HUTCHISON PORTS (UK) LIMITED
BATHSIDE BAY DEVELOPMENT, HARWICH

TRAFFIC IMPACT ASSESSMENT
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1. INTRODUCTION

1.1 Hutchison Ports (UK) Limited (HPUK) seek planning permission for the provision of four additional maritime berths and associated handling facilities at Bathside Bay (BSB), Harwich. Figure 1 illustrates the location of the site.

1.2 The proposed facility will be used for the shipping of containerised goods. There will be opportunities for interchange between deep sea shipping and coastal shipping, rail and road. This traffic impact assessment (TIA) considers road-based travel to and from the new facility. Figure 2 illustrates the locations of the junctions and links considered in this TIA.

1.3 An initial transport assessment (TA) was submitted to the Highways Agency (HA) and Essex County Council (ECC) on 11 April 2003. The HA commented on the TA on 11 August 2003 (Appendix A) and ECC responded with comments on 12 November 2003 (Appendix A).

1.4 As a result of the comments received from the two highway authorities it was necessary to undertake additional assessments. Further detailed dialogue has been ongoing between the highway authorities and their consultants. This has resulted in amendments to base data and other input parameters to the TIA. It has also resulted in some changes to the outputs and results.

1.5 This TIA modifies the previous submissions in the light of the further dialogue with the highway authorities and supersedes all previous TIA work.

Scope

1.6 The scope of this TIA is as follows:-

i) The proposed development is briefly described.

ii) Existing conditions are described.

iii) Traffic generation associated with the proposed development is assessed.

iv) The trip distributions and traffic assignments associated with the proposed development are assessed.

v) Traffic growth in the study area is assessed.

vi) The traffic impact of committed development is assessed.

vii) Highway assessment traffic flows are estimated and the performance of the following junctions assessed in the assessment year with the proposed development in place:-

a) A120/Ingestre Street Roundabout, Harwich.

b) A120/Proposed Port Access Roundabout.

c) A120/Parkeston Bypass "Safeway" Roundabout.

d) A120/Parkeston Road/Station Road/Europa Way Roundabout.

e) A120/Church Hill/Main Road "Ramsey Bridge" Roundabout.

f) A120/Harwich Road Junction, Wix.

g) A120/Colchester Road Junction, Wix.

h) A120/B1035 "Horsley Cross" Roundabout.

i) A120/Little Bentley/Bentley Road Junction.

j) A120/Park Road/Harwich Road Junction.

k) A120/A133 Junction.

l) A120/A1232/A12 Junction, Colchester.

viii) A link capacity assessment is undertaken for the length of the A120 contained within the TIA study area and mitigation measures are proposed.

ix) The findings of the highway assessments are summarised.

x) Employee parking at the site is considered.

Conclusions

1.7 This TIA concludes as follows:-

i) Junctions at which the impact of the proposed development should be tested have been agreed with the HA and ECC. There are 12 such junctions.

ii) The performance of these locations has been assessed in the 2022 assessment year with the proposed development in place during the AM and PM highway peak hours.

iii) At 8 of the study junctions no alteration to the highway will be necessary as a result of the proposed development.

v) At 4 of the study junctions means by which the highway impact of the proposed development may be addressed have been identified.

vi) The link capacity of the A120 contained within the TIA study area has been assessed with the proposed development in place. Mitigation measures are necessary to address link capacity issues between the Ramsey Bridge roundabout and the existing dual carriageway section at Hare Green.

viii) The level of car parking provision at the site necessary to provide for employee travel has been identified.

1.8 Subject to the adoption of the measures recommended in this TIA the development will have no materially detrimental impact on highway conditions.

2. PROPOSED DEVELOPMENT

2.1 The proposed development is shown in Appendix A and has the following features:-

i) Major dock facility with direct rail access.

ii) An on-site logistics facility.

i) A 9.9 acre hardstanding/open storage area. In the April 2003 and December 2003 TIAs, this area was expected to be used for the storage of imported cars. However, this use has been removed from the proposed development although the traffic allowances associated with the use of this site have been retained in this TIA as a proxy for the traffic flows associated with the established use of the site.

iv) A leisure facility at Gas House Creek. Access to the leisure facility will be taken via the A120 to the north of the Ingestre Street roundabout.

2.2 The dock will take road access solely from the existing roundabout on the A120 at the site's southern frontage.

2.3 The proposed development will become operational in 2007.

3. EXISTING CONDITIONS

Development Site

3.1 The site location is shown on Figure 1. The site lies between Harwich to the east, Dovercourt to the south, Parkeston to the west and the River Stour to the north. Most of the site currently lies between low and high water.

3.2 The Harwich to Manningtree railway and the A120 road pass close to the southern boundary of the site. The circulatory carriageway of the Parkeston roundabout is part of the A120(T) trunk road. The A120(T) continues as a trunk road to the west of Parkeston roundabout.

Public Transport

3.3 Appendix B presents a summary of bus services currently available within walking distance of the site. A weekly service passes close to the site. Dovercourt railway station is within 1km walking distance of the site entrance.

Traffic Surveys

3.4 Appendix C presents traffic survey information for each of the sites in the study area.

3.5 Traffic surveys were undertaken at the Parkeston roundabout and the Safeway roundabout in February 2003, after the opening of the Parkeston Bypass. Traffic surveys were undertaken at the Crown junction in August 2001 and March 2002 for the AM and PM peaks, respectively. AM and PM peak period traffic surveys were undertaken in July 2003 for all other sites in the study area.

3.6 The HA's consultants, URS, undertook 12 hour traffic surveys on the A120 to the west of the Parkeston roundabout and to the west of the Ramsey Bridge roundabout on Thursday 12 February 2004.

Travel to Work Survey

3.7 Appendix D presents a summary of the findings of a travel to work survey undertaken among employees of HIP in 2002.

3.8 The modal share of travel to work trips at HIP is as follows:-

Modal Share: Travel To Work Trips, HIP

Mode	Percent By Mode	
	Day Shift	Night Shift
Bus	0.8%	0%
Bicycle	21.4%	15.1%
Car Driver	68.7%	74.5%
Car Passenger	2.3%	1.9%
Walk	4.6%	4.7%
Motor Cycle	2.3%	3.8%

Route Management Strategy

3.9 The HA has published a Route Management Strategy (RMS) for the A12 and the A120 (east of Colchester), which proposes measures to improve traffic conditions on the route. The RMS seeks to maximise the potential capacity of the existing trunk road by analysing operational capacity and road safety records.

3.10 The A120 from the A12 to Hare Green was built as a new dual carriageway as part of Colchester Bypass in 1982. The section east of Hare Green is single carriageway with short sections of dual carriageway at some junctions. Over the years it has been improved and bypasses to take the traffic out of Wix and Harwich were constructed in 1973 and 1981, respectively.

3.11 The A120 carries approximately 30,000 vehicles per day on the dual carriageway section and up to 12,000 vehicles per day on the single carriageway sections.

3.12 The RMS proposes the following measures in the study area:-

i) A12/A1232 junction: signing improvements and signalisation of westbound slip road. This project was completed in March 2004.

ii) A120 Hare Green/Harwich Road junction: install roundabout at Harwich Road junction and restrict turning movements at Park Road junction. Estimated completion date 2005/6, subject to funding.

iii) A120/A133 junction: modification to allow all moves. The HA have no current proposals and no programme for such works.

iv) Accident route study between A120/A133 intersection and Parkeston roundabout. Review of A120(T) junctions and accesses to improve safety. A study has been undertaken with the recommended measures to be implemented in the following years.

Multi Modal Study

3.13 The Government Office for the East of England has published the final report of the London to Ipswich Multi Modal Study (LOIS). The study area consists of a core area (broadly centred along the A12 (M25 junction 28 to Ipswich) and A120 (Stansted to Harwich) corridors), an inner area (which surrounds the core area and encapsulates a wider zone of influence) and an outer area which incorporates much of the south-east of England and beyond.

3.14 LOIS considered conditions on the A120 between Colchester and Harwich and recommended the dualling of the A120 between Hare Green (i.e. the A120/A133 junction) and the Parkeston roundabout. LOIS identified the benefits associated with this proposal to be as follows:-

i) Improved access to HIP.

ii) Significant accident benefits.

iii) Support for rural regeneration policies within the area inland of Harwich.

3.15 LOIS set out an implementation programme for its preferred strategy based on a timescale between 2016 and 2031, which assumed that rail upgrades, such as the Felixstowe to Nuneaton improvement, have been implemented. The A120 Hare Green to Harwich improvement was identified as a longer term proposal to be implemented after year 2016 following the completion of all high priority actions contained within the A12/A120 RMS. The principal reasons for including this improvement within LOIS were to facilitate better access to the Port of Harwich and to improve the road safety record of the A120.

3.16 The Secretary of State (SoS) responded to the LOIS study in July 2003. The SoS did not ask the HA to prioritise work on the A120(T) dualling to the east of Hare Green, considering such a scheme to be for the longer term. In the shorter term, the SoS asked the HA to address safety issues on this section of the trunk road within the RMS.

Road Safety

3.17 ECC have provided a record of the number and severity of personal-injury accidents (PIAs) that occurred between the Safeway roundabout and Hare Green junction during the period 1 January 1999 to 31 December 2003. The data is presented in Appendix E.

PIAs at Junctions in the TIA Study Area

3.18 The PIAs that occurred at the junctions in the TIA study area are summarised as follows:-

Summary of Personal-Injury Accidents at TIA Study Junctions, 1 January 1999 to 31 December 2003

Location	Number of Accidents of Stated Severity		
	Fatal	Serious	Slight
A120/Parkeston Bypass "Safeway" Roundabout.	0	1	3
A120/Parkeston Road/Station Road/Europa Way roundabout.	0	0	5
A120/Church Hill/Main Road "Ramsey Bridge" roundabout.	0	2	1
A120/Harwich Road junction, Wix.	0	1	1
A120/Colchester Road junction, Wix.	0	0	2
A120/B1035 "Horsley Cross" roundabout.	0	2	7
A120/Little Bentley/Bentley Road junction.	2	5	6
A120/Park Road/Harwich Road staggered junction.	0	3	15
A120/A133 junction.	2	6	19

3.19 Four fatal accidents were recorded at junctions in the TIA study area as follows:-

i) Two fatal PIAs occurred at the A120 Little Bentley/Bentley Road junction. One of these involved a motorcycle losing control on the Little Bentley approach to the junction which caused the rider to fall off into the path of another vehicle. The other fatal PIA at this junction involved an overtaking vehicle driving onto the wrong side of the carriageway at the point where the A120 changes from dual carriageway to single carriageway. The vehicle then collided with an oncoming vehicle. Neither of the fatal accidents at this location involved HGVs.

ii) Two fatal PIAs occurred at the A120/A133 junction and these involved a pedal cycle which was competing in the time trial colliding with a broken down vehicle and a motorcycle on the A120 losing control due to hitting debris from a vehicle mounting the crash barrier and hitting the bridge railings on the A133. Neither of the fatal accidents at this location involved HGVs.

3.20 The above fatal accidents are particularly random events and, as such, do not have any common causal factors.

3.21 The following table compares the accident records in section 3.18 above with those estimated in Appendix E using the method set out in the Design Manual for Roads and Bridges (DMRB) Volume 13, Section 1, Part 2, Chapter 5 "The Valuation of Accidents at Junctions":-

Comparison of Number of Accidents at the TIA Study Junctions with DMRB Predicted Number of Accidents, 5-Year Period

Location	Number of Accidents	
	Observed	Predicted
A120/Parkeston Bypass "Safeway" Roundabout.	4	Recently changed: no prediction
A120/Parkeston Road/Station Road/Europa Way roundabout.	5	Atypical form (part signals): recently changed: no prediction
A120/Church Hill/Main Road "Ramsey Bridge" roundabout.	3	5
A120/Harwich Road junction, Wix.	2	3
A120/Colchester Road junction, Wix.	2	2
A120/B1035 "Horsley Cross" roundabout.	9	6
A120/Little Bentley/Bentley Road junction.	13	8
A120/Park Road/Harwich Road staggered junction.	18	9
A120/A133 junction	27	No Prediction

3.22 Predictions are not made at merges or diverges since the DMRB method is not applicable in such cases. Flows changed during the study period at the Safeway and Parkeston roundabouts due to the opening of the Parkeston Bypass in August 2002 and future accident patterns may therefore differ from those recorded.

3.23 Two of the PIAs that occurred at the A120/Parkeston Bypass "Safeway" roundabout involved nose-to-tail collisions on the A120(west) approach to the roundabout due to drivers failing to notice stopping vehicles in front of them. Such accidents are typical of those that occur at roundabouts. The other PIAs involved a motorcycle losing control due to a strong gust of wind and a cyclist riding into the path of a vehicle while negotiating the roundabout. The above accidents have no common causal factors and there are therefore no particular issues associated with road safety at this junction. Three of the four accidents at this location occurred before the Parkeston Bypass was opened in August 2002.

3.24 Five PIAs occurred at the A120/Parkeston Road/Station Road/Europa Way roundabout. Three of these involved collisions between vehicles entering the roundabout from the A120 west approach and vehicles negotiating the roundabout. Such accidents are typical of those that occur at roundabouts. The remaining PIAs involved a motorcycle colliding with the vehicle it was overtaking and a collision due to a pedal cycle crossing the A120 at the Pelican crossing when it did not have priority to cross. The above accidents therefore have no common causal factors and there are therefore no particular issues associated with road safety at this junction. All of the accidents occurred before the Parkeston Bypass opened.

3.25 Twenty seven accidents were recorded at the A120/A133 junction during the 5 year period. However, only three of these accidents occurred on the A120, two of which were slight accidents and one was fatal. The fatal accident involved a motorcycle on the A120 losing control due to hitting debris from a vehicle mounting the crash barrier and hitting the bridge railings on the A133, as explained in section 3.19 earlier. The slight accidents involved a vehicle misjudging the traffic flows when joining the A120 from the A133 and a vehicle joining the A120 and pulling in to pick up a pedestrian without indicating. None of the accidents at the A120/A133 junction involved HGVs.

3.26 The HA completed improvements to the A120/A133 junction in February 2004 in order to make the junction safer for road users by raising driver awareness of the alignment of the slip roads and by improving the approach to the A120 trunk road.

3.27 The safety improvements included the following:-

i) The right hand bend of the southbound off-slip of the A133 being emphasised by hazard marker posts and "slow" road markings.

ii) Visibility on the southbound off-slip improved by removing areas of planting on the offside of the approach to the A120 bridge.

iii) The perception of the approach to the bend on the southbound off-slip changed and a series of yellow backed chevrons on the outside of the bend prior to the A120 bridge provided.

iv) Bend warning signs on the southbound off-slip with yellow backing boards and supplementary plates advising drivers of 'Max Speed 50'.

v) The first set of existing bend warning signs on the westbound on-slip upgraded with yellow backing boards, supplemented by 'Reduce Speed Now' plates.

vi) The second set of existing bend warning signs on the westbound on-slip upgraded with yellow backing boards and supplementary 'Max Speed 50' plates.

vii) The perception of the approach to the bend on the westbound on-slip changed and a series of yellow backed chevron signs on the outside of the bend

provided, the first three at a height to be seen prior to Old Harwich Road Bridge.

viii) 'Slow' road markings to accompany all of the above signing on the westbound on-slip.

ix) 'Traffic Merges Ahead' signing prior to the merge of the A133 slip road with the A120 westbound.

3.28 It is considered that the above safety improvements will mitigate any existing road safety issues at the A120/A133 junction. However, there are no particular accident problems on the A120(T) at the A120/A133 junction and no development traffic is expected to use the A133 at this location.

3.29 At most sites where the accident rate could be predicted, the actual accident rate is lower than should be expected. At others the accident rate is higher, notably at the Horsley Cross roundabout and the A120/Park Road/Harwich Road junction. However, these junctions are likely to be improved following the HA's road safety review of the A120.

PIAs on Study Area Links in the TIA

3.30 The PIAs that occurred on the links between the junctions in the TIA study area are summarised as follows:-

Summary of Personal-Injury Accidents on the Links in the TIA Study Area, 1 January 1999 to 31 December 2003

Link	Number of Accidents of Stated Severity		
	Fatal	Serious	Slight
Safeway roundabout to Parkeston roundabout.	0	0	1
Parkeston roundabout to Ramsey Bridge roundabout.	0	0	3
Ramsey Bridge to Harwich Road, Wix.	1	4	16
Harwich Road, Wix to Colchester Road, Wix.	1	7	8
Colchester Road, Wix to Horsley Cross.	0	1	0
Horsley Cross to Little Bentley.	0	1	3
Little Bentley to Park Road.	1	0	1
Park Road to A133.	0	0	1

3.31 Three fatal accidents were recorded on the links in the TIA study area as follows:-

i) A fatal PIA occurred on the A120 between the Ramsey Bridge roundabout and Harwich Road and involved a vehicle on the offside of the carriageway colliding with oncoming vehicles.

ii) A fatal PIA occurred between Harwich Road and Colchester Road and involved two motorcycles travelling in opposite directions colliding while their front wheels were not in contact with the ground.

iii) A fatal PIA occurred between Little Bentley and Park Road and involved a vehicle failing to see stationary vehicles ahead which caused it to lose control and collide with two vehicles in the offside lane.

3.32 The above fatal accidents are particularly random and, as such, do not have any common causal factors. The above fatal accidents also did not involve HGVs.

3.33 The following table compares the accident records in section 3.30 above with those estimated in Appendix E using the method set out in the Design Manual for Roads and Bridges (DMRB) Volume 13, Section 1, Part 2, Chapter 4 "The Valuation of Accidents on Links":-

Comparison of Number of Accidents on the Links in the TIA Study Area with DMRB Predicted Number of Accidents, 5 Year Period

Link	**Number of Accidents**	
	Observed	**Predicted**
Safeway roundabout to Parkeston roundabout.	1	0
Parkeston roundabout to Ramsey Bridge roundabout.	3	4
Ramsey Bridge to Harwich Road, Wix.	21	17
Harwich Road, Wix to Colchester Road, Wix.	16	22
Colchester Road, Wix to Horsley Cross.	1	5
Horsley Cross to Little Bentley.	4	5
Little Bentley to Park Road.	2	4

Park Road to A133.	1	3

3.34 At most sites the actual accident rate is lower than should be expected. At others the accident rate is higher but, in such cases, the difference is never more than a single accident.

HGV Involvement in Recorded PIAs on the A120

3.35 The HGV involvement in the recorded PIAs has been identified from the accident data. The percentage of PIAs that involve HGVs has been calculated for each junction and link along the A120. The HGV involvement in the PIAs is presented in Appendix E and is summarised as follows:-

HGV Involvement in the Recorded PIAs on the A120 in the Period 1 January 1999 to 31 December 2003

Location	Total PIAs	PIAs involving HGVs	Percentage of PIAs involving HGVs
Junctions			
Safeway roundabout	4	0	0.0%
Parkeston roundabout	5	0	0.0%
Ramsey Bridge roundabout	3	0	0.0%
Harwich Road junction, Wix	2	0	0.0%
Colchester Road junction, Wix	2	0	0.0%
Horsley Cross roundabout	9	2	22.2%
Bentley Road junction	13	0	0.0%
Park Road junction	18	2	11.1%
A120/A133 junction	27	0	0.0%
Junctions Total	83	4	4.8%
Links			
Safeway roundabout to Parkeston roundabout	1	1	100.0%
Parkeston roundabout to Ramsey Bridge roundabout	3	0	0.0%
Ramsey Bridge roundabout to Harwich Road junction	21	6	28.6%
Harwich Road junction to Colchester Road junction	16	6	37.5%
Colchester Road junction to Horsley Cross roundabout	1	0	0.0%
Horsley Cross roundabout to Bentley Road junction	4	0	0.0%
Bentley Road junction to Park Road junction	2	0	0.0%
Park Road junction to A120/A133 junction	1	0	0.0%
A120/A133 junction to Crown junction	0	0	0.0%
Links Total	49	13	26.5%
Overall Total	132	17	12.9%

3.36 The data supplied by the HA for the ATC counter at Wix during March 2004, identifies the average two-way total daily vehicle flow as 12489 vehicles including 2239 HGVs. The average percentage of HGVs during the day is therefore 17.93%. The ATC data is presented in Appendix E.

3.37 The above table demonstrates that the frequency of accidents involving HGVs along the length of the A120 in the five year period from January 1999 to December 2003 is low, with only 17 of the total 132 recorded accidents involving HGVs. This equates to 12.9% of the total recorded accidents involving HGVs, which is low when compared with the 17.93% HGV throughput.

3.38 The above table identifies that more accidents involving HGVs occurred at the Horsley Cross roundabout than would be expected. Further examination of the accident details within the 5 year period at this location suggests that there are no common causal factors between the two accidents which involved HGVs.

3.39 It has also been identified that the percentages of accidents involving HGVs on the A120 between the Ramsey Bridge roundabout and the Harwich Road junction, Wix and between the Harwich Road junction and the Colchester Road junction, Wix are higher than the 17.93% throughput of HGVs on these links.

3.40 Further inspection of the accident details between the Ramsey Bridge roundabout and the Harwich Road junction, Wix revealed that two of the accidents involved HGV drivers failing to notice vehicles in front of them braking and another two accidents involved collisions which occurred due to HGVs overtaking other vehicles. The remaining two accidents involved a HGV losing control and a collision between two vehicles one of which was attempting to overtake a HGV. All of these accidents were of slight severity.

3.41 Further inspection of the accident details between the Harwich Road junction, Wix and the Colchester Road junction, Wix revealed that two accidents involved collisions which occurred due to vehicles overtaking other vehicles. One of these accidents involved an overtaking vehicle colliding with a HGV travelling in the opposite direction and the other accident involved a collision due to a vehicle attempting to overtake a HGV which veered into the path of the overtaking vehicle. The remaining accidents involved a HGV losing control, a swerving vehicle colliding with a HGV, a vehicle pulling out into the path of a HGV and a vehicle driver failing to notice a HGV braking for a large oncoming vehicle. Of the six accidents involving HGVs on this link, 5 were slight accidents and 1 was serious. The serious accident involved the swerving vehicle colliding with a HGV.

3.42 Of particular interest is the fact that the accident analysis has also identified that no accidents occurred involving HGVs driving on the wrong side of the carriageway.

Killed or Seriously Injured (KSI) PIAs

3.43 Analysis of the recorded PIAs on the A120 has revealed that there were 2 serious accidents that involved HGVs in the 5 year period from January 1999 to December 2003.

3.44 One of the serious accidents occurred on the Horsley Cross roundabout and involved a HGV, travelling west on the A120, overturning as it negotiated the roundabout. No other vehicles were involved. The other serious accident occurred on the A120 between Harwich Road, Wix and Colchester Road, Wix and involved a swerving vehicle colliding with a HGV.

3.45 Analysis has been undertaken to predict the number of KSIs that involve HGVs on each link of the A120. The analysis has been undertaken using the HGV through flows on each link and the HGV fatal or serious accident rate of 10 vehicles per 100 million vehicle-kilometres in 2002 as identified in Road Casualties Great Britain 2002. The analysis and the extract from Road Casualties Great Britain 2002 are presented in Appendix E.

3.46 The analysis estimates that one KSI would occur on the A120 between Harwich Road, Wix and Colchester Road, Wix over a 5 year period. The data from ECC identifies that one serious accident occurred on this link within the 5 year period. This therefore suggests that the severity of accidents involving HGVs is not a concern at this location.

Study by HA

3.47 The HA commissioned a study into collisions along the A120(T) between the Crown junction and the Parkeston roundabout. The study was completed on 18 June 2003.

3.48 The study findings include the following:-

i) The accident rate in the study area was 21.3 personal-injury accidents per 100 million vehicle kilometres.

ii) The accident rate for all roads in Great Britain during year 2000 was 50 personal-injury accidents per 100 million vehicle kilometres.

iii) The study investigated both links and cluster sites. From the 7 links in the study area no further investigation was recommended.

iv) Further investigation was recommended at the Horsley Cross and Parkeston roundabouts.

v) Further measures were proposed in the study area prior to the June 2003 study being undertaken. These include closure of the central reserve gaps at the A120/Bentley Road and A120/Park Road junctions which, subject to funding, could be carried out in 2005/6 i.e. before the proposed port development is constructed.

3.49 The HA study therefore confirms that road safety on the A120 between the Crown junction and Parkeston roundabout gives no special cause for concern.

Summary: Road Safety

3.50 The personal-injury accident record on the A120 has been considered.

3.51 An analysis based on a comparison of the reported personal-injury accident rates at junctions and links on the A120 with the predicted accident rates obtained from the DMRB National standard methodology found the actual accident rate on the route to be lower than would be expected for an equivalent road built to current design standards.

3.52 A study undertaken for the HA found the accident rate on the route to be less than half the national average (21.3 personal-injury accidents per 100 million vehicle kilometres on the A120 compared with the national average of 50 personal-injury accidents per 100 million vehicle kilometres).

3.53 Both studies confirm that the A120 east of its junction with the A1232 is safer than could be expected.

4. TRAFFIC GENERATION

4.1 The proposed development is planned to be complete in 2007. In accordance with HA policy, the assessment year is 15 years after the year of opening, i.e. year 2022.

4.2 The traffic generation associated with the proposed development will have the following components:-

i) HGV traffic associated with the proposed dock.

ii) Employee traffic associated with the proposed dock.

iii) Traffic associated with the proposed logistics facility and the proposed leisure facility at Gas House Creek.

Container-Related HGV Traffic Associated with the Proposed Dock

4.3 Appendix F presents the method by which the container-related HGV traffic associated with the proposed dock is assessed. The method has the following key features:-

i) HGV traffic will be limited by the operation of the dock.

ii) The rate at which HGV traffic increases following the opening of the new facility is estimated here to be as presented in demand forecasts in the business model for the new facility developed by HP. It is anticipated that the port will handle 1.68 million TEU in the 2022 assessment year based on a throughput of 1200 TEU/quay m/year and a quay length of 1.4km.

iii) The transhipment share (i.e. the proportion which transfers from one ship to another without leaving the dock) of containers handled by the dock is expected to be 24%.

iv) The rail share of containers handled by the dock is expected to be at least 22.5% of the 76% non-transhipment share. This equates to approximately 0.98 million TEU per year. Based on 265 working days per year, this is equivalent to 3734 TEU per day.

v) The HA have agreed that a working figure of 3000 two-way container-related HGVs per day should be adopted in this TIA. The corresponding TEU to HGV ratio is therefore 1.245 TEU per HGV. Although this ratio is greater than that used in the previous TIA (1.12), it is considerably lower than that adopted for the Dibden Bay development (1.62). The TEU to HGV ratio is therefore considered to be robust.

vi) For the purposes of the junction assessments, allowance is made for variation in HGV flows throughout the year based on observations at the Port of Felixstowe. Base traffic flows on the A120(T) peak in August. Dock-related HGV flows are estimated to be 1557 HGVs per day in each direction during August. The peak for dock-related flows at the Port of Felixstowe occurs in October. However, the development-related HGVs have been estimated on the basis of the port operating at capacity. As such, there will be no peaks in the development-related HGV generation used in this TIA. By factoring these HGVs to August levels, the TIA takes a robust approach to HGV traffic generation. The approach taken in this TIA with regard to traffic volumes represents the worst case. Therefore, it is anticipated that any capacity issues identified in the subsequent analysis will only occur on limited occasions with typical HGV volumes being lower.

vii) The temporal distribution of arrivals during a typical day is established on the basis of observation at the Port of Felixstowe. Data is available for two-hour periods. The peak number of HGV arrivals occurs during the PM period 1600 to 1800, when 14.37% of the daily HGV traffic arrives. During the AM period 0800 to 1000, only 10.34% of HGVs will arrive.

viii) The temporal distribution of HGV departures during a typical day is established on the basis of the observed temporal distribution of arrivals at the Port of Felixstowe and records of dwell time at the port.

ix) Following discussion with the HA, the temporal distribution of HGV arrivals and departures at the proposed port has been assessed on a detailed basis which allows the assessment of HGV arrivals and departures at 15 minute intervals throughout the day and night.

Employee Traffic Associated with the Proposed Dock

4.4 Arising out of the work on the TIA was the proposal to adopt 7am/7pm shift change times rather than the 8am, 4pm and 12 midnight shift change times originally envisaged. By doing this, HPUK are standardising the shift patterns with those recently adopted at Port of Felixstowe and ensuring that their employees travel outside the normal AM and PM highway peak hours so as not to exacerbate congestion at those times.

4.5 The number of shift-based employees at the proposed facility will be 502 in 2007 rising to 766 in 2010 and later years.

4.6 The workforce will be divided into 4 shifts. The shift pattern for each individual will be as follows:-

Day 1	Work day shift
Day 2	Work day shift
Days 3 to 4	Work night shift
Days 4 to 5	Work night shift
Days 5 to 8	Rest

4.7 The maximum number of employees per shift will therefore be 192 (i.e. one quarter of the total workforce of 766).

4.8 There will be an additional 6 office-based employees who will work between the hours of 0800 and 1800 Monday to Friday.

4.9 The travel survey at HIP (Appendix D) identified that 68.7% of employees on the day shift travelled to and from work as car drivers. The corresponding figure for the night shift was 74.5%. Shift changeover times at BSB occur during the day, when public transport and other non-motorised modes of transport (eg walk and cycle) are considered to be realistic alternatives to the private car. The day-time modal share identified at HIP is therefore applicable to as a basis for estimating the target car mode share for the BSB development.

4.10 A green travel plan (GTP) is proposed to be implemented for the development. The GTP proposes a target modal share for car drivers of 60%. This target modal share is adopted to estimate the traffic generation associated with BSB employees. Appendix F therefore estimates that, in 2010 and later, 115 car movements (ie 60% of 192) will be generated by employees arriving and 115 car movements will be generated by employees departing at the shift changeover times.

Development Peak Hour Traffic Generation

4.11 The AM and PM hours of peak traffic generation associated with the site will occur at the times of shift change, when employees will travel to and from the site by car. Shifts will change at 0700 and 1900. It is assumed that all car-borne employees travelling to the site prior to a shift change will do so during the 30 minute period before the shift change, and that all car-borne employees leaving the site after a shift change will do so during the 30 minute period after the shift change. As the employee shift change traffic plus freight traffic during these changeover periods is expected to be greater than the peak for freight-only traffic, the peak traffic flows associated with the use of the port would therefore be expected to occur during the periods 0630 to 0730 and 1830 to 1930. These periods fall outside of the highway peak hours. The following table considers base traffic flows from the Wix ATC during the development and highway peak hours:-

Comparison of Development Peak Hour and Highway Peak Hour Traffic Flows

	2-Way Peak Hour Flows (Vehicles)			
	0630 to 0730 (Development AM Peak Hour)	**0800 to 0900 (Highway AM Peak Hour)**	**1700 to 1800 (Highway PM Peak Hour)**	**1830 to 1930 (Development PM Peak Hour)**
Employee Flows (2-way)	230	0	0	230
HGV Flows (2-way)	96	140	228	192
Wix ATC Base Data	578	1178	1143	873
Totals	777	1318	1371	1295

4.12 The above table demonstrates that the peak interaction between the port-related traffic and the baseline traffic occurs during the AM and PM highway peak hours. Assessments of the performance of links and junctions are only therefore required during the highway peak hours.

Logistics Facility

4.13 Groupage is a process associated with container ports whereby goods are removed from containers and packed into bespoke capacity loads for onward distribution.

4.14 The proposed on-site logistics facility at BSB is likely to cater for all groupage requirements, such that groupage-related trips will be internal to the BBCT development and should not therefore be included in the off-site HGV traffic generation calculations.

4.15 HPUK estimate that the proposed logistics facility is likely to process approximately 1260 containers per week (180 containers per day assuming a 7-day working week for BSB employees). This would generate approximately 2520 two-way container movements per week (360 per day) between the container terminal and the logistics facility. Since the logistics facility is on-site, these container movements would be internal to the port development and would not therefore be present on the external highway network.

4.16 The loads in the 1260 containers would be consolidated into loads for approximately 945 13.6m curtain-sided trailers. These would therefore produce up to a maximum of 1890 HGV trips per week (378 per day assuming a 5-day working week for haulage companies) on the external highway network, assuming that all HGV movements include an empty trip (ie 945 empty HGVs in and 945 loaded HGVs out).

4.17 The working HGV traffic generation figure of 3000 HGVs per day was agreed on the basis that this figure accounts for all port-related HGVs, including those associated with the logistics facility. Of the 3000 HGVs estimated to be generated by the proposed development, 378 will therefore be 13.6m curtain-sided trailers associated with the logistics facility.

Open Storage

4.18 The April 2003 and December 2003 TIAs contained an allowance for an open storage area, which was proposed to be used for the storage of new cars prior to their delivery to customers. Cars were to be delivered individually and no HGV movements (eg car transporters) were generated by this use. The traffic generation associated with car departures from the site and with travel to the site by car delivery drivers was reflected in the assessment.

4.19 However, the car storage use of the open storage area does not form part of the development proposal. However, for robustness, Appendix F presents an assessment of the traffic generation associated with the car storage use of the open storage area as a proxy for any subsequent use of that part of the site.

Gas House Creek Proposed Leisure Facility

4.20 A yachting marina is proposed, to be used by the existing yacht club, small boat owners and fishermen, who all currently use berths within Bathside Bay or Harwich Town. No additional traffic will result from the transfer of these activities to the new facility.

4.21 A public viewing area is to be provided. Appendix F presents the estimated traffic generation associated with the public viewing area.

Associated BSB-Related Development Traffic

4.22 In addition to the above, there will be additional traffic generated by the BSB development (eg service vehicles, deliveries, couriers, contractors, etc.). Appendix F presents an estimation of the associated development traffic generation based on records of visiting vehicles at the Port of Felixstowe.

Summary: Traffic Generation of Proposed Dock

4.23 The traffic generation associated with the proposed development is summarised in the following table:-

Total External Road Traffic Generation (Two-Way, Vehicles)

	Period				
	AM Peak (0800 to 0900)	**PM Peak (1700 to 1800)**	**Daytime Off-Peak Hourly Average**	**Night Time Off-Peak Hourly Ave**	**Daily (24 hours)**
Employment (Light Vehicles)					
Development employment	0 (115 in the hour 0600 to 0700 and 115 in the hour 0700 to 0800)	0 (115 in the hour 1800 to 1900 and 115 in the hour 1900 to 2000)	0	0	460
HGVs					
Total HGVs	134 (139)	220 (228)	153 (158)	36 (38)	3000 (3114)
Additional Developments					
Gas House Creek Viewing Area	36	36	36	0	576
Car Storage	8	8	8	0	128
Additional Services associated with the Development	12	12	12	0	192
Total Additional Developments	56	56	56	0	896
Total	190 (195)	276 (284)	242 (247)	36 (38)	4356 (4470)

Notes:-

i) The figures in brackets represent the estimated number of external HGV trips which include the seasonal variation factor of 1.038. The seasonal variation factor is used to factor the number of HGVs to the highest monthly levels (August) for the junction capacity assessments.

ii) The daytime off-peak period is taken as the average of flows between 0600 and 2200 hours but excluding the AM and PM peak hours. The daytime off-peak hour does not include the employee trips as these occur only around the 0700 and 1900 shift changeover times.

iii) The night time inter-peak is taken as the average of flows between 2200 and 0600 hours.

iv) The car storage area traffic flows do not arise as a result of the proposed development but remain in the analysis as a proxy for the traffic flows associated with the re-use of the car storage area site.

5. TRIP DISTRIBUTION AND TRAFFIC ASSIGNMENT

Trip Distribution

5.1 Appendix G presents the estimated distribution of trips associated with each of the following categories of traffic generated by the proposed development:-

i) HGV traffic associated with the proposed dock.

ii) Employee traffic associated with the proposed dock.

iii) Traffic associated with the open storage, the proposed leisure facility at Gas House Creek and the associated development-related traffic.

HGV Traffic

5.2 HGV traffic is assigned to the A120 west to the A12 and then assigned on the basis of an examination of the current split of HGVs at the A120/A12 intersection.

5.3 Dock-related HGV traffic is assigned to the A120 west of Harwich. Upon arrival at the A120/A12 intersection it is assigned pro-rata to the surveyed HGV turning movements between the A120 and the A12 north and south of the junction and between HGVs approaching the junction from the A120 (east) and routing to the A1232 south into the town of Colchester. Use of the right turn HGV movement from the A1232 (from Colchester) to the A120 (east) as part of a proxy for dock-related HGV travel patterns would result in an assessed 8.0% and 24.2% of all HGVs to the dock starting their trips in the town of Colchester during the AM and PM peak hours, respectively. This is not considered to be realistic. The left turn HGV movement from the A120 (east) to A1232 (to Colchester) is therefore estimated to reflect the right turn HGV movement from the A1232 (from Colchester) to the A120 (east), ie 1.4% and 2.9% of all dock-related HGV traffic is estimated to route between the A1232 (Colchester) and A120 (east) during the AM and PM peak hours, respectively.

5.4 Appendix G presents the distribution and Appendix H presents the assignment of these trips.

Employee Traffic

5.5 Appendix G presents an assessment of the distribution of employee travel to work trips. The distribution of employee residences by District is estimated to be as follows:-

District	Estimated Number of Employees	
Tendring	620	(81.6%)
Colchester	80	(10.5%)
Babergh	20	(2.63%)
Ipswich	20	(2.63%)
Suffolk Coastal	20	(2.63%)

5.6 The distribution of employee traffic is estimated to be as follows:-

Estimated Distribution of Employee Travel to Work Cars

Location	No of Cars Arriving/Departing	No of Vehicles on A120
A120/A1352 West Street junction	1	1
A120/Ingestre Street	14	1
Site Access	0	15 eastbound 99 westbound
A120/Parkeston Bypass	3	96
A120/Station Road: to south	65	31
A120/Ramsey Bridge: to north	5	26
A120/Ramsey Bridge: to south	3	23
A120/Little Bentley (to south)	2	21
A120/A1232/A12 north	9	12
A120/A12 south (grade separated)	12	0

Open Storage and the Proposed Leisure Facility at Gas House Creek

5.7 Appendix G presents an assessment of the distribution of trips associated with the proposed open storage and the proposed leisure facility at Gas House Creek.

5.8 The distribution of traffic associated with the proposed leisure facility at Gas House Creek is summarised as follows:-

Estimated Distribution of Trips Associated with Gas House Creek

Location	No of Cars Arriving/Departing	No of Vehicles on A120
A120 north of Ingestre Street	18	18
A120/Ingestre Street	3	15
A120/Parkeston Bypass	1	14
A120/Station Road: to south	12	2
A120/Ramsey Bridge: to north	1	1
A120/Ramsey Bridge: to south	1	0

Traffic Assignment

5.9 Appendix H presents assignments of development-related traffic for the following cases:-

i) Employee travel to work traffic during the AM highway peak period at the A120/Bentley Road/Little Bentley junction only. This is because the highway peak hour for this junction overlaps with the development peak hour. Employee travel to work traffic is not present at any of the other junctions during the highway peak hours as these do not overlap the development peak hours.

ii) HGV dock-related traffic during the AM and PM highway peak periods.

iii) Traffic associated with the open storage, the proposed leisure facility at Gas House Creek and the associated development-related traffic during the AM and PM highway peak periods.

6. TRAFFIC GROWTH

6.1 Traffic growth in the study area during the period to 2022 will be of the following types:-

i) General growth in base traffic. The HA have asked that growth be assessed separately for HGVs and for light vehicles.

ii) Additional traffic arising from the transfer of roll on/roll off (RORO) shipping to HIP since 2001 and other increases in activity at HIP.

iii) Committed development. This is considered in the following chapter.

General Traffic Growth: HGVs

6.2 Appendix I presents an assessment of HGV traffic growth during the periods to 2007 (year of opening), 2010 (required for air quality assessment purposes) and 2022 (15 years after the year of opening).

6.3 Through correspondence with the HA and ECC, as agreed, general HGV traffic growth (other than that associated with HIP) is modelled on the basis of National Road Traffic Forecast (NRTF) low growth factors, which are as follows:-

Estimated NRTF Low Growth Factors for Non-HIP-Related HGVs

HGV Type	From	To 2007	To 2010	To 2022
Rigid	2001	1.027	1.045	1.118
Rigid	2002	1.022	1.041	1.114
Rigid	2003	1.018	1.036	1.109
Articulated	2001	1.135	1.207	1.548
Articulated	2002	1.111	1.181	1.514
Articulated	2003	1.089	1.156	1.482

General Traffic Growth: Light Vehicles

6.4 The growth of background traffic other than HGVs is modelled using TEMPRO 4.2 software with an income factor applied to the basic TEMPRO projections, as recommended by the HA in their letter dated 12 February 2003. The assessment is presented in Appendix I. The findings are summarised as follows:-

TEMPRO 4.2 Growth Factors for Tendring District

From	To	AM Peak	PM Peak
2001	2007	1.100	1.082
	2010	1.145	1.125
	2022	1.299	1.260
2002	2007	1.082	1.067
	2010	1.127	1.110
	2022	1.279	1.244
2003	2007	1.065	1.055
	2010	1.108	1.095
	2022	1.258	1.227

HIP-Related Traffic Growth

6.5 HGV growth associated with HIP is based on the projected growth in traffic through HIP until 2012. RORO traffic was transferred to HIP from the Port of Felixstowe on 15 September 2002. HSL's e-mail dated 28 January 2003 suggested a method whereby growth in HGV traffic may be estimated. The estimated growth factors are as follows:-

Estimated Growth Factors for HIP Related HGVs

From	To 2007	To 2010	To 2022
2001	2.345	2.792	3.078
2002	1.338	1.594	1.757
2003	1.262	1.504	1.657

7. COMMITTED DEVELOPMENT

7.1 ECC has provided details of committed development to be incorporated in this TIA.

7.2 Appendix J presents an assessment of the traffic generation, trip distribution and traffic assignment likely to be associated with each element of the committed development identified by ECC. The traffic generation is estimated on the basis of 85th percentile trip rates from the TRICS Database and is therefore robust.

7.3 The routing of committed development traffic to its first point of contact with the A120 is in accordance with the geographic layout diagram prepared by ECC and presented in Appendix J.

8. HIGHWAY ASSESSMENTS

8.1 The following chapters of the TIA consider the changes in traffic flows likely to arise at the study locations as a result of the proposed development, the implications of those changes for highway users and, where necessary, proposed mitigation measures.

8.2 Paragraph 4.11 of this report identified that the peak interaction between the port-related traffic and the baseline traffic occurs during the AM and PM highway peak hours. Assessments of the performance of links and junctions are therefore undertaken during these peak hours.

Assessment Flows

8.3 Appendix K presents assessments of future traffic flows at each study location in the hour of peak local traffic flow.

8.4 The following chapters of this TIA present capacity assessments at each location during the AM and PM highway peak periods.

9. A120/INGESTRE STREET ROUNDABOUT, HARWICH

9.1 This junction is shown on Figure 3. Appendix L presents the assessment of the performance of this junction in the year 2022 with the proposed development in place. ARCADY5 software has been used in the assessment. The findings are summarised as follows:-

Highway Assessment Findings: A120/Ingestre Street Roundabout Year 2022 With Development

Approach	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
A120 (east)	0.125	0.1	0.206	0.3
Ingestre Street	0.040	0.0	0.023	0.0
A120 (west)	0.213	0.3	0.196	0.2
Site Access	0.005	0.0	0.005	0.0

(Note: Max RFC = maximum ratio of flow to capacity; Max Queue = maximum queue length (vehicles))

9.2 Predicted maximum RFC values for both the morning and evening peak periods are well below the 0.85 capacity threshold used to identify a roundabout junction that is operating at its practical capacity. The A120/Ingestre Street roundabout would therefore operate satisfactorily in the assessment year with the proposed development in place. No mitigation is therefore required at this location.

10. A120/PROPOSED PORT ACCESS ROUNDABOUT

10.1 This junction is shown on Figure 4. Appendix M presents the assessment of the performance of this junction in the year 2022 with the proposed development in place. ARCADY5 software has been used in the capacity assessment. The findings are summarised as follows:-

Highway Assessment Findings: A120/Proposed Port Access Roundabout Year 2022 With Development

Approach	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
A120 (east)	0.143	0.2	0.193	0.2
Gated Access	0.004	0.0	0.002	0.0
A120 (west)	0.261	0.4	0.329	0.5
Proposed Access	0.073	0.1	0.092	0.1

10.2 The ARCADY5 results demonstrate that the A120/Port Access roundabout would operate satisfactorily during both peak periods for the assessment year of 2022 with the proposed development in place. It is therefore concluded that no mitigation is necessary at this location.

11. A120/PARKESTON BYPASS "SAFEWAY" ROUNDABOUT

11.1 This junction is shown on Figure 5. Appendix N presents the assessment of the performance of this junction in the year 2022 with the proposed development in place. ARCADY5 software has been used in the assessment. The findings are summarised as follows:-

Highway Assessment Findings: A120/Parkeston Bypass "Safeway" Roundabout Year 2022 With Development

Approach	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
A120 (east)	0.234	0.3	0.373	0.6
Gated Access	0.048	0.1	0.075	0.1
A120 (west)	0.570	1.3	0.711	2.4
Safeway/Bypass	0.239	0.3	0.476	0.9

11.2 The capacity assessment results for both AM and PM peak periods demonstrate that the RFCs of all junction approaches would be within capacity. The A120/Parkeston Bypass "Safeway" roundabout would be expected to operate satisfactorily in the assessment year with the proposed development in place. It is therefore concluded that no mitigation would be required at this location.

12. A120/PARKESTON ROAD/STATION ROAD/EUROPA WAY ROUNDABOUT

12.1 This junction is shown on Figure 5. Appendix O presents the assessment of the performance of this junction in the year 2022 with the proposed development in place. The A120 (east) approach to the junction is signal controlled and a pelican crossing is present on the A120 (east) exit from the roundabout.

Modelling Methodologies

12.2 The roundabout has been modelled using the following two methods:-

i) ARCADY5 software is used to model the conventional roundabout approaches at this junction and LINSIG software is used to model the traffic signal-controlled approach. The signal-controlled arm of the junction is modelled within ARCADY as having sufficient capacity so as to not delay traffic entering the junction. The model therefore replicates conditions on the other 4 arms of the junction as if the signal-controlled arm is working within capacity. The circulatory stop line is modelled in LINSIG as two links and two lanes, with the traffic flows assigned to each link according to their origin/destination. In this way the uneven queuing that is likely to occur at this stop line is modelled. The A120 (east) approach is modelled as one link and two lanes, with the offside lane being modelled as a 1 pcu long flare. Although the flare on this lane could accommodate up to 4 pcu, the flare is modelled as accommodating 1 pcu to represent the actual demand on this lane.

ii) TRANSYT software is used to model the signalised node and Parkeston Road arm of the roundabout, in accordance with advice from TRL (copy of relevant TRL advice is presented in Appendix O). This is because the signalisation of the A120 East arm will have an effect on the capacity of the Parkeston Road arm of the roundabout. However, the A120(T), Station Road and Europa Way arms of the roundabout will be unaffected by the partial signalisation and hence the outputs from the ARCADY5 model used in section 12.2 i) above are applicable to these arms of the roundabout. The signalised node is modelled using the same method as used in the LINSIG model.

2022 With Development Case

12.3 The findings of the ARCADY analyses in the AM and PM peak periods are summarised as follows:-

Highway Assessment Findings: A120/Parkeston Road Roundabout Year 2022 With Development: Assessment of Priority-Controlled Entries to the Junction

Approach	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
A120 (east)	Signal Controlled			
Parkeston Road	0.634	1.7	0.471	0.9
A120 (west)	0.654	1.8	0.574	1.3
Station Road	0.210	0.3	0.343	0.5
Europa Way	0.028	0.0	0.056	0.1

12.2 The LINSIG assessment of the performance of the A120 (east) signal controlled entry to the roundabout finds as follows:-

A120/Parkeston Road Junction: LINSIG Model of Signal Controlled A120 (East) Entry: 2022 With Development

Approach	AM Peak (33s Cycle Time)		PM Peak (90s Cycle Time)	
	Degree of Saturation (%)	Max Queue (pcu/lane)	Degree of Saturation (%)	Max Queue (pcu)
Roundabout Circulatory Offside Lane	16.7	1	27.6	2
Roundabout Circulatory Nearside Lane	52.0	2	100.7	19
A120 (East)	88.5	7	99.6	27

12.3 The above table confirms that the both the A120 east approach and the roundabout circulatory would be operating above the 90% degree of saturation threshold during the PM peak with the proposed development in place.

12.4 The TRANSYT assessment of the A120 east signalised node and the Parkeston Road arm finds as follows:-

A120/Parkeston Roundabout: TRANSYT Model of Signal Controlled A120 (East) Entry: 2022 With Development

Approach	AM Peak (37s Cycle Time)		PM Peak (90s Cycle Time)	
	Degree of Saturation (%)	**Max Queue (pcu)**	**Degree of Saturation (%)**	**Max Queue (pcu)**
Roundabout Circulatory Offside Lane	15	1	28	3
Roundabout Circulatory Nearside Lane	47	3	101	21
A120 East	89	11	100	47
Parkeston Road	74	6	56	1

12.5 The above table confirms that the both the A120 east approach and the roundabout circulatory would be operating above the 90% degree of saturation threshold during the PM peak hour with the proposed development in place.

12.6 Both the LINSIG and TRANSYT-based models confirm that the existing junction will operate overcapacity during the PM peak hour. Mitigation measures are therefore required. Since this junction is the first point of contact of development traffic with the trunk road network, the HA require that the junction should operate within capacity in the 2022 assessment year.

Proposed Improvement

12.7 The following improvements are therefore proposed at the Parkeston roundabout and are shown on Figure 6:-

i) Widening of the A120 between and Parkeston and "Safeway" roundabouts to accommodate a full 2-lane approach to the Parkeston Roundabout.

ii) Changes to the lane markings on the A120 (East) approach to the Parkeston roundabout.

iii) Widening of the A120 (west) exit to accommodate a two-lane exit.

iv) Relocation of the stop line on the circulatory carriageway to increase the available stacking space.

v) Relocation of the pelican crossing on the A120 (east) exit to increase the available stacking space for vehicles. This also increases the stagger distance between the pedestrian crossings on the A120 (east) eastbound exit and westbound approach from and to the junction and therefore increases the storage space for pedestrians on the splitter island.

12.8 Appendix F presents assessments of the performance of the modified signalised node in the 2022 assessment year with the proposed development in place. The findings from the LINSIG assessment are as follows:-

A120/Parkeston Road Junction: Signal Controlled A120 (East) Entry: 2022 With Development: Proposed Improvement

Approach	**AM Peak (27s Cycle Time)**		**PM Peak (30s Cycle Time)**	
	Degree of Saturation (%)	**Max Queue (pcu)**	**Degree of Saturation (%)**	**Max Queue (pcu)**
Roundabout Circulatory Offside Lane	13.7	0	20.7	1
Roundabout Circulatory Nearside Lane	42.5	1	75.5	4
A120 (East)	68.5	5	88.6	10 (5 per lane)

12.9 The above table confirms that the signalised node of the Parkeston roundabout will operate satisfactorily with the proposed improvements in place with queues well within the available storage space on both the circulatory and the A120 (east) approaches.

12.10 The findings from the TRANSYT assessment are as follows:-

A120/Parkeston Roundabout: TRANSYT Model of Signal Controlled A120 (East) Entry: 2022 With Development

Approach	AM Peak (30s Cycle Time)		PM Peak (33s Cycle Time)	
	Degree of Saturation (%)	**Max Queue (pcu)**	**Degree of Saturation (%)**	**Max Queue (pcu)**
Roundabout Circulatory Offside Lane	12	1	18	1
Roundabout Circulatory Nearside Lane	38	2	66	4
A120 East	66	7	87	14 (7 per lane)
Parkeston Road	70	5	57	3

12.11 The above table confirms that the signalised node of the Parkeston roundabout will operate satisfactorily with the proposed improvements in place with queues well within the available storage space on both the circulatory and the A120 (east) approaches.

12.12 Both the LINSIG and TRANSYT-based analyses confirm that the Parkeston roundabout will operate satisfactorily with the proposed improvements in place, with all approaches operating within capacity and no queues exceeding the available storage lengths.

Pelican Crossing

12.13 Appendix O also presents a LINSIG assessment of the performance of the pelican crossing on the A120 (east) exit from the roundabout. The LINSIG assessment demonstrates that, so long as cycle times are above 41 seconds and 52 seconds in the AM and PM peaks, respectively, the queues at the pelican will, on average, not exceed 5pcu and will not therefore block back over Europa Way. Such cycle times can be ensured by setting the minimum green times for the traffic phase to 24 seconds and 35 seconds, respectively.

12.14 The equivalent cycle times in the no development case during the AM and PM peak hours are 37 seconds and 30 seconds, respectively. The maximum increase in delay for pedestrians will therefore be 22 seconds in the PM peak hour. The increase in delay in the AM peak hour will be 4 seconds. Such increases in delay only involve those pedestrians who arrive at the crossing at the end of the green man aspect. On most occasions, pedestrian delays will be shorter. The cycle times associated with the pelican crossing are greater than those associated with the signalised node, which could result in a build-up of pedestrians on the splitter island. However, the proposed improvements increase the stagger distance between the pedestrian crossings on the A120 (east) eastbound and westbound arms of the junction and therefore increase the storage space for pedestrians on the splitter island.

13. A120/CHURCH HILL/MAIN ROAD "RAMSEY BRIDGE" ROUNDABOUT

13.1 This junction is shown on Figure 7. Appendix P presents the assessment of the performance of this junction in the year 2022 with the proposed development in place. ARCADY5 software has been used in the capacity assessment. The findings for the most demanding cases in the AM and PM peak periods are summarised as follows:-

Highway Assessment Findings: A120 Ramsey Bridge Roundabout Year 2022 With Development

Approach	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
A120 (east)	0.627	1.7	0.860	5.5
Church Hill	0.526	1.1	0.329	0.5
A120 (west)	0.700	2.3	1.068	54.5
Main Road	0.254	0.2	0.712	2.3

13.2 The junction demonstrates RFCs of in excess of 0.85 in the assessment year on the A120 approaches in the development PM peak case. Modification of the junction is therefore proposed, as shown on Figure 8. An assessment of the performance of the modified roundabout in the 2022 assessment year with the proposed improvements in place is presented in Appendix P. The findings are as follows:-

Highway Assessment Findings: Modified A120 Ramsey Bridge Roundabout Year 2022 With Development

Approach	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
A120 (east)	0.423	0.7	0.565	1.3
Church Hill	0.650	1.8	0.406	0.7
A120 (west)	0.514	1.1	0.782	5.6
Main Road	0.216	0.3	0.630	1.3

13.3 The modified junction would operate satisfactorily in the assessment year with the proposed improvement in place.

14. A120/HARWICH ROAD JUNCTION, WIX

14.1 This junction is shown on Figure 9. Appendix Q presents the assessment of the performance of this junction in the year 2022 with the proposed development in place. PICADY4 software has been used for this capacity assessment. The findings for the most demanding cases in the AM and PM peak periods are summarised as follows:-

Highway Assessment Findings: A120/Harwich Road, Wix Ghost Island Junction: Year 2022 With Development

Approach	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
Left Turn into A120	0.113	0.1	0.891	2.3
Right Turn into A120	0.261	0.4	1.109	6.1
Right Turn into Harwich Road	0.052	0.1	0.069	0.1

14.2 An RFC of 1.109 is predicted for the Harwich Road approach to the junction during the evening peak period for the 2022 assessment including development traffic. This RFC is exceeds the practical capacity threshold of 0.85 and therefore mitigation is required to improve capacity at this junction

14.3 Improvements are necessary at this junction as shown on Figure 10 and involve upgrading the junction from a 'ghost-island' priority junction to a junction incorporating single lane dualling. Single lane dualling enables vehicles turning right out of Harwich Road to safely wait for gaps in eastbound traffic in the central reserve rather than seek simultaneous gaps in both the westbound and eastbound traffic streams as is required for the 'ghost-island' layout.

14.4 Appendix Q presents an assessment of the performance of the modified junction in the 2022 assessment year with the proposed development in place. The findings from the PICADY4 assessment are as follows:-

Highway Assessment Findings: A120/Harwich Road, Wix Junction with Single Lane Dualling: Year 2022 With Development

Approach	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
Left Turn into A120	0.151	0.2	0.052	0.1
Right Turn into A120	0.230	0.3	0.279	0.4
Right Turn into Harwich Road	0.069	0.1	0.065	0.1

14.5 The PICADY4 results demonstrate that the modified junction would operate satisfactorily in the assessment year with the proposed development in place.

14.6 Chapter 21 of this report identifies that link capacity improvements are required along this stretch of the A120. This junction will therefore be improved as part of the link capacity mitigation scheme.

15. A120/COLCHESTER ROAD JUNCTION, WIX

15.1 This junction is shown on Figure 11. Appendix R presents the assessment of the performance of this junction in the year 2022 with the proposed development in place. PICADY4 software has been used in the assessment. The findings for the most demanding cases in the AM and PM peak periods are summarised as follows:-

Highway Assessment Findings: A120/Colchester Road, Wix Ghost Island Junction: Year 2022 With Development

	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
Location				
Left Turn from Colchester Road	0.262	0.4	0.129	0.1
Right Turn from Colchester Road	0.000	0.0	0.000	0.0
Right Turn into Colchester Road	0.138	0.2	0.240	0.3

15.2 With RFCs significantly lower than 0.85 for both the morning and evening peak periods the A120/Colchester Road junction is expected to operate within capacity for the 2022 with development scenario. No mitigation is therefore required in this location.

15.3 Chapter 21 of this report identifies that link capacity improvements are required along this stretch of the A120. This junction will therefore be modified as part of the link capacity mitigation scheme.

15.4 Appendix R therefore presents a PICADY4 assessment using typical geometric parameters for the junction with a wide single carriageway link capacity mitigation scheme in place. The results are summarised as follows:-

Highway Assessment Findings: A120/Colchester Road, Wix Ghost Island Junction: Typical Geometry with the Link Capacity Mitigation Measures in Place, Year 2022 With Development

	Results of Analysis			
	AM Peak		PM Peak	
Location	Max RFC	Max Queue	Max RFC	Max Queue
Left Turn from Colchester Road	0.263	0.4	0.129	0.1
Right Turn from Colchester Road	0.000	0.0	0.000	0.0
Right Turn into Colchester Road	0.130	0.1	0.225	0.3

15.5 The PICADY4 results demonstrate that the modified junction would operate satisfactorily in the assessment year with the proposed development in place and that a junction of this form would be appropriate, in capacity terms, with the proposed link capacity mitigation measures in place.

16. **A120/B1035 "HORSLEY CROSS" ROUNDABOUT**

16.1 This junction is shown on Figure 12. Appendix S presents the assessment of the performance of this junction in the year 2022 with the proposed development in place. The standard ARCADY5 software is used in the assessment. The findings for the most demanding cases in the AM and PM peak periods are summarised as follows:-

Highway Assessment Findings: A120/B1035 "Horsley Cross " Roundabout Year 2022 With Development

Approach	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
A120 (east)	0.718	2.5	0.545	1.2
B1035	0.538	1.1	0.370	0.6
A120 (west)	0.459	0.8	0.768	3.2
Clacton Road	0.387	0.6	0.800	3.7

16.2 The ARCADY5 results demonstrate that the A120/B1035 "Horsley Cross" roundabout would operate within capacity at the assessment year of 2022 with development traffic included. No mitigation is therefore required at this location.

17. A120/LITTLE BENTLEY/BENTLEY ROAD JUNCTION

17.1 This junction is shown on Figure 13. Appendix T presents an assessment of the performance of this right-to-left staggered junction in the 2022 assessment year with the proposed development in place. PICADY4 software has been used in the capacity assessment for this junction. The findings are as follows:-

Highway Assessment Findings: A120/Little Bentley/Bentley Road Junction: Year 2022 With Development

Location	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
Right Turn from Little Bentley	0.206	0.3	0.175	0.2
Right Turn into Little Bentley	0.002	0.0	0.018	0.0
Left Turn from Little Bentley	0.029	0.0	0.019	0.0
Right Turn from Bentley Road	0.159	0.2	0.308	0.4
Right Turn into Bentley Road	0.026	0.0	0.031	0.0
Left Turn from Bentley Road	0.015	0.0	0.025	0.0

17.2 With RFCs well below 0.85 for both the morning and evening peak periods the A120/Little Bentley/Bentley Road junction is expected to operate within capacity for the 2022 with development scenario. No mitigation is therefore required in this location.

18. A120/PARK ROAD/HARWICH ROAD JUNCTION

18.1 This junction is shown on Figure 14. Appendix U presents an assesssment of the performance of this right-to-left staggered junction in the 2022 assessment year with the proposed development in place. PICADY4 software has been used in the assessment. The findings are as follows:-

Highway Assessment Findings: A120/Park Road/Harwich Road Junction: Year 2022 With Development

Location	Results of Analysis			
	AM Peak		PM Peak	
	Max RFC	Max Queue	Max RFC	Max Queue
Right-turn from Harwich Road	0.644	1.7	0.447	0.8
Left-turn from Harwich Road	0.436	0.8	0.046	0.0
Right Turn into Harwich Road	0.027	0.0	0.141	0.2
Right-turn from Park Road	0.013	0.0	0.016	0.0
Left-turn from Park Road	0.002	0.0	0.003	0.0
Right Turn into Park Road	0.007	0.0	0.000	0.0

18.2 With RFCs well below 0.85 for both the morning and evening peak periods the A120/Park Road/Harwich Road junction is expected to operate within capacity for the 2022 with development scenario. No mitigation is therefore required in this location.

19. A120/A133 JUNCTION

19.1 The grade separated limited move A120/A133 junction is shown on Figure 15.

19.2 Appendix V presents an assessment of the A120/A133 merge and diverge facilities at the junction using the method set out in National Design Standard TD 22/92 "Layout of Grade Separated Junctions". The cases tested are the AM and PM with and without development cases for the assessment year of 2022. The findings are summarised as follows:-

A120/A133 Merge and Diverge Facilities, Year 2022

Facility	**Period**	**Form of Facility (TD 22/92 merge/diverge type)**		
		Without Development	**With Development**	**Currently Available**
Diverge	AM	Type A	Type A	Type A
	PM	Type B	Type B	Type A
Merge	AM	Type B/E	Type B/E	Type A
	PM	Type B	Type B	Type A

19.3 The traffic associated with the proposed development does not require any changes to be made to the merge and diverge facilities at the A120/A133 junction.

20. A120/A1232/A12 CROWN JUNCTION, COLCHESTER

20.1 This junction consists of:-

i) A grade-separated roundabout (A120/A1232) beneath which the A120 mainline passes, and associated slip roads to and from the A120 mainline east and west of the roundabout (Figure 16). The HA have signalised the A120(E) approach to this junction. Scheme drawings for this improvement are presented in Appendix W.

ii) A merge and a diverge at the junction of the A120 and the A12 to the west of the grade-separated roundabout (Figure 17).

iii) A merge and a diverge at the junction of the A1232 and the A12 to the north of the grade-separated roundabout (Figure 18).

Modelling Methodologies

20.2 Only one node on the roundabout is signal controlled. The following methods of capacity assessment are therefore adopted:-

i) LINSIG software is used to model the signalised node. This approach is in accordance with the approach taken by Atkins on behalf of the HA who have reviewed the signalisation options for this roundabout. The priority controlled approaches to the roundabout have been modelled using ARCADY5. However, the signalisation results in an increase in capacity of the A120 east arm of the junction for given geometric parameters. This in turn releases more vehicles onto the circulatory carriageway and increases the circulatory flow past the other three arms. In order to represent this in the ARCADY5 model of the junction, the geometric parameters of the A120 east arm are adjusted so that this approach will have the same average capacity over the peak hour as that for the A120 east arm as determined by the LINSIG assessment. In this way, the effect of the signalisation of the A120 east arm on the rest of the junction can be modelled.

ii) TRANSYT software is used to model the signalised node and the A1232 Ipswich Road and A120 (west) arms of the roundabout, in accordance with advice from TRL (copy of the relevant TRL advice is presented in Appendix O). This is because the partial signalisation of the A120 East arm will have an effect on the capacity of the A1232 arm of the roundabout. A significant proportion of traffic from the signalised A120 (east) arm is destined for the A12 (north) arm. The partial signalisation of the roundabout will therefore also have an effect on the capacity of the A120 (west). However, the A12 (north) arm of the roundabout will be unaffected by the partial signalisation and hence the output from the ARCADY5 model referred to in section 20.2 i) above is applicable to this arm of the roundabout.

2022 No Development Case

20.3 The results of the LINSIG assessment are presented below:-

LINSIG Results for the HA Signalisation of the A120 East Exit Slip Road – 2022 No Development Case

Link	Degree of Saturation (%)	Queue (pcu)
AM Peak – 120s Cycle Time		
A120 East Exit Slip Road Nearside Lane	113.4	45
A120 East Exit Slip Road Offside Lane	44.9	6
Circulatory Nearside Lane	112.8	62
Circulatory Offside Lane	96.2	24
PM Peak – 120s Cycle Time		
A120 East Exit Slip Road Nearside Lane	58.8	7
A120 East Exit Slip Road Offside Lane	85.0	12
Circulatory Nearside Lane	85.6	15
Circulatory Offside Lane	35.6	6

20.4 The above table demonstrates that the degree of saturation values for three of the approach lanes to the signalised node exceed the normal threshold value of 90% during the AM peak hour. Furthermore, the queue on the nearside lane of the circulatory will exceed the queue stacking area and block back over the A120 east exit slip road. The signalised node would operate satisfactorily during the PM peak hour.

20.5 The results of the ARCADY5 assessment for the Crown junction in the 2022 no development case are as follows:-

ARCADY Results for the Crown Junction – 2022 No Development Case

	Results of ARCADY Analysis			
	AM Peak		PM Peak	
Arm	**Max RFC**	**Max Queue**	**Max RFC**	**Max Queue**
A120 East	N/A	N/A	N/A	N/A
A1232 Ipswich Road	1.944	489.0	1.098	105.2
A120 West	0.441	0.8	0.943	10.5
A12	0.898	8.0	1.188	111.4

20.6 The above table demonstrates that the maximum RFC values for all movements exceed the normal threshold value of 0.85.

20.7 The results from the TRANSYT assessment are summarised as follows:-

TRANSYT Results for the HA Signalisation of the A120 East Exit Slip Road – 2022 No Development Case

Link	Degree of Saturation (%)	Queue (pcu)
AM Peak – 120s Cycle Time		
A120 East Exit Slip Road Nearside Lane	158	172
A120 East Exit Slip Road Offside Lane	63	10
Circulatory Nearside Lane	93	40
Circulatory Offside Lane	80	26
B1232 Ipswich Road	113	167
A120 West	50	1
PM Peak – 79s Cycle Time		
A120 East Exit Slip Road Nearside Lane	66	7
A120 East Exit Slip Road Offside Lane	88	12
Circulatory Nearside Lane	90	24
Circulatory Offside Lane	37	5
B1232 Ipswich Road	97	52
A120 West	86	7

20.8 The above table demonstrates that the degree of saturation values for two of the approach lanes to the signalised node exceed the normal threshold value of 90% during the AM peak hour. The signalised node would operate satisfactorily during the PM peak hour. The B1232 approach has a degree of saturation in excess of its practical capacity during both peak hours.

20.9 Both the LINSIG and TRANSYT-based analyses confirm that the Crown junction will operate over capacity during both the AM and PM peak hours without the proposed development in place.

2022 With Development Case

20.10 The findings of the LINSIG analysis for the HA signalisation in the 2022 with development case are as follows:-

LINSIG Results for the HA Signalisation of the A120 East Exit Slip Road – 2022 With Development Case

Link	Degree of Saturation (%)	Queue (pcu)
AM Local Peak – 120s Cycle Time		
A120 East Exit Slip Road Nearside Lane	113.7	46
A120 East Exit Slip Road Offside Lane	47.9	7
Circulatory Nearside Lane	112.8	62
Circulatory Offside Lane	96.2	24
PM Local Peak – 120s Cycle Time		
A120 East Exit Slip Road Nearside Lane	53.8	7
A120 East Exit Slip Road Offside Lane	91.4	16
Circulatory Nearside Lane	90.4	18
Circulatory Offside Lane	37.6	6

20.11 The above table demonstrates that the degree of saturation values for three of the approach lanes to the signalised node exceed the normal 90% threshold value during the AM peak hour. The degree of saturation for the nearside lane of the circulatory carriageway also exceeds this threshold value during the PM peak hour.

20.12 The results of the ARCADY5 assessment for the Crown junction in the 2022 with development case are as follows:-

ARCADY Results for the Crown Junction – 2022 With Development Case

	Results of ARCADY Analysis			
	AM Peak		PM Peak	
Arm	**Max RFC**	**Max Queue**	**Max RFC**	**Max Queue**
A120 East	N/A	N/A	N/A	N/A
A1232 Ipswich Road	2.057	510.6	1.150	147.7
A120 West	0.439	0.8	0.939	12.4
A12	0.912	9.4	1.216	130.3

20.13 The above table demonstrates that the maximum RFC values for all movements exceed the normal threshold value of 0.85 during either the AM or PM peak hours and that predicted queue lengths are significantly longer as a result of the proposed development.

20.14 The TRANSYT analysis is summarised as follows:-

TRANSYT Results for the HA Signalisation of the A120 East Exit Slip Road – 2022 With Development Case

Link	Degree of Saturation (%)	Queue (pcu)
AM Peak – 120s Cycle Time		
A120 East Exit Slip Road Nearside Lane	169	184
A120 East Exit Slip Road Offside Lane	71	11
Circulatory Nearside Lane	91	37
Circulatory Offside Lane	77	25
B1232 Ipswich Road	113	178
A120 West	51	1
PM Peak – 120s Cycle Time		
A120 East Exit Slip Road Nearside Lane	57	8
A120 East Exit Slip Road Offside Lane	90	34
Circulatory Nearside Lane	89	19
Circulatory Offside Lane	37	9
B1232 Ipswich Road	102	107
A120 West	92	16

20.15 The above table demonstrates that the degree of saturation values for two of the approach lanes to the signalised node exceed the normal 90% threshold value during the AM peak hour. The signalised node operates satisfactorily during the PM peak hour. Capacity is also exceeded on the B1232 and A120 (west) arms of the roundabout and queues are significantly longer as a result of the proposed development.

20.16 Both the LINSIG and TRANSYT-based assessments confirm that the Crown junction will operate overcapacity in the 2022 assessment year with the proposed development

in place. The proposed development will also give rise to significant increases in queue lengths when compared to the "no development" case.

Possible Improvements

20.17 An improvement has been sought that seeks to achieve at least nil-detriment in accordance with DTLR Circular 4/2001. Figure 19 identifies an improvement that comprises lane widening and road marking improvements, as follows:-

i) A120 east - widening to 3 lanes;

ii) Minor geometric changes to the A120 west approach;

ii) A1232 south - widening to 3 lanes plus exit widening;

iii) A1232 north - widening to 3 lanes.

20.18 The findings of the LINSIG analysis for the possible improvements shown on Figure 19 in the 2022 with development case are presented in the table below:-

LINSIG Results for the Possible Improvements – 2022 With Development Case

Link	Degree of Saturation (%)	Queue (pcu)
AM Peak – 120s Cycle Time		
A120 East Exit Slip Road Nearside Lane	37.3	4
A120 East Exit Slip Road Centre Lane	97.0	21
A120 East Exit Slip Road Offside Lane	57.2	8
Circulatory Nearside Lane	96.6	25
Circulatory Offside Lane	77.0	13
PM Peak – 120s Cycle Time		
A120 East Exit Slip Road Nearside Lane	36.7	4
A120 East Exit Slip Road Centre Lane	16.9	2
A120 East Exit Slip Road Offside Lane	87.8	14
Circulatory Nearside Lane	88.7	17
Circulatory Offside Lane	34.5	6

20.19 By comparing the above table with that in paragraph 20.3, it can be seen that the proposed improvements will give rise to a significant betterment over the existing signalised node during the AM peak, operating with significantly shorter queues than in the no development case. During the PM peak hour, the proposed improvements will allow the junction to operate within capacity. The possible improvements also represent an improvement in performance of the signalised node when compared to the HA signalisation scheme and will therefore provide a net benefit.

20.20 The results of the ARCADY assessment for the possible improvements to the Crown junction shown on Figure 19 in the 2022 with development case are as follows:-

ARCADY Results for the Crown Junction – 2022 With Development Case

	Results of ARCADY Analysis			
	AM Peak		PM Peak	
Arm	**Max RFC**	**Max Queue**	**Max RFC**	**Max Queue**
A120 East	N/A	N/A	N/A	N/A
A1232 Ipswich Road	1.656	333.0	0.965	18.1
A120 West	0.392	0.6	0.814	3.6
A12	0.742	2.9	0.999	23.1

20.21 The above table, in comparison with that in section 20.5, demonstrates, overall, a significant betterment over the existing junction with approaches operating below the normal RFC threshold of 0.85 or with significantly shorter queues than in the no development case.

20.22 The findings of the TRANSYT assessment are as follows:-

TRANSYT Results for the Possible Improvements – 2022 With Development Case

Link	Degree of Saturation (%)	Queue (pcu)
AM Peak – 120s Cycle Time		
A120 East Exit Slip Road Nearside Lane	36	5
A120 East Exit Slip Centre Lane	94	24
A120 East Exit Slip Road Offside Lane	56	10
Circulatory	91	68 (34 per lane)
B1232 Ipswich Road	107	115
A120 West	43	0
PM Peak – 42s Cycle Time		
A120 East Exit Slip Road Nearside Lane	39	2
A120 East Exit Slip Centre Lane	20	1
A120 East Exit Slip Road Offside Lane	88	9
Circulatory	88	20 (10 per lane)
B1232 Ipswich Road	86	16
A120 West	71	5

20.23 By comparing the above table with that in section 20.7, it can be seen that the proposed improvements will give rise to a significant betterment over the existing signalised node and the B1232 Ipswich Road and A120 West arms, operating with significantly shorter queues than in the no development case. The possible improvements also represent an improvement in performance of the signalised node when compared to the HA signalisation scheme and will therefore provide a net benefit.

20.24 Both the LINSIG and TRANSYT-based analyses of the possible improvements to the Crown junction confirm that the possible improvements will give rise to a significant betterment over the "no development" case.

Merges and Diverges

20.25 Appendix W presents assessments of the following merges and diverges at the junction using the method set out in National Design Standard TD22/92. The cases tested are the worst hour 2022 assessment year flows with and without the proposed development. The merges and diverges tested are as follows:-

i) A120 on- and off-slips east of the A120/A1232 rotary.

ii) A120 on- and off-slips west of the A120/A1232 rotary.

iii) A120 on- and off-slips at the A12 east of the rotary.

iv) A1232 on- and off-slips at the A12 north of the rotary.

20.26 The finding is that no change to the merge and diverge facilities will be necessary as a result of the proposed development.

21. LINK CAPACITY

Theory

21.1 Departmental Advice Note TA 46/97 defines the congestion reference flow (CRF) of a link as an estimate of the annual average daily traffic (AADT) flow at which the carriageway is likely to be congested.

21.2 The CRF of a link is given by the following formula (TA 46/97):-

$$CRF = CAP \times N_L \times W_f \times (100/PkF) \times (100/PkD) \times (AADT/AAWT)$$

where, CAP is the maximum hourly lane throughput, as defined in TA 46/97;

N_L is the number of lanes per direction;

W_f is a width factor;

PkF is the proportion of the total daily flow (2-way) that occurs in the peak hour;

PkD is the directional split (percentage) of the peak hour flow;

AADT is the annual average daily traffic flow on the link;

AAWT is the annual average weekday traffic flow on the link.

21.3 The ratio of AADT flow to CRF (RFC_{crf}) for a link can therefore be estimated if the AADT flow on that link is known. However, base AADT data is only available for the link between the Ramsey Bridge roundabout and Harwich Road junction at Wix. In order to eliminate errors caused by factoring peak hour counts to AADT flows, HSL derived the following relationship to estimate the RFC_{crf} for a link from flows during the busiest peak hour period:-

$$RFC_{crf} = F_1/(CAP \times N_L \times W_f)$$

where F_1 is the peak hour flow in the busiest direction.

21.4 A technical note, "Derivation of Ratio of Flow to Congestion Reference Flow (CRF)", which details the derivation of the above formula, is presented in Appendix X.

Link Capacity Assessment

21.5 A spreadsheet was produced to estimate the RFC_{crf} for each link on the A120 between the proposed site access roundabout and the Crown junction in each year from 2003 to the 2031. Appendix X presents printouts of the spreadsheet and a note titled "Link Capacity Spreadsheet Explanatory Note", which explains the methodology and function of each page in the spreadsheet.

21.6 The detailed results of the link capacity assessment are presented in Appendix X. In the “no development” case, the AADT is not predicted to exceed CRF on any of the links considered.

21.7 The key results for the “with development” case are summarised as follows:-

RFC_{crf} for the A120 Between the Harwich Road Junction, Wix and the Crown Junction in the 2022 Assessment Year

Link	Standard	RFC_{crf} in 2022	Year in which AADT exceeds CRF
Crown junction to Hare Green junction	Dual carriageway	67.2	Beyond 2022
Hare Green junction to Park Road junction	Dual carriageway	32.6	Beyond 2022
Park Road junction to Little Bentley junction	Dual carriageway	34.4	Beyond 2022
Park Road junction to Little Bentley junction	7.1m single carriageway	112.8	2012
Little Bentley junction to Horsley Cross roundabout	Dual carriageway	33.3	Beyond 2022
Little Bentley junction to Horsley Cross roundabout	7.6m single carriageway	99.8	Beyond 2022
Horsley Cross roundabout to Colchester Road junction, Wix	Dual carriageway	34.3	Beyond 2022
Horsley Cross roundabout to Colchester Road junction, Wix	6.8m single carriageway	117.4	2011
Colchester Road junction, Wix to Harwich Road junction, Wix	6.7m single carriageway	112.6	2013
Harwich Road junction, Wix to Ramsey Bridge roundabout	Dual carriageway	34.5	Beyond 2022
Harwich Road junction, Wix to Ramsey Bridge roundabout	6.9m single carriageway	117.6	2011
Ramsey Bridge roundabout to Parkeston roundabout	Dual carriageway	23.9	Beyond 2022
Ramsey Bridge roundabout to Parkeston roundabout	7.6m single carriageway	99.3	Beyond 2022
Parkeston roundabout to Safeway roundabout	7.3m single carriageway	94.9	Beyond 2022
Safeway roundabout to Port Access roundabout	7.3m single carriageway	50.2	Beyond 2022

21.8 The above table confirms that the AADT will exceed CRF on a number of links to the west of the Ramsey Bridge roundabout in the 2022 assessment year. AADT will not

exceed CRF to the east of the Ramsey Bridge roundabout in the 2022 assessment year.

Proposed Improvements

21.9 In order to mitigate the effect of the proposed development on link capacity on the A120, it is proposed to upgrade the above sections of the A120 as follows:-

i) Park Road junction to Little Bentley junction – upgrade the existing single carriageway section to dual 2-lane carriageway (D2) standard, in order to maintain route continuity. However, a 10m wide single carriageway (WS2) would address the capacity issue on this link.

ii) In order to maintain route continuity on the section of the A120 between the Hare Green junction and the Horsley Cross roundabout, it is proposed to upgrade the existing single carriageway section between the Little Bentley junction and the Horsley Cross roundabout to 2-lane dual carriageway (D2) standard, even though the AADT will not exceed CRF on this link until after the 2022 assessment year.

iii) Horsley Cross roundabout to Colchester Road junction, Wix - upgrade the existing single carriageway to at least 10m wide single carriageway (WS2) standard.

iv) Colchester Road junction, Wix to Harwich Road junction, Wix - upgrade the existing single carriageway to at least WS2 standard.

v) Harwich Road junction, Wix to Ramsey Bridge Roundabout - upgrade the existing single carriageway to at least WS2 standard.

21.10 With the proposed improvements, the RFC_{crf} values on the over-capacity links upon which improvements are proposed, as summarised in sections 21.9 i) to v) above, in the 2022 assessment year are as follows:-

RFC_{crf} with Proposed A120 Improvements in 2022 Assessment Year

Link	Proposed Standard	RFC_{crf} in 2022 Assessment Year (%)
Park Road junction to Little Bentley junction	D2	34.4
Little Bentley junction to Horsley Cross roundabout	D2	33.3
Horsley Cross roundabout to Colchester Road junction, Wix	WS2	74.0
Colchester Road junction, Wix to Harwich Road junction, Wix	WS2	69.4
Harwich Road junction, Wix to Ramsey Bridge Roundabout	WS2	74.9

21.11 The above table confirms that, with the proposed improvements to the A120 in place, AADT will not exceed CRF in the 2022 assessment year.

Road Safety

21.12 Chapter 3 of this report considered accident rates on links in the TIA study area and found that, in general, the accident rate on the A120 is lower than would be expected for a road of similar standard. The mitigation measures proposed in this chapter will further enhance road safety on the A120. For example, the proposed dualling between Hare Green and Horsley Cross will be safer than the existing single carriageway sections and the proposed WS2 between the Ramsey Bridge roundabout and the Horsley Cross roundabout will be built to modern standards and will therefore be safer than the existing substandard single carriageway sections.

22. HIGHWAY ASSESSMENT: SUMMARY

Junction Assessments

22.1 The performance of the study location junctions has been assessed on the basis of year 2022 estimated traffic flows with the proposed development in place and, where appropriate, additional cases without development.

22.2 The assessment cases considered are robust in the following respects:-

i) Base flows are factored to highest month flows (August).

ii) All development-related HGV flows are assigned to the A120 west of the site.

iii) A robust figure for development-related HGV traffic generation is adopted.

22.3 Mitigation measures are considered to be necessary at the following locations:-

i) A120/Parkeston Road roundabout. Measures are proposed at this junction as shown on Figure 6 to accommodate the additional traffic arising from the proposed development.

ii) A120/Church Hill/Main Road "Ramsey Bridge" roundabout. Measures are proposed at this junction as shown on Figure 8 to accommodate the additional traffic arising from the proposed development.

iii) A120/Harwich Road junction, Wix. Measures are proposed at this junction as shown on Figure 10 to accommodate the additional traffic arising from the proposed development.

iv) A120/A1232/A12 Crown junction. Measures are proposed at this junction as shown on Figure 19 to accommodate the additional traffic arising from the proposed development.

Link Capacity Assessments

22.4 The performance of the A120 links in the TIA study area has been assessed on the basis of year 2022 estimated traffic flows with the proposed development in place.

22.5 Mitigation measures are considered to be necessary on the following links:-

i) Park Road junction to Little Bentley junction. Measures are proposed to upgrade the existing single carriageway section to 2-lane dual carriageway (D2) standard.

ii) Little Bentley junction to Horsley Cross roundabout. Measures are proposed to upgrade the existing single carriageway section to D2 standard in order to maintain route continuity on the section of the A120 between the Hare Green junction and the Horsley Cross roundabout.

iii) Horsley Cross roundabout to Colchester Road junction, Wix. Measures are proposed to upgrade the existing single carriageway section to at least 10m wide single carriageway (WS2) standard.

iv) Colchester Road junction, Wix to Harwich Road junction, Wix. Measures are proposed to upgrade the existing single carriageway section to at least WS2 standard.

v) Harwich Road junction, Wix to Ramsey Bridge Roundabout. Measures are proposed to upgrade the existing single carriageway section to at least WS2 standard.

23. EMPLOYEE PARKING

23.1 The proposed travel plan sets a target for car driver travel to work mode share of 60%.

23.2 Each shift will include 192 employees.

23.3 The shift pattern is as follows:-

i) 0700 to 1900

iii) 1900 to 0700.

23.4 At each shift changeover time, there will be parked on site the cars driven by newly-arrived employees about to start work and the cars driven by employees about to leave the site having worked. At this time the employee parking demand within the proposed travel plan will be maximised and will be equal to:-

192 x 2 x 60% = 230 spaces.

23.5 230 parking spaces are therefore proposed to be provided on the site.

24. SUMMARY AND CONCLUSIONS

24.1 Junctions at which the impact of the proposed development should be tested have been agreed with the HA and ECC. There are 12 such junctions.

24.2 The performance of these locations has been assessed in the 2022 assessment year with the proposed development in place during the AM and PM highway peak hours.

24.3 At 8 of the study junctions no alteration to the highway will be necessary as a result of the proposed development.

24.4 At 4 of the study junctions means by which the highway impact of the proposed development may be addressed have been identified.

24.5 The link capacity of the A120 contained within the TIA study area has been assessed with the proposed development in place. Mitigation measures are necessary to address link capacity issues between the Ramsey Bridge roundabout and the existing dual carriageway section at Hare Green.

24.6 The level of car parking provision at the site necessary to provide for employee travel has been identified.

24.7 Subject to the adoption of the measures recommended in this TIA the development will have no materially detrimental impact on highway conditions.

HSL
27 May 2004

HUTCHISON PORTS (UK) LIMITED
BATHSIDE BAY DEVELOPMENT, HARWICH

FIGURES AND APPENDICES (A TO I ONLY) TO
TRAFFIC IMPACT ASSESSMENT
MAY 2004

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