Appendix TA - S

SPREADSHEET MODELLING METHODOLOGY NOTE

London Resort Company Holdings

LONDON RESORT TRAFFIC ASSESSMENT

Strategic Modelling Methodology

LR-DC-WSP-REP-842.0
NOVEMBER 2020

PUBLIC

London Resort Company Holdings

LONDON RESORT TRAFFIC ASSESSMENT

Strategic Modelling Methodology

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INTRODUCTION

1 INTRODUCTION

1.1 BACKGROUND

1.1.1. WSP have been engaged by London Resort Company Holdings Ltd (LRCH) to provide transportation advice and highways input to the proposed development of The London Resort on the Swanscombe Peninsula, Kent. WSP, with consultation from world leading resort specialists and experts, have been involved in developing the transport, highway and infrastructure master plan for the development business case. WSP are also leading on preparing the supporting transport documents for the Nationally Significant Infrastructure Project (NSIP) application and corresponding Development Consent Order (DCO) which will cover a variety matters, such as transport modelling, transport assessments, and travel demand management.

1.1.2. Introduced by the Planning Act in 2008, a DCO was intended to simplify and speed up the process of obtaining planning permission for large scale developments, designated as NSIP. Obtaining development consent under the 2008 Act involves a front-loaded process where the developer consults on a proposed project before submitting an application. The application, once accepted, will then be examined by a single inspector or a panel of inspectors from the Planning Examining Body. The DCO not only provides planning consent for the project but may also incorporate other consents and include authorisation for the compulsory acquisition of land.

1.2 SITE LOCATION

1.2.1. The London Resort is proposed to be located on the Swanscombe Peninsula in Dartford, Kent and the main Kent project site was chosen based on its relative location and accessibility to European cities, transport and service infrastructure. To support the delivery of this significant leisure attraction, the Essex Project Site has been identified for its proximity to several ports, including Tilbury, and ability to exploit links to existing cruise liners which will enable the Resort to offer the highest level of accessibility for a development of its kind.

1.2.2. The location of The London Resort will enable the development to capitalise on the proximity of public transport networks by providing effortless and efficient access from the local rail, bus and coach stations. The Kent and Essex Project site locations have been discussed in detail within this chapter and information on the existing accessibility via active, sustainable and private modes of transport has been presented.

1.2.3. The Kent Project Site lies approximately 30 km east-south-east of central London on the south bank of the River Thames, in the county of Kent. It occupies most of the Swanscombe Peninsula and includes a corridor for transport connections generally extending southwards to the A2 trunk road.

1.2.4. The Essex Project Site is located approximately 35km east-south-east of central London on the north bank of the River Thames, in the county of Essex and has primarily been identified to introduce a new car park at the Port of Tilbury. The Site location is presented in **Figure 1-1** and identified by the red polygons to the north and south of the River Thames respectively.

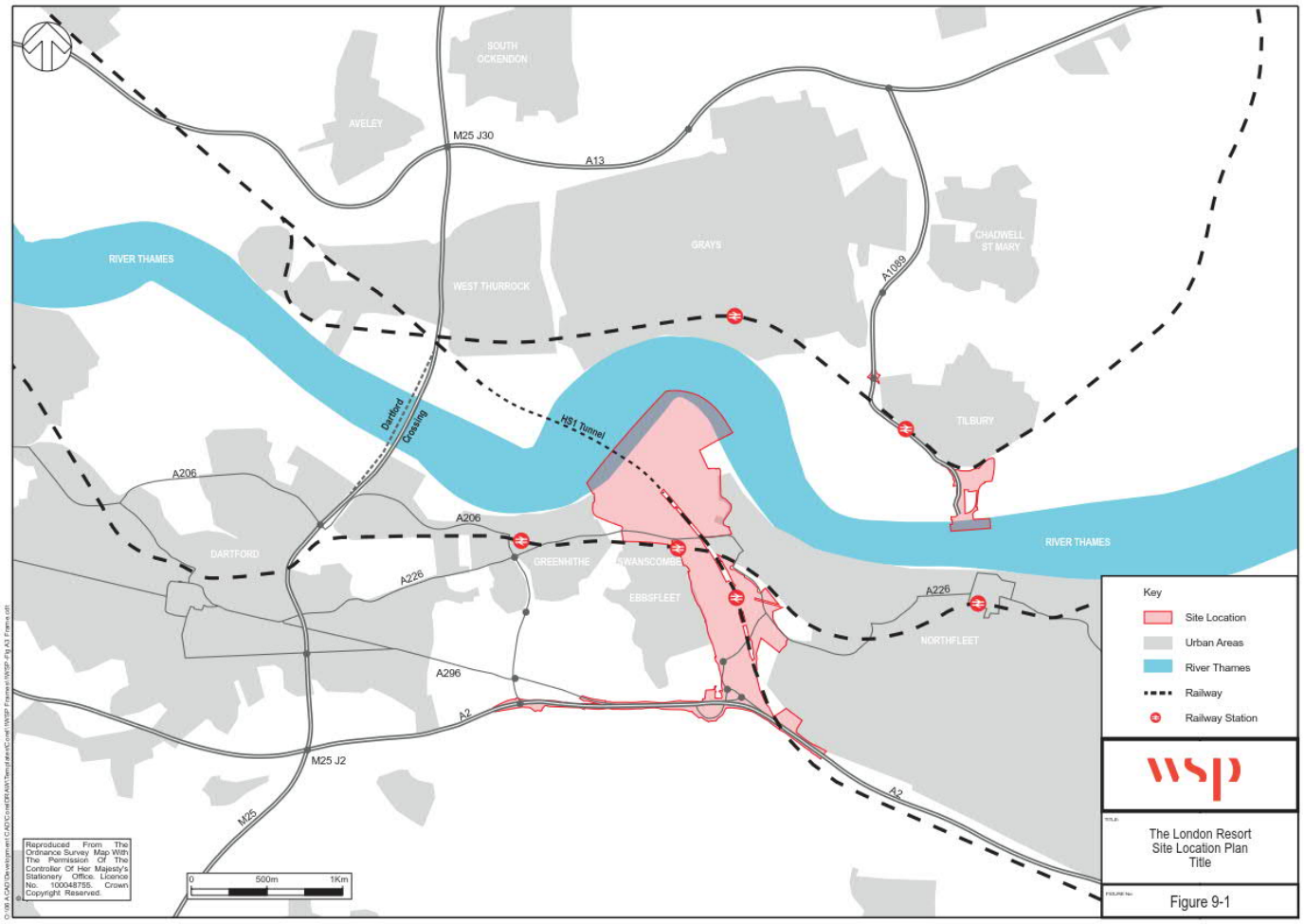

Figure 1-1: The London Resort Site Location

1.2.5. The Kent Project Site is bisected by the High Speed 1 and North Kent railway lines, which operate from nearby Ebbsfleet International, Greenhithe, Swanscombe and Northfleet stations.

1.3 THE LONDON RESORT

1.3.1. The London Resort seeks to provide a world class entertainment park with quality and visitor experience at the core of its design and offering a unique global destination that is unrivalled in the UK and across the rest of the World. The leisure core will be built using a phased program with opening of Gate One initially, before building out Gate Two – a complimentary area to Gate One, enabling guests to visit two World leading theme parks within the same resort but with each delivering its own unique content and visitor experience.

1.3.2. The proposals of the site are indicatively set out as follows;

- A multi-IP global resort including leading brands related to film television, electronic gaming and toys
- Phased approach delivering two unique parks
- The leisure core will comprise a range of events space, themes rides and attractions, entertainment venues, theatres and cinemas
- Gate One and Gate Two will have entrance plazas offering ancillary retail, dining and entertainment facilities (RDE)
- Approximately 3,550 suites across four hotels providing family, upmarket, luxury and themed accommodation
- A Waterpark incorporated within one of the on-site hotels
- A 'conferention' centre, combined conference and convention facilities capable of hosting a wide range of entertainment, sporting, exhibition and business events
- A linked building hosting a range of eSports, video and computer gaming events
- Approximately 2,000 single units contained within 500 on-site dwellings for Resort workers
- People mover and transport interchange between Ebbsfleet International, the pier and the main entrance.

1.3.3. Given the seasonal variability of visitors at the Resort, it is proposed that an 85th percentile assessment day is to form the basis of the assessment. The 85th percentile assessment day represents the demand of circa 38,000 visitors with only 54 days a year exceeding this level which generally occur at weekends or during holiday periods.

1.3.4. The proposed access strategy seeks to promote sustainable transport access to The London Resort via a variety of transport modes.

1.4 EXISTING HIGHWAY CONDITIONS

Strategic Road Network

1.4.1. **Figure 1-2** shows the SRN within the vicinity of the Kent Project Site and Essex Project Site. The strategic routes in the vicinity of the Kent Project Site include the A2(T) connecting the M25 at Junction 2 with the Junction 1 of the M2 to the southeast of Gravesend. Other key routes include the A282 providing a link between the Junction 2 and 31 of the M25, and essentially, it forms part of the M25 motorway.

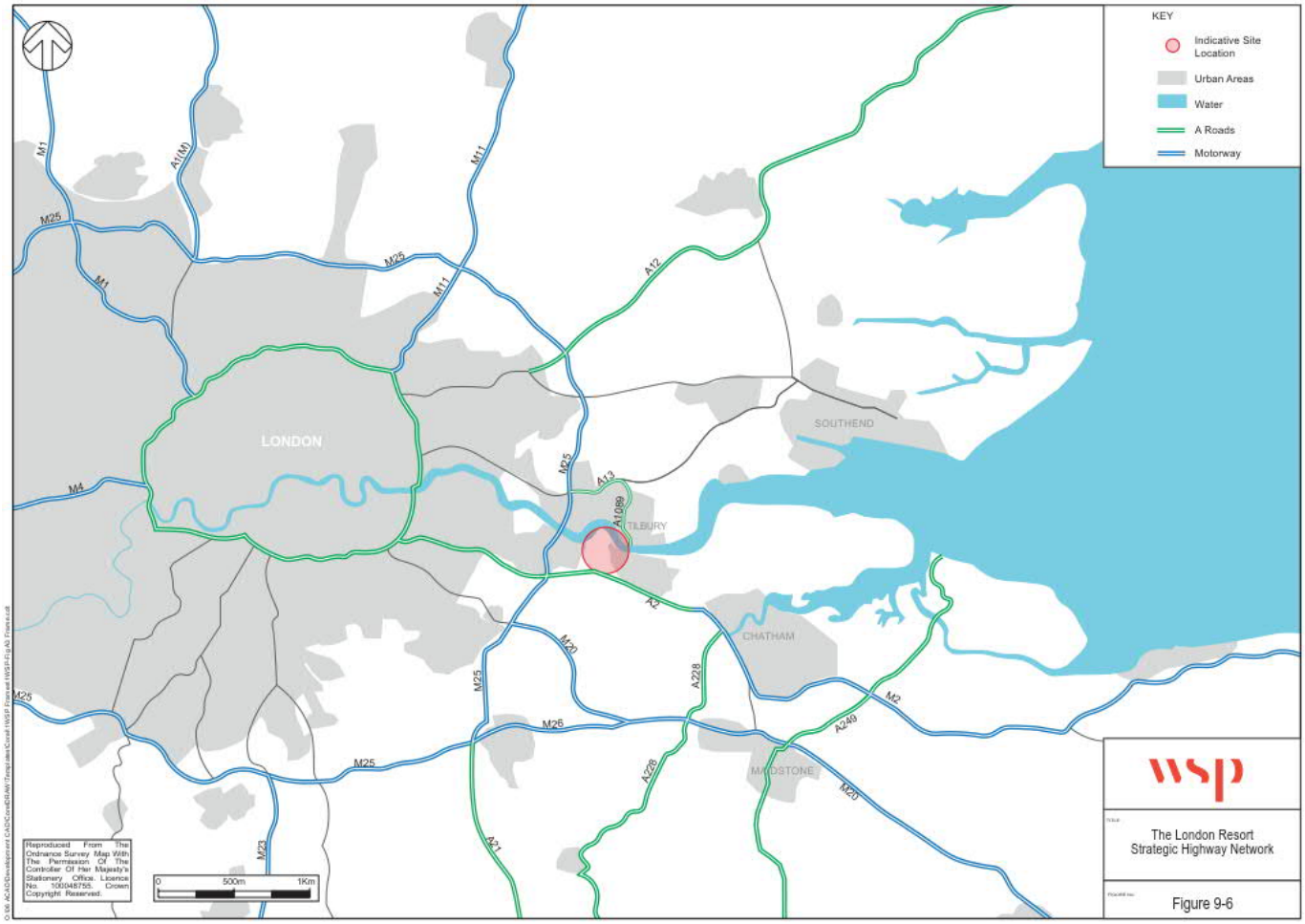

Figure 1-2: Strategic Road Network

M25

1.4.2. The M25 (including the A282 section) is a dual three to six-lane road that is subject to the motorway regulations. The motorway circumscribes London and provides direct access to London and other major roads and motorways serving the South East, the East and other UK regions. The M25, as a motorway-standard road, is not provided with cycle or pedestrian facilities along its length, but in many cases, these are available on parallel routes.

1.4.3. The M25 J30 is a four-arm signalised roundabout junction that allows connections between the M25 and A13, the roundabout is a three lane circulatory and is subject to 50mph speed limits with no stopping regulations.

A282

1.4.4. The section of the A282 between Junction 1a and 2 of the M25 follows a north-south alignment. To the north of M25 Junction 1a, the A282 deviates slightly to the east while approaching the River Thames. The A282 crosses the Thames from Dartford to Thurrock via Dartford Tunnel, with traffic in the opposite direction (i.e. Thurrock to Dartford) utilising the Queen Elizabeth II Bridge. Both the tunnel and the bridge, commonly known as the Dartford Crossing, form a crucial gateway carrying up to 160,000 vehicles a day in either direction.

A13

1.4.5. The Essex Project Site in Tilbury is accessed from the M25 Junction 30 to the north of the River Thames, the A13 and then A1089.

1.4.6. The A13 is a dual three to four lane road subject to 50mph speed limits between M25 J30 to A1202 where the speed increases to 70mph until it connects to the A1089. The M25 J30 provides access to the A13 and further connects with the A1089 in an east-west alignment towards the Essex Project Site. Subject to motorway regulations, this road does not provide pedestrian or cycle facilities along the length. It provides connections west towards Basildon and east to Dagenham.

A1089 Dock Road approach/ Dock Road/ St Andrew's Road/ Ferry Road

1.4.7. The A1089 will be the main access point for the Essex Project Site, Tilbury carpark situated close to Tilbury Docks. The A1089 is 6km dual carriageway subject to motorway regulations, that follows a north-south alignment and provides a connection to the north with the A13 and Tilbury Docks to the south. The road is accessed from the A13 to the north using the A13/ A1089 junction using the priority two lane off-slip/on-slip alignment.

1.4.8. The A1089 Dock Road/ Dock Approach Road between the Asda roundabout and A13 is a dual lane road subject to national speed limits along the length, with a footway on the western side of the carriageway between the Asda roundabout and the Marshfoot interchange off slip where the footway facilities then link with Old Dock Approach.

1.4.9. A1089 St Andrew's Road between the Asda roundabout and Tilbury Docks is a dual lane road subject to 40mph speed limits with a footway on the western side of the carriageway. After Tilbury Docks the A1089 is a single carriageway two-way road with speed limits of 40mph, with a shared cycle and pedestrian pathway along both sides of the road before reaching the Ferry Road roundabout.

A2

1.4.10. The A2(T) is a dual four-lane road that runs approximately 2km to the south of the Kent Project Site and parallel to the A226 (details of which are provided in the next sub section) in an east-west alignment. It provides a connection to the west, to locations such as Dartford and east London, and the east to locations such as Gravesend and Chatham from where it then operates as the M2 to Faversham. From Faversham, the M2 then reverts to the A2 as far as Dover.

1.4.11. The main access point to the Kent Project Site is obtained from the A2/ A2260 junction; a dual lane off slip/ on slip alignment met by a double priority roundabout arrangement. Traffic egressing from the A2 east use the southern off slip before travelling north to the A2260/ Ackers Drive four arm priority roundabout with a pedestrian crossing on the A2 and A2260 eastern arm. Traffic from the A2 west use the eastern A2260 roundabout; a three-arm priority junction subject to 50mph speed limits.

1.4.12. In addition to the key routes outlined above, from the regional perspective, the wider SRN also comprises the M2, M20, M26, A249, A299, A12, M11, A1(M), M1 and M23.

LOCAL HIGHWAY NETWORK

1.4.13. The local highway network review has been compiled using information from the 2017 and 2020 Site visit observations and a comprehensive desktop study. **Figure 1-3** demonstrates the local highway network within the vicinity of the Kent and Essex Project Sites.

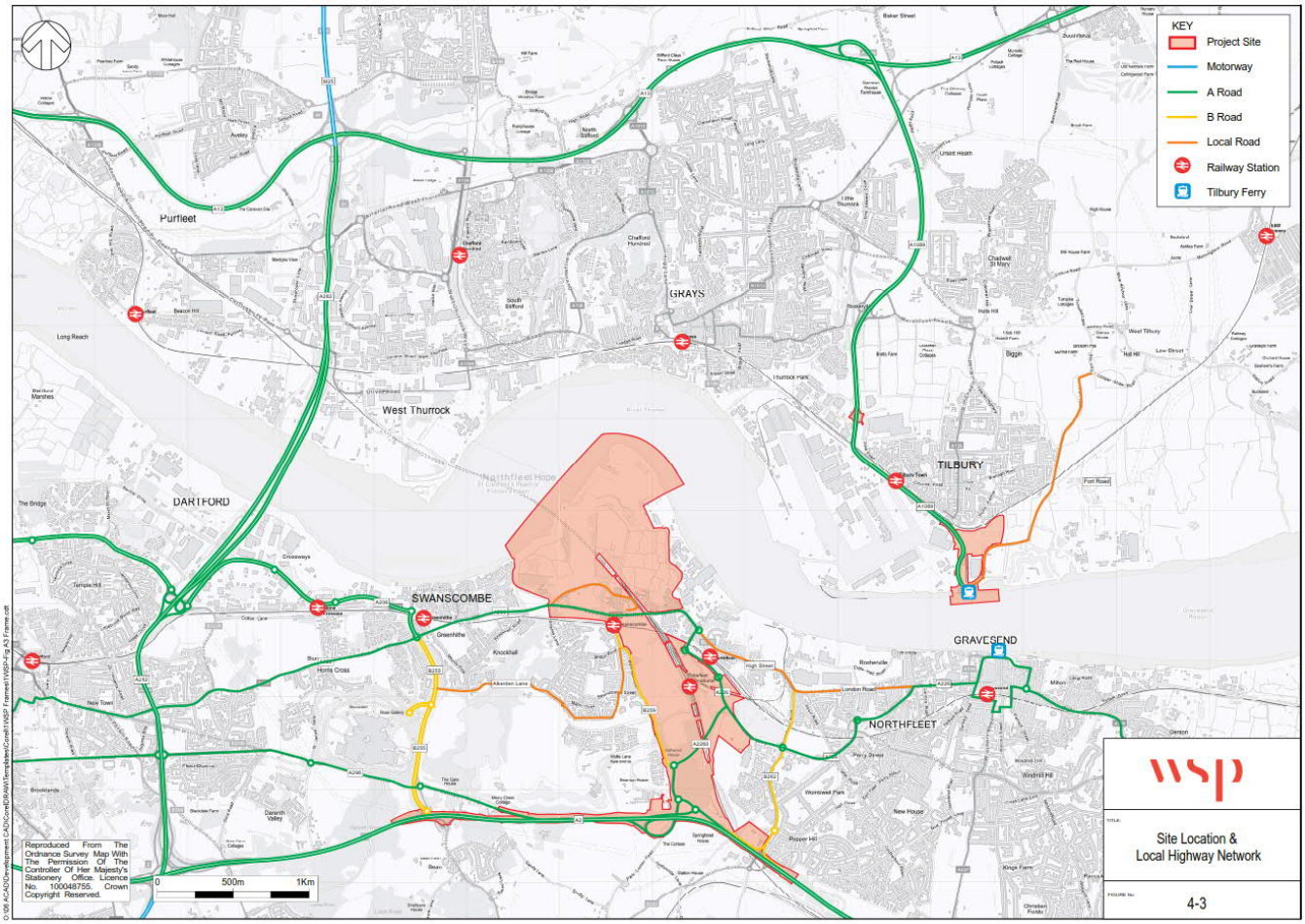

Figure 1-3: Local Highway Network

A226

1.4.14. The A226 London Road/Thames Way is one of the principal local roads running in the east-west direction separating the Swanscombe Peninsula and the local centre of Swanscombe. It is a single carriageway road with a speed limit of 30mph. Short sections of on-road cycle lanes and parking bays are provided along some parts of the route, and a mix of land uses are present along its length, including schools, commercial activity and residential areas.

A206

1.4.15. A206 Crossways Boulevard is a local road that joins the A226 London Road and links to Dartford through to the M25/A282 via the Littlebrook Interchange (M25 Junction 1a). The road is a suburban dual carriageway with two lanes operating in each direction, and it is subject to a 40mph speed limit. Off-road shared pedestrian/cycle facilities are provided to both sides of the road.

B255

1.4.16. The B255 St. Clements Way/High Street/The Avenue is also a principal local road that continues from the A206 southwards to the A2(T) at the Bean Lane roundabout. It is a dual carriageway with a 40mph speed limit from the A226 to the Bluewater roundabout, where the speed limit increases to 50mph until the B255 reaches the A2(T). The road has a continuous, good quality off-road shared pedestrian/cycle lane along its east side.

B259

1.4.17. B259 Stanhope Road/Southfleet Road is situated directly to the south of the Kent Project Site location in a north-south alignment linking the A226 London Road to the A2(T) at a double roundabout arrangement. The road is a narrow single carriageway, with one lane in each direction and it is subject to a 30mph speed limit. Some sections of the road are designated 20mph zones, coupled with other traffic management measures, such as kerb buildouts for single-vehicle widths. Parking bays, parking spaces marked on-road and a mix of footways at one or both sides of the carriageway are seen along this, mainly residential, road.

B2175

1.4.18. B2175 Stonebridge Road/High Street/A226 London Road is approximately 2.5km long section of road to the east of the Kent Project Site, bounded by residential properties and local shops. The B2175 is a single carriageway road with one lane in each direction. Footways are provided to both sides of the road, and intermittent on-road and shared off-road pedestrian/cycle facilities are also provided. Furthermore, sheltered bus stops and signalled crossings are located along the road. A 30mph speed limit applies to most of the road. However, there is a 40mph section between Rosherville Way, that crosses under the B2175, and its junction with Springhead Road.

B262

1.4.19. B262 Springhead Road is approximately 2km long section of road that extends from the B2175 London Road to the A2(T). It is a 30mph two-way single carriageway road, linking through a residential area to the north of the railway line and a mix of land uses including the industrial, cemetery, colleges and community services to the south of Thames Way.

International Way

1.4.20. International way is 30mph two-way single carriageway road, providing access to Ebbsfleet International station and carparks from access points on the A2260 Ebbsfleet Gateway and the B259 Southfleet Road.

The Essex Project Site in Tilbury is separated from the existing settlement by the railway line serving both the docks as well as Tilbury Town. The railway line creates a physical barrier between the Port of Tilbury and residential parts of Tilbury. The area is accessible predominantly by the A1089, with only limited connections to the local highway network.

1.5 SUSTAINABLE TRANSPORT MODES

1.5.1. One of the significant advantages of the project site, setting it apart from any other major resort of its type, is the availability of public transport options; the developments proximity to available rail services, location adjacent to the River Thames and nearby Fastrack bus services provides a unique opportunity for the accessibility of the Proposed Resort.

1.6 PURPOSE OF THIS TECHNICAL NOTE

1.6.1. An approach was agreed, in principal, between key stakeholders that a combined approach of local junction modelling, microsimulation modelling and an EXCEL based spreadsheet transport model derived from existing strategic traffic models would be used for assessing the London Resort impacts.

1.6.2. Highways England provided WSP with outputs from the A2 Bean and Ebbsfleet (A2BE) model for use in the development of the EXCEL based spreadsheet transport model.

1.6.3. The results of the EXCEL based spreadsheet transport model would be taken forward for use in the air quality assessments used to support the DCO application along with other operational assessments.

1.6.4. The purpose of this technical note is to document the methodology used to develop the EXCEL base spreadsheet transport model. It will contain a description of the sources of traffic data used, along with descriptions of the processes used to generate the base year and forecast year model flows.

1.7 STRUCTURE OF THIS TECHNICAL NOTE

1.7.1. The technical note is structured with the following sections:

- Section 1: Introduction and Context
- Section 2: Data Sources
- Section 3: Base Model Development
- Section 4: Forecast Model Development
- Section 5: Air Quality outputs
- Section 6: Summary.

2

DATA SOURCES

2 DATA SOURCES

2.1 INTRODUCTION

2.1.1. The following sections set out the data sources that have been used for the production of the EXCEL based spreadsheet transport model.

2.2 A2 BEAN AND EBBSFLEET MODEL

2.2.1. The A2 Bean and Ebbsfleet Model (A2BE) was commissioned by Highways England as part of the traffic assessment for the upgrade of the Bean and Ebbsfleet junctions along the A2. A cordon of the Lower Thames Area Model (LTAM) v1 has been used as the basis for A2BE Stage 3 study and transport modelling work

2.2.2. The base year model (March 2016) has the following time periods:

- AM Peak Hour: 07:00 - 08:00
- Inter Peak Average Hour: 09:00 - 15:00
- PM Peak Hour: 17:00 - 18:00.

2.2.3. The area of detailed modelling for the A2BE model is shown in **Figure 2-1**.

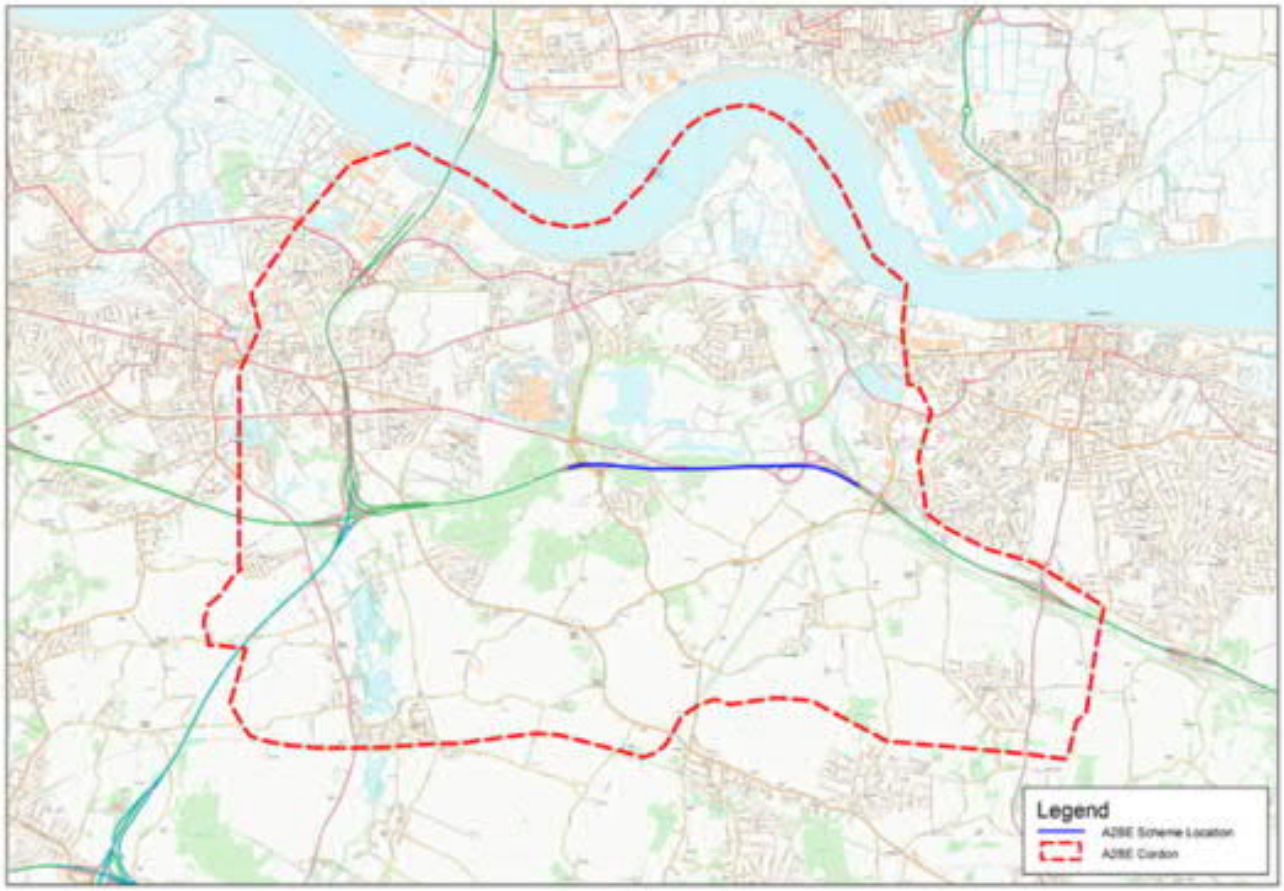

Figure 2-1: A2BE model: area of detailed modelling

2.2.4. For the purpose of model forecasting, the following forecast year models were developed:

- Forecast year 2023 ('scheme opening year')
- Forecast year 2026 ('LTC opening year'): This was the assumed opening year at the time of the production of the A2BE forecast year transport models
- Forecast year 2031. This is the mid-point forecast year between the scheme opening year and the design year
- Forecast year 2038 ('design year') 15 years after opening
- Forecast year 2051 for economic assessment of the scheme.

2.3 A2 BEAN TO EBBSFLEET MODEL OUTPUT

2.3.1. Highways England provided data, in GIS format, for the 2016 base year model and for the Do Something scenarios where the upgrades to the junctions have been completed. The output included, for the three peak hour models:

- three car user classes
- Light Goods Vehicles (LGV) user class
- Heavy Goods Vehicle (HGV) user class
- Average speeds on each of the links.

2.3.2. **Figure 2-2** shows the extent of the area where the A2BE model data was provided. Whilst the Lower Thames Crossing (LTC) does not fall within the extent of the A2BE model, the matrices used in the model were derived from the LTC model, so the later forecast years assume that the Lower Thames Crossing is operational.

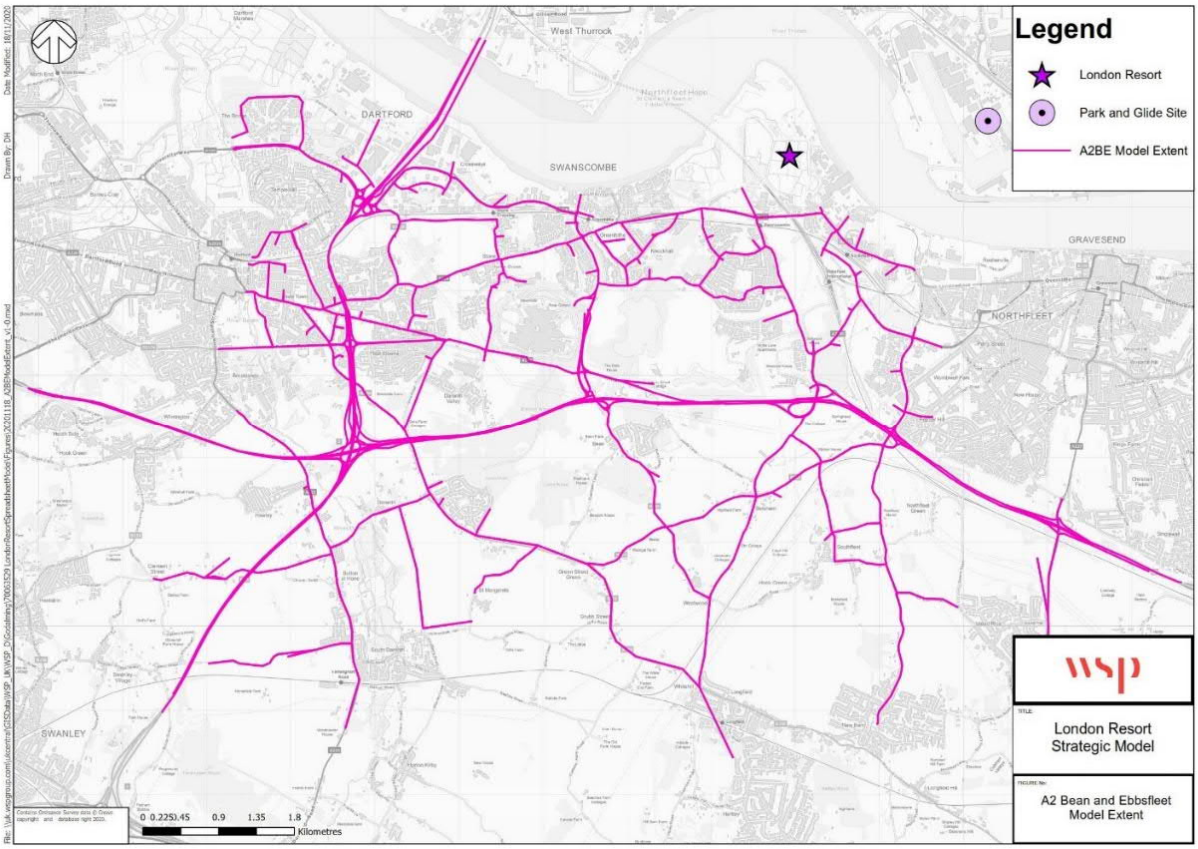

Figure 2-2: A2 Bean and Ebbsfleet Model Extent

2.4 THURROCK TRAFFIC COUNTS

2.4.1. Traffic counts were undertaken in November 2017 in support of a development of a VISSIM model in the Thurrock Area for the Intu Lakeside retail park.

2.4.2. **Figure 2-3** shows the location of each of these traffic counts. Counts were undertaken for the AM peak, PM peak and Weekend Peak hour.

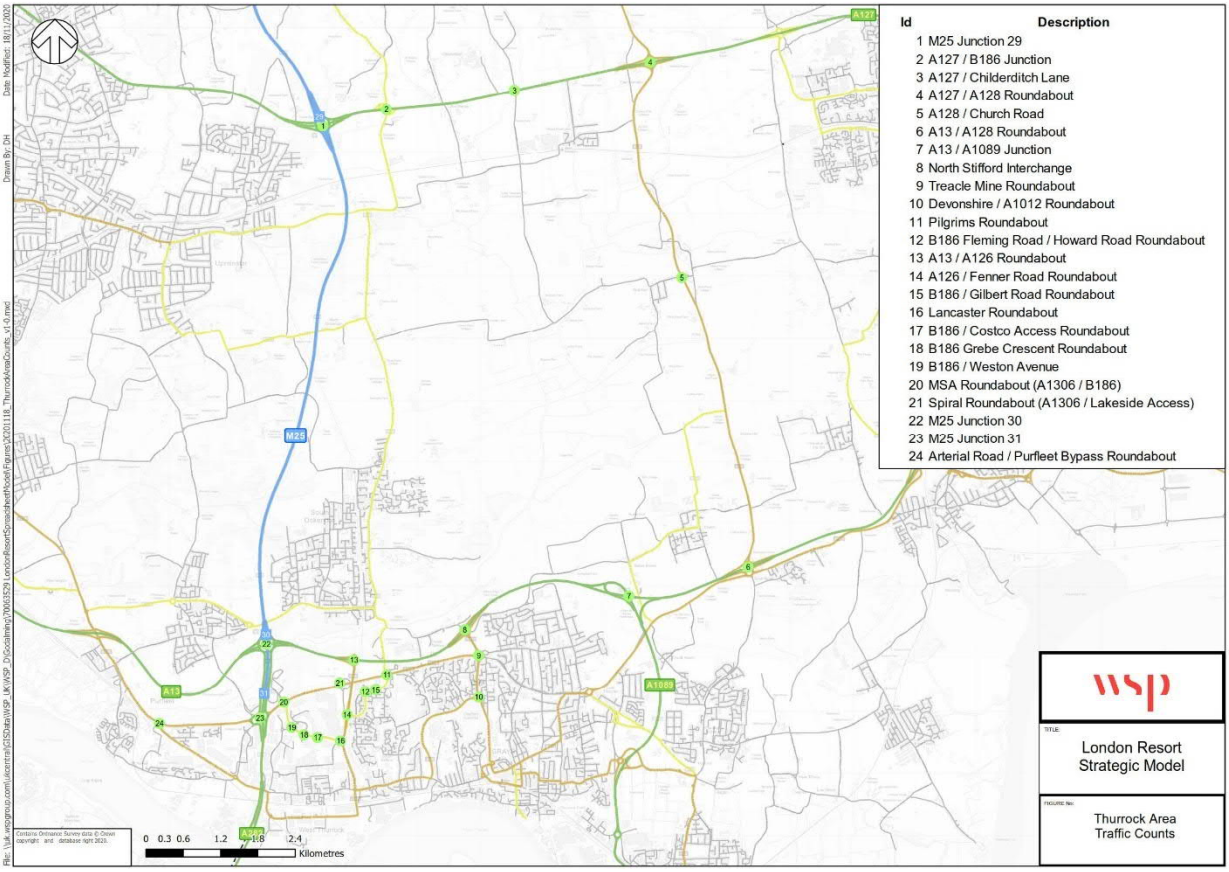

Figure 2-3: Location of Thurrock Area Traffic Counts

2.5 LOWER THAMES CROSSING FORECAST REPORT

2.5.1. As part of the 2018 consultation on the proposed Lower Thames Crossing (LTC) Highways England published a forecast report (https://highwaysengland.citizenspace.com/ltc/consultation/supporting_documents/Traffic%20Forecasting%20Report.pdf) outlining the projected impacts on traffic of the proposed scheme.

2.5.2. Chapter 9 of the above report contained the projected flows and HGV percentages of traffic on the proposed route. The forecast years covered included 2026, 2031 and 2041, and included the AM peak and PM peak.

2.6 HIGHWAYS ENGLAND AND DFT TRAFFIC COUNTS

2.6.1. Highways England maintain a series of fixed traffic count locations across the Strategic Road Network. The Department of Transport (DfT) undertake regular traffic counts at key locations across the country.

2.6.2. **Figure 2-4** shows the location of relevant traffic count site across the study area within the vicinity of the London Resort.

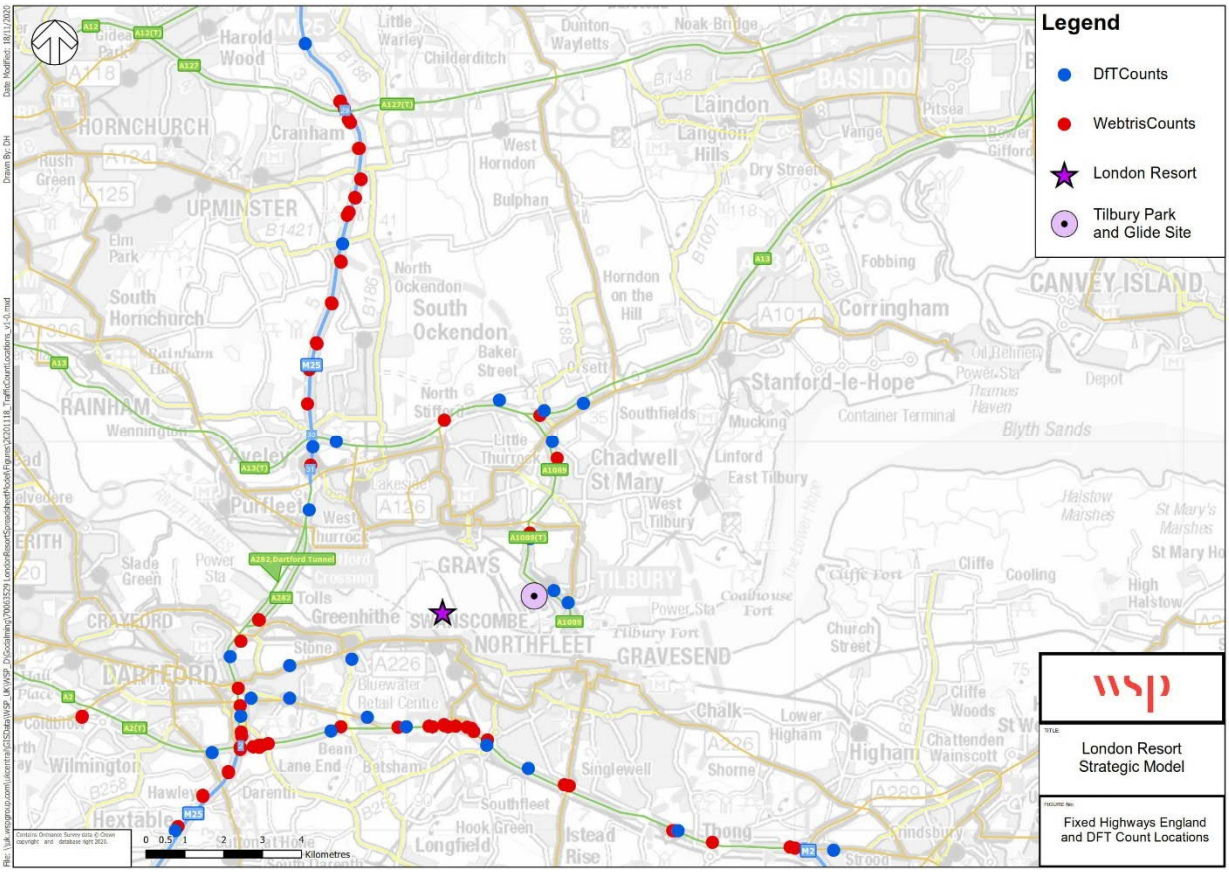

Figure 2-4: Location of Highways England and DFT Traffic Counts

2.7 COMMITTED DEVELOPMENTS

2.7.1. The A2 Bean to Ebbsfleet (A2BE) transport model has a number of committed development and infrastructure improvements included with the model which are shown in **Table 2-1**.

2.7.2. In areas of the EXCEL based spreadsheet transport model which extended beyond the scope of the A2BE model extent (see Figure 2-1) growth from developments north of the River Thames has been included by the use of National Trip End Model (NTEM) growth factors accessed via the TEMPRO programme as discussed in **Section 2.8**.

Table 2-1: Development included in the A2 Bean to Ebbsfleet transport model

Developments	Infrastructure
▪ Eastern Quarry (Barton Wilmore)	▪ Lower Thames Crossing (Highways England)
▪ Bluewater Shopping Centre – new tunnel (Kent County Council)	▪ A2 Bean and Ebbsfleet Junction Improvements (Highways England)
▪ Stone Pit I (Graham Simpkin Planning)	
▪ Stone Lodge Complex (BAM Construction)	
▪ Stone Pit II (Barton Wilmore)	
▪ Land West of Springhead Road – Outline (Countryside Properties)	
▪ Land West of Springhead Road – Reserved Matters (Countryside Properties)	
▪ Northfleet Embankment (Keepmoat Homes Ltd)	
▪ Land at Coldharbour Road (Bovis Homes/Persimmon Homes)	

2.8 NATIONAL TRIP END MODEL

2.8.1. The Department of Transport (DfT) maintains the National Trip End Model (NTEM) to establish a common baseline for all assessments for traffic growth in the UK. Growth factors for model flows can be extracted from this model using the Trip End Model Program (TEMPRO).

2.8.2. **Table 2-2** to **Table 2-4** shows the projections within the NTEM model for the number of households and jobs that are anticipated in Thurrock, Dartford and Gravesham for the coming years.

Table 2-2: NTEM Projections for Thurrock

Model Year	2018	2023	2024	2029	2038
Number of Households	70,379	77,125	78,484	85,095	96,764
Change from 2018	N/A	+ 6,746	+ 8,105	+ 14,716	+ 26,385
Number of Jobs	72,361	73,902	74,119	75,107	77,084
Change from 2018	N/A	+ 1,541	+ 1,758	+ 2,746	+ 4,723

Table 2-3: NTEM Projections for Dartford

Model Year	2018	2023	2024	2029	2038
Number of Households	44,452	47,566	48,185	51,228	56,510
Change from 2018	N/A	+ 3,114	+ 3,733	+ 6,776	+ 12,058
Number of Jobs	64,609	66,115	66,311	67,193	68,960
Change from 2018	N/A	+ 1,506	+ 1,702	+ 2,584	+ 4,351

Table 2-4: NTEM Projections for Gravesham

Model Year	2018	2023	2024	2029	2038
Number of Households	43,539	45,870	46,171	48,100	51,536
Change from 2018	N/A	+ 2.331	+ 2,632	+ 4,561	+ 7,997
Number of Jobs	37,409	38,217	38,329	38,841	39,862
Change from 2018	N/A	+ 808	+ 920	+ 1,432	+ 2,453

2.8.3. The A2BE model identifies 12,431 new dwellings across Dartford and Gravesham. This is lower than the combined NTEM projection of an additional 20,055 new dwellings by 2038. This would therefore indicate that the A2BE model is compatible with the NTEM projections, with difference between the identified developments and the NTEM projection made up via background growth.

2.8.4. For Thurrock, **Table 2-5** contains the sites have been specifically identified as part of the London Resort scoping exercise.

Table 2-5: Identified Thurrock Developments

Site Name	Location	Number of Dwellings	Number of Jobs	Notes
Tilbury 2 Port Expansion	East of Tilbury	N/A	≈ 500	
Thurrock Flexible Generation Plant	East of Tilbury	N/A	N/A	Environmental statement states that only a limited full-time workforce will be utilised
Tilbury Energy Centre	East of Tilbury	N/A	N/A	Project currently on hold. (November 2018)
Chadfields, Tilbury	Tilbury FC Stadium	112	N/A	
Land West of Lytton Road		140	N/A	
Land adjacent Wood View and Chadwell Road		75	N/A	
Star Industrial Estate		203	N/A	
Land part of Little Thurrock Marshes		161	N/A	
Purfleet Regeneration	Purfleet	2,850	1,795	Final Committee Report 25/04/2019
TOTAL		**3,541**	**2,295**	

Given the nature of the EXCEL based spreadsheet transport model it has not been possible to include development trips specifically as you would within e.g. highway assignment model. The number of new dwellings/jobs identified in the Thurrock district is lower than the projections included within NTEM as shown in **Table 2-2**.

When compared to the NTEM projections contained in **Table 2-2** then the future growth that has been applied to the EXCEL based spreadsheet transport model provides a robust estimate of future traffic growth to the north of the River Thames.

2.9 ROAD TRAFFIC FORECASTS 2018

2.9.1. The Department for Transport released an updated version of the Road Traffic Forecast in 2018 (RTF18). This forecast contains an assessment of the likely traffic growth and traffic speeds for the next forty years. The forecast is broken down by road type and country region. The traffic speed forecast is also segmented by peak hour.

2.10 ADDITIONAL DATA SOURCES

2.10.1. To infill some of the gaps in information to assist with the air quality assessment around Northfleet and Grays, traffic counts from published Traffic Assessments were used. These included the following developments:

- Purfleet Centre Regeneration
- Devonshire Road Housing Development
- Northfleet Embankment Development.

2.11 CONSTRUCTION AND OPERATIONAL TRAFFIC DATA

2.11.1. The expected traffic impact of the London Resort was taken from the results of the analysis undertaken in the following technical notes:

- **Technical Note 1 Travel Demand:** This Technical Note presents a methodology to determine the likely multi-modal trip generation for visitors and staff, and the travel demand expected based upon the forecast annual and daily visitor figures calculated by ProFun Management Group Inc (ProFun) and Leisure Development Partners (LDP)
- **Technical Note 2 Trip Distribution:** The Technical Note forecasts the trip distribution from the London Resort based on the distribution from existing developments of a similar nature. The report presents a breakdown of the origin of all visitors against the time of travel to the London Resort
- **Technical Note 3 Mode Share:** This Technical Note completed a review process to identify sites/resorts that were applicable for a more in-depth review for use in the analysis of visitor and staff modal splits. The final modal split for Cars has been applied to the trip distribution.

3

BASE MODEL DEVELOPMENT

3 BASE MODEL DEVELOPMENT

3.1 NETWORK DEVELOPMENT

3.1.1. The strategic model aims to capture all the relevant traffic flows within the vicinity of the London Resort site. Close to the resort it is likely that local traffic in and around Swanscombe and Ebbsfleet will be impacted by the resort, so a fine level of detail is required. Further afield, it is anticipated that resort traffic will be constrained to the strategic road network, resulting in a focus on the A2, A13, M25 and A282.

3.1.2. The extent of the EXCEL based spreadsheet transport model is Junction 29 of the M25 to the north and Junction 3 of the M25 to the south. Beyond these locations it is anticipated that all resort traffic will be on the strategic road network and would have limited interaction with local traffic.

3.1.3. The scope of the model includes the location of the Lower Thames Crossing and the connecting link between the A13 / A1089 junction and the M25. The full scope is shown in **Figure 3-1**.

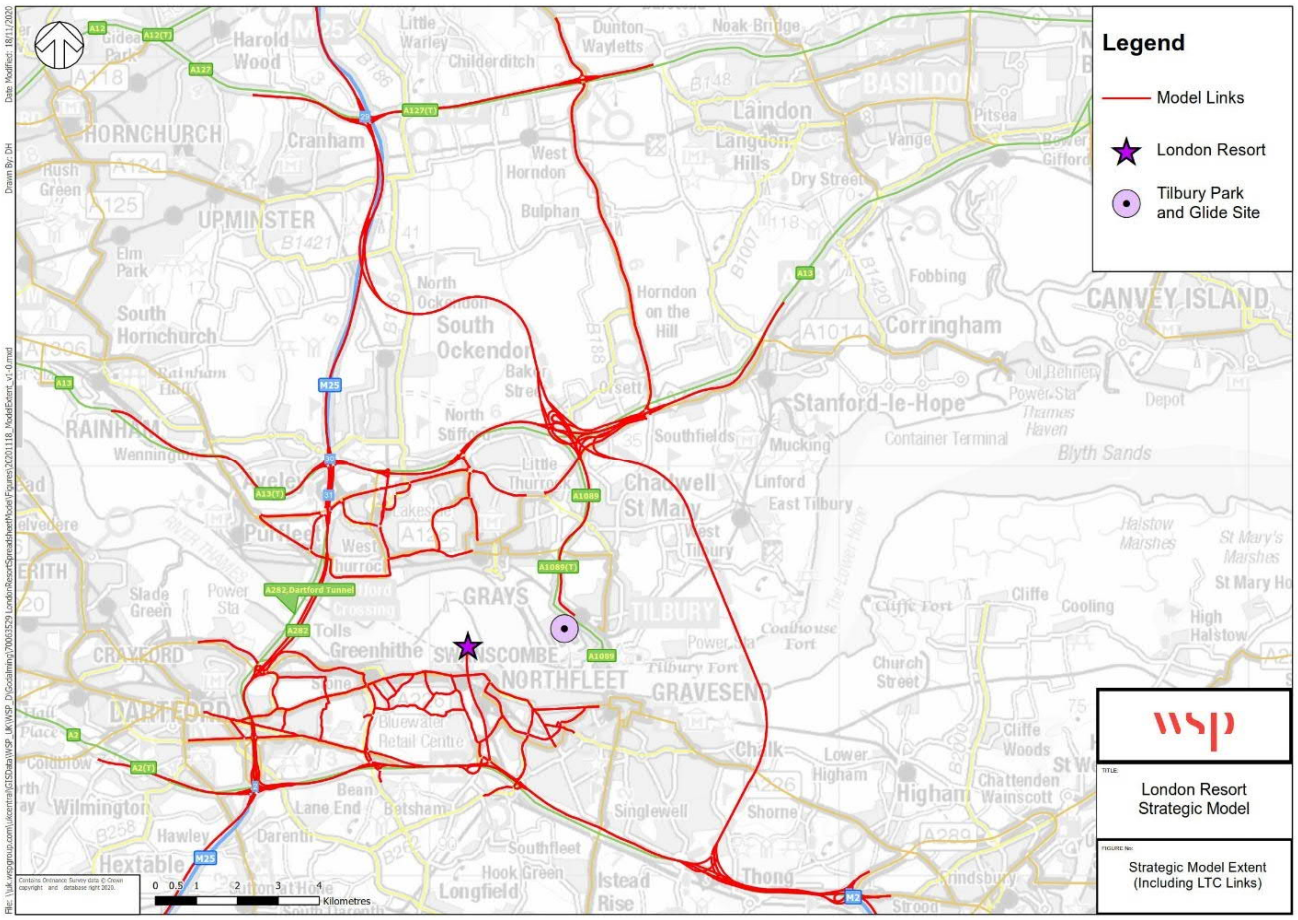

Figure 3-1: Strategic Model Extent (Including Lower Thames Crossing)

3.2 CALCULATION OF BASE YEAR FLOWS

3.2.1. In co-ordination with the air quality assessment team, a base year of 2018 was chosen. Flows for the AM peak and PM peak were extracted from the A2BE model and from the Thurrock Count locations for links south and north of the river respectively.

3.2.2. As the base year for the A2BE model was 2016 it was determined that base year flows would be taken by looking at the linear growth between the A2BE base year and the first forecast year of 2023. For links unaffected by the Bean and Ebbsfleet schemes these links could be matched and the growth calculated. For links involved within the Bean and Ebbsfleet schemes the closed equivalent links were found to calculate the growth in traffic flows between 2016 and 2018.

3.2.3. Traffic flows from the Thurrock counts as described in Section 2 were used directly to inform the model flows for most links north of the river.

3.2.4. Links at the junction of the A2 and M2 were outside the scope of the A2BE model. Traffic flows were calculated for this junction using values taken from the Highways England and Department for Transport traffic counts.

3.2.5. Factors to convert between the sum of the AM peak and PM peak flow were calculated using the traffic data taken from the Department for Transport counts. Counts were grouped by location north or south of the river and the difference between the daily flow and peak hour flows was calculated. The resulting factors are shown in Table 3-1.

Table 3-1: Peak flow to AADF conversion factors

Location of Traffic Counts	Conversion factor for AM peak and PM peak flows to AADT
Thurrock and Essex	6.1097
Gravesham and Kent	6.0579

3.3 HGV PERCENTAGES AND TRAFFIC SPEEDS

3.3.1. For links covered by the A2BE model, HGV percentages were calculated by dividing the total number of vehicles from the HGV user class against the total vehicular flow for the link.

3.3.2. For links not covered by the A2BE model, the HGV percentage was taken directly from the Road Traffic Forecast for 2018 (RTF18) by dividing the number of expected mileage for HGV vehicles by the total mileage. Links were categorised by region and road type before being assigned a HGV percentage value from the RTF18.

3.3.3. An adjustment to HGV% values was made to account for the various bus routes throughout the region.

3.3.4. Traffic speeds were also taken from the A2BE model where possible. For links not covered by the A2BE model traffic speeds were taken directly from the RTF18, segmented by road type and region.

3.4 BASE YEAR MODEL

3.4.1. **Figure 3-2** and **Figure 3-3** show the AM peak and PM peak traffic flows for the 2018 base year.

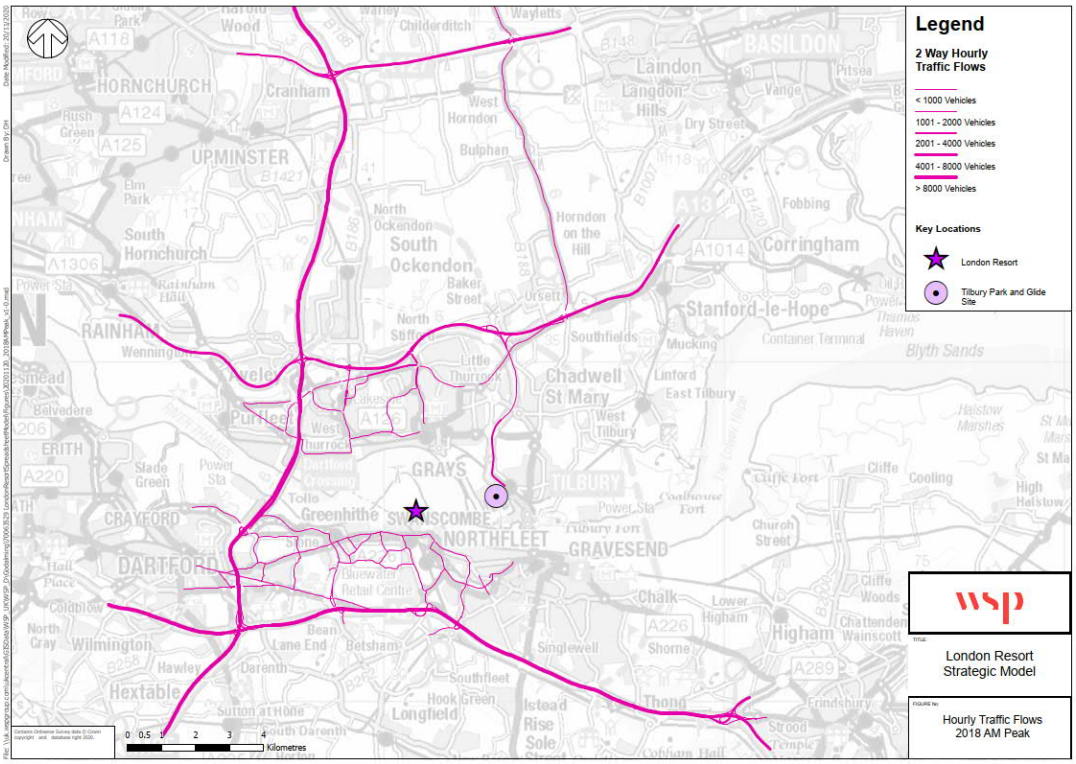

Figure 3-2: 2018 AM peak two-way traffic flows

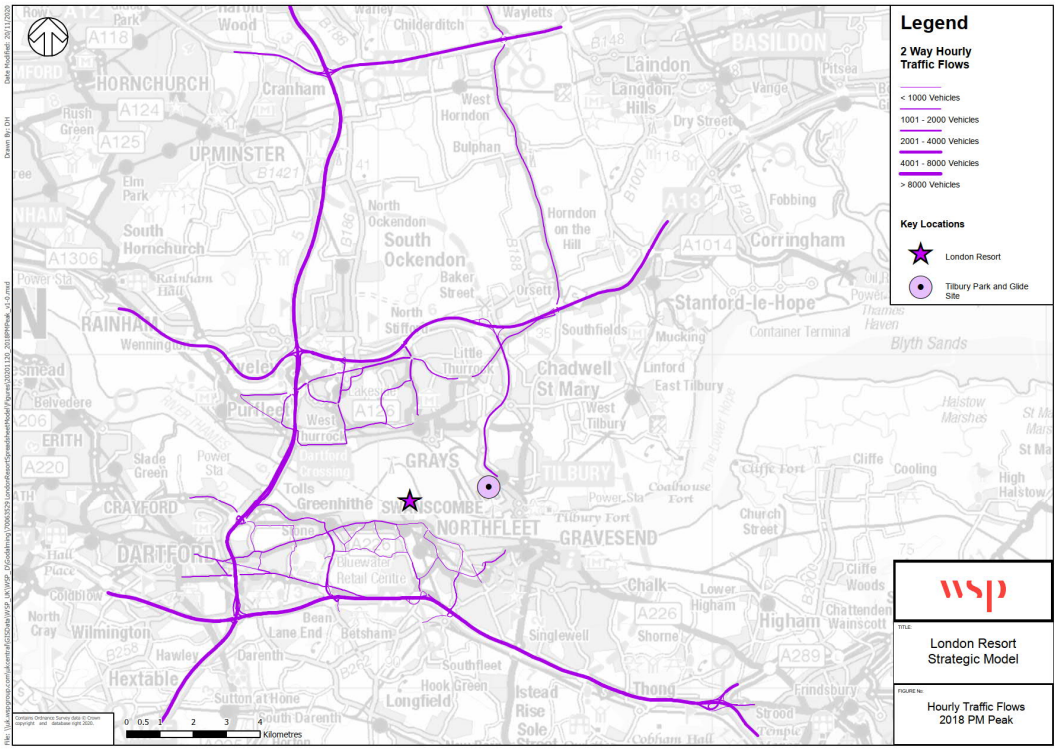

Figure 3-3: 2018 PM peak two-way traffic flows

3.4.2. **Figure 3-4** show the Annual Average Daily Traffic (AADT) flows for the 2018 base year.

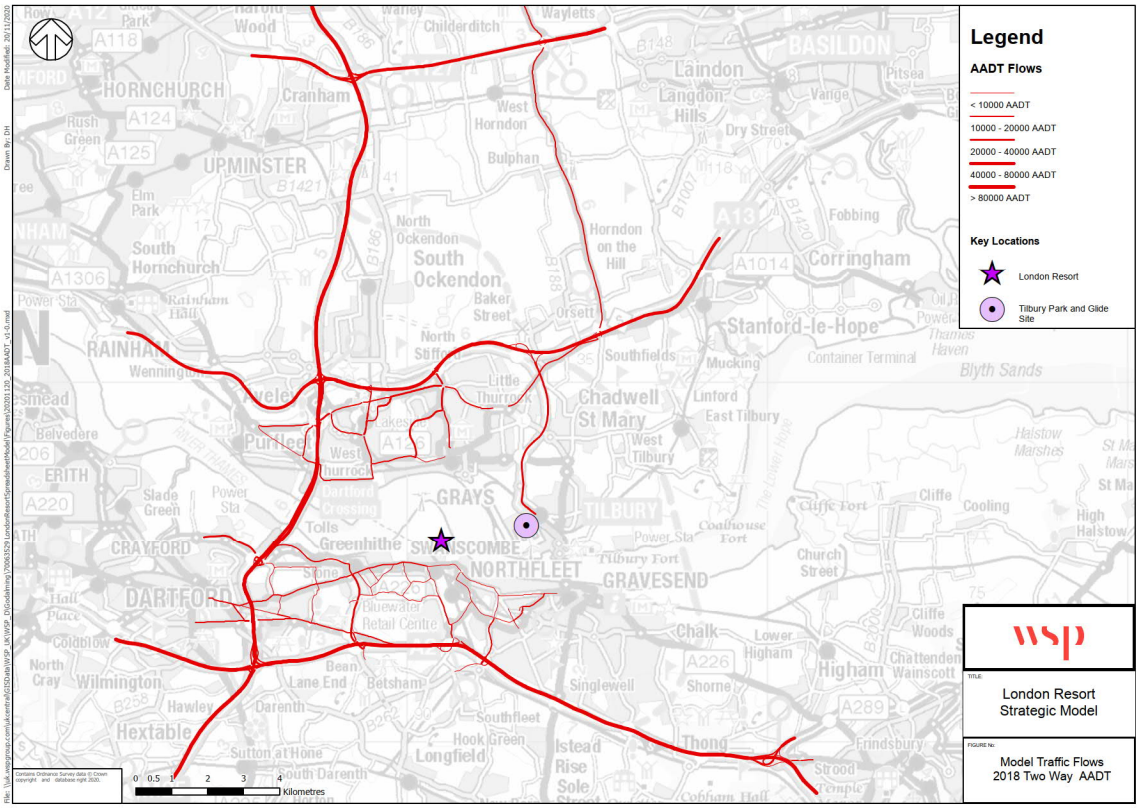

Figure 3-4: 2018 Annual Average Daily Traffic - two-way traffic flows

4

FORECAST MODEL DEVELOPMENT

4 FORECAST MODEL DEVELOPMENT

4.1 FORECAST SCENARIOS

4.1.1. In co-ordination with the air quality assessment team, the following forecast years were chosen to assess the development of the resort.

- 2023: Assessment of construction traffic
- 2024: Main Gate Opening
- 2029: Second Gate Opening
- 2038: The London Resort maturity.

4.1.2. To account for the impact of the Lower Thames Crossing (LTC) two scenarios were developed for the 2029 and 2038 forecast years i.e. one with LTC in operation and one without LTC in operation. **Table 4-1** shows the full set of model scenarios

Table 4-1: Scenario Listing

Scenario Name	Identifier	Model Year	LTC Operational	DS Traffic
2023 Do Minimum	2023 DM	2023	N/A	N/A
2023 Do Something	2023 DS	2023	N/A	Construction Traffic
2024 Do Minimum	2024 DM	2024	N/A	N/A
2024 Do Something	2024 DS	2024	N/A	Resort Traffic (1 Gate)
2029 Do Minimum Without LTC	2029 DM	2029	No	N/A
2029 Do Something Without LTC	2029 DS	2029	No	Resort Traffic (2 Gates)
2029 Do Minimum With LTC	2029 LDM	2029	Yes	N/A
2029 Do Something With LTC	2029 LDS	2029	Yes	Resort Traffic (2 Gates)
2038 Do Minimum Without LTC	2038 DM	2038	No	N/A
2038 Do Something Without LTC	2038 DS	2038	No	Resort Traffic (Full Maturity)
2038 Do Minimum With LTC	2038 LDM	2038	Yes	N/A
2038 Do Something With LTC	2038 LDS	2038	Yes	Resort Traffic (Full Maturity)

4.2 FORECAST GROWTH DEVELOPMENT

4.2.1. Figure 4-1 shows a flowchart outlining the process used to develop the forecast scenarios. Blue boxes represent the various growth scenarios whereas red boxes describe the process used to generate the subsequent growth scenario.

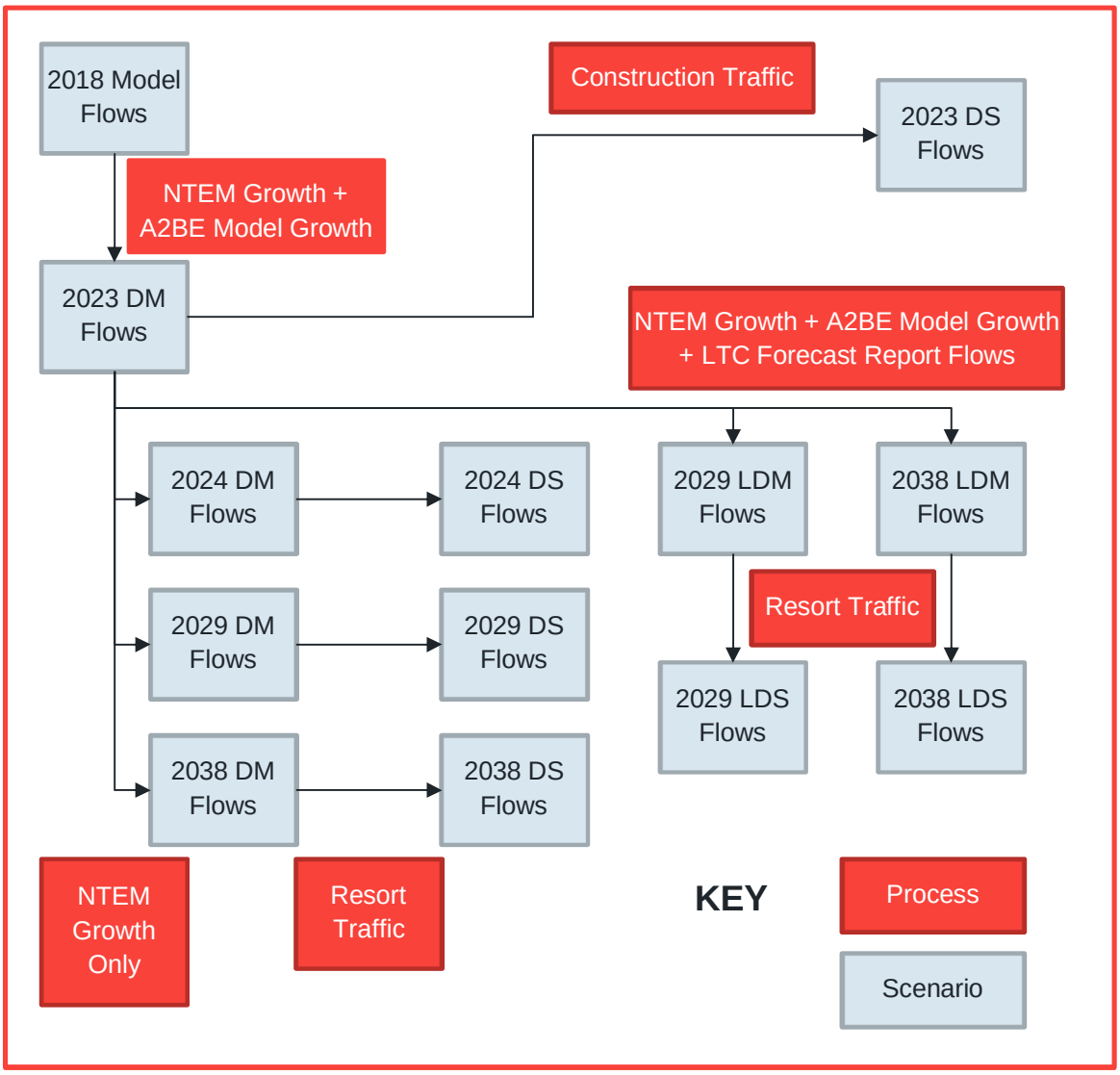

Figure 4-1: Forecast Development Flowchart

4.2.2. 2023 was chosen as a common year to pivot future growth scenarios from because it aligns with the only forecast year from the A2BE model that is unaffected by the LTC, as well as including all the proposed network changes that will result from the Bean and Ebbsfleet scheme.

4.2.3. NTEM growth was used to increase the model flows from the 2018 base to the 2023 forecast year for all links not covered by the A2BE model.

4.2.4. For the 2024 scenario and the “without LTC” scenarios it was no longer possible to use the A2BE model as the forecast scenarios were derived from a LTC model that therefore included the assumption that the LTC was operational. Therefore, for all these scenarios model growth was calculated used NTEM growth factors only.

4.2.5. For the “with LTC” scenarios the A2BE models could be used. The linear trend between the 2026 and 2031 model was used to calculate the 2029 scenario flows. The 2038 scenario flows were taken directly from the 2038 A2BE model year.

4.2.6. Flows for links directly affected by the LTC were taken from the LTC forecast report (https://highwaysengland.citizenspace.com/ltc/consultation/supporting_documents/Traffic%20Forecasting%20Report.pdf). Linear trends between the flows published in the report were used to calculate flows in the 2029 and 2038 model years.

4.2.7. For all links that were not covered by the A2BE model nor the LTC forecast report NTEM growth was used instead. To account for traffic switching from the M25 and Dartford Crossing to the LTC a comparison was set up between the traffic growth expected on the M25 through NTEM growth and the growth seen in the LTC and A2BE forecasts. The difference between these growth factors was used to adjust the NTEM growth used for links along the M25.

4.2.8. The Do Something scenarios were generated by directly adding the traffic associated with the resort onto the existing traffic within the links. No traffic reassignment was assumed because of this additional traffic.

4.3 HGV PERCENTAGES AND MODEL SPEEDS

4.3.1. HGV Percentages for each scenario were taken from the A2BE models or the LTC forecast report when appropriate. If it was not possible to use these models, then HGV percentages were calculated from the RTF 18 as described in Section 3.3.

4.3.2. For the Do Something scenarios, construction traffic was assumed to consist of HGV and the HGV percentage was adjusted accordingly. Resort traffic was assumed to be private cars only, and so the additional traffic had the effect of reducing the HGV percentage overall.

4.3.3. Traffic speeds were taken from the A2BE model when appropriate, otherwise the RTF18 values were used. It was not possible to calculate the effect the additional resort traffic would have on traffic speeds without a full traffic assignment model, so traffic speeds were extracted for the Do Minimum scenarios only.

4.4 SUMMARY LIST OF ASSUMPTIONS

4.4.1. There are a number of assumptions associated with the production of the base year EXCEL based spreadsheet transport model including:

- Use of A2 Bean to Ebbsfleet transport model
- Use of local count information north of the River Thames
- Use of NTEM / TEMPRO factors to take into account forecast year traffic growth north of the River Thames
- Information from published reports regarding traffic flows on the Lower Thames Crossing and the reduction of traffic flows on the surrounding road network e.g. M25, Dartford Tunnel, A13 and A2.

4.5 THE LONDON RESORT TRAFFIC

4.5.1. The London Resort is expected to become operational in 2024 with the opening of the main park alongside the RDE element and 2,300 Hotel rooms. The opening of Gate Two is expected to be approximately 2029. The timeline in **Figure 4-2** outlines the expected profile.

Figure 4-2: The London Resort expected operational profile

4.5.2. The proposed infrastructure will be operational from 2024 including the junction upgrade on the A2, the dedicated Resort road, the people mover from the Thames to Ebbsfleet International via The London Resort and the enhanced bus services within the local area.

4.5.3. The London Resort is proposed to open Easter of 2024 and as 2025 therefore forms the first full operational year, this is the first year that will be assessed. 2029, the year in which Gate Two and remaining 1,250 hotel suites open, will also be assessed. The final assessment year is 2038, by which point industry experts have forecast The London Resort will have reached maturity and stabilisation in growth

4.5.4. In order to generate The London Resort development flows, for input into the EXCEL based spreadsheet transport model, microsimulation model and local junction modelling, the visitor trip distributions (detailed in TN2 by area of Resort) were applied to the total visitor arrival and departure information, supplied by ProFun. The distribution of total vehicles was calculated by applying the private vehicle mode share and occupancy information, calculated in TN3 to the total people distribution.

4.5.5. Following feedback as part of the 2020 consultation, WSP have incorporated a mode share to represent drop offs and associated increase in vehicles on the highway network. It has been assumed that drop-offs would only occur within a 60-minute drivetime radius of the main Resort Project Site and that for every two drop offs, one vehicle also departs the site within the same hour – therefore every drop off/pick-up generates 1.5 two-way trips on the network to allow time for arrival, set down/pick-up and departure. These vehicles were combined with the private vehicles to determine a full distribution profile for visitors.

4.5.6. The London Resort proposals that underpin the transport strategy now include the provision of car and coach parking at the Port of Tilbury. Based on UK Home Origin analysis undertaken in 2017, it was determined that 25% of visitor car and coach parking should be provided in Tilbury and that car parks in both Project Sites would fill up and empty at the same ratio. Therefore 25% of visitors using private car or drop-off/pick-up will arrive and depart from Tilbury, with the remaining 75% of visitors travelling in this way utilising the Kent Project Site.

4.5.7. Staff distribution, provided to WSP by Volterra, was applied to the total staff hourly arrival and departure numbers, followed by the private vehicle mode share and expected occupancy to determine the total vehicle staff distribution.

4.5.8. It is assumed that all staff who are forecast to drive to The London Resort, will park at the Kent Project Site and therefore all staff private vehicle arrivals and departures are to/from Swanscombe via the dedicated Resort road.

4.5.9. Visitors arriving by private vehicle and being dropped off were combined with staff total vehicles to determine the distribution of total vehicles to The London Resort Kent Project Site and Essex Project Site respectively on the 85th percentile day, for each of the assessment years: 2025, 2029 and 2038.

4.5.10. **Figure 4-3** presents a flow diagram detailing the step-by-step methodology for generating the full distribution, by local authority.

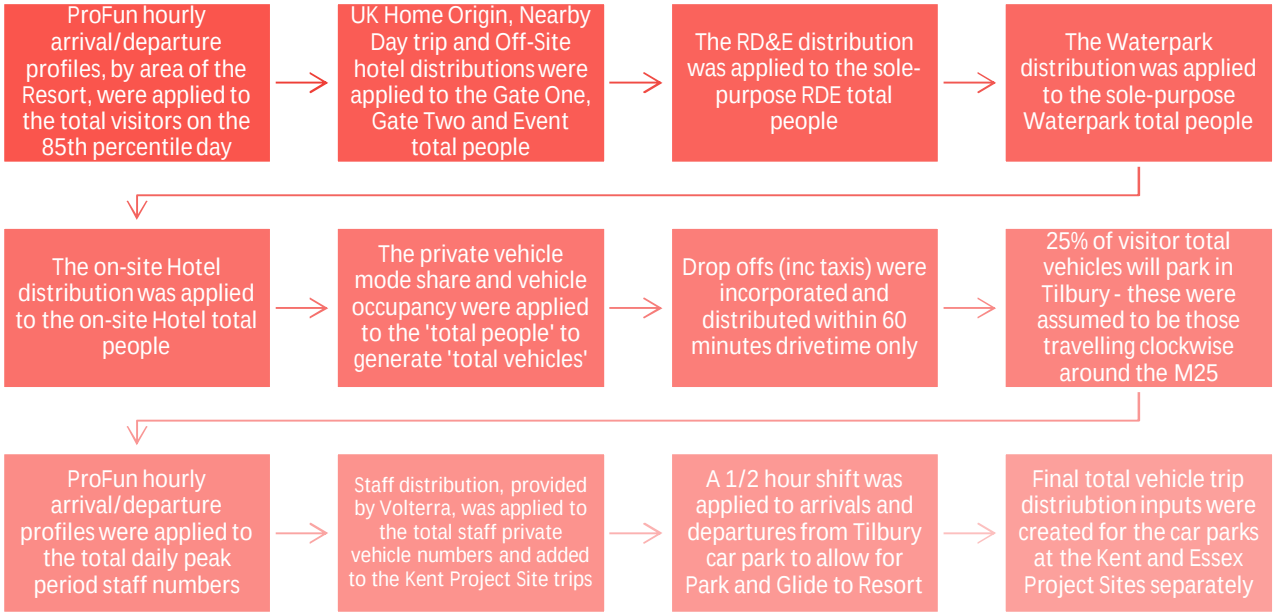

Figure 4-3: The London Resort, Development Flows Methodology

4.5.11. Using Google Maps journey planning tools, routes were assigned to each Local Authority to determine the assignment of the origin-destination development trips on the highway network. The provision of 25% visitor car and coach parking in Tilbury means a limited number of vehicles use the Dartford Crossing as it is reasonable to assume only those travelling clockwise around the M25 (or from within Essex) will park at Tilbury and likewise, people travelling anti-clockwise around the M25 (or from within Kent) will park in Swanscombe.

4.5.12. A Technical Note (Technical Note 2 Trip Distribution) has been produced which forecasts the trip distribution from the London Resort based on the distribution from existing developments of a similar nature. The report presents a breakdown of the origin of all visitors against the time of travel to the London Resort.

THE LONDON RESORT - CONSTRUCTION TRAFFIC

4.5.13. The construction routing for vehicles accessing the main resort site has been proposed to minimise the impact on the local highway network. The construction routing will require all vehicles to utilise the A2 Ebbsfleet International exit to access the Kent Project Site from the Strategic Road Network as shown in **Figure 4-4**.

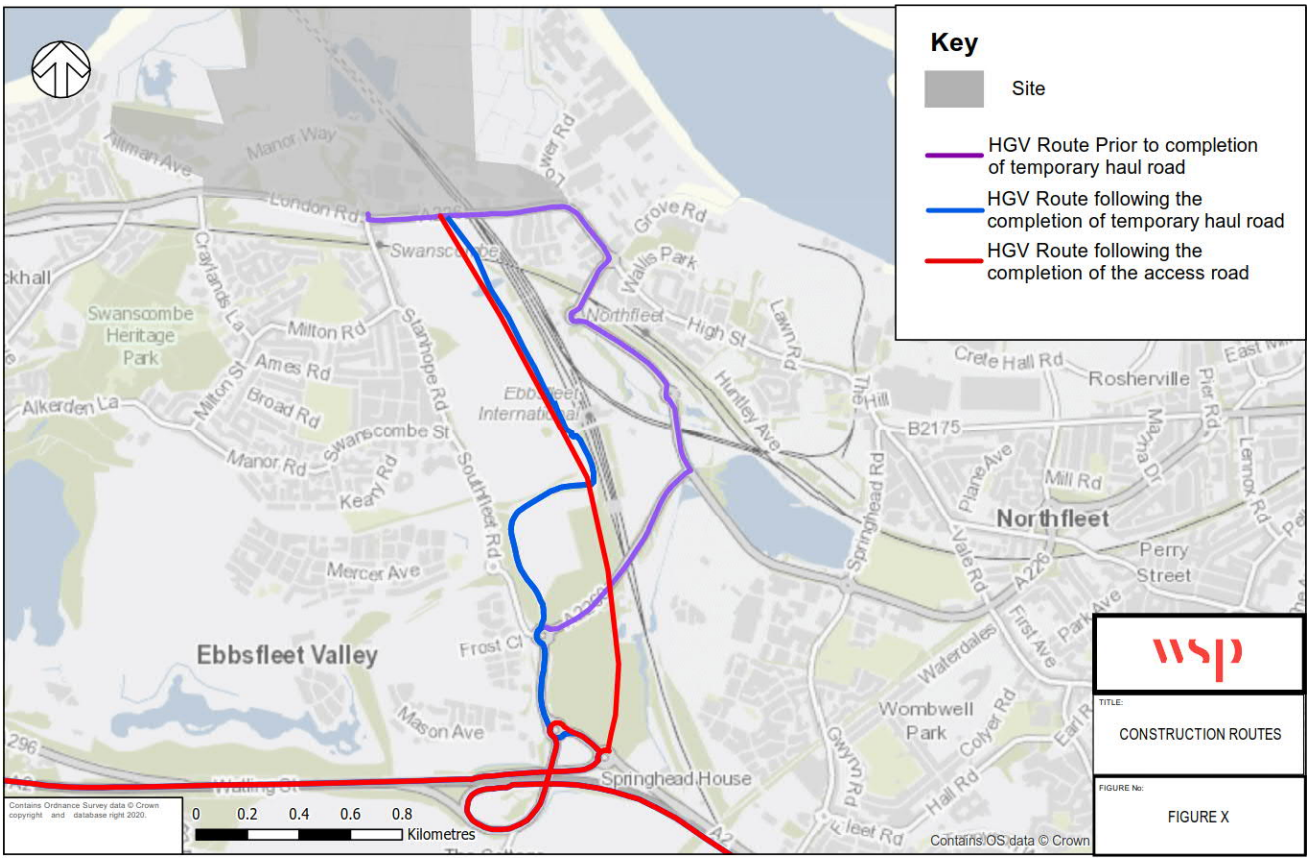

Figure 4-4: Construction Routes

4.5.14. The peak construction period will require 6,000 construction workers to be working each day at The London Resort. It is proposed that 25% of the construction workers will live on-site during week, the remaining 75% will be Daily Commuter construction workers. During the peak construction period in Phase 1 it is forecast that the Kent Project Site will generate 1,008 movements a day (equates to 2,016 two-way trips) which will split across the day between 06:00-19:00 with no trips arriving or departing in the AM peak or PM peak. The Essex Project Site will generate 206 movements a day (equates to 412 two-way trips) these will be split over the arrival (06:00-08:00) and departure (18:00-19:00) periods for the construction workers.

4.5.15. **Figure 4-5** shows the AADT flows for construction traffic in 2023 and the routes that the traffic is on.

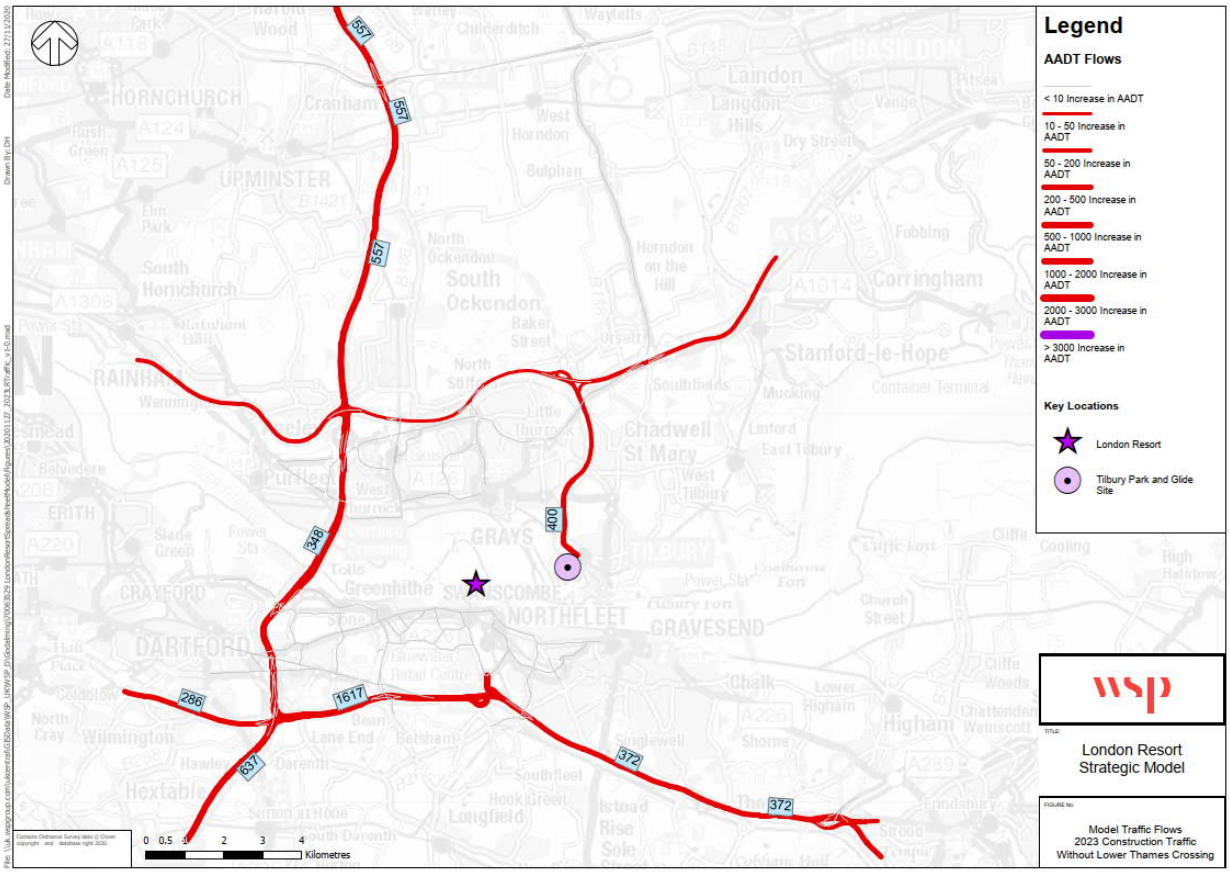

Figure 4-5: The London Resort: Construction Traffic (2023)

THE LONDON RESORT - DEVELOPMENT TRAFFIC

4.5.16. The London Resort traffic is shown in **Figure 4-6** for the 2024 (Main Gate Opening), **Figure 4-7** for 2029 (Second Gate Opening) and **Figure 4-8** for 2038 (The London Resort Maturity) without taking the impact of the Lower Thames Crossing route into account.

4.5.17. These show that The London Resort AADT flows predicted to be on the network along with the distribution of those trips is 3,372 in 2024, 4,612 in 2029 and 6,111 in 2038.

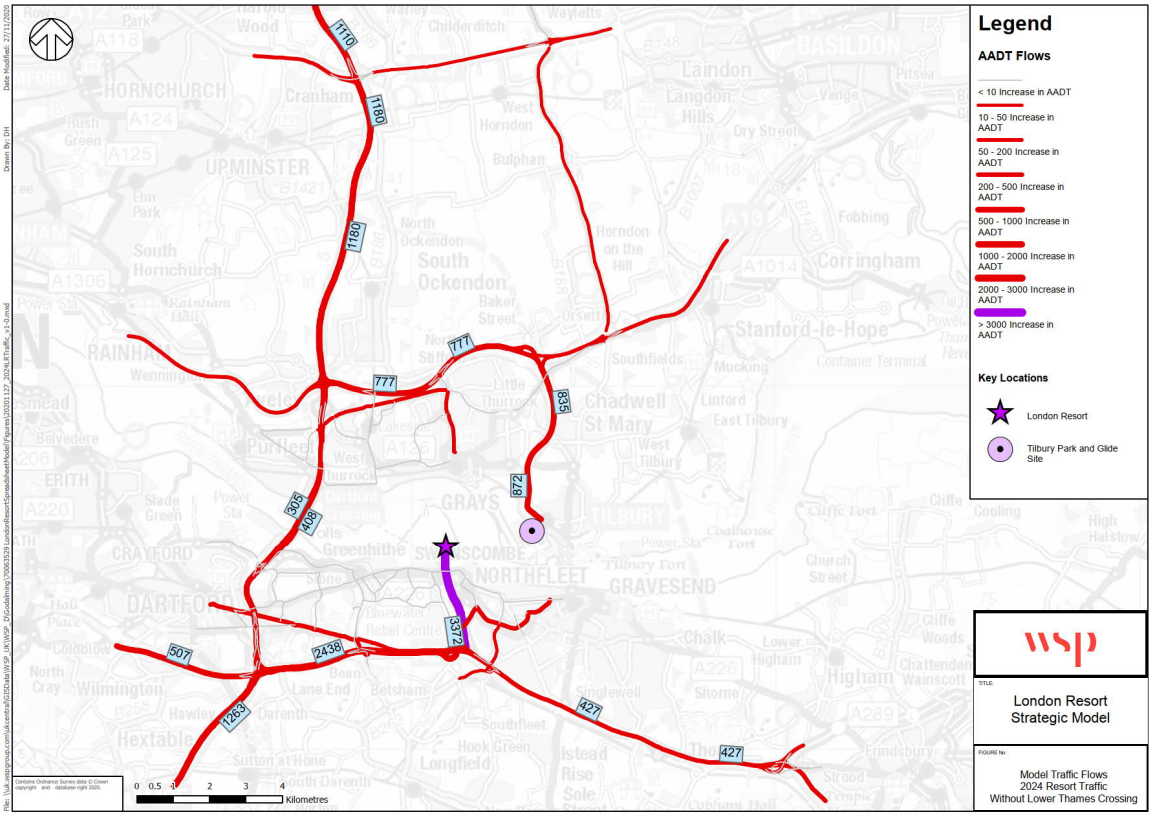

Figure 4-6: London Resort traffic – 2024 (Main Gate Opening)

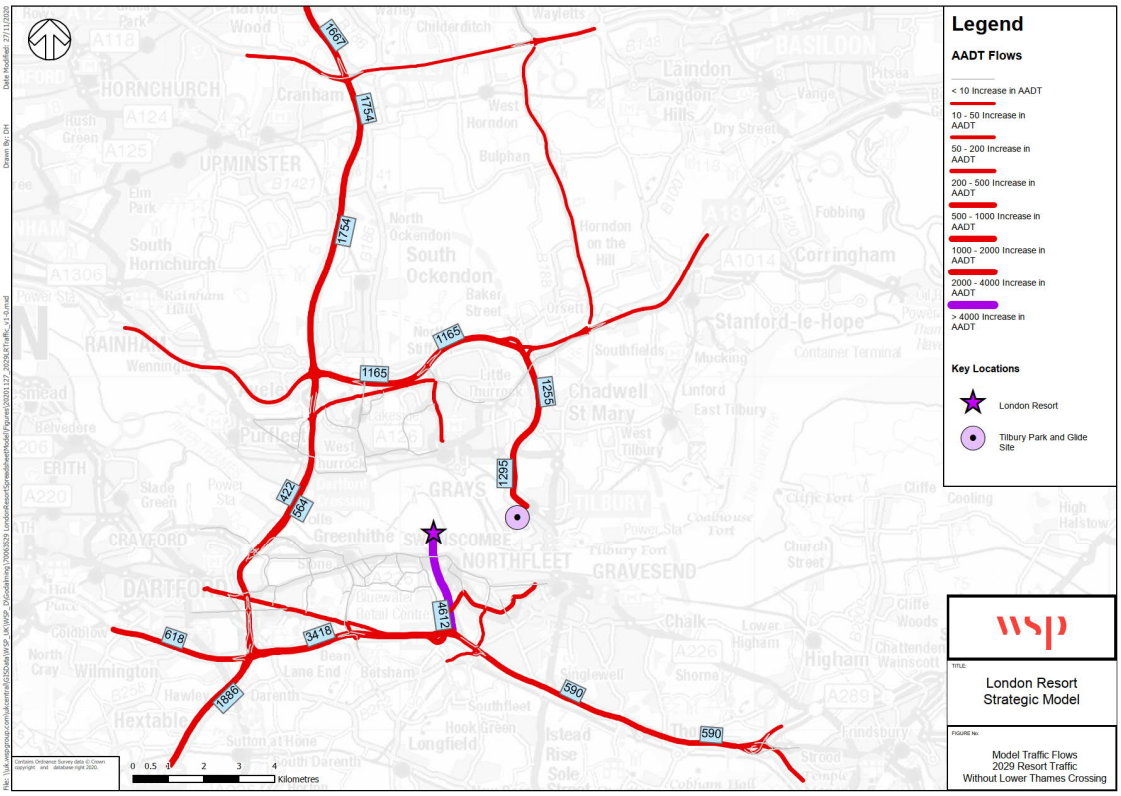

Figure 4-7: London Resort traffic – 2029 (Second Gate Opening)

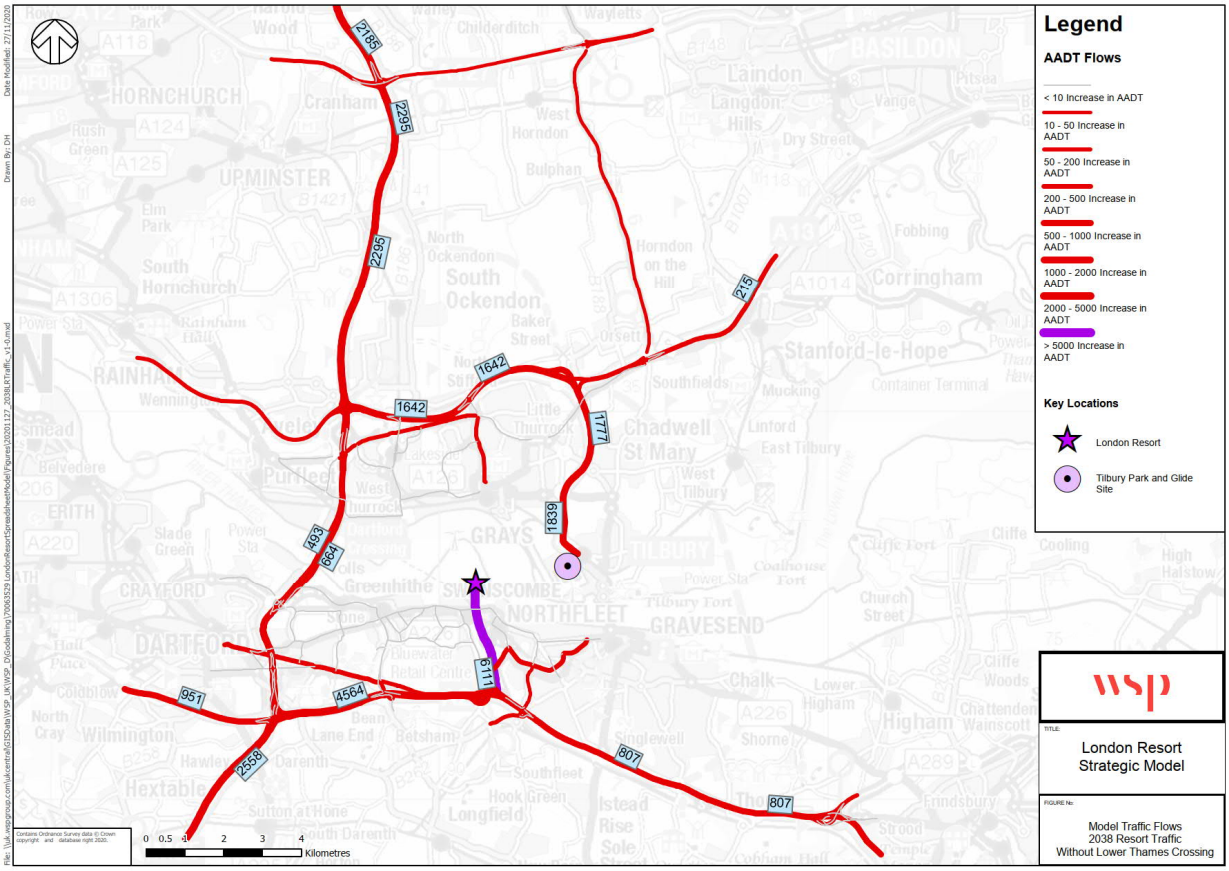

Figure 4-8: London Resort traffic – 2038 (The London Resort Maturity)

4.6 FORECAST YEAR MODEL: DO MINIMUM

4.6.1. **Figure 4-9** for the 2024 (Main Gate Opening), **Figure 4-10** for 2029 (Second Gate Opening) and **Figure 4-11** for 2038 (The London Resort Maturity) for the Do Minimum i.e. without The London Resort traffic included.

4.6.2. The AADT flow diagrams do not take into account the impact of the Lower Thames Crossing route.

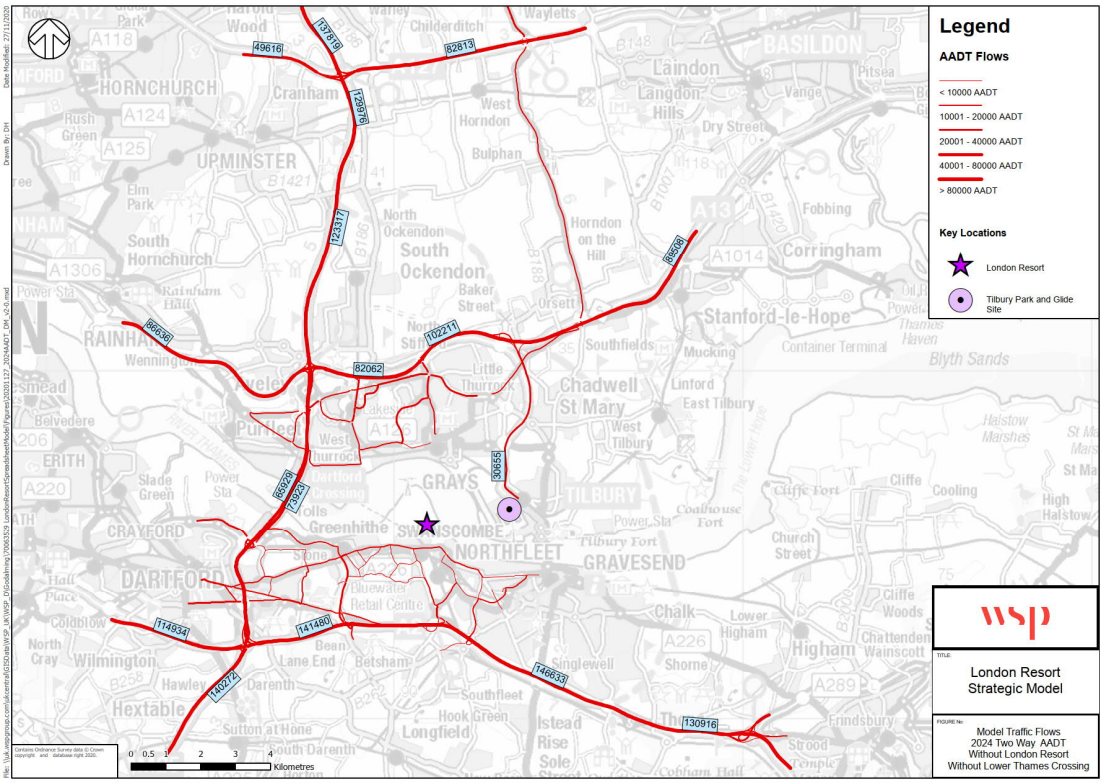

Figure 4-9: 2024 (Main Gate Opening) AADT flows

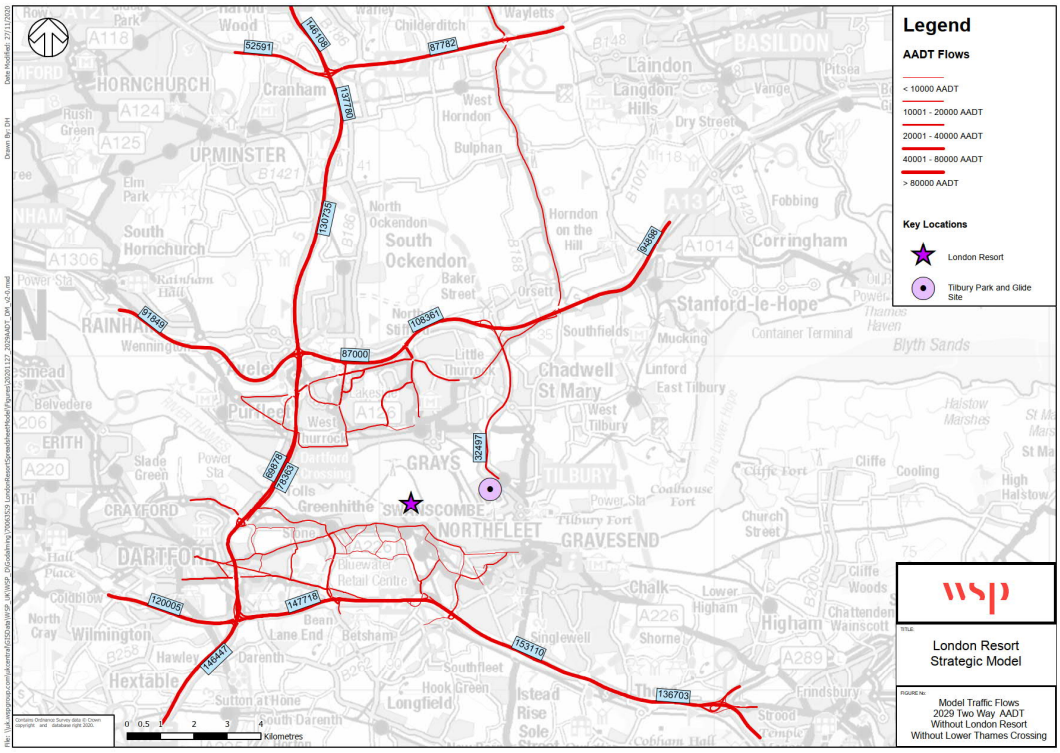

Figure 4-10: 2029 (Second Gate Opening) AADT flows

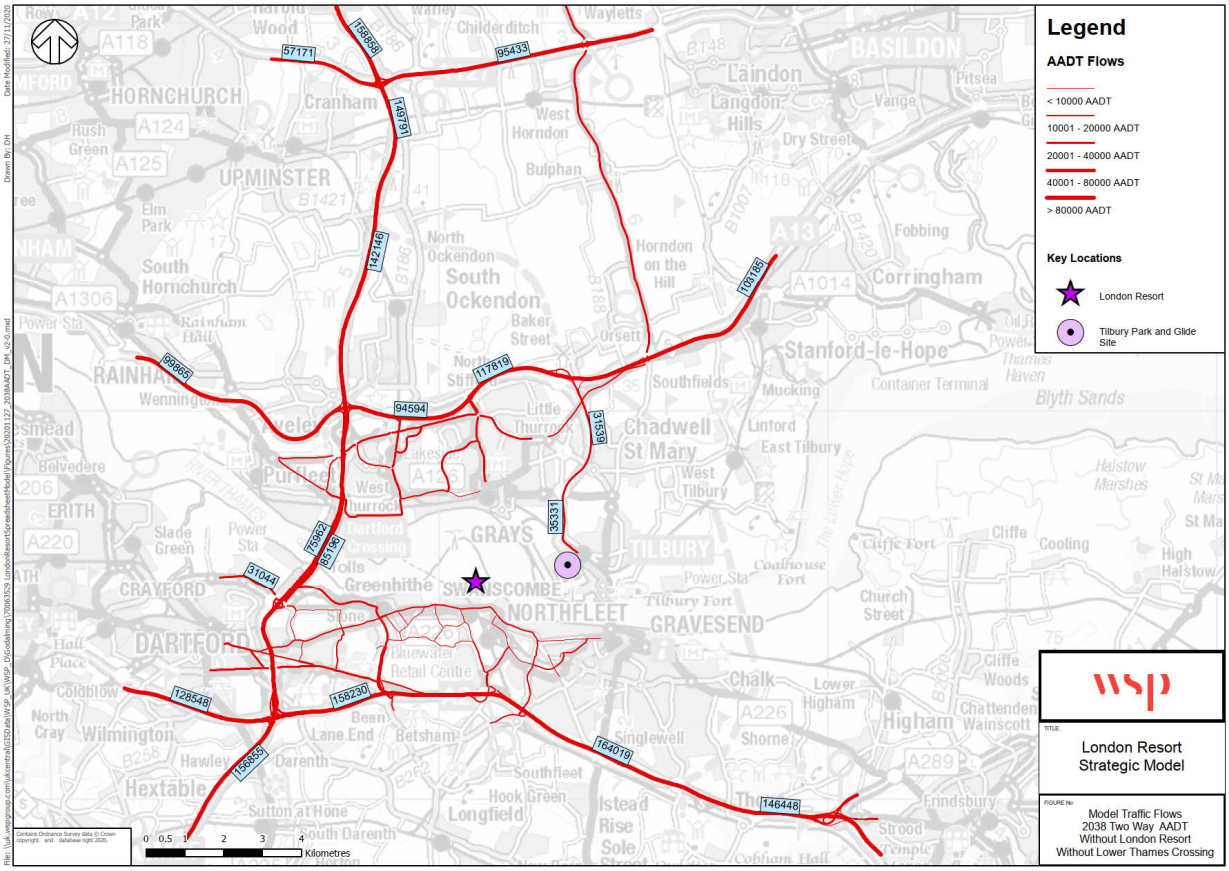

Figure 4-11: 2038 (The London Resort Maturity) flows

4.7 FORECAST YEAR MODEL: DO SOMETHING

4.7.1. **Figure 4-12** for the 2024 (Main Gate Opening), **Figure 4-13** for 2029 (Second Gate Opening) and **Figure 4-14** for 2038 (The London Resort Maturity) for the Do Something i.e. with The London Resort traffic included.

4.7.2. The AADT flow diagrams also do not take into account the impact of the Lower Thames Crossing route.

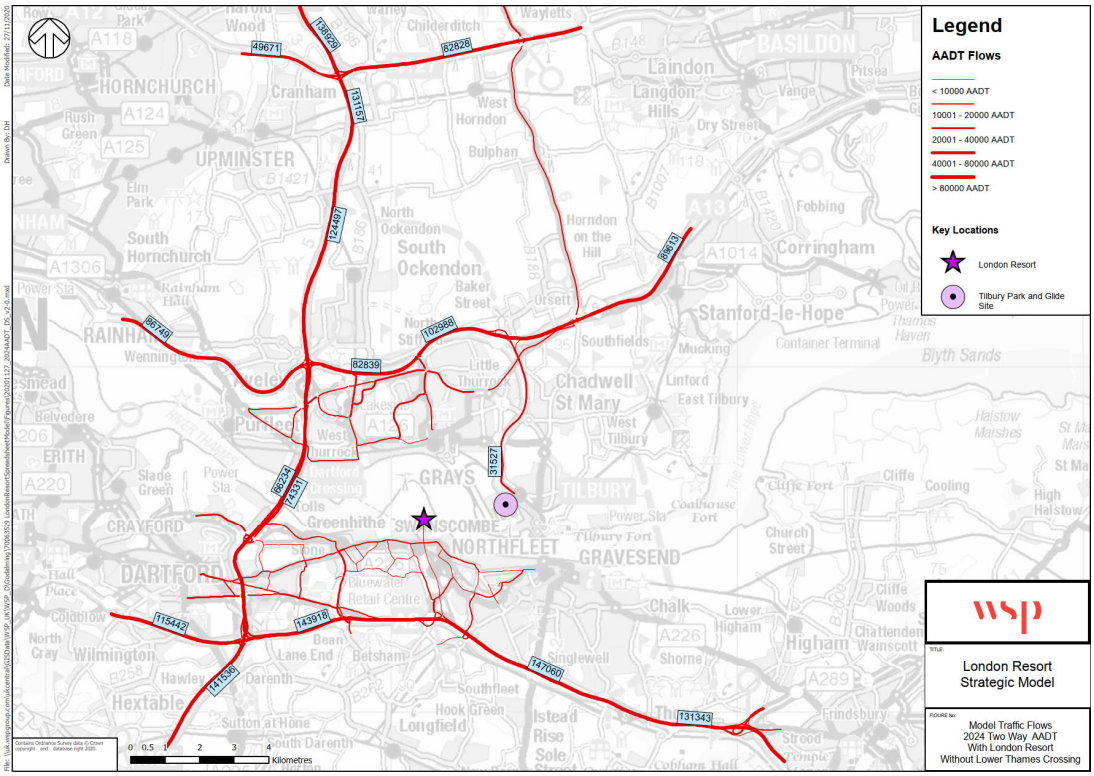

Figure 4-12: 2024 (Main Gate Opening) AADT flows

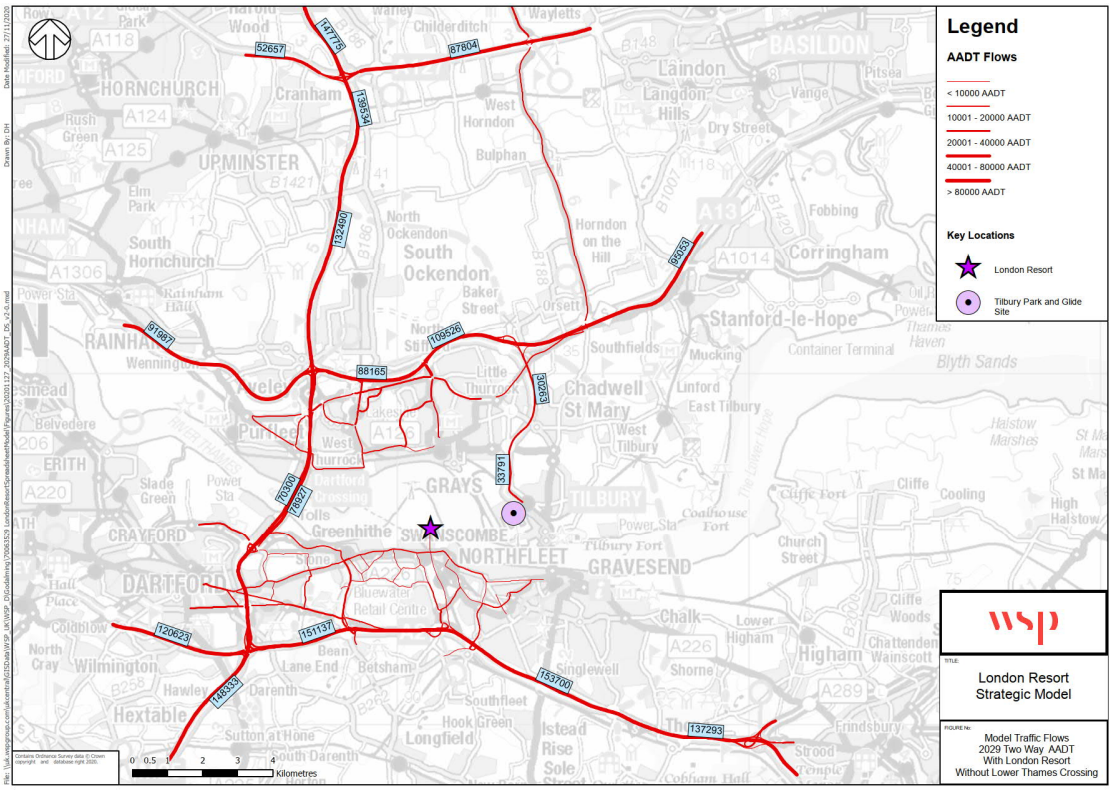

Figure 4-13: 2029 (Second Gate Opening) AADT flows

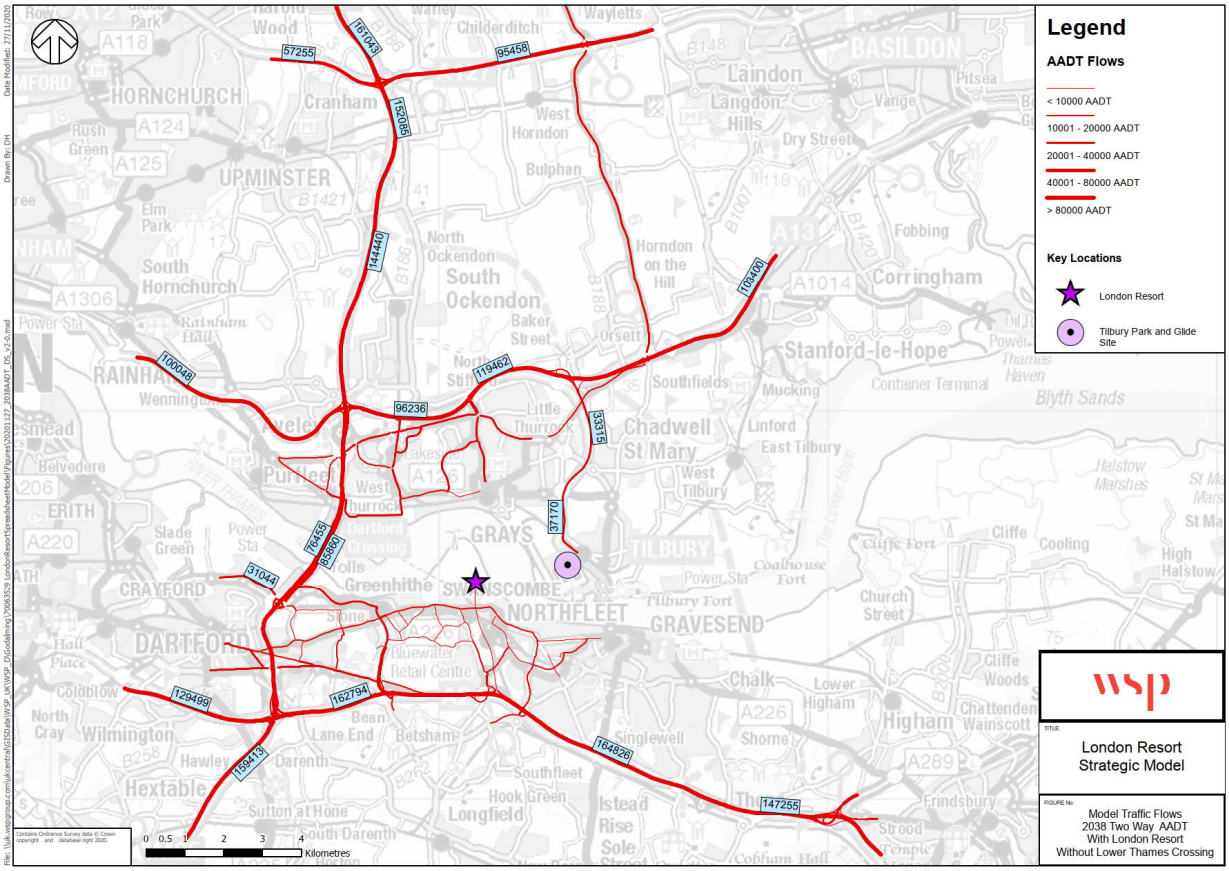

Figure 4-14: 2038 (The London Resort Maturity) flows

4.8 LOWER THAMES CROSSING

4.8.1. The Lower Thames Crossing (LTC) is also a NSIP which is seeking to obtain consent through a DCO application. Whilst the application was submitted by Highways England on October 23 2020, it is understood that at the time of writing, the LTC DCO has been withdrawn, albeit that the intention is to resubmit as soon as possible. If consented, the LTC would be the longest road tunnel in the UK, stretching 26 miles and would include the implementation of 14.3 miles of new highway connecting the M2 / A2, A13 and M25.

4.8.2. Whilst the existing conditions within this Chapter review the current provision and accessibility of the Kent and Essex Project Sites by active travel, sustainable modes and the highway network, the LTC is an important strategic consideration when developing the transport strategy for The London Resort as its potential implementation by 2027 has been considered in the transport modelling assessment of The London Resort proposals.

4.8.3. If the LTC proposals are consented, the scheme will cause significant re-distribution of vehicles on the existing highway network within Kent, Thurrock and ultimately seek to reduce traffic levels as well as congestion at the Dartford Crossing.

4.8.4. **Figure 4-15** for the 2029 (Second Gate Opening) and **Figure 4-16** for 2038 (The London Resort Maturity) for the Do Minimum i.e. without The London Resort traffic included.

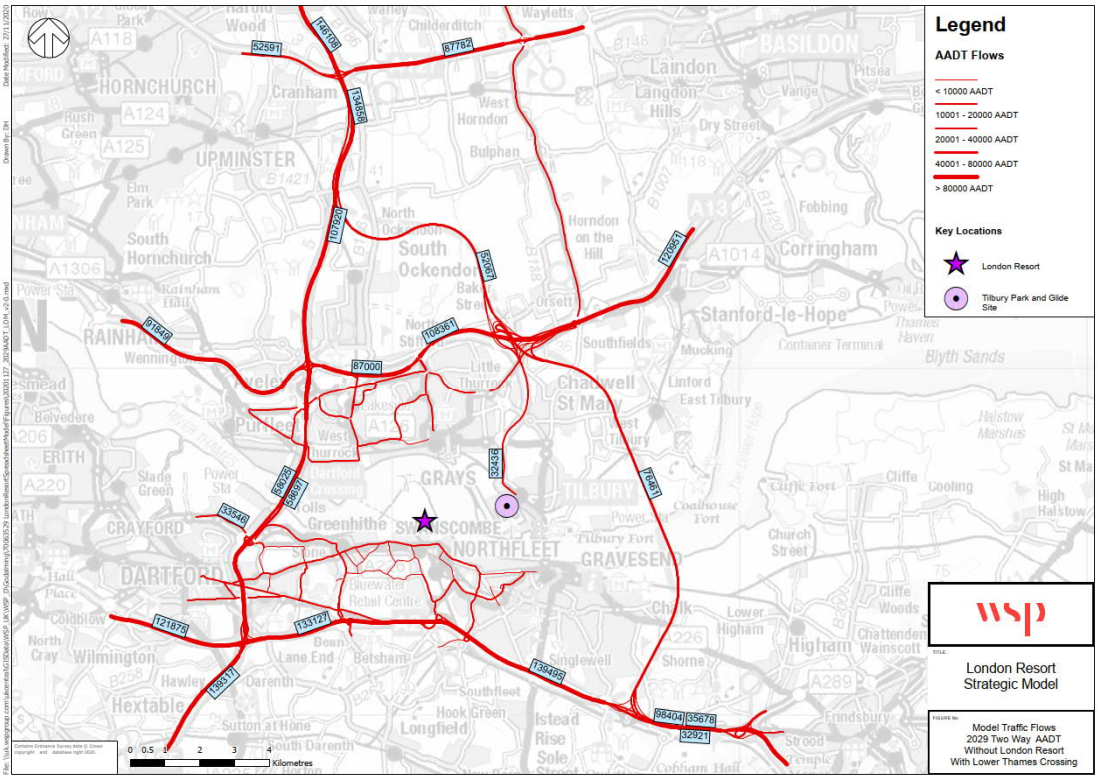

Figure 4-15: 2029 (Second Gate Opening) AADT flows

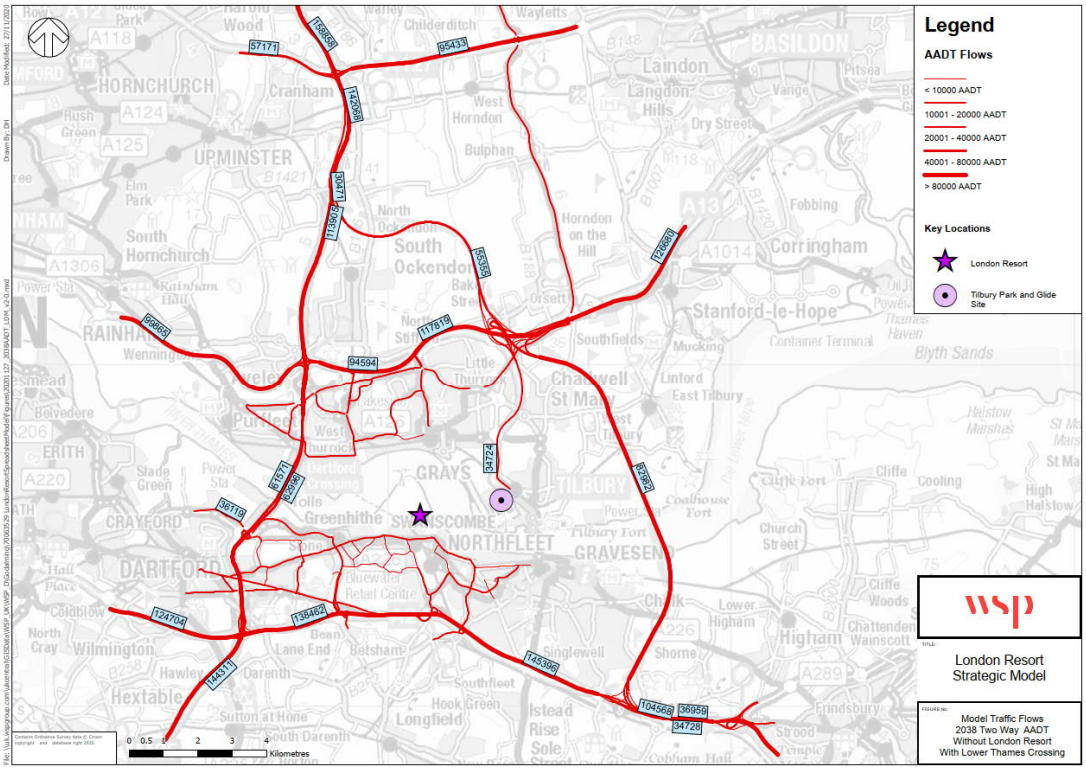

Figure 4-16: 2038 (The London Resort Maturity) flows

4.8.5. **Figure 4-17** for the 2029 (Second Gate Opening) and **Figure 4-19** for 2038 (The London Resort Maturity) for the Do Something i.e. with The London Resort traffic included.

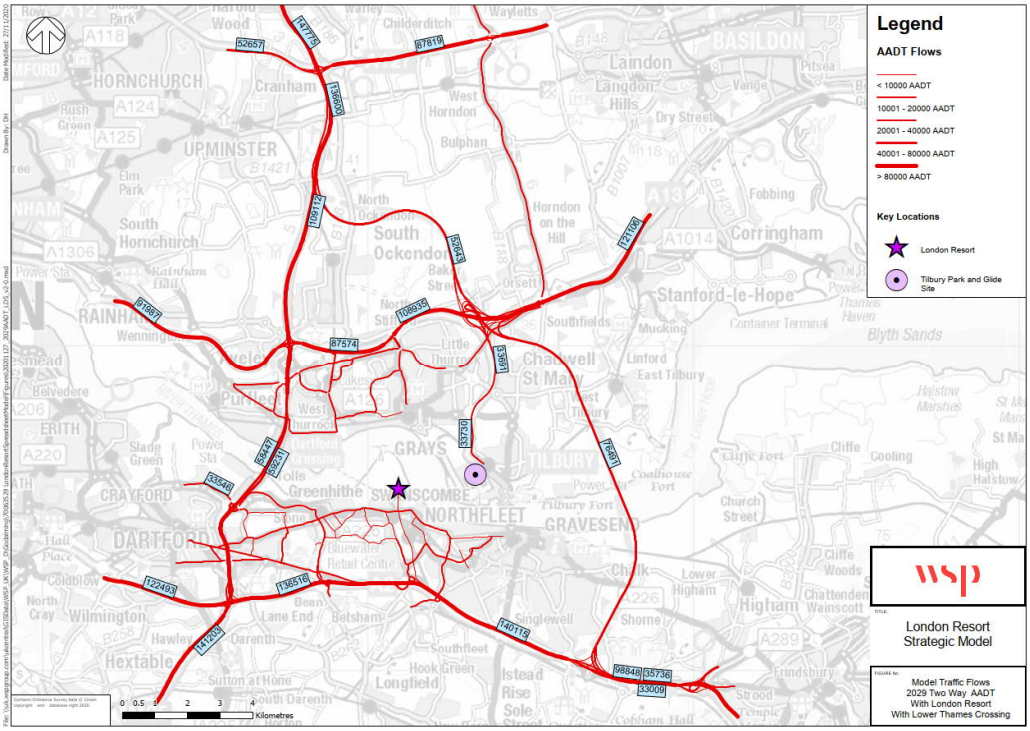

Figure 4-17: 2029 (Second Gate Opening) AADT flows

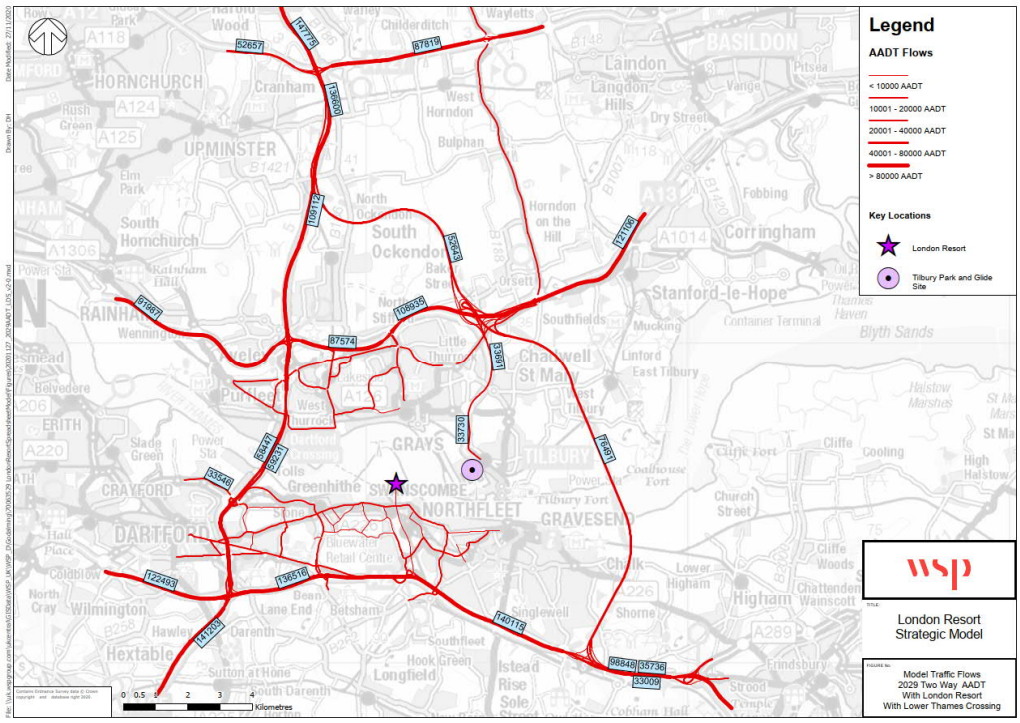

Figure 4-18: 2038 (The London Resort Maturity) flows

4.8.6. As can be seen in **Figure 4-19** the introduction of the Lower Thames Crossing scheme is predicted to reduce the flows on the M25, A2 and A13

- M25 north of the River Thames: reduction in AADT of 28,240
- Dartford Tunnel: reduction in AADT of 36,591
- A2 west of the A2 Bean junction: reduction in AADT of 19,768
- A2 east of the A2 Ebbsfleet junction: reduction in AADT of 18,623
- A2 east of the southern LTC junction: reduction in AADT of 41,880.

4.8.7. There is predicted to be an AADT flow of 82,982 on the LTC itself with AADT flows of 36,959 and 34,748 predicted to be on the on-slip and off-slip respectively at the LTC connection with the A2.

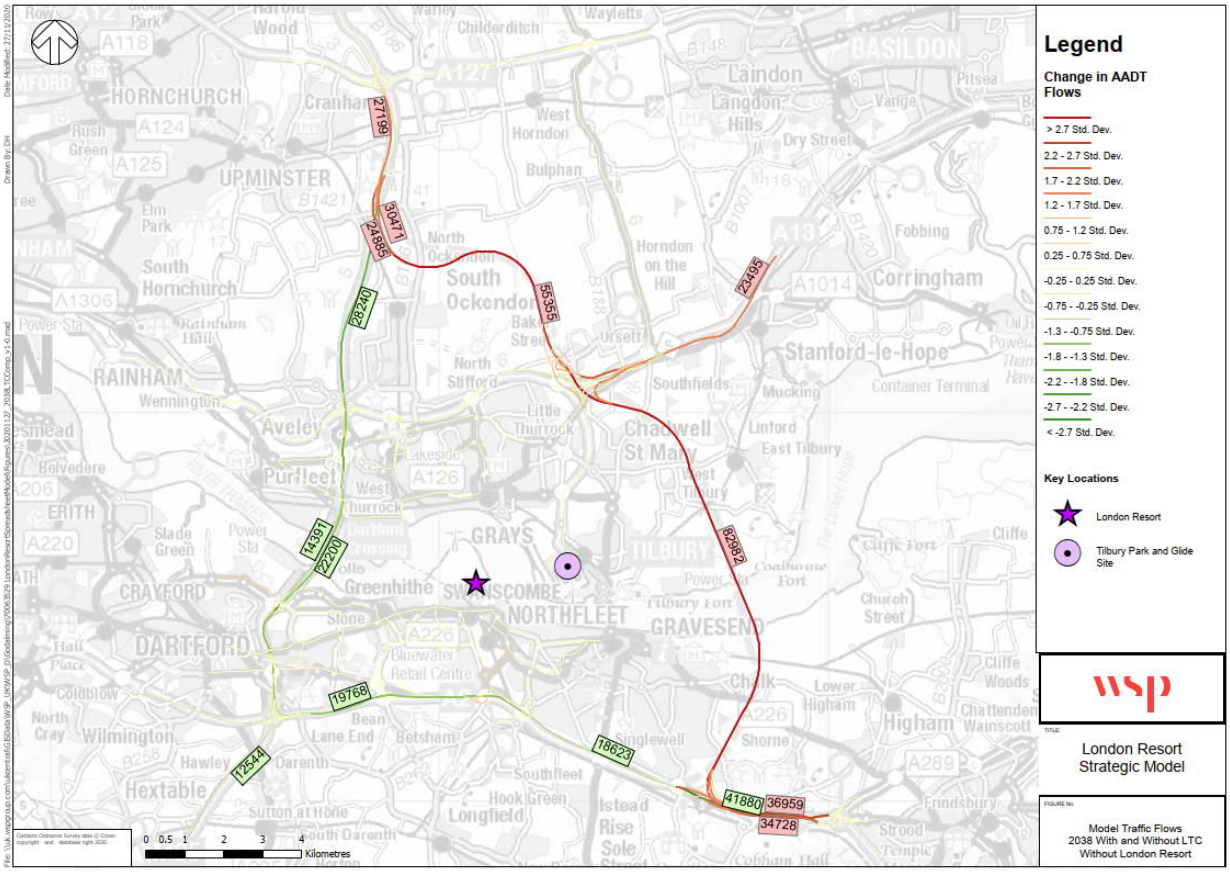

Figure 4-19: 2038 AADT differences in the DM (with and without LTC)

4.8.8. Figure 4-20 shows the reduction in AADT when The London Resort traffic is introduced on:

- M25 north of the River Thames: reduction in AADT of 26,733
- Dartford Tunnel: reduction in AADT of 35,472
- A2 west of the A2 Bean junction: reduction in AADT of 15,242
- A2 east of the A2 Ebbsfleet junction: reduction in AADT of 17,778
- A2 east of the southern LTC junction: reduction in AADT of 41,246.

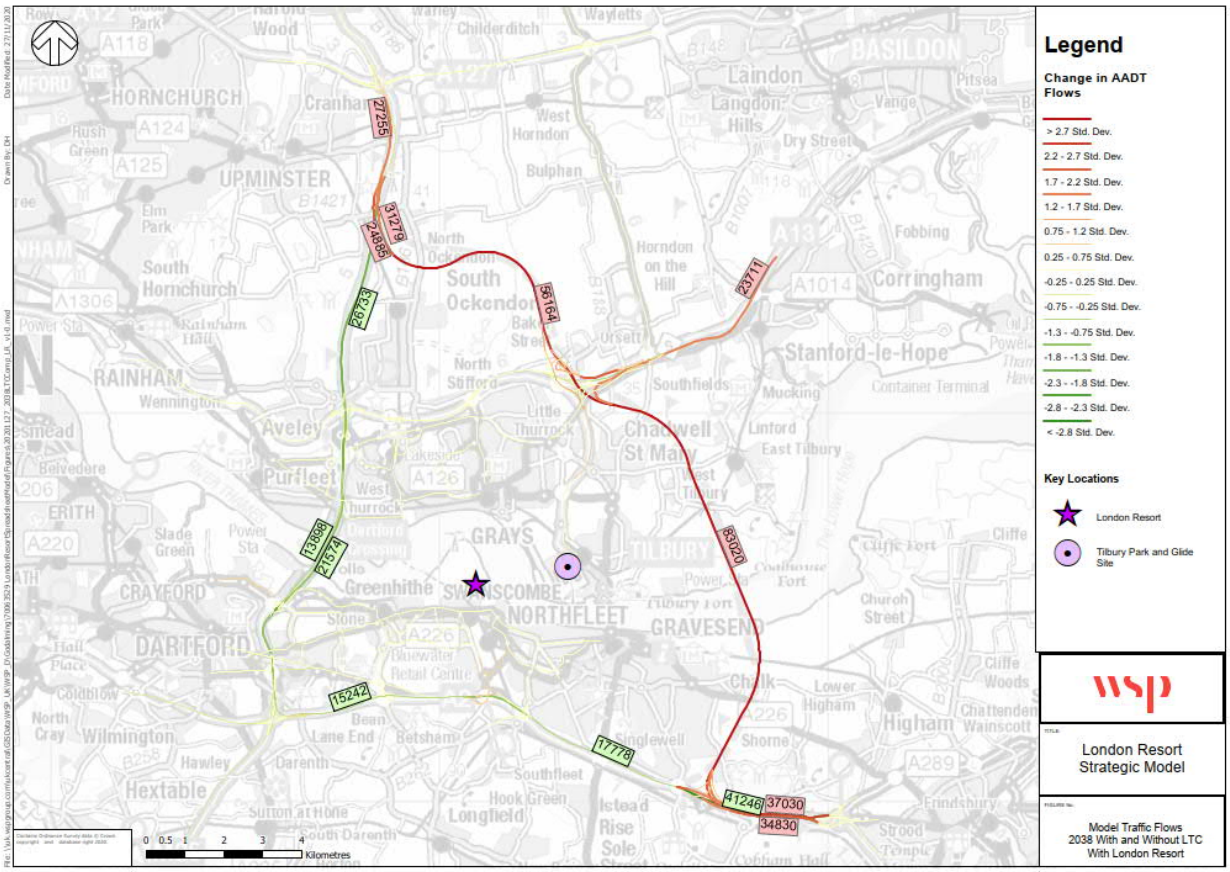

Figure 4-20: 2038 AADT differences in the DM (with and without LTC) – including The London Resort traffic

4.8.9. There is predicted to be a smaller reduction in the AADT flow on the M25, Dartford Crossing and the A2 however there is still predicted to be a reduction in AADT flow with the introduction of the LTC and The London Resort.

5

AIR QUALITY OUTPUTS

5 AIR QUALITY OUTPUTS

5.1.1. Information has been supplied to Buro Happold for use within their Air Quality assessment which includes:

- Annual Average Daily Traffic (AADT) flows
- Average speeds
- Percentage of Medium Duty Vehicles (MDV) i.e. Heavy Goods Vehicles and Buses.

5.1.2. The scenarios that have been supplied, in GIS layers, include

- Existing baseline: 2018
- Construction peak year: 2023 (Do Nothing)
- Construction peak year: 2023 (Do Something)
- Operational year (Gate One): 2024 (Do Nothing)
- Operational year (Gate One): 2024 (Do Something)
- Operational year (Gate Two): 2029 (Do Nothing)
- Operational year (Gate Two): 2029 (Do Something)
- Maturity of Proposed Development: 2038 (Do Nothing)
- Maturity of Proposed Development: 2038 (Do Something).

6

SUMMARY

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6.1.1. WSP have been engaged by London Resort Company Holdings Ltd (LRCH) to provide transportation advice and highways input to the proposed development of The London Resort on the Swanscombe Peninsula, Kent.

6.1.2. An approach was agreed, in principal, between key stakeholders that a combined approach of local junction modelling, microsimulation modelling and a spreadsheet-based transport model derived from existing strategic traffic models would be used for assessing the London Resort impacts.

6.1.3. Highways England provided WSP with outputs from the A2 Bean and Ebbsfleet (A2BE) model for use in the development of the EXCEL based spreadsheet transport model.

6.1.4. The results of the spreadsheet model have been taken forward for use in the air quality assessments used to support the DCO application along with other operational assessments.

6.1.5. A number of data sources were used in the development of the EXCEL based spreadsheet transport model including:

- A2 Bean to Ebbsfleet (A2BE) transport model outputs in GIS format
- Local traffic counts in the Thurrock area
- Road Traffic Forecast 2018 (RTF18)
- Transport Assessments
- Lower Thames Crossing Forecast Report (https://highwaysengland.citizenspace.com/ltc/consultation/supporting_documents/Traffic%20Forecasting%20Report.pdf)
- Highways England and DFT Traffic Counts.

6.1.6. The extent of the EXCEL based spreadsheet transport model is Junction 29 of the M25 to the north and Junction 3 of the M25 to the south. Beyond these locations it is anticipated that all resort traffic will be on the strategic road network and would have limited interaction with local traffic.

6.1.7. In co-ordination with the air quality assessment team, the following forecast years were chosen to assess the development of the resort.

- 2023: Assessment of construction traffic
- 2024: Main Gate Opening
- 2029: Second Gate Opening
- 2038: The London Resort maturity.

6.1.8. The outputs from the EXCEL based spreadsheet transport model shows a predicted reduction in the flows on the M25, Dartford and A2 when the Lower Thames Crossing is open. The inclusion of The London Resort increases flows on the M25, Dartford Crossing and the A2 west of the Bean Interchange however that increase still shows an AADT flow decrease of 15,242 when the Lower Thames Crossing is included.

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