.4	2	5
			OS	54.7	1	5	48.5	1	5
	10	Chyvelah Vale Exit Pedestrian Crossing	-	56.0	5	7	27.3	1	3
	PRC (%)				**27.9**			**11.3**	
2038 Base + Development	1	A390 Eastbound Approach	NS	35.5	3	11	39.4	3	12
			Mid	34.7	3	8	47.4	4	11
			OS	34.0	-	-	47.4	-	-
	2	Maiden Green Services Approach	-	26.6	1	26	34.3	2	25
	3	A390 Westbound Approach	NS	68.0	6	17	52.7	4	13
			OS	48.6	4	12	52.4	5	12
	4	Chyvelah Vale Approach	NS	39.2	2	20	57.6	4	23
			OS	19.8	2	17	34.5	3	17
	5	North Circulatory	NS	20.2	1	5	33.9	2	5
			Mid	34.3	2	6	44.2	2	4
			OS	30.8	2	7	14.8	1	3
	6	East Circulatory	-	69.2	4	22	44.1	3	24
	7	South Circulatory	NS	19.7	1	4	29.1	1	5
			Mid	44.3	1	4	52.3	2	6
			OS	3.4	0	3	6.8	1	4
	8	West Circulatory	-	29.8	2	15	52.1	2	15
	9	Eastbound Exit Pedestrian Crossing	NS	3.4	1	3	3.0	0	3
			Mid	22.7	2	6	38.1	1	5
			OS	38.4	3	4	47.7	1	5
	10	Chyvelah Vale Exit Pedestrian Crossing	-	56.7	5	7	27.8	2	5
	PRC (%)				**30.0**			**14.7**	

12.7.8 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.7.9 The proposed development is generally forecast to result in an overall improvement in junction performance. In 2023, a reduction in PRC of 9% is forecast during the AM peak hour, but an increase in PRC of 53% is forecast during the PM peak hour. In 2038, increases in PRC of 2% and 3% are forecast during the AM and PM peak hours respectively.

12.7.10 During the AM peak hour, the reduction in performance (in terms of PRC) in 2023 is associated with an increase in DoS of 4% on the East Circulatory (the worst-performing arm). Across the junction, most arms are forecast to experience a reduction in DoS, in some cases up to 28% (on A390 eastbound), with reductions in queueing of up to 2 PCUs. Similar levels of reduction in DoS and queueing are forecast in 2038. Changes in delay are small, generally at under 10 seconds.

12.7.11 During the PM peak hour, the significant improvement in performance (in terms of PRC) in 2023 is due to a reduction in DoS of 25% on the A390 westbound (the worst-performing arm), with an associated reduction in queueing of 3 PCUs. Across the junction, most arms are forecast to experience a reduction in DoS, with some experiencing minor increases (of up to 4%). Changes in queueing are generally no more than 1 PCU. Similar levels of reduction in DoS and queueing are forecast in 2038. Changes in delay are small, generally at under 10 seconds.

12.7.12 The improvements in performance are due to a reduction in total traffic entering the junction; this can be attributed to the reassignment of traffic onto the NAR in the 'Base + Development' scenarios together with a reduction in background traffic on the A390 corridor as part of future trends, namely home relocation associated with the proposed development and reassignment of traffic as a result of the extension to the P&R (as discussed at **Chapter 11**).

12.8 Junction 10: Treliske Roundabout

12.8.1 The Treliske Roundabout is located on the A390 corridor to the east of the Langarth Garden Village. The northern arm of the junction, Penventinnie Lane, provides vehicle access to the RCHT car parks, industrial areas on Oak Lane and to the rural areas north of Truro. Following development of Langarth Garden Village, Penventinnie Lane will also provide direct connectivity to the NAR as well as via Oak Lane. The roundabout includes an emergency vehicle only access and an eastbound bus lane (and bus gate) on the A390 approach to the junction.

12.8.2 The junction has been assessed using LinSig. The model's geometric parameters are based on as-built drawing supplied by CORMAC (Drawing No. S315/Asbuilt/A3, dated 8th January 2018). The model operation is based on signal specification supplied by CORMAC (dated 24th March 2019). The signal cycle time has been set at 60 seconds which is appropriate for a roundabout junction with the phases allocated to separate streams. The signal controller includes dedicated phases for the emergency vehicle access. There is also a dedicated phase for the bus lane which provides priority movement through the roundabout.

12.8.3 For the purposes of this assessment the pedestrian crossings over the A390 to the west of the junction have been included in the model, with the required phases added into the model operation. The pedestrian crossing is assumed to be called once per cycle (once per minute) which is considered to be an appropriate for the likely pedestrian demand at this location.

12.8.4 The results of the junction capacity modelling are summarised in **Table 12-10**.

Table 12-10: Summary of Junction Capacity Modelling – Junction 10

Scenario	Arm		Lane	AM Peak Hour			PM Peak Hour		
				DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base	1	Penventinnie Lane	NS	34.2	-	-	-	82.7	-
			OS	34.1	3	24	24	82.7	25
	2	Emergency Vehicle Access	-	29.3	2	33	33	40.8	37
	3	A390 East	NS	34.3	3	7	7	43.1	14
			Mid	48.5	4	7	7	51.9	13
			OS	48.5	-	-	-	51.9	-
	4	Newbridge View	-	1.8	0	4	4	1.0	4
	5	A390 West	Bus	12.5	1	31	31	21.5	33
			NS	62.7	6	22	22	54.8	12
			OS	61.1	6	21	21	51.7	11
	6	Circulatory North	NS	39.0	1	5	5	81.3	32
			OS	41.2	1	4	4	81.0	31
	7	Circulatory East	NS	37.6	2	24	24	48.4	12
			OS	34.0	2	22	22	57.3	11
	8	Circulatory West	-	59.6	5	25	25	68.0	50
	9	A390 West Ped. Crossing Eastbound	Bus	2.1	1	5	5	3.6	6
			NS	27.4	3	7	7	34.3	7
			OS	26.8	3	7	7	32.3	7
	10	A390 West Ped. Crossing Westbound	NS	34.6	3	5	5	44.1	5
			OS	38.4	3	5	5	52.1	5
		PRC (%)			**43.6**			**8.8**	
2023 Base + Development	1	Penventinnie Lane	NS	38.4	-	-	-	65.7	-
			OS	38.4	3	21	21	65.7	25
	2	Emergency Vehicle Access	-	32.9	2	35	35	40.8	37
	3	A390 East	NS	33.9	3	6	6	28.9	7
			Mid	50.5	3	6	6	45.1	6
			OS	50.5	-	-	-	45.1	-
	4	Newbridge View	-	1.7	0	3	3	0.8	3
	5	A390 West	Bus	8.5	1	30	30	24.5	34
			NS	66.9	6	27	27	74.7	25
			OS	65.8	6	26	26	73.3	25
	6	Circulatory North	NS	41.7	1	6	6	59.1	8
			OS	45.0	1	6	6	61.2	8
	7	Circulatory East	NS	14.5	1	25	25	39.2	25
			OS	13.0	1	22	22	46.8	21
	8	Circulatory West	-	67.8	7	25	25	77.4	35
	9	A390 West Ped. Crossing	Bus	1.4	1	5	5	4.1	6
			NS	25.1	3	6	6	34.3	7
			OS	24.7	3	6	6	33.6	7
	10	A390 East Exit Merge	NS	30.5	2	4	4	29.8	4
			OS	33.4	2	4	4	34.8	5
		PRC (%)			**32.7**			**16.3**	

2038 Base	1	Penventinnie Lane	NS	34.3	-	-	-	90.8	-
			OS	34.3	3	21	21	90.8	34
	2	Emergency Vehicle Access	-	32.9	2	35	35	40.8	37
	3	A390 East	NS	39.9	4	8	8	50.3	16
			Mid	53.6	4	7	7	58.5	15
			OS	53.6	-	-	-	58.5	-
	4	Newbridge View	-	1.8	0	4	4	1.0	5
	5	A390 West	Bus	14.0	1	39	39	25.0	41
			NS	65.1	4	23	23	63.4	15
			OS	63.6	4	22	22	59.9	14
	6	Circulatory North	NS	43.9	1	5	5	91.3	46
			OS	46.5	1	5	5	90.8	45
	7	Circulatory East	NS	38.8	2	21	21	47.8	12
			OS	40.8	1	19	19	61.8	11
	8	Circulatory West	-	64.9	6	27	27	68.0	37
	9	A390 West Ped. Crossing Eastbound	Bus	2.3	1	5	5	4.2	6
			NS	28.5	3	7	7	38.3	7
			OS	27.8	3	7	7	36.2	7
	10	A390 West Ped. Crossing Westbound	NS	39.1	3	5	5	48.1	5
			OS	43.3	3	5	5	57.7	5
		PRC (%)			**38.2**			**-1.4**	
2038 Base + Development	1	Penventinnie Lane	NS	39.8	-	-	-	70.8	-
			OS	39.8	3	21	21	70.8	27
	2	Emergency Vehicle Access	-	32.9	2	35	35	40.8	37
	3	A390 East	NS	39.0	3	7	7	33.7	7
			Mid	55.0	4	6	6	49.6	7
			OS	55.0	-	-	-	49.6	-
	4	Newbridge View	-	1.7	0	3	3	0.8	3
	5	A390 West	Bus	10.5	1	30	30	29.0	33
			NS	70.0	6	28	28	81.5	30
			OS	69.3	6	28	28	80.5	29
	6	Circulatory North	NS	44.8	1	6	6	63.0	8
			OS	47.6	1	6	6	64.3	8
	7	Circulatory East	NS	14.5	1	24	24	27.6	20
			OS	12.5	1	22	22	42.9	18
	8	Circulatory West	-	69.7	7	26	26	80.7	37
	9	A390 West Ped. Crossing Eastbound	Bus	1.8	1	5	5	4.8	6
			NS	26.3	3	7	7	37.3	7
			OS	26.0	3	7	7	36.9	7
	10	A390 West Ped. Crossing Westbound	NS	34.6	2	4	4	31.3	5
			OS	37.3	2	4	4	37.4	5
		PRC (%)			**28.6**			**10.5**	

12.8.5 The results show that junction operates within practical capacity in all assessment scenarios and modelled time periods, with the exception of the '2038 Base' scenario during the PM peak hour; practical capacity is marginally exceeded on Penventinnie Lane (DoS of 90.8%) and the northern circulatory (DoS of 91.3%), but these remain within absolute capacity. Traffic demand at the junction is higher during the PM peak hour, hence why the junction is forecast to operate with a greater degree of capacity constraint during this time period in all scenarios.

12.8.6 In 2023, the proposed development results in a slight worsening of junction performance during the AM peak hour, with a reduction in PRC of 11%. The greatest impact is forecast on the western circulatory arm, with increases in DoS and queueing of 8% and 2 PCUs respectively. The increase in queueing results in the storage of the western circulatory being exceeded by approximately 1 PCU, which is not considered to be a material issue. The remaining lanes of the junction network experience either a reduced level of deterioration or improvements to junction performance, most notably on the eastern circulatory which experiences a 21% to 23% reduction in DoS. Changes in delay are small on all arms, of no more than 5 seconds. During the PM peak hour, the proposed development results in an improvement in overall junction performance, with an increase in PRC of 8%. There are reductions (of up to 22% DoS, 4 PCUs and 24 seconds on the northern circulatory) and increases (of up to 22% DoS, 3 PCUs and 14 seconds on the A390 West) in DoS, queueing and delay as part of signal optimisation.

12.8.7 In 2038, the proposed development results in a slight worsening of junction performance during the AM peak hour, with a reduction in PRC of 10%. Increases in DoS and queueing are of up to 6% (on Penventinnie Lane and A390 West) and 2 PCUs (on A390 West) respectively. Changes in delay are small on all arms, at under 10 seconds. As per the forecasts for 2023, queueing on the western circulatory is shown to exceed storage capacity, in this case by 2 PCUs. From further analysis of the modelling using the 'queue animation' tool within LinSig, it is identified that the point at which queueing exceeds on the western circulatory exceeds storage capacity is when it is given a green signal, meaning that this is a 'moving queue', and therefore its effects will be limited. There are improvements in the performance of some lanes, again most notably the eastern circulatory. The junction continues to operate well within practical capacity. During the PM peak hour, the proposed development results in an improvement in overall junction performance, with an increase in PRC of 12%. There are reductions (of up to 20% DoS, 8 PCUs and 7 seconds on Penventinnie Lane, and 28% DoS, 11 PCUs and 38 seconds on the northern circulatory) and increases (of up to 21% DoS, 6 PCUs and 15 seconds on the A390 West) as part of signal optimisation.

12.8.7.1 In both the 2023 and 2038 scenarios, the proposed development is forecast to have a minor impact on junction performance during the AM peak hour and result in material improvements to junction operation during the PM peak hour. This is due to only a marginal increase in traffic demand during the AM peak hour, and a reduction during the PM peak hour. This can be attributed to the reassignment of traffic from Oak Lane and RCHT land uses onto the NAR in the 'Base + Development' scenarios together with a reduction in background traffic on the A390 corridor as part of future trends, namely home relocation associated with the proposed development and the extension to the P&R (as discussed at **Chapter 4**).

12.9 Junction 11: A390 / Treliske Lane Priority T-Junction

12.9.1 The A390 / Treliske Lane T-Junction is located on the A390 corridor to the east of Langarth Garden Village, approximately 600m south-east of the Treliske Roundabout. Left turns only are permitted from Treliske Lane. A right-turn ghost island is provided for right turn movements from the A390 to Treliske Lane. The junction has been assessed using Junctions 9. The results of the junction capacity modelling are summarised in **Table 12-11**.

Table 12-11: Summary of Junction Capacity Modelling – Junction 11

Scenario	Movement	AM Peak Hour			PM Peak Hour		
		RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base	Stream B-AC	0.08	1	9	0.07	1	11
	Stream C-AB	0.03	0	8	0.04	0	10
2023 Base + Development	Stream B-AC	0.12	1	10	0.08	1	12
	Stream C-AB	0.04	0	9	0.04	0	11
2038 Base	Stream B-AC	0.10	1	9	0.09	1	12
	Stream C-AB	0.04	0	9	0.07	1	12
2038 Base + Development	Stream B-AC	0.14	1	10	0.14	1	14
	Stream C-AB	0.04	0	9	0.08	1	13

Notes:

1. *Arm A = A390 West, Arm B = Treliske Lane, Arm C = A390 East.*
2. *Stream B-AC = left turns from Treliske Lane to A390 East. Stream C-AB = ahead and right turn movements from A390 East.*

12.9.2 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.9.3 The impact of the proposed development is forecast to be minor. In 2023, the greatest impact during the AM and PM peak hours is forecast to occur on Treliske Lane, with increases in RFC of 0.04 and 0.01 during the AM and PM peak hours respectively. In 2038, the greatest impact is also forecast to occur on Treliske Lane, with increases in RFC of 0.04 and 0.05 during the AM and PM peak hours. There are negligible changes in queueing and delay on each arm of the junction in both peak hours in both 2023 and 2038.

12.9.4 Overall, the impact of the proposed development on the operation of the junction is not severe.

12.10 Junction 12: A390 / Newbridge Lane Roundabout

12.10.1 The A390 Newbridge Lane roundabout junction is located on the A390 corridor to the east of Langarth Garden village, 630m east of the Treliske Roundabout. The junction operation is atypical for a mini-roundabout, with the A390 westbound arm operating unopposed and a give-way line operating on the roundabout circulatory. The ARCADY module in Junctions 9 does not provide a reasonable simulation of this operation within one junction model. It has therefore been necessary to use two junctions within the same modelling file to simulate the unusual give-way arrangement at this junction, comprised of:

- Junction 1 – Southern Crossroads – Crossroads arrangement models A390 westbound priority flow, with the southern arm (Arm B) comprised of Newbridge Lane, and the northern arm (Arm D) being the give-way for movements from A390 West to Newbridge Lane.
- Junction 2 – Northern Roundabout – Standard Roundabout arrangement models A390 eastbound priority flow, with the southern arm comprised of the give-way for movements from A390 West to Newbridge Lane.

12.10.2 The junction also includes a signalised pedestrian crossing (staggered) across the A390 eastern arm. This is connected to a queue detector on Newbridge Lane. Should queueing on Newbridge Lane exceed a certain level, the crossing is called to create gaps in the A390 westbound to allow for traffic from Newbridge Lane to exit. Junctions 9 does not adequately provide for modelling of such features and therefore the results presented for Newbridge Lane are on the basis of no gap creation from the pedestrian crossing.

12.10.3 The results of the junction capacity modelling are summarised in **Table 12-12**.

Table 12-12: Summary of Junction Capacity Modelling – Junction 12

Scenario	Movement	AM Peak Hour			PM Peak Hour		
		RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base	J1 - Stream B-ACD	0.56	2	25	0.35	1	18
	J1 – Stream D-ABC	0.16	1	12	0.24	1	12
	J2 – Arm B	0.16	1	4	0.10	1	4
	J2 – Arm C	0.45	1	4	0.62	2	6
2023 Base + Development	J1 - Stream B-ACD	0.60	2	29	0.37	1	19
	J1 – Stream D-ABC	0.22	1	13	0.26	1	13
	J2 – Arm B	0.17	1	4	0.10	1	4
	J2 – Arm C	0.48	1	4	0.65	2	6
2038 Base	J1 - Stream B-ACD	0.69	3	38	0.41	1	20
	J1 – Stream D-ABC	0.19	1	13	0.28	1	13
	J2 – Arm B	0.18	1	4	0.11	1	4
	J2 – Arm C	0.47	1	4	0.70	3	7

2038 Base + Development	J1 - Stream B-ACD	0.73	3	46	0.45	1	23
	J1 – Stream D-ABC	0.24	1	15	0.31	1	14
	J2 – Arm B	0.19	1	4	0.11	1	4
	J2 – Arm C	0.50	1	5	0.74	3	8

Notes:

1. *Junction 1: Arm A = A390 East, Arm B = Newbridge Lane, Arm C = A390 West, Arm D = A390 West to Newbridge Lane (Give Way); Junction 2: Arm B = Newbridge Lane, Arm C = A390 West.*
2. *Stream B-ACD = ahead and left turn movements from Newbridge Lane. Stream D-ABC = ahead and right turn movements from A390 West to Newbridge Lane (Give Way).*

12.10.4 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.10.5 The impact of the proposed development is forecast to be minor. In 2023, the greatest impact during the AM and PM peak hours is forecast to occur on the internal give-way for movements from the A390 West to Newbridge Lane (an increase of RFC of 0.06), and on the entry to the roundabout from the A390 West (an increase in RFC of 0.03). Similar levels of increase in RFC are forecast in 2038. There are negligible changes in queueing and delay on each arm of the junction in both peak hours in both 2023 and 2038.

12.10.6 Overall, the impact of the proposed development on the operation of the junction is not severe.

12.11 Junction 13: A390 / Navigator Way Signalised Junction

12.11.1 The A390 / Navigator Way signalised junction is located on the A390 corridor to the east of Langarth Garden Village, 850m east of the Treliske Roundabout. Navigator Way, the southern arm of the junction serves as an access to residential areas south of the A390. The junction includes staggered pedestrian crossings over the A390 East and Navigator Way arms of the junction.

12.11.2 The junction has been assessed using LinSig. The model geometric parameters are based on aerial imagery of the junction. The model operation based on signal specification supplied by CORMAC (dated 5th April 2017). The signal cycle time has been set at 90 seconds which is appropriate for a signalised junction with four stages. The pedestrian crossing phases are incorporated into traffic stages, rather than on-demand, and therefore the model assumes that all crossing phases are called once in every cycle. Right-turn movements from the A390 West to Navigator Way are supported by an indicative right-turn arrow phase. This operation allows right-turning traffic to 'gap-accept' the opposing A390 westbound traffic flow during Stage 1 and also allowing for unopposed right-turn phase during Stage 2. For the purposes of this assessment it is assumed that Stage 2 is included in every cycle during the AM and PM peak hours, as given the volume of right-turning traffic flows it is likely that this would occur in practice under MOVA operation.

12.11.3 The results of the junction capacity modelling are summarised in **Table 12-13**.

Table 12-13: Summary of Junction Capacity Modelling – Junction 13

Scenario	Arm	Lane	AM Peak Hour			PM Peak Hour		
			DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base	1 A390 East	-	94.9	29	42	92.7	26	35
	2 Navigator Way	NS	54.8	-	-	54.0	-	-
		OS	52.5	3	54	54.0	3	62
	3 A390 West	NS	63.0	12	13	82.0	20	20
		OS	63.0	-	-	82.0	-	-
	PRC (%)			**-5.4**			**-3.0**	
2023 Base + Development	1 A390 East	-	102.6	51	103	102.8	51	105
	2 Navigator Way	NS	54.8	-	-	54.0	-	-
		OS	52.5	3	54	54.0	3	62
	3 A390 West	NS	65.8	13	13	86.1	23	23
		OS	65.8	-	-	86.1	-	-
	PRC (%)			**-14.0**			**-14.2**	

2038 Base	1 A390 East	-	105.8	65	148	103.4	54	114
	2 Navigator Way	NS	79.5	-	-	69.8	-	-
		OS	75.8	5	69	69.8	4	70
	3 A390 West	NS	66.1	13	14	90.9	27	29
		OS	66.1	-	-	90.9	-	-
	PRC (%)			**-17.6**			**-14.9**	
2038 Base + Development	1 A390 East	-	112.1	96	239	112.3	97	243
	2 Navigator Way	NS	79.5	-	-	69.8	-	-
		OS	75.8	5	70	69.8	4	70
	3 A390 West	NS	68.7	14	8	96.3	33	43
		OS	68.7	-	-	96.3	-	-
	PRC (%)			**-24.6**			**-24.8**	

12.11.4 The results show that the junction is forecast to exceed practical or absolute capacity in all assessment scenarios and modelled time periods. The A390 East (westbound) exceeds absolute capacity in all assessment scenarios and modelled time periods with the exception of the '2023 Base' scenario, during which it exceeds practical capacity. The A390 West (eastbound) exceeds practical capacity during the PM peak hour in the 2038 scenarios. Navigator Way remains within practical capacity in all assessment scenarios and modelled time periods.

12.11.5 The proposed development is forecast to result in an overall deterioration in junction performance. In 2023, reductions in PRC of 9% and 11% are forecast during the AM and PM peak hours respectively. In 2038, reductions in PRC of 7% and 10% are forecast during the AM and PM peak hours respectively. The reductions in PRC are primarily related to an increase in DoS on the A390 East. Given the capacity position of this approach, small increases in DoS are forecast to result in significant increases in queueing and delay. In 2023, increases in DoS of 8% and 10% are forecast during the AM and PM peak hours respectively, resulting in increases in queueing of 22 and 25 PCUs, and increases in delay of 61 and 70 seconds. In 2038, increases in DoS of 6% and 9% are forecast during the AM and PM peak hours respectively, resulting in increases in queueing of 31 and 44 PCUs, and increases in delay of 91 and 129 seconds. The levels of queueing would extend to some minor side-road junctions (e.g. Penwerris Road, Pendrea Wood and Penweathers Lane) in most scenarios. On the remainder of the junction, the proposed development is forecast to result in increases in DoS, queueing and delay of no more than 5%, 6 PCUs and 14 seconds respectively, all forecast on the A390 West during the PM peak hour in 2038; this results in a queue which could extend to Junction 12 (A390 / Newbridge Lane roundabout) in this scenario.

12.11.6 Opportunities to improve the operational performance of the junction have been examined in terms of changes to signal timings. The key capacity constraint on the A390 East (westbound) arm relates to the level of green time. Under the 90 second cycle time, the green time allocated to this arm is maximised within the model operation by ensuring all other stages run to their stage minimums. An increase in cycle time would reduce the proportion of time 'lost' within each cycle (associated with the change in stages) and allow an increase in green time on constrained arms. This effects of this have been examined in terms of an increase in cycle time to 120 seconds, the results of the junction capacity modelling for the 'Base + Development' scenarios are summarised in **Table 12-14**.

Table 12-14: Summary of Junction Capacity Modelling – Junction 13 (Increase in Cycle Time)

Scenario	Arm	Lane	AM Peak Hour			PM Peak Hour		
			DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base + Development	1 A390 East	-	91.2	32	29	91.4	32	29
	2 Navigator Way	NS	73.0	-	-	72.0	-	-
		OS	70.0	4	86	72.0	4	101
	3 A390 West	NS	59.0	13	10	77.9	22	16
		OS	59.0	-	-	77.9	-	-
	PRC (%)			**-1.3**			**-1.5**	
2038 Base + Development	1 A390 East	-	100.8	57	78	99.8	54	68
	2 Navigator Way	NS	94.2	-	-	93.0	-	-
		OS	89.8	8	125	93.0	7	157
	3 A390 West	NS	62.4	14	12	87.4	30	24
		OS	62.4	-	-	87.4	-	-
	PRC (%)			**-12.0**			**-10.9**	

12.11.7 The results show that, with an increase in cycle time to 120 seconds, the junction is forecast to operate within absolute capacity in all 'Base + Development' scenarios, with the exception of the A390 East (westbound) arm during the AM peak hour in 2038. The junction is shown to experience an improvement in performance when compared with a cycle time of 90 seconds, with levels of queueing and delay reduced to below 'Base' levels on the A390 approaches. However, this does result in a deterioration in performance on Navigator Way, when compared with the 'Base' scenarios at a cycle time of 90 seconds. In 2023, The increases in DoS, queueing and delay on this arm are up 18%, 1 PCU and 39 seconds in 2023, and up to 23%, 3 PCUs and 87 seconds in 2038 (all during the PM peak hour).

12.11.8 In all scenarios, the full increase in cycle time of 30 seconds is generally allocated to Stage 1 (eastbound and westbound movements on the A390), meaning delay from these arms is reassigned onto other stages and associated demands, including pedestrian crossing movements, as part of model optimisation. The results and improvements in performance on the A390 arms associated with an increase in cycle time are therefore provided for review and consideration by CC as a potential way to improve the traffic performance on the A390 in this part of the network.

12.12 Junction 14: A390 / Malabar Road Priority T-Junction

12.12.1 The A390 / Malabar Road T-Junction is located on the A390 corridor to the east of Langarth Garden Village, approximately 300m west of the Dalvenie Roundabout.

12.12.2 The junction has been assessed using Junctions 9. The results of the junction capacity modelling are summarised in **Table 12-15**.

Table 12-15: Summary of Junction Capacity Modelling – Junction 14

Scenario	Movement	AM Peak Hour			PM Peak Hour		
		RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base	Stream B-AC	0.37	1	36	0.58	2	59
	Stream C-AB	0.10	1	10	0.07	1	10
2023 Base + Development	Stream B-AC	0.53	2	56	1.06	9	281
	Stream C-AB	0.11	1	10	0.07	1	10
2038 Base	Stream B-AC	0.53	2	62	1.16	12	366
	Stream C-AB	0.12	1	10	0.09	1	11
2038 Base + Development	Stream B-AC	0.80	4	147	2.51	44	2258
	Stream C-AB	0.12	1	11	0.09	1	11

Notes:

1. *Arm A = A390 West, Arm B = Malabar Road, Arm C = A390 East.*
2. *Stream B-AC = left turns from Malabar Road to A390 West. Stream C-AB = ahead and right turn movements from A390 East.*

12.12.3 The results show that, in the '2023 Base' scenario, all arms of the junction are forecast to operate within practical capacity during both the AM and PM peak periods. The proposed development is forecast to result in a significant impact on Malabar Road, particularly in the PM peak hour, where there is an increase in RFC of 0.48, resulting in the arm exceeding absolute capacity. This is shown to result in increases in queueing and delay of 7 PCUs and 222 seconds respectively. The remainder of the junction network is shown to operate well within practical capacity.

12.12.4 In the '2038 Base' scenario, Malabar Road is forecast to exceed absolute capacity during the PM peak hour, with the remainder of the junction operating within practical capacity. Again, the proposed development is forecast to result in a significant impact on Malabar Road, primarily during the PM peak hour, with an increase in RFC of 1.35, resulting in the arm significantly exceeding absolute capacity. This is shown to result increases in queueing and delay of 32 PCUs and circa 1,900 seconds respectively. The remainder of the junction network is shown to operate well within practical capacity.

12.12.5 Junctions 9 models reaching / exceeding capacity become increasingly sensitive to changes in traffic flows and will often report disproportionate increases in queueing and delay. In this case, this is related to the level of through-movements on the A390 reaching a threshold at which the model considers that gaps for existing from Malabar Road are no longer available. In reality, and particularly along urban corridors, informal give-way movements will occur with mainline traffic allowing traffic from the side road to exit; these driver behaviours have been observed at the junction. Furthermore, there is a signalised pedestrian crossing located on the western arm of A390, which, when called, creates gaps in traffic on the A390 to assist exit movements from Malabar Road. These informal driver behaviours and operation of the crossing cannot be adequately replicated within Junctions 9.

12.12.6 It is acknowledged that for sufficient gaps in traffic to be created will likely require both the pedestrian crossing to be called and to ensure the exit of the junction is not blocked by mainline westbound traffic when the crossing is called. Potential features that could be built-in to the existing junction layout to create gaps and facilitate exit movements have been examined.

12.12.7 In terms of gap creation through calling of the pedestrian crossing, options include the provision of a queue detector on Malabar Road, which, as per the arrangement at other junctions on the A390 corridor (see Junctions 13 and 16), would identify when queueing reaches a level and call the pedestrian crossing. Alternatively, the pedestrian crossing could be called at a set frequency. It is recognised that frequent occurrences of the crossing being called when there is no pedestrian demand could lead to potential safety issues in terms of drivers ignoring a red signal. The function would therefore likely be limited to operation during the AM and PM peak periods when the creation of gaps in mainline traffic are required and when demand for the crossing is likely to be higher in any event. There is likely to be frequent demand, meaning the crossing would be likely to be called naturally rather than automatically, given this is the most easterly crossing on the A390 prior to the Dalvenie Roundabout and accommodates the desire line for routes between significant residential land uses to the south of the A390 and Station Road (for access to Sainsbury's and towards the City Centre). In addition, 'Keep Clear' markings would be required on the A390 (westbound) to ensure a gap is maintained for right-turn movements from Malabar Road to be undertaken when the pedestrian crossing is called.

12.12.8 The effects on the A390 mainline traffic from the calling of the pedestrian crossing at regular intervals have been examined through a LinSig model. The model includes the eastbound and westbound stoplines on the A390, with intergreens calculated in accordance with the Traffic Signs Manual. From a review of the traffic flow forecasts, it is identified that the demand for exit movements from Malabar Road is highest in the '2038 Base + Development' scenario; there is demand from 73 vehicles (17 left-turn movements, 56 right-turn movements) and 119 vehicles (31 left-turn movements, 88 right-turn movements), equating to up two movements per minute. The calling of the pedestrian crossing every 90 seconds (i.e. a cycle time of 90 seconds) is considered reasonable in terms of gap creation / minimising delay on Malabar Road, accommodating pedestrian crossing demand and minimising delay to mainline flows on the A390. On this basis, the crossing would be called 40 times during the peak hours, and, on each occasion, would hold traffic on the A390 for 18 seconds (based on appropriate intergreen and phase minimum timings). This would provide sufficient gaps for exiting traffic from Malabar Road.

12.12.9 The results are presented for the 'Base + Development' scenarios in **Table 12-16**.

Table 12-16: Summary of Junction Capacity Modelling – Junction 14 (Crossing Called at 90 Second Intervals)

Scenario	Arm		Lane	AM Peak Hour			PM Peak Hour		
				DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base + Development	1	A390 East	-	69.5	14	10	77.9	18	13
	2	A390 West	-	68.4	13	10	76.5	17	12
	PRC (%)				**29.5**			**15.6**	
2038 Base + Development	1	A390 East	-	75.8	17	12	85.1	23	17
	2	A390 West	-	73.9	16	12	84.3	22	16
	PRC (%)				**18.7**			**5.7**	

12.12.10 **Table 12-16** shows that the calling of the pedestrian crossing at regular intervals to create gaps for traffic exiting from Malabar Road would not have a significantly adverse effect on the A390 mainline traffic. The strategy in regard to mitigation through gap creation (and associated design measures) is therefore considered reasonable and is put forward to CC for review and consideration.

12.13 Junction 15: A390 / Dobbs Lane Priority T-Junction

12.13.1 The A390 / Dobbs Lane T-Junction is located on the A390 corridor to the east of Langarth Garden Village, approximately 80m west of the Dalvenie Roundabout. Dobbs Lane primarily serves residential land uses. It also serves Aldi, the access for which is setback around 20m from the A390. Given the separation from the junction with the A390, exit movements from Aldi can, subject to queueing on Dobbs Lane, rely on some informal give-way behaviours on Dobbs Lane, although this cannot be captured within Junctions 9. The approach to the junction from the A390 East comprises two lanes for westbound movements and one lane for right-turn movements. The two lanes for westbound traffic extend from the exit of the Dalvenie Roundabout and as such vehicles can be prone to lane changing on the approach, primarily from the nearside westbound lane to the right-turn lane. This cannot be reasonably replicated in Junctions 9 and is not considered to have significant implications for capacity.

12.13.2 The results of the junction capacity modelling are summarised in **Table 12-17**.

Table 12-17: Summary of Junction Capacity Modelling – Junction 15

Scenario	Movement	AM Peak Hour			PM Peak Hour		
		RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base	Stream B-AC	0.16	1	9	0.13	1	9
	Stream C-AB	0.21	1	11	0.13	1	10
2023 Base + Development	Stream B-AC	0.17	1	9	0.21	1	10
	Stream C-AB	0.22	1	11	0.17	1	11
2038 Base	Stream B-AC	0.19	1	9	0.20	1	10
	Stream C-AB	0.28	1	12	0.19	1	12
2038 Base + Development	Stream B-AC	0.20	1	9	0.27	1	11
	Stream C-AB	0.26	1	12	0.15	1	11

Notes:

1. *Arm A = A390 West, Arm B = Dobbs Lane, Arm C = A390 East.*
2. *Stream B-AC = left turns from Dobbs Lane to A390 eastbound. Stream C-AB = ahead and right turn movements from A390 East.*

12.13.3 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.13.4 The impact of the proposed development is forecast to be minor. The greatest impact is forecast to occur on Dobbs Lane during the PM peak hour, with increases in RFC of 0.08 and 0.07 in 2023 and 2038 respectively. There are negligible changes in queueing and delay in both peak hours in both 2023 and 2038.

12.13.5 Overall, the impact of the proposed development on the operation of the junction is not severe.

12.14 Junction 16: Dalvenie Roundabout

12.14.1 The Dalvenie Roundabout is located on the A390 corridor to the east of Langarth Garden Village, approximately 1.3km south-west of Truro City Centre. The junction provides access to a Sainsbury's Supermarket and to NCH as the northern and southern arms respectively. Station Road which provides a vehicle route towards Truro Railway Station and the City Centre from the north of Truro.

12.14.2 Upstream of the junction on the A390 West arm, there is an alternative access to Station Road which allows traffic turning left from the A390 West to Station Road to bypass the main roundabout junction. There is also the option for right-turning traffic to use this route. For the purposes of this assessment, it has been assumed that all left-turn movements from the A390 to Station Road use the bypass, but all right turn movements will use the roundabout.

12.14.3 The junction also includes a signalised pedestrian crossing (staggered) across the A390 eastern arm. This is connected to a queue detector on the NCH arm. Should queueing on NCH exceed a certain level, the crossing is called to create gaps in the A390 westbound to assist traffic exiting from NCH. Junctions 9 does not adequately provide for modelling of such features and therefore the results presented for NCH are on the basis of no gap creation from the pedestrian crossing.

12.14.4 The junction has been assessed using Junctions 9. The results of the junction capacity modelling are summarised in **Table 12-18**.

Table 122-18: Summary of Junction Capacity Modelling – Junction 16

Scenario	Arm		AM Peak Hour			PM Peak Hour		
			RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base	A	Station Road	0.22	1	4	0.14	1	3
	B	Sainsburys Access	0.15	1	4	0.18	1	4
	C	A390 East	0.49	1	4	0.39	1	3
	D	NCH	0.07	1	5	0.26	1	6
	E	A390 West	0.49	1	5	0.48	1	5
2023 Base + Development	A	Station Road	0.23	1	4	0.17	1	3
	B	Sainsburys Access	0.16	1	4	0.20	1	4
	C	A390 East	0.51	1	4	0.43	1	3
	D	NCH	0.08	1	5	0.26	1	6
	E	A390 West	0.49	1	5	0.53	2	5
2038 Base	A	Station Road	0.27	1	4	0.28	1	4
	B	Sainsburys Access	0.20	1	5	0.27	1	6
	C	A390 East	0.61	2	5	0.46	1	4
	D	NCH	0.10	1	6	0.34	1	7
	E	A390 West	0.56	2	6	0.59	2	6
2038 Base + Development	A	Station Road	0.28	1	4	0.24	1	4
	B	Sainsburys Access	0.20	1	5	0.27	1	5
	C	A390 East	0.60	2	5	0.49	1	4
	D	NCH	0.10	1	6	0.33	1	7
	E	A390 West	0.55	2	5	0.59	2	6

12.14.5 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.14.6 The impact of the proposed development is forecast to be negligible, with increases in RFC of no more than 0.05 (in 2023 on the A390 West during the PM peak hour), resulting in negligible changes in queueing and delay.

12.14.7 Overall, the impact of the proposed development on the operation of the junction is not severe.

12.15 Junction 17: A39 / A390 / Falmouth Road Double Mini-Roundabout

12.15.1 The A39 / A390 / Falmouth Road Double Mini-Roundabout junction is located on the A390 corridor to the south of Truro City Centre. The junction has been assessed as a linked network using Junctions 9, comprised of the north-western (Junction 1) and south-eastern (Junction 2) mini-roundabouts. The results of the junction capacity modelling are summarised in **Table 12-19**.

Table 12-19: Summary of Junction Capacity Modelling – Junction 17

Scenario	Arm		AM Peak Hour			PM Peak Hour		
			RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base	J1 – A	A390 West	0.68	3	12	0.79	4	15
	J1 – B	Falmouth Road	0.19	1	6	0.52	2	11
	J1 – C	Internal Eastbound Link	0.90	8	23	0.67	2	8
	J2 – A	A39 Arch Hill	1.09	70	159	0.88	8	23
	J2 – B	Internal Westbound Link	0.75	3	15	1.28	141	488
	J2 – C	A39 Morlaix Avenue	0.96	16	50	1.17	105	350
2023 Base + Development	J1 – A	A390 West	0.68	3	11	0.83	5	18
	J1 – B	Falmouth Road	0.20	1	6	0.53	2	12
	J1 – C	Internal Eastbound Link	0.89	8	22	0.69	3	9
	J2 – A	A39 Arch Hill	1.10	76	169	0.91	10	28
	J2 – B	Internal Westbound Link	0.76	4	15	1.33	171	593
	J2 – C	A39 Morlaix Avenue	0.97	18	57	1.17	112	373
2038 Base	J1 – A	A390 West	0.85	6	25	1.01	28	83
	J1 – B	Falmouth Road	0.24	1	6	0.68	3	20
	J1 – C	Internal Eastbound Link	1.03	62	145	0.77	4	12
	J2 – A	A39 Arch Hill	1.20	143	426	0.95	15	43
	J2 – B	Internal Westbound Link	0.80	4	17	1.48	331	1062
	J2 – C	A39 Morlaix Avenue	1.26	167	483	1.35	283	935
2038 Base + Development	J1 – A	A390 West	0.81	5	20	0.94	12	41
	J1 – B	Falmouth Road	0.25	1	6	0.61	2	16
	J1 – C	Internal Eastbound Link	0.96	17	46	0.76	4	11
	J2 – A	A39 Arch Hill	1.18	132	372	0.97	18	51
	J2 – B	Internal Westbound Link	0.85	6	23	1.44	270	873
	J2 – C	A39 Morlaix Avenue	1.17	107	286	1.37	293	991

12.15.2 The results show that, in the '2023 Base' scenario, there are a number of arms forecast to exceed practical or absolute capacity. During the AM peak hour, the internal eastbound link and A39 Morlaix Avenue are forecast to exceed practical capacity, with the A39 Arch Hill exceeding absolute capacity. During the PM peak hour, the A39 Arch Hill is forecast to exceed practical capacity, whilst the internal westbound link and A39 Morlaix Avenue are forecast to exceed absolute capacity. The proposed development is not forecast to result in a material impact on any arms in terms of RFC, increases of no more than 0.01 and 0.05 during the AM and PM peak hours respectively.

12.15.3 In the '2038 Base' scenario, the A390 West is forecast to operate at practical capacity during the AM peak hour, and to exceed absolute capacity during the PM peak hour. The internal eastbound link is forecast to exceed absolute capacity during the AM peak hour. The A39 Arch Hill is forecast to exceed absolute capacity during the AM peak hour, and to exceed practical capacity during the PM peak hour. The internal westbound link is forecast to exceed absolute capacity during the PM peak hour. The A39 Morlaix Avenue is forecast to exceed absolute capacity during the AM and PM peak hours.

12.15.4 The proposed development is forecast to result in significant improvements to junction performance. During the AM peak hour, reductions in RFC of 0.07 and 0.09 are forecast on the internal eastbound link and A39 Morlaix Avenue respectively, resulting in reductions in queueing of 45 and 60 PCUs, and reductions in delay of 99 and 197 seconds. During the PM peak hour, reductions in RFC of 0.07 and 0.04 are forecast on the A390 West and internal westbound link, resulting in reductions in queueing of 16 and 61 PCUs, and reductions in delay of 42 and 189 seconds. Some arms are forecast to experience an increase in RFC, with greatest impact shown on the A39 Morlaix Avenue, with an increase in queueing and delay of 10 PCUs and 56 seconds respectively.

12.15.5 Overall, the junction is forecast to operate with a similar level of performance in 2023 in 'Base' and 'Base + Development' scenarios. In 2038, the proposed development is generally forecast to result in an improvement in overall junction performance. The impact of the proposed development is not considered to be severe.

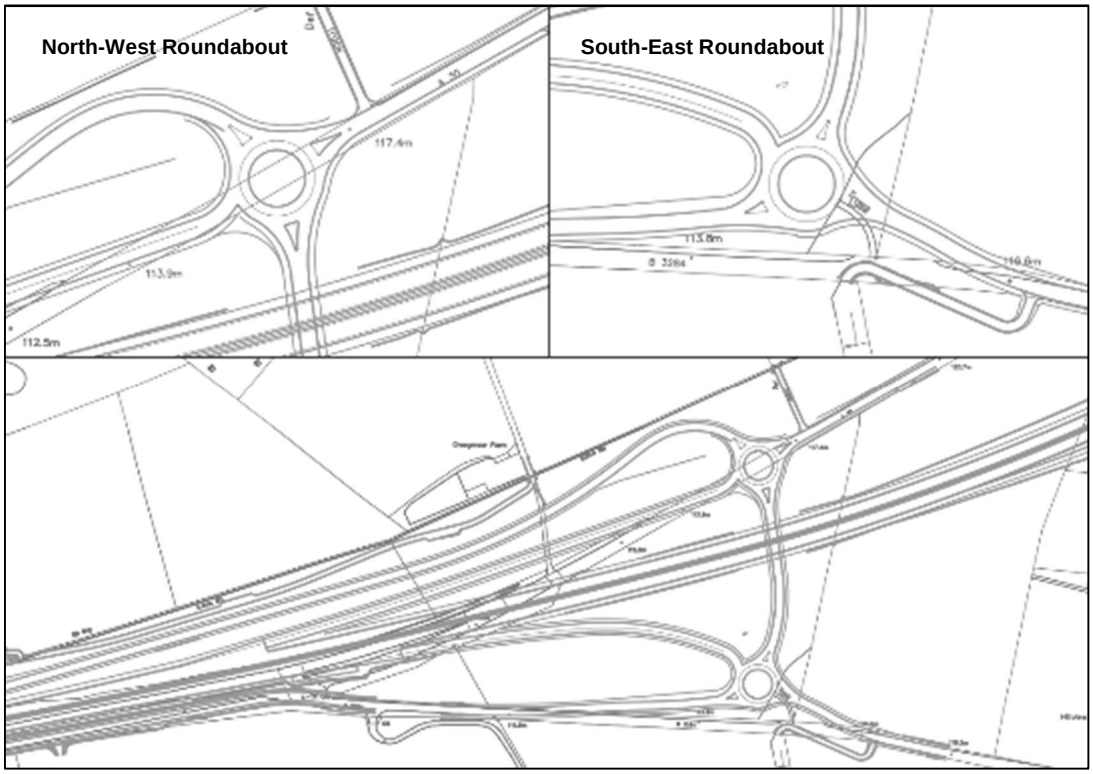
12.15.6 It is understood that strategies to achieve performance improvements at the junction have been explored by CC. These have included capacity improvements through a scheme to convert the double mini-roundabout to a single, large roundabout; this was deferred in 2017. Further investigations have been undertaken by CC in regard to the effectiveness of demand management measures to reduce traffic demand at the junction. These include enhancements to the Falmouth branch line (to encourage a shift from car to rail) and CC's corporate TP. It is understood that a demand management strategy is the approach that CC has adopted in regard to the junction, and that this will be delivered through the Truro Transport Strategy Refresh. It is therefore likely that the junction will perform well within the levels reported in this assessment following the introduction of the Truro Transport Strategy Refresh.

12.16 Junctions 18-19: Chybucca Junction

12.16.1 The A390 / B3284 Chybucca junction is located on the A30 corridor to the northwest of Langarth Garden village, approximately 3.5km north of the existing Chiverton Cross Roundabout. The existing junction is a staggered crossroad junction with the B3284 as the minor arms. As part of the committed Chiverton Cross to Carland Cross highway scheme, the junction will be converted to a grade-separated 'dumbbell' roundabout arrangement with two roundabouts either side of the new dual-carriageway with a connecting link crossing the mainline. The connecting link will be circa 130m in length, accommodating approximately 23 PCUs. The junction will serve the new dual carriageway via a northbound off-slip and southbound on-slip. The northbound off-slip will be 415m in length, accommodating 72 PCUs. The existing A30 will be downgraded to a side road.

12.16.2 The layout of the committed junction is shown in **Figure 12-3**. The north-western roundabout is referred to as Junction 18 for the purposes of this assessment. The south-eastern roundabout is referred to as Junction 19.

Figure 12-3: Chybucca Junction Committed Layout



12.16.3 The roundabouts have been assessed using Junctions 9, given the configuration as a linked junction network. The model geometric parameters are based on the committed junction layout supplied by CORMAC, with reasonable assumptions made regarding lane markings where they were absent from the design.

12.16.4 The results of the junction capacity modelling for the north-western roundabout (Junction 18) are summarised in **Table 12-20**.

Table 12-20: Summary of Junction Capacity Modelling – Junction 18

Scenario	Arm		AM Peak Hour			PM Peak Hour		
			RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base	A	Side Road North	0.02	0	4	0.04	0	4
	B	Link to Junction 19	0.06	1	3	0.16	1	3
	C	A30 Northbound Off-Slip	0.37	1	4	0.34	1	4
	D	B3284 West	0.18	1	5	0.13	1	5
2023 Base + Development	A	Side Road North	0.03	0	5	0.07	1	5
	B	Link to Junction 19	0.06	1	3	0.16	1	3
	C	A30 Northbound Off-Slip	0.39	1	4	0.36	1	4
	D	B3284 West	0.18	1	5	0.13	1	5
2038 Base	A	Side Road North	0.05	1	4	0.07	1	4
	B	Link to Junction 19	0.07	1	3	0.17	1	3
	C	A30 Northbound Off-Slip	0.39	1	4	0.33	1	4
	D	B3284 West	0.20	1	6	0.14	1	5
2038 Base + Development	A	Side Road North	0.07	1	5	0.10	1	5
	B	Link to Junction 19	0.07	1	3	0.17	1	3
	C	A30 Northbound Off-Slip	0.39	1	4	0.38	1	4
	D	B3284 West	0.20	1	6	0.15	1	5

12.16.5 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods. The impact of the proposed development is forecast to be negligible, with increases in RFC of no more than 0.05, resulting in negligible changes in queueing and delay. The queue lengths at the roundabout are no more than 1 PCU in all assessment scenarios, which are well within the theoretical storage capacity of both the connecting link to Junction 19 and the dual-carriageway northbound off-slip.

12.16.6 The results of the junction capacity modelling for the north-western roundabout (Junction 19) are summarised in **Table 12-21**.

Table 12-21: Summary of Junction Capacity Modelling – Junction 19

Scenario	Arm		AM Peak Hour (08:00-09:00)			PM Peak Hour (17:00-18:00)		
			RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base	A	B3284 East	0.23	1	4	0.46	1	5
	B	Side Road South	0.01	0	4	0.00	0	0
	C	A30 Southbound On-Slip	0.55	2	7	0.40	1	5
	D	Link to Junction 18	0.24	1	4	0.46	1	5
2023 Base + Development	A	B3284 East	0.00	0	0	0.01	0	4
	B	Side Road South	0.57	2	7	0.41	1	5
	C	A30 Southbound On-Slip	0.26	1	4	0.45	1	5
	D	Link to Junction 18	0.01	0	4	0.01	0	4
2038 Base	A	B3284 East	0.59	2	7	0.43	1	5
	B	Side Road South	0.26	1	4	0.45	1	5
	C	A30 Southbound On-Slip	0.00	0	0	0.01	0	4
	D	Link to Junction 18	0.59	2	7	0.48	1	6
2038 Base + Development	A	B3284 East	0.23	1	4	0.46	1	5
	B	Side Road South	0.01	0	4	0.00	0	0
	C	A30 Southbound On-Slip	0.55	2	7	0.40	1	5
	D	Link to Junction 18	0.24	1	4	0.46	1	5

Note: Results for the A30 Southbound On-Slip are nil as this arm does not enter the roundabout.

12.16.7 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods. The impact of the proposed development is forecast to be negligible, with increases in RFC of no more than 0.05, resulting in negligible changes in queueing and delay. The queue lengths at the roundabout are no more than 1 PCU in all assessment scenarios, which are well within the theoretical storage capacity of both the connecting link to Junction 18.

12.16.8 Overall, both of the dumbbell roundabouts are forecast to operate well within practical capacity in all assessment scenarios and modelled time periods. Queues between the two roundabouts are shown to be well within the storage of the connecting highway. Queues are also well within the storage of the A30 northbound slip road, meaning that there will be no queues onto the A30 mainline carriageway in any of the assessed scenarios.

12.17 Access A: A390 / NAR 'West Langarth' Signalised Roundabout

12.17.1 The West Langarth signalised roundabout will serve as the westernmost connection to the NAR. Details of the development access strategy are provided in **Chapter 8**.

12.17.2 The junction has been assessed using LinSig. The results of the junction capacity modelling are summarised in **Table 12-22**.

Table 12-22: Summary of Junction Capacity Modelling – West Langarth Signalised Roundabout

Scenario	Arm	Lane	AM Peak Hour			PM Peak Hour		
			DoS (%)	MMQ (PCUs)	Delay (secs)	DoS (%)	MMQ (PCUs)	Delay (secs)
2023 Base + Development	1 NAR Approach	NS	40.3	3	26	58.2	5	23
		OS	36.7	-	-	57.5	-	-
	2 A390 East Approach	NS	39.3	4	15	66.3	6	21
		OS	36.7	-	-	59.0	-	-
	3 A390 West Approach	NS	58.1	-	-	40.3	-	-
		Mid	58.1	5	18	40.3	4	16
		OS	36.1	4	18	23.3	2	16
	4 Circulatory North-East	NS	48.2	1	6	45.7	1	11
		OS	41.5	1	6	35.8	1	11
	5 Circulatory South-East	NS	36.3	1	11	68.0	2	18
		OS	36.7	1	11	68.0	2	18
	6 Circulatory West	NS	2.0	1	27	5.0	1	31
		OS	0.0	0	0	0.0	0	0
	7 A390 East Exit Merge	NS	40.3	3	26	58.2	5	23
		OS	36.7	-	-	57.5	-	-
	8 A390 West Exit Merge	NS	39.3	4	15	66.3	6	21
		OS	36.7	-	-	59.0	-	-
	PRC (%)			**54.8**			**32.4**	
2038 Base + Development	1 NAR Approach	NS	45.8	3	28	71.3	6	27
		OS	41.8	-	-	69.9	-	-
	2 A390 East Approach	NS	43.5	4	15	77.0	8	23
		OS	40.0	-	-	67.8	-	-
	3 A390 West Approach	NS	74.2	-	-	48.7	-	-
		Mid	74.2	8	22	48.7	5	17
		OS	46.7	5	19	31.9	3	17
	4 Circulatory North-East	NS	42.7	1	5	52.6	2	11
		OS	51.5	1	7	46.3	1	12
	5 Circulatory South-East	NS	41.5	1	13	78.9	3	25
		OS	41.8	1	13	79.2	3	25
	6 Circulatory West	NS	2.0	1	27	5.0	1	29
		OS	0.0	0	0	0.0	0	27
	7 A390 East Exit Merge	NS	45.8	3	28	71.3	6	-
		OS	41.8	-	-	69.9	-	23
	8 A390 West Exit Merge	NS	43.5	4	15	77.0	8	-
		OS	40.0	-	-	67.8	-	-
	PRC (%)			**21.3**			**13.6**	

12.17.3 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.18 Access F: Oak Lane / NAR T-Junction

12.18.1 The priority T-Junction at Oak Lane will serve as a connection to the NAR through Access 'F'. The junction has been assessed using Junctions 9. The results of the junction capacity modelling are summarised in **Table 12-23**.

Table 12-23: Summary of Junction Capacity Modelling – Oak Lane T-Junction

Scenario	Movement	AM Peak Hour			PM Peak Hour		
		RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base + Development	Stream B-AC	0.38	1	11	0.21	1	9
	Stream C-AB	0.22	1	8	0.54	2	13
2038 Base + Development	Stream B-AC	0.40	1	11	0.22	1	10
	Stream C-AB	0.23	1	8	0.62	2	15

Notes:

1. *Arm A = Oak Lane West, Arm B = NAR Access F, Arm C = Oak Lane East.*
2. *Stream B-AC = Movements from Malabar Road to Oak Lane East/West. Stream C-AB = ahead and right turn movements from A390 East.*

12.18.2 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.19 Access G: Penventinnie Lane / NAR T-Junction

12.19.1 The priority junction at Penventinnie Lane will serve as a connection to the NAR through Access 'G'. The junction has been assessed using Junctions 9. The results of the junction capacity modelling are summarised in **Table 12-24**.

Table 12-24: Summary of Junction Capacity Modelling – Penventinnie Lane / NAR T-Junction

Scenario	Movement	AM Peak Hour			PM Peak Hour		
		RFC	Queue (PCUs)	Delay (secs)	RFC	Queue (PCUs)	Delay (secs)
2023 Base + Development	Stream B-AC	0.17	1	11	0.08	1	7
	Stream C-AB	0.07	1	6	0.09	1	7
2038 Base + Development	Stream B-AC	0.22	1	11	0.10	1	8
	Stream C-AB	0.08	1	7	0.12	1	7

Notes:

1. *Arm A = NAR Access G, Arm B = Penventinnie Lane North, Arm C = Penventinnie Lane South.*
2. *Stream B-AC = Movements from Penventinnie Lane North to NAR Access G and Penventinnie Lane South. Stream C-AB = ahead and right turn movements from A390 Penventinnie Lane South.*

12.19.2 The results show that the junction is forecast to operate well within practical capacity in all assessment scenarios and modelled time periods.

12.20 Summary

12.20.1 This chapter of the TA outlines the methodology and results of junction capacity modelling undertaken to assess the development traffic impact of Langarth Garden Village on the local highway network. A total of 19 junctions on the local highway network have been assessed, in addition to the development vehicle accesses. Priority-controlled junctions, including T-Junctions and roundabouts have been assessed using Junctions 9 software. Signal-controlled junctions have been assessed using LinSig.

12.20.2 A precis of junction performance and development traffic impact is provided in **Table 12-25**. The summary includes a Red, Amber, Green (RAG) colour-coding to illustrate the level of development impact at each junction:

The junction is forecast to perform within practical capacity during all assessment scenarios.

The junction is forecast to perform above capacity (practical or absolute), but the development impact is not material and therefore is not considered severe, OR, the junction performs within absolute capacity but above practical capacity, with a material development impact. The approach to mitigation of junctions classified under these criteria are discussed below.

The junction is forecast to perform over absolute capacity, with a material development impact. Mitigation is required.

Table 12-25: Summary of Junction Capacity Modelling

Junction		Development Impact, 2023		Development Impact, 2038	
		RAG	Brief Summary	RAG	Brief Summary
1	B3277 / Chiverton Cross Garage Roundabout		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.02), but negligible increases in queueing and delay.		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (0.04), but negligible increases in queueing and delay.
2	Chiverton Cross Roundabout		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.07), but negligible increases in queueing and delay.		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.08), but negligible increases in queueing and delay.
3	A390 / Langarth P&R Access Signalised Junction		Junction operates well within practical capacity during all scenarios. Proposed development results in improvements in performance, with increases in PRC of 17% (AM) and 50% (PM).		Junction operates well within practical capacity during all scenarios. Proposed development results in improvements in performance, with increases in PRC of 18% (AM) and 44% (PM).
4	Threemilestone Roundabout		Junction operates well within practical capacity during all scenarios. Proposed development results in improvements in performance, with increases in PRC of 15% (AM) and 26% (PM).		Junction operates well within practical capacity during all scenarios. Proposed development results in improvements in performance, with increases in PRC of 2% (AM) and 12% (PM).
5	Chyvelah Road / Link to Threemilestone Roundabout Signalised Junction		Junction operates well within practical capacity during all scenarios. Proposed development results in slight deterioration in performance during the AM peak hour (reduction in PRC of 3%) but an improvement during the PM peak hour (increase in PRC of 22%).		Junction operates well within practical capacity during all scenarios. Proposed development results in slight deterioration in performance during the AM peak hour (reduction in PRC of 2%) but an improvement during the PM peak hour (increase in PRC of 15%).
6	Chacewater Hill / Threemilestone Retail Park Signalised Junction		Junction operates within practical capacity during all scenarios. Proposed development results in significant reduction in PRC during the AM peak hour (19%) although this results in only minor increases in queueing and delay. A minor reduction in PRC is forecast during the PM peak hour (4%).		Junction operates within practical capacity during all scenarios. Proposed development results in significant reduction in PRC during the AM peak hour (16%) although this results in only minor increases in queueing and delay. A minor reduction in PRC is forecast during the PM peak hour (1%).
7	A390 / Chyvelah Road Signalised Junction		Junction operates well within practical capacity during all scenarios. Proposed development results in improvements in performance, with increases in PRC of 96% (AM) and 72% (PM).		Junction operates well within practical capacity during all scenarios. Proposed development results in improvements in performance, with increases in PRC of 104% (AM) and 70% (PM).
8	A390 / Higher Besore Road Signalised Junction		Junction operates within practical capacity during all scenarios. Impact from the proposed development is significant (reductions in PRC of 22% AM and 26% PM) owing to the creation of the northern arm as part of the access strategy and associated increase in traffic flows. However, the junction continues to operate within practical capacity in 'Base + Development' scenarios.		Junction operates within practical capacity during all scenarios. Impact from the proposed development is significant (reductions in PRC of 16% AM and 22% PM) owing to the creation of the northern arm as part of the access strategy and associated increase in traffic flows. However, the junction continues to operate within practical capacity in 'Base + Development' scenarios.
9	Maiden Green Roundabout		Junction operates within practical capacity during all scenarios. Proposed development results in a reduction in PRC of 9% during the AM peak hour, although this results in only minor increases in queueing and delay. An increase in PRC of 53% is forecast during the PM peak hour.		Junction operates well within practical capacity during all scenarios. Proposed development results in improvements in performance, with increases in PRC of 2% (AM) and 3% (PM).

Junction		Development Impact, 2023		Development Impact, 2038	
		RAG	Brief Summary	RAG	Brief Summary
11	A390 / Treliske Lane T-Junction		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.04), but negligible increases in queueing and delay.		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.05), but negligible increases in queueing and delay.
12	A390 / Newbridge Lane Roundabout		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.06), but negligible increases in queueing and delay.		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.06), but negligible increases in queueing and delay.
13	A390 / Navigator Way Signalised Junction		A390 East exceeds practical capacity in the 'Base' scenario and absolute capacity in the 'Base + Development' scenario. Development impact is significant on the A390 East (up to 10% DoS and 25 PCUs) but minor elsewhere. Overall impact is -9% (AM) and 11% (PM) PRC. Opportunities to mitigate impact through an increase in cycle time have been identified for review and consideration by CC.		A390 East exceeds absolute capacity in 'Base' and 'Base + Development' scenarios. Development impact is significant on A390 East (up to 9% DoS, but 44 PCUs) with issues of exit-blocking created on the A390 West. Overall impact is -7% (AM) and 10% (PM) PRC. Opportunities to mitigate impact through an increase in cycle time have been identified for review and consideration by CC
14	A390 / Malabar Road T-Junction		Junction operates within practical capacity during all scenarios, with the exception of Malabar Road in the 'Base + Development' scenario during the PM peak hour, which exceeds absolute capacity. Development impact on Malabar Road is significant in terms of RFC, queueing and delay. Opportunities to mitigate impact through formalisation of gap provision on the A390 have been identified for review and consideration by CC.		Malabar Road exceeds absolute capacity in both the 'Base' and 'Base + Development' scenarios during the PM peak hour. Development impact on Malabar Road is significant in terms of RFC, queueing and delay. Opportunities to mitigate impact through formalisation of gap provision on the A390 have been identified for review and consideration by CC.
15	A390 / Dobbs Lane T-Junction		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.08), but negligible increases in queueing and delay.		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.07), but negligible increases in queueing and delay.
16	Dalvenie Roundabout		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.05), but negligible increases in queueing and delay.		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.03), but negligible increases in queueing and delay.
17	A39 / A390 / Falmouth Road Double Mini-Roundabout		Junction exceeds absolute capacity during all scenarios. Proposed development does not result in a material impact. The capacity constraints at the junction are recognised and have been discussed with reference to CC's strategy, and no mitigation from the proposed development is considered to be required.		Junction exceeds absolute capacity during all scenarios. Proposed development results in an improvement in performance, with reductions in RFC of up to 0.09 and significant reductions in queueing and delay on associated arms. Some increases in RFC are forecast but, on balance, performance is shown to improve. The capacity constraints at the junction are recognised and have been discussed with reference to CC's strategy, and no mitigation from the proposed development is considered to be required.
18 / 19	Chybucca Junction		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.03), but negligible increases in queueing and delay.		Junction operates well within practical capacity during all scenarios. Proposed development results in minor increases in RFC (up to 0.05), but negligible increases in queueing and delay.

Junction	Development Impact, 2023		Development Impact, 2038	
	RAG	Brief Summary	RAG	Brief Summary
Access A: West Langarth Signalised Roundabout		Junction operates well within practical capacity in the 'Base + Development' scenarios.		Junction operates well within practical capacity in the 'Base + Development' scenarios.
Access F: Oak Lane / NAR T-Junction		Junction operates well within practical capacity in the 'Base + Development' scenarios.		Junction operates well within practical capacity in the 'Base + Development' scenarios.
Access G: Penventinnie Lane / NAR T-Junction		Junction operates well within practical capacity in the 'Base + Development' scenarios.		Junction operates well within practical capacity in the 'Base + Development' scenarios.

12.20.3 **Table 12-25** shows that most junctions are forecast to operate within practical capacity in all assessment scenarios, with acceptable levels of impact from the proposed development. The exceptions to this are Junctions 13 (A390 / Navigator Way signalised) and 14 (A390 / Malabar Road T-junction), which are shown to experience capacity constraints / significant impacts as a result of the proposed development. Potential measures for mitigation at these junctions have been identified for review and consideration by CC, in its role as LHA.

12.20.4 In regard to Junction 17 (A39 / A390 / Falmouth Road Double Mini-Roundabout), it is recognised that there are existing capacity constraints, that CC is seeking to address through a demand management strategy, the effects of which in terms of traffic reductions have not been accounted for in the traffic flow forecasts and associated capacity assessment. It is therefore likely that the junction will perform well within the levels reported in this assessment. It is on this basis and with regard to CC's strategy for the junction that the level of impact from the proposed development is not considered to require mitigation.

12.20.5 Overall, the residual transport effects of the proposed development are not considered to be severe. The traffic impact of the proposed development is considered acceptable and in accordance with Paragraph 109 of the NPPF.

13. Summary and Conclusions

13.1 Summary

Site Context

13.1.1 AECOM was commissioned by CORMAC Solutions Ltd (herein referred to as 'CORMAC'), through a partnership arrangement for Cornwall Council (CC), to produce a TA to accompany a planning application for a residential led mixed-use development close to Threemilestone, Truro, in Cornwall.

13.1.2 The 240-hectare site is located to the north of the A390 road at Threemilestone and extends in an elongated fashion from West Langarth Farm in the west to Truro Golf Club in the east. The proposed development site is approximately 3km in length and ranges in width up to circa 800m wide at its central point. Truro City Centre lies 3.5km from the Maiden Green Roundabout, at the eastern extremes of the site. The A30 routes to the west, approximately 2km from the western extent of the site. The site lies within the Kenwyn Parish boundary and abuts the Truro City Council boundary at the east.

13.1.3 The site is allocated for development in the emerging *Truro and Kenwyn Neighbourhood Development Plan* (NDP). It benefits from numerous consents for residential and non-residential development that have not yet lapsed; these include consents relating to Langarth (References: PA11/06124 and PA15/11489), East Langarth / Willow Green (References: PA14/10755, PA16/07602, PA16/07603, PA16/07610) and Maiden Green (Reference: PA14/00703). In total, the consents at these three sites provide for residential development of circa 2,500 dwellings and retail development of 90,963sqm.

13.1.4 The key principles of this TA were approved with the highway authorities following submission of a TA Scoping Note in January 2020. A revision to the Scoping Note was issued in June 2020, which set out a revision to the approach to traffic assessment, in order to accurately assess impacts and determine trigger points for infrastructure improvements or requirements. The TA has been produced on the basis of the matters discussed and agreed with the highway authorities.

Existing Situation and Accessibility

13.1.5 The TA provides a description of existing transport conditions and accessibility at the site, including current highway safety and traffic conditions, sustainable transport opportunities, and access to local facilities and amenities on the local highway network.

13.1.6 Key highway links in the vicinity of the site include the A390 to the south, a single carriageway road running on an east-west alignment between Chiverton Cross (A30) and Truro. The A30, accessed around 2km to the west, is the main highway route through Cornwall from Exeter, where it meets the M5 Motorway. The consented A30 Carland to Chiverton Cross (CtCC) scheme will deliver improvements including dualling of the A30 and the provision of grade-separated junctions at Chiverton Cross and Chybucca.

13.1.7 Highway safety on the study area network has been reviewed using Personal Injury Accident (PIA) data obtained from CC. Analysis of the PIA data concludes that there are no locations where highway design has been determined as a causation factor or is indicative of an inherent highway safety issue.

13.1.8 There are numerous opportunities for sustainable transport within the local area, including walking and cycling routes, Public Rights of Way (PRoW), neighbouring bus stops and the Langarth Park and Ride (P&R). There is a wide of range of services and amenities in close proximity to the site, providing retail, commercial, educational and health provisions for future residents. Services and amenities are available with access by a range of modes at reasonably attractive journey times. Bus services, including the P&R, provide access to the City Centre, rail station and locations further afield, whilst walking and cycling offer access to a selection of local amenities within a range of up to 20 minutes depending the location of the origin.

13.1.9 The site is therefore considered to be highly accessible when using active travel modes and public transport. The proposed development will enhance this through its Sustainable Transport Strategy (STS) and provision of a comprehensive range of local amenities which will be available to all site users and the surrounding community.

Proposed Development

13.1.10 The description of the development is as follows:

"Hybrid planning application for Langarth Garden Village comprising;

A. A full planning application for construction of the Northern Access Road and associated access junction arrangements onto the A390, new junctions to the quiet lanes and associated infrastructure and earthworks and retaining and boundary features.

B. An outline planning application with all matters reserved to create a mixed use, landscape-led community comprising a phased development of up to 3,550 dwellings plus 200 extra care units and 50 units of student/health worker accommodation, including affordable housing; five local centres comprising local retail (E), offices (E), restaurants and cafes (E), drinking establishments (sui generis), hot food takeaway (sui generis), health and community facilities (F1 and E), a local care health centre (E), a blue light centre for emergency services (sui generis), up to two primary schools (F1), business and commercial floorspace (E), brewery / public house (sui generis) and associated areas of open space to include a suitable alternative natural greenspace as a strategic open space a community farm/allotments, public realm, renewable energy provision and energy centre, park and ride extension (of up to 600 spaces or 2.73 ha), cycle lanes, connections with the existing highway network including crossings of the A390, quiet lanes, drainage and associated infrastructure, including the demolition of buildings and structures, site clearance and associated earthworks.

C. The Application is accompanied by an Environmental Statement."

13.1.11 CC has sought Capital Funding to acquire some of the land from individual developers and to act as 'master developer' to ensure a comprehensive masterplan approach to the whole site. The scheme will deliver both high quality homes and a substantial level of complementary land uses (with an appropriate level available to future residents during the early phases of the build-out), therefore minimising the need to travel off-site. The access strategy, masterplan design, and STS will offer substantial opportunities for travel by sustainable modes. The overall strategy will ensure a sustainable community that is an attractive place to live and work.

13.1.12 The proposed development will be served, in full, by the Northern Access Road (NAR). CC has secured a Housing Infrastructure Fund (HIF) grant from the Ministry of Housing, Communities and Local Government (MHCLG) to deliver the NAR. The NAR will run parallel to the A390 and connect from West Langarth in the west, to Royal Cornwall Hospital Trust (RCHT) and existing commercial / employment land (at Oak Lane / Penventinnie Lane) in the east. Other access points for both vehicle and non-vehicle access will be provided along its length. Prior to the delivery of the NAR, the Interim Link Road (ILR) will facilitate early construction on the site, and has sufficient capacity to facilitate the occupation of up to 300 dwellings. Upon opening of the NAR, the section of the ILR to the south of the western development plot access will be restricted to buses only (controlled by a bus gate). The remaining ILR to the north of this location will be retained as vehicular access to the adjoining development plots.

13.1.13 The NAR will provide a primary route through the site with secondary and tertiary links complementing the access and movement strategy within the development. Cycle routes and footways will play a key part in the connectivity of the site providing an integrated and permeable scheme.

13.1.14 The strategy for the proposed development provides a closely linked walkable neighbourhood with strategic links to the A390 and associated facilities. The proposed development will provide a range of measures to promote sustainable travel and the principles of *Manual for Streets* (MfS) and *Manual for Streets 2: Wider Application of the Principles* (MfS2) have been used to inform the design parameters for the transport network within the scheme. A number of crossing points and connections are provided to reduce the potential barrier effect of the A390. PRoW continue through the site and beyond to connect to and enhance existing provisions whilst public transport services will be integrated through the proposed development.

Sustainable Transport Strategy

13.1.15 Planning policy and wider travel trends all point towards the need and potential to reduce car-dependency and increase the uptake of sustainable transport in the context of not only the 'climate emergency', but also in terms of healthier lifestyles and management of existing highway networks. It is vital that we move away from the 'Predict and Provide' methodologies which have entrenched car dominance in our cities. Instead, we need to implement 'Decide and Provide', which establishes the travel patterns which support low carbon and active lifestyles, and then provides the measures required to deliver on that aspiration. This ambition forms the basis for the STS for the proposed development.

13.1.16 The aim of the STS is to minimise the level of traffic generated by the development, and to achieve a substantial reduction in existing traffic through encouraging mode shift to offset traffic generated by the proposed development. This will be achieved through a range of measures that will be integral to the proposed development and will reduce traffic, both from the development itself but also in regard to other (background) traffic. This includes measures that will reduce the need to travel, reduce the distances that people need to travel (supporting active travel), embed sustainability into the design of the development, and support people's opportunity to travel sustainably. This is consistent with the hierarchical approach to transport mitigation set out at Paragraph 110 of the *National Planning Policy Framework* (NPPF, 2019).

13.1.17 Furthermore, CC is delivering a range of initiatives in Truro which will benefit existing and future residents. This includes the public sector TP and Truro Transport Strategy (TTS) Refresh.

Development Trip Generation, Distribution and Assignment

13.1.18 Multi-modal trip generation forecasts have been prepared based on person trips and mode shares. Total person trips have been extracted from the TRICS database for each of the land uses to derive the total person trip generation of the proposed development. A mode share for each type of land, derived from 2011 Census and National Travel Survey (NTS) sources, has then been applied to the person trip rates to derive multi-modal trip rates for each land use. The multi-modal trip rates have then been applied to development quanta, from which it was identified that the highest person and vehicle trip generation during the weekday AM and PM peak periods occurs during the hours commencing 08:00hrs and 17:00hrs respectively. These have been used as the peak development traffic hours for the purposes of this TA.

13.1.19 The forecasts derived from this methodology have been refined to take account of the effects of internalisation of trips (i.e. trips between land uses within the development) and mode shift associated with the STS. Appropriate levels of internalisation and mode shift associated with the STS have been identified, based on discussions with CC. In regard to the former, these have been applied as a reduction in external trip generation. With regards to the latter, the adjustments in traffic mode share have been reassigned onto other modes to derive 'adjusted' multi-modal trip rates. The 'adjusted' multi-modal trip rates, together with the internalisation factors, have been applied to the development quanta for the respective land uses to derive a tailored multi-modal external trip generation of the proposed development.

13.1.20 Overall, the proposed development is forecast to generate around 3,800 two-way external person trips during the AM peak hour, of which around 1,100 are forecast to be vehicle trips. During the PM peak hour, the proposed development is forecast to generate around 3,600 two-way external person trips, of which around 1,100 are forecast to be vehicle trips. Vehicles (as a driver or rider) generally account for the highest mode share (29% in the AM peak hour, 30% in the PM peak hour), followed by walking (29% in the AM peak hour, 27% in the PM peak hour) and public transport (21% in the AM peak hour, 27% in the PM peak hour). Car share and cycling have similar mode shares, at around 10%. In summary, around 60% of peak hour trips are forecast to be undertaken by sustainable modes, and 40% by private vehicles.

13.1.21 External development traffic has been distributed and assigned to the local highway network using a spreadsheet model based on 2011 Census data. The likely routeing of development traffic between the development site and origins / destinations has been established using an online route planning application for a neutral weekday peak hour period. Where more than one route has been available, appropriate weighting has been applied based on a generalised cost formula.

Assessment Scenarios

13.1.22 The assessment scenarios have been produced using a spreadsheet model informed by future baseline traffic flows derived from data and forecasts from the Truro HIF SATURN model, with local adjustments to ensure sufficient granularity for local impact assessment. The forecasts also include committed infrastructure changes, including those associated with the committed A30 CtCC scheme; this will result in significant changes in background traffic flows on the network upon opening (in 2023), and therefore it is considered appropriate for assessments to be informed by forecasts based on the future highway network.

13.1.23 Traffic in the model associated with previous incarnations of the proposed development site has been removed (more refined development traffic forecasts are added at a later stage of the process). It should be acknowledged that a significant number of dwellings are currently consented on the site of the proposed development through previous applications. Whilst these are technically 'committed development', it has been agreed with CC that the future baseline traffic flows will not include dwellings consented on site for the purpose of presenting a clear analysis of traffic conditions both with and without the proposed development.

13.1.24 The SATURN model forecast years of 2023 and 2038 have been utilised. 2023 is the earliest year of assessment available in the area-wide model (corresponding with the expected opening of the A30 CtCC scheme). 2038 is the latest year of assessment available in the model and is considered to represent a reasonable timeframe for later phases of build-out of the proposed development and assessment of operational effects. The weekday AM and PM peak hours have been examined for each assessment year, both without ('Base' scenario) and with ('Base + Development') the proposed development.

13.1.25 Current and future trends in travel patterns have been identified and adjustments made to the future year baseline traffic flows to provide a more realistic assessment of future traffic conditions. These trends include an increase in homeworking, reductions in longer distance in-commuting through rebalancing housing and jobs, and transfer of traffic to P&R services as a result of an extension to the existing Langarth P&R. A clear methodology has been identified for the application of each trend with reference to supporting evidence and incorporated into 'Base' and 'Base + Development' scenarios as appropriate.

Traffic Impact Assessment

13.1.26 Junction capacity modelling has been undertaken to assess the development traffic impact of Langarth Garden Village on the local highway network. A total of 19 junctions on the local highway network have been assessed, in addition to the development vehicle accesses (four junctions). Priority-controlled junctions, including T-Junctions and roundabouts have been assessed using Junctions 9 software. Signal-controlled junctions have been assessed using LinSig.

13.1.27 The assessment shows that most junctions are forecast to operate within practical capacity in all assessment scenarios, with acceptable levels of impact from the proposed development. The exceptions to this are Junctions 13 (A390 / Navigator Way signalised) and 14 (A390 / Malabar Road T-junction), which are shown to experience capacity constraints / significant impacts as a result of the proposed development. Potential measures for mitigation at these junctions have been identified for review and consideration by CC, in its role as Local Highway Authority (LHA).

13.1.28 In regard to Junction 17 (A39 / A390 / Falmouth Road Double Mini-Roundabout), it is recognised that there are capacity constraints, although this is an existing issue and not attributable to the proposed development, and the impact of the proposed development is not considered to be severe. It is understood that CC is seeking to address existing capacity constraints through a demand management strategy, the effects of which in terms of traffic reductions have not been accounted for in the traffic flow forecasts and associated capacity assessment. It is therefore likely that the junction will perform well within the levels reported in this assessment. It is on this basis and with regard to CC's strategy for the junction that the level of impact from the proposed development is not considered to require mitigation.

13.1.29 Overall, the residual transport effects of the proposed development are not considered to be severe. The traffic impact of the proposed development is therefore considered to be acceptable and in accordance with Paragraph 109 of the NPPF.

13.2 Policy Compliance

13.2.1 The development proposals are compliant with the policy framework outlined in **Chapter 4**. The specific elements of the development proposals and the policies to which they adhere are outlined in **Table 13-1**.

Table 13-1: Development Policy Compliance

Development Proposal	Policy
The development proposals are the subject of a TA. The TA has been prepared in consultation with Highway Authorities (CC and Highways England (HE)) and in accordance with relevant national and local guidance.	NPPF, Paragraph 111 Cornwall Local Plan 2010-2030, Policy 2
The development proposals are supported by a Framework Travel Plan (FTP), which provides the overarching mechanism for subsidiary Travel Plans (TPs) to be prepared for specific site occupation. This complies with the specific requirements outlined in the relevant policies.	NPPF, Paragraph 108a NPPF, Paragraph 111 Cornwall Local Plan 2010-2030, Policy 2
The application proposals have been subject to pre-application consultation with CC and HE as the highways authorities. These consultations have defined the scope of this TA and the application proposals, including the STS.	NPPF, Paragraphs 39-46
The access strategy includes the NAR, a primary transport route between West Langarth and Tresliske Hospital, with vehicular access onto the A390 at West Langarth, Richard Lander School and Penventinnie Lane. The access strategy provides safe, secure and convenient access for all users.	NPPF, Paragraph 108b Cornwall Local Plan 2010-2030, Policy 2 Emerging Truro and Kenwyn NPD, Policy H3
The development proposals will introduce key services and facilities within walking / cycling distance of the site, creating a sustainable community by reducing the overall travel demand at the development. Employment, education, leisure, retail and other community facilities will be available for both Langarth Garden Village and the surrounding area (with an appropriate level available to future residents during the early phases of the build-out).	NPPF, Paragraph 103-104 Cornwall Local Plan 2010-2030, Policy 2 Emerging Truro and Kenwyn NPD, Policy H3 Connecting Cornwall 2030, Policy 4
The proposed development provides a fully integrated network of footways and cycleways throughout the proposed development, which connect with existing off-site strategy. Full permeability of the entire development site and between the site and surrounding area will encourage the uptake of sustainable transport at and around the site. A new bus service will be provided to connect the proposed development with key destinations in Truro including RCHT, New County Hall (NCH), Truro Railway Station and the City Centre. This will be pump-primed during the build-out of the development to ensure that an appropriate and attractive service is available to users of the development at all phases. The proposed development includes an extension (600 spaces) to the existing Langarth P&R, increasing capacity to 1,809 spaces in total. This will enable increased usage of the P&R facility, reducing onward car travel to key destinations. The proposed development has been designed to enable charging of Electric Vehicles (EVs) (including e-bikes) in safe, accessible and convenient locations.	NPPF, Paragraph 108a NPPF, Paragraph 110a NPPF, Paragraph 110d NPPF, Paragraph 110e Cornwall Local Plan 2010-2030, Policy 2 Emerging Truro and Kenwyn NPD, Policy H3
The proposed development will seek to reduce vehicle movements by managing and limiting parking supply at the residential and office developments. An overarching parking strategy has been developed as part of the Design Codes for the proposed development, so as to establish a consistent approach to the parking provision and management of spaces throughout the development.	NPPF, Paragraph 105
The proposed development is forecast to result in localised traffic impacts at a small number of locations on the local highway network. However, options that suitably mitigate the impacts have been identified, for discussion with the LHA. There is no severe residual impact on the highway network.	NPPF, Paragraph 108c NPPF, Paragraph 109 The Strategic Road Network: Planning for the Future, Highways England (2015), Paragraph 101

13.3 Conclusions

13.3.1 This TA has outlined the anticipated impact of the proposed development of Langarth Garden Village on the study highway network. The development meets the requirements of the NPPF as follows:

- The proposed development provides a suitable mix of complementary land uses which will reduce the need for travel on the local highway network;
- The access strategy facilitates safe and suitable access for pedestrians, cyclists and public transport, whilst ensuring efficient vehicle access;
- The STS includes a package of measures that embed sustainability into the design of the development and support people's opportunity to travel sustainably; and
- The cumulative residual impacts on the highway network of the proposed development are not considered to be severe, and therefore the traffic impact of the proposed development is considered to be acceptable in accordance with Paragraph 109 of the NPPF.