15 TRAFFIC AND TRANSPORT

15.1 INTRODUCTION

15.1.1 This chapter provides a summary of the direct impacts resulting from road traffic generated by AMEP. A Transport Assessment (TA) has also been prepared, which provides a more detailed assessment of the traffic impacts of the proposed development. The TA is provided in *Annex 15.1.* A Travel Plan has also been prepared for the site, which is provided in *Annex 15.2.*

15.1.2 The significance of the road traffic impacts have been assessed independently for the AMEP site and for the Compensation Site. Traffic impacts relating to the Compensation Site are reported in Volume 2.

15.1.3 In this chapter, traffic impacts due to AMEP as well as other proposed developments in the area have been assessed. Appropriate mitigation measures have been devised, dependent on the significance of these impacts. Finally an assessment of the residual impacts after mitigation has been undertaken.

15.1.4 The main methodology of the assessment within the EIA is to:

- identify the routes that traffic generated by all phases of the development will take when arriving at and departing from the site;
- estimate likely traffic volumes; and
- provide an assessment of the resultant environmental impacts for the construction and operational phases of the proposed development.

15.1.5 This chapter also assess the impact of the development on rail traffic and on pedestrians and cyclists.

15.2 LEGISLATION, POLICY AND GUIDANCE

15.2.1 There are several national and Local Plan policies that are relevant to the assessment of traffic impact. These are summarised here.

Planning Policy Guidance/Statements

Department for Communities and Local Government (2011), 'Planning Policy Statement 13: Transport'

15.2.2 *PPS 13* aims to integrate transport and planning over all levels to support sustainable transport solutions for people and freight travel. This policy was first published in March 2001, but has recently been updated in January 2011. The policy is designed to influence development to reduce the need to travel long distances by making effective use of local resources in terms of jobs, leisure facilities and housing. It proposes encouraging land use that makes walking, cycling and public transport more effective and efficient.

15.2.3 The three main objectives to *PPS 13* are to:

- promote more sustainable transport choices for both people and for moving freight;
- promote accessibility to jobs, shopping, leisure facilities and services by public transport, walking and cycling; and
- reduce the need to travel, especially by car.

National Policy Statements

15.2.4 The NPS for Ports states that,

> *'If a project is likely to have significant transport implications, the applicant's ES should include a transport assessment…..*
>
> *Applicants should consult the Highways Agency and/or the relevant highway authority, as appropriate, on the assessment and mitigation. The assessment should distinguish between the construction, operation and decommissioning project stages as appropriate.*
>
> *Where appropriate, the applicant should prepare a travel plan, including demand management measures to mitigate transport impacts. The applicant should also provide details of proposed measures to improve access by public transport, walking and cycling, to reduce the need for parking associated with the proposal and to mitigate transport impacts.'*

15.2.5 Broadly speaking, however, the NPS promotes the use of rail and coastal or inland shipping over road transport.

15.2.6 The decision maker is advised that,

> *'(s)ubject to requirements imposed and/or provided that the applicant is willing to enter into planning obligations which mitigate transport impacts, with attribution of costs calculated in accordance with the Department's guidance, then development consent should not be withheld, and limited weight should be applied to residual effects'.*

15.2.7 Such obligations or requirements are recommended to be structured flexibly so as to keep to a reasonable minimum the risk that either applicants or network providers incur costs providing infrastructure that turns out to be under-used.

Local Plan Policy

North Lincolnshire Council Local Plan

15.2.8 The general objectives in the *Local Plan* that refer to development and transport issues are to:

- facilitate urban and rural regeneration, making optimum use of derelict and under-used sites;
- allocate land for a range of house types, including an adequate supply of affordable housing;
- promote economic prosperity, achieve a competitive position in national and international markets and create sustainable employment by allocating appropriate sites for commercial and industrial development; and
- maximise the opportunities for walking, cycling and public transport and to reduce the need to travel, particularly by private car.

15.2.9 The *Local Plan* hopes to achieve these objectives by:

- encouraging industrial developers to make use of rail, water and air freight, and development at sites identified in the *Local Plan* served by these modes will be supported;
- ensuring that jobs, shopping, leisure and services are highly accessible by public transport, walking and cycling;

- including cycle links with existing or proposed routes where such opportunity exists and ensuring a provision of cycle parking facilities;

- improving the local rail network, including new and existing railway stations and the upgrading of existing railway lines;

- making provisions for new areas of development to be located and designed to allow convenient access by bus and train; and

- establishing the North Lincolnshire Strategic Road Network (NLSRN), which is designed to:
  - create priority routes for through traffic;
  - remove through traffic from town centres;
  - accommodate large volumes of local traffic;
  - encourage, protect and enhance the environment; and
  - protect the regional policy of favouring freight movement, at the expense of commuting, for those freight movements which cannot transfer to rail or water–borne modes.

15.2.10 The *Local Plan* also recognises that in certain areas the car will continue to be the main mode of travel but hopes to enhance the rural bus network.

15.2.11 Policy **T1:** The site is listed as one where development proposals which generate a significant volume of traffic movement will be permitted.

Other

Institute of Environmental Management and Assessment (1993), Guidance Notes No. 1: Guidelines for the Environmental Assessment of Road Traffic

15.2.12 The environmental impact of traffic generated by the Project has been assessed with reference to the *Guidelines for the Environmental Assessment of Road Traffic (EART)* published by the Institute of Environmental Management and Assessment (IEMA).

15.2.13 The guidance recommends that with new development the following rules be considered when assessing increase in flow on highway links:

- include highway links where traffic flows will increase more than 30 percent (or the number of HGVs will increase by more than 30 percent); and

- include any specifically sensitive areas where traffic flows will increase by 10 percent or more.

Department for Transport (2007) Guidance on Transport Assessment

15.2.14 The guidance is not a statement of Government policy but should be read in conjunction with, and in the context of, relevant Government policies. The guidance is a national document intended to be used for developments affecting the transport system, including public transport, the strategic road network and local highways and footpaths in England. Therefore local highway authorities and the Highways Agency (HA) will be working on the same basis in performing their respective network management duties.

15.2.15 The overarching principle within the guidance brings up to date the changes in Government policy on the transport effects of developments. The policy, and Guidance, moves away from the former "predict and provide" to emphasis on "managing travel demand". More emphasis is given to the use of Travel Plans with a preference for an "outcomes" approach rather than a "measures" approach. Thus Travel Plans will need to span extended periods of perhaps five to ten years, with regular reviews and updates to ensure that the outcomes are achieved.

Department for Transport (2007) Circular 2007/02

15.2.16 Department for Transport (DfT) *Circular 02/2007* was published in March 2007 and is aimed at planning the efficient movement of people and freight on the national road network. It encourages the development of land to promote sustainable and integrated transport solutions that will best serve the road networks and reduce the traffic impacts.

Department for Transport (April 2009) Good Practice Guidelines: Delivering Travel Plans through the Planning Process

15.2.17 National guidance on travel plans is set out in the DfT's publication *Good Practice Guidelines: Delivering Travel Plans through the Planning Process* (2009). In the case of large mixed-use developments with multiple occupants, this guidance recommends Framework Travel Plans (FTPs). It further recommends that an FTP should;

> '*set overall outcomes, targets and indicators for the entire site. It is best administered centrally. It should set the parameters for the requirement for individual sites (or uses/elements) within the overall development to prepare and implement their own subsidiary travel plans. These should*

comply with and be consistent with the wider targets and requirements of the framework travel plan. Potential occupiers need to be advised of the travel plan requirements. The framework travel plan should also clarify as far as possible the timeframe for completion of individual travel plans and the implementation of specific measures within them as the development proceeds, including management and review.'

15.3 ASSESSMENT METHODOLOGY AND CRITERIA

Overview

15.3.1 The assessment methodology is in accordance with the principles of *PPG 13*, the *Guidelines for EART,* IEMA (2003) and the DfT *Guidance on Transport Assessment* (2007).

15.3.2 The roads that will carry the vast majority of development traffic in the construction and operational phases will be the A160, A180 and M180, which, for the most part, avoid sensitive residential areas. Therefore, with the exception of the A160 (which has been identified as a sensitive link by the HA), the 30 percent threshold has been applied to these links.

15.3.3 For the A160 and any sensitive local roads that are affected, the 10 percent rule has been applied.

15.3.4 The IEMA Guidelines set out a range of potential environmental effects that can arise due to increased traffic flow. The following potential impacts have been assessed:

- changes to traffic conditions on the local highway network and their potential for delays and congestion; and
- accidents and safety.

15.3.5 Additional criteria for undertaking junction capacity assessments, derived by the HA taken from the *Department for Transport (2007) Guidance on Transport Assessment* is as follows:

> *'significant impact is created by 30 additional two way trips on the strategic highway network in the peak hour (30 trips is taken as one directional on slip roads)'.*

Therefore, this is the threshold that has been applied across the whole network in terms of assessing the impact of AMEP on junction capacity.

15.3.6 Noise and air quality assessments have also been carried as part of the EIA, based upon the traffic data which derived in this chapter (refer to *Chapter 16* and *Chapter 17*).

15.3.7 Hourly flows were required for an 18 and 24 hour period for a typical weekday, Saturday and Sunday. In order to calculate these, flows from TRADS were used. Twelve sites along the A180 were reviewed. For each hour of the day the flows were averaged over a 5-day week in a neutral month. Factors were then calculated so that the traffic in the remaining hours of the day could be calculated from the peak traffic hours. Factors were also derived for Saturdays and Sundays.

15.3.8 The flows were broken down into total traffic and heavy goods vehicles only and stated for specific links in the highway network. Flows for the following scenarios were provided:

- base and committed development traffic;
- base, committed development traffic and AMEP construction traffic; and
- base, committed development traffic and AMEP operational traffic.

15.3.9 The method of assessing the traffic impacts of construction and operation of AMEP involves:

- describing the existing transport network and existing road traffic flows which are potentially sensitive to traffic and transport impacts;
- identifying the future baseline conditions based on traffic survey information, growthed to the assessment years;
- predicting the traffic impacts that are likely to arise during the construction and operation of the development; and
- identifying measures to mitigate any predicted impacts.

15.3.10 During initial scoping discussions with the HA and NLC, the issue of the proposed HA A160/A180 upgrade scheme was raised, in terms of how this should be taken into account within the EIA.

15.3.11 The main approach to AMEP is the A160, which is a trunk road and carries around 13 000 vehicles per day, including approximately 5 700 heavy goods vehicles (44 percent) with road users experiencing severe congestion at times, particularly along the single carriageway sections.

15.3.12 Traffic flows are expected to increase significantly by 2030 to approximately 22 000 vehicles per day, which will result in more severe congestion if the A160 is not improved. Eight improvement options were developed by the HA to upgrade the A160 to dual carriageway standard throughout and public consultation was undertaken in 2010.

15.3.13 The objectives of the proposed scheme are to:

- improve access to the Port of Immingham;
- relieve congestion and improve journey times on the A160; and
- improve safety for both road users and local residents.

15.3.14 Following the Comprehensive Spending Review (CSR) in October 2010, the programme for the A160/A180 highway improvement is unknown. The scheme is in "the development group", where further analysis is required by DfT. Given the current assumptions, if funding was secured, it will not be possible to start construction until after 2015, which would be a slip of approximately 18 months on the current estimated start date.

15.3.15 A meeting was held on the 9 November 2010 with NLC and the HA to discuss the work being undertaken by HA's Consultants, Pell Frischmann on the A160/A180 SATURN model update. It was agreed that due to the prolongation of Pell Frischmann's programme as a result of the CSR, the SATURN model would not be ready within the timescales required to utilise it for the purposes of the AMEP EIA.

15.3.16 Therefore, it was agreed that the following process for assessing the impact of the proposed development would be undertaken:

- distribute and assign the trip generation to the network, agreeing this with NLC and the HA;

- obtain the committed development traffic flows to include in the assessment;

- run junction capacity models for those junctions with a significant impact ie over 30 two way trips; and

- identify any mitigation required to ensure junction capacity is 'no worse off' than the 'base + committed development' scenario.

15.3.17 Although there is a possibility that the A160/A180 scheme will be given funding, or alternative streams of funding may be found, for the purposes of the EIA, scenarios with the scheme in place are not included.

15.3.18 At a meeting on the 8 March 2011 with NLC and the HA, it was agreed that mitigation would be required to ensure that the 'base + existing committed development' flows were no worse with AMEP than without .

Construction

15.3.19 Vehicle trips due to the construction phase will comprise of staff for the terrestrial element, staff for the marine element and deliveries. Construction programmes for the terrestrial and marine elements have been provided which show the months with the highest number of members of staff arriving at site.

15.3.20 For the terrestrial element, the greatest number of works likely to be on site at any one time is 270. The working hours for these employees are assumed to be 7.00am to 7.00pm, Mondays to Fridays and 7.00am to 5pm on Saturdays.

15.3.21 For the quay works different shift systems are used depending on the type of work. The worst case will be week 32 where 223 members of staff are expected on site. *Table 15.1* shows a breakdown of the various jobs and the shift system that will be used.

Table 15.1 Breakdown of staff in the construction of the marine element

Job	Number of workers	Shift system
Reinforcment	78	Two shift
Concrete	48	Day shift
Earthworks/Drainage	40	Day shift
Site Management	28	Day shift
Piling-Personal	6	Two shift
Crane Operator	5	Day shift
Equipment-Personal	12	Day shift
Dredge-Personnel	6	Three shift

15.3.22 The shift times will be as follows:

- 3-shift system
  6.00am to 2.00pm, 2.00pm to 10.00pm, 10.00pm to 6.00am

- 2-shift system
  6.00am to 2.00pm, 2.00pm to 10.00pm

- Day-shift system
  7.00am to 7.00pm

15.3.23 The distribution for construction staff is the same as that used for the operational staff which is described in more detail in *Paragraph 15.3.34* to *Paragprah 15.3.37*.

15.3.24 The worst case due to deliveries during the construction phase, via the road network, will be 20 HGVs/hour. Including the return trip that is 40 HGVs/hour two-way trips. These will be made between the hours of 7.00am and 7.00pm and it is assumed, for the purposes of assessment that all deliveries will originate in the west and be routed along the A160, Humber Road and Rosper Road.

Operation

15.3.25 The anticipated operational usage of the site in terms of personnel and the transportation of materials have been considered.

15.3.26 An employment and building schedule for AMEP is detailed in *Annex 4.3*, which was used to calculate employee trip generation. From the schedule the predicted number of employees per building and the shift patterns were taken. The total numbers of employees in the operational phase are as follows:

- total number working the 3 shift system is 3 396 employees;
- total number working the 2 shift system is 245 employees; and
- total number working the day shift system is 631 employees.

15.3.27 These are then converted to vehicle trips by applying model splits taken from the journey to work census data for seven "super output" areas within the Ferry Ward of North Lincolnshire. The resulting mode splits are shown *Table 15.2* below.

Table 15.2 Baseline Mode Split

Mode	Percentage
Train	0.1%
Bus	1.9%
Taxi	0.2%
Car Driver	81.8%
Car Passenger	10.9%
Motorcycle	1.2%
Bicycle	2.1%
On Foot	1.1%
Other	0.7%

Source: 2001 Census, Journey to Work Data

15.3.28 Due to the location of AMEP it has been agreed that the use of sustainable transport would be limited therefore it should be assumed that all staff arrive by car, either as a driver or passenger. In reality this would be an overestimation, however it will result in a robust assessment. The proportion of car drivers to car passengers will be kept the same resulting in 88.2 percent car drivers and 11.8 percent car passengers.

15.3.29 The total number of employee vehicle trips in the operational phase is as follows:

- Total number working the 3 shift system is 2 504 employees;
- Total number working the 2 shift system is 186 employees; and
- Total number working the day shift system is 443 employees.

15.3.30 There are three types of shift pattern in operation at AMEP, the exact times of which are undecided. However, it is anticipated that it will vary over the site to reduce the impact on the highway network. For the purposes of trip generation the following shift times are used:

- 3-shift system
  5.30am to 1.30pm, 1.30pm to 9.30pm, 9.30pm to 5.30am
  6.00am to 2.00pm, 2.00pm to 10.00pm, 10.00pm to 6.00am
  6.30am to 2.30pm, 2.30pm to 10.30pm, 10.30pm to 6.30am

- 2-shift system
  5.30am to 1.30pm, 1.30pm to 9.30pm
  6.00am to 2.00pm, 2.00pm to 10.00pm
  6.30am to 2.30pm, 2.30pm to 10.30pm

- Day-shift system
  9.00am to 5.00pm

15.3.31 It is assumed that the number of people on each shift system will be split evenly.

15.3.32 As the day shift system is the only one that will arrive and depart during the network peak hours addition trips have been considered in order to ensure a robust assessment. During the morning peak hour, all day shift workers are assumed to arrive between 8.00am and 9.00am. A number of trips have also been included for staff potentially departing during the morning peak hour. TRICS was used to ascertain the typical ratio of departures in the morning peak for B1 and B2 land use types. A similar exercise was undertaken for staff potentially arriving form the evening peak hour. The results can be seen in *Table 15.3* and the full TRICS output can be found in *Appendix L* of *Annex 15.1*.

Table 15.3 TRICS modification for day shift arrivals and departures

	Arrivals	**Departures**
Trip rates		
8.00am-9.00am	0.326	0.068
Percentage	100%	20.9%
Number of trips	443	93
Trip rates		
5.00pm-6.00pm	0.034	0.269
Percentage	12.6%	100%
Number of trips	56	443

15.3.33 The generated trips were distributed through a gravity model. The model calculates a percentage of trips based on the car travel times from ward to the site weighted by the population of the ward. The population data was sourced from the 2001 census with the travel times being derived through a car accessibility analysis within the Accession package. A time penalty was incorporated into the network to reflect the toll incurred when crossing the Humber Bridge. These trips were then allocated to roads based on the expected route from ward to site.

15.3.34 The percentage allocation to each route obtained from the gravity model can be viewed in *Table 15.4* and a visual representation of this data can be found in *Appendix M* of *Annex 15.1.*

Table 15.4 Route allocation from the gravity model

Origin	Route	Percentage
Hull and the coast to the northeast	A15 via Humber Bridge / A1077 / A160	11.3 %
Lincoln and south of the study area	A46 / A1173 / Manby Road / A1173	5.0 %
Brigg and surrounding area	A18 / A180 / A160	0.1 %
Grimsby and the coast to the southeast	A180 / A1173	19.1 %
West of Grimsby	A1136 / A180 / A1173	5.5 %
York, Wakefield, Doncaster and area to the west of the study area	M180 / A180 / A160	50.0 %
Area local to AMEP	Journey to Work allocation used	9.0 %

15.3.35 For those areas within the immediate locale, the distribution of trip making was achieved through analysis of the census journey to work proportions from the 2001 census. A map showing this can be found in *Appexdix M* of *Annex 15.1*

15.3.36 The gavity model shows that 9.0 percent of trips originated from inside the study area. *Table 15.5* shows the journey to work distribution as a percentage and as a proportion of 18.8 percent.

Table 15.5 Route allocation from journey to work 2001 census data

Origin	Route	Percent allocation	As a proportion of 18.8 %	Redistribution of unallocated wards
Goxhill and area to west of AMEP	A1077 / A160	26.5 %	2.4 %	2.8 %
Immingham and south	Manby Road / A1173	51.9 %	4.7 %	5.6 %
Immingham Docks	Humber Road	1.5 %	0.1 %	0.2 %
Area east of Immingham	North Moss Lane / A1173	3.9 %	0.4 %	0.4 %
Unallocated wards		16.2 %	1.5 %	0.0 %

15.3.37 The transportation of materials is presented as annual movements by mode. First principle assumptions based on the operational characteristics of the site have then been used to profile the traffic to provide hourly HGV movements. HGV traffic has then been assigned to the highway network in accordance with the origin/destinations and assumed routes.

15.3.38 However, it is anticipated that the majority of HGVs will use the strategic road network via the Rosper Road/A160/A180 route. Similar first principle assumptions based on projected employee numbers, working hours and shift patterns have been used to derive employee trip movements and these have been assigned to the highway network.

15.3.39 With regard to the number of expected deliveries, *Table 15.6* details the information used to determine the number of tonnes delivered by road per year. Deliveries will also be made via rail and sea, also shown in *Table 15.6*.

Table 15.6 HGV Delivery Assumptions

Component	Delivery Mode
Nacelle	
Weight of each nacelle:	300 tonnes
Number constructed per year	600
60% delivered by sea	108 000 tonnes delivered by sea per year
1% delivered by rail	1 800 tonnes delivered by rail per year
39% delivered by road	70 200 tonnes delivered by road per year
Towers	
Weight of each tower	400 tonnes
Number constructed per year	400
50% delivered by sea	80 000 tonnes delivered by sea per year
49% delivered by rail	78 400 tonnes delivered by rail per year
1% delivered by road	1 600 tonnes delivered by road per year
Blades	
Weight of each blade	25 tonnes (3 per turbine)
Number constructed per year	1200
80% delivered by sea	24 000 tonnes delivered by sea per year
1% delivered by rail	300 tonnes delivered by rail per year
19% delivered by road	5 700 tonnes delivered by road per year
Foundations	
Weight of each foundation	800 tonnes
Number constructed per year	50
20% delivered by sea	8 000 tonnes delivered by sea per year
40% delivered by rail	16 000 tonnes delivered by rail per year
40% delivered by road	16 000 tonnes delivered by road per year

15.3.40 It is estimated that a total of 93 500 tonnes will be delivered to AMEP by road each year. It is assumed that deliveries could be made 24 hours a day except at peak times, which are considered as between 7 am to 10 am and 4 pm to 7 pm. It is also assumed deliveries will not be made on Sundays (52 days per year) and bank holidays (eight per year). This result is 304 days being considered as delivery days and each day having 18 delivery hours. That calculates as 5 472 delivery hours per year. For the purposes of this exercise it is assumed that a HGV can carry 20 tonnes which results in AMEP requiring one HGV delivery per hour. Due to the number of assumptions made within this calculation the number of HGV deliveries is rounded up to two per hour.

15.3.41 An analysis has also been undertaken in the unlikely event that all deliveries to the site were made by road. This equates to 312 800 tonnes in one year. Using the same assumptions as above, the predicted number of HGV deliveries per hour would be three. Even if this number was rounded up to four HGVs per hour, this will not have a significant impact on the highway network.

Sensitive Receptors

15.3.42 An analysis of local highway network in terms of groups of indivulas who may have a high sensitivity to the impact of the proposed development was undertaken. The following sensitive receptors have been identified for the impact of the proposed development on the highway network:

- Drivers experiencing delays on A160 due to intensification of use;
- Drivers encountering possible congestion problems at the following junctions:
  - Rosper Road/Humber Road
  - A160/Top Road/Habrough Road
  - A160/Ulceby Road
- identification of accident clusters;
- consideration of vulnerable road users at uncontrolled pedestrian crossing at junction of A160/Town Street; and
- possible intensification of severance issue in South Killingholme, school located north of A160.

Significance Criteria

15.3.43 An assessment has been made of the significance of the impacts taking into account the importance/sensitivity of the receptor, the magnitude of impact, the duration/persistence of impact and the likelihood of the impact. Examples of criteria that have been used to make judgements on the importance/sensitivity of the receptor(s) and the magnitude of change are presented in

15.3.44 *Table* 15.7 and *Table 15.8* respectively.

Table 15.7 Receptor Sensitivity

Receptor Sensitivity/Importance	Description
High	People whose livelihood depends upon unrestricted movement within their environment; this includes commercial drivers and the companies who employ them. Local residents whose daily activities depend upon unrestricted movement within their environment. Receptors such as schools, colleges, accident hotspots.
Moderate	People who pass through or habitually use the area but whose livelihood is not wholly dependant on free access. Receptors such as congested junctions, hospitals, most residential areas and conservation areas.
Low	Occasional users of the road network. Receptors such as public open space.
Negligible	Users not sensitive to transport effects.

Table 15.8 Magnitude of Effect

Subject Area	Magnitude of Effect			
	Major	**Moderate**	**Slight**	**Negligible**
Effect on walking and cycling	Greater than +/- 25% change to existing levels of walking and cycling.	Up to +/- 25% change to existing levels of walking and cycling.	Up to +/- 10% change to existing levels of walking and cycling.	No measurable change from existing mode share or habits.
Effect on public transport	Greater than +/- 25% change to existing levels of public	Up to +/- 25% change to existing levels of public	Up to +/- 10% change to existing levels of public	No measurable change from existing mode share or habits.

Subject Area	Magnitude of Effect			
	Major	**Moderate**	**Slight**	**Negligible**
	transport patronage.	transport patronage	transport patronage.	
Private vehicular traffic from operation of scheme	Greater than +/- 30%change in traffic flow or HGV content. (10% on sensitive links)	Up to +/- 30% change in traffic flow or HGV content. (10% on sensitive links)	Up to +/- 5% change in traffic flow or HGV content.	No measurable increase or decrease in traffic flow or nature of traffic.
Construction related traffic	Construction daily traffic flow greater than scheme related daily traffic flows.	Construction daily traffic flow greater than 100 vehicles per day on major road network, or greater than 50 vehicles per day on minor roads.	Construction daily traffic flow less than 100 vehicles per day on major road network, or greater than 25 vehicles (but less than 50) on minor roads.	Construction daily traffic flow less than 25 vehicles per day on all roads.

15.3.45 The categories that have been used when classifying overall significance are indicated in *Table 15.9*.

Table 15.9 Significance of Effect

Subject Area	Significance of Effect		
	Major	**Moderate**	**Slight / Negligible**
Effect on walking and cycling	The majority of people in the study area changing their walking and cycling habits.	Some people in the study area changing their walking and cycling habits.	Negligible mode shift.
Effect on public transport	Mode shift which increases or reduces the level of patronage such that the operational capacity of existing services is exceeded.	Mode shift which increases or reduces the level of patronage but remains within the operational capacity of existing services.	Negligible mode shift.

Subject Area	Significance of Effect		
	Major	**Moderate**	**Slight / Negligible**
Effect on walking and cycling	The majority of people in the study area changing their walking and cycling habits.	Some people in the study area changing their walking and cycling habits.	Negligible mode shift.
Private vehicular traffic from operation of the scheme	Change which leads to perception of an increase or decrease in delays and congestion.	Change which will increase or decrease traffic flows but remain within the design capacity of the road.	Negligible change.
Construction related traffic	Traffic passes through residential areas.	Some traffic through residential areas.	Traffic only affects strategic routes.

15.3.46 An assessment has also been made of the significance of residual impacts ie those remaining after mitigation.

15.4 CONSULTATION

15.4.1 A number of scoping meetings and discussions have been held with NLC, the HA and North East Lincolsnhire Council (NELC) to identify the most appropriate method for undertaking the traffic impact assessment. At a meeting on the 10th November 2010, an agreed way forward was identified following the announcement of the CSR, and the implications on the certainty of the A160/A180 scheme (the minutes are provided in *Appendix A* of *Annex 15.1*).

15.4.2 Other Scoping Opinion comments are summarised in the consultation tables in *Annex 2.2*, with a response on how each comment has been addressed within the ES.

15.5 BASELINE

The Highway Network

15.5.1 Access to and egress from the site will be via Rosper Road, which is a single carriageway road with no footways. There are three proposed site entrances off Rosper Road, between 1km and 1.5km from the priority junction with Humber Road.

15.5.2 To the west of the Rosper Road / Humber Road junction is the ABP Immingham Port operational area, and to the west is the start of the A160 trunk road, which provides a link between the A180 trunk road and Immingham docks.

15.5.3 Approximatley 280 m to the west of the Rosper Road / Humber Road junction is the A160 / A1173 Manby Road five-arm roundabout, between which is a railway bridge crossing Humber Road. There are no height restrictions displayed on the bridge.

15.5.4 The A1173 Manby Road is dual carriageway with two lanes in each direction, for approximately 800 m. The A1173 connects to the A180 at the grade separated Stallingborough Interchange, via junctions with Kings Road and North Moss Lane. At the Great Coates Interchange (Europarc) on the A180, to the east of Stallingborough Interchange, the A1136 provides a link to Grimsby town centre.

15.5.5 To the west of the Humber Road / Manby Road roundabout, the A160 connects to the A180 at the Brocklesby Interchange. The A180 then merges into the M180 at the Barnetby Interchange. The M180 ends at Junction 5 of the M18, to the north east of Doncaster. To the east, the A180 connects to Grimsby and Cleethorpes.

Bus Services

15.5.6 At present there is no direct access to the application site via a public bus service. The closest bus stops to the application site are located in East Halton and South Killingholme, approximately 3.5 km by road from the nearest proposed site entrance.

15.5.7 The stops in South Killingholme are currently served by two bus services, the details for which are outlined in *Table 15.10* below.

Table 15.10 Local bus services

Service No.	Route	Bus stop	Frequency
45	Cleethorpes to Immingham	South Killingholme - Greengate Lane	30mins from 0640
250	Grimsby to Barton	South Killingholme	3 per day

Source: Traveline and Stagecoach

15.5.8 It is unlikely that the public bus service will be improved until a critical mass of employees is working on the site and a clear picture of potential use emerges.

Rail Services

15.5.9 The nearest mainline station is Habrough (approximately 5 km), which is currently served by Northern Rail Service 31 (Barton-on-Humber to Cleethorpes). Trains serve this station as well as the Ulceby and Thornton Abbey stations, every two hours.

15.5.10 Harbrough is also on the First TransPennine Express Route, which has an hourly service to the following destinations:

- Manchester Airport
- Manchester Piccadilly
- Stockport
- Sheffield
- Meadowhall
- Doncaster
- Scunthorpe
- Barnetby
- Grimsby
- Cleethorpes

15.5.11 The rail timetables and provided in *Appendix C* of *Annex 15.1.*

15.5.12 In terms of the deliveries by rail, consultation has been undertaken with Network Rail. Network Rail can confirm that, based on current demand, there is sufficient capacity on the Killingholme branch (KIL1 and KIL2) between Humber Road Junction and the proposed Able UK connection (adjacent to Regent Oil Level Crossing) to support two extra train paths per 'day'. For the avoidance of doubt a 'day' is classified as the full 24 hour cycle and it must be recognised that Network Rail cannot guarantee when within the cycle, paths would be made available.

15.5.13 In other words, Network Rail has agreed that no significant rail traffic impacts will arise from the proposed use, which they agree may be up to 500 trains per year, with a maximum of two per day.

Pedestrians

15.5.14 The preferred maximum walking distance for commuting journeys on foot is stated in the *Institute of Highways and Transportation (2001) Guidelines for providing for Journeys on Foot* as 2 km. Only southern East Halton and North Killingholme are within the maximum acceptable walking distance of the proposed development.

15.5.15 There is no direct pedestrian access to site, as the main roads do not accommodate footpaths. However, a public right of way exists between East Halton and the site and would act as a direct access for employees living in this village.

Cyclists

15.5.16 Based on guidance published by the Institute of Highways and Transportation, the settlements of East Halton, North Killingholme, South Killingholme, Habrough and Immingham are all within a reasonable cycling distance to the site. This is based on the average length of a cycle journey, which is 5.0 km (2.8 miles).

15.5.17 At present, there are no dedicated cycle paths between the above mentioned settlements and the application site. Cyclists from Habrough and Immingham would be required to cross and/or use the A160, which might make cycling to work less attractive from potential employees in these settlements.

Public Rights of Way

15.5.18 It is currently proposed that a footpath that runs along the flood defence bund will be diverted around the edge of the site.

Traffic Data

15.5.19 The baseline traffic data that is being used to assess the impacts of the proposed development has been provided by Pell Frischmann on behalf of the Highways Agency. This data is provided in *Appendix D* of *Annex 15.1*. The traffic surveys were undertaken in June 2010, as part of the A160/A180 SATURN model work being undertaken by Pell Frischmann to update the base model.

15.5.20 The junction count data was only available between 7 am and 7 pm; automatic traffic count data from the HA's TRADs database was used to obtain link flows outside of these hours.

15.5.21 Additionally, a fully classified traffic survey was commissioned at the A180/A1136/Europarc junction, as no data was available at this junction. This was undertaken on Tuesday 18 January 2011 and is provided in *Appendix E* of *Annex 15.1*.

15.5.22 Due to the spread of operational employee movements the assessment of a number of hours, in addition to the network peak, were considered:

- 5 am to 6 am;
- 6 am to 7 am;
- 8 am to 9 pm;
- 1 pm to 2 pm;
- 2 pm to 3 pm;
- 5 pm to 6 pm;
- 9 pm to 10 pm; and
- 10 pm to 11 pm.

15.5.23 Two locations are shown in *Table 15.11* and *Table 15.12* to compare the effect that AMEP trips have on the network during all the time periods. The committed development traffic is not included in this comparison as the flows are only available for the network peak hours.

Table 15.11 Location A160 north of the junction with A180

	Northbound traffic		**Southbound traffic**		**Two-way traffic**	
Time Period	Base flow (veh/hr)	Base flows & AMEP flows (veh/hr)	Base flow (veh/hr)	Base flows & AMEP flows (veh/hr)	Base flow (veh/hr)	Base flows & AMEP flows (veh/hr)
5am to 6am	222	623	413	594	635	1217
6am to 7am	664	865	534	896	1198	1761
7am to 8am	982	982	567	567	1549	1549
8am to 9pm	617	888	501	557	1118	1445
1pm to 2pm	435	636	441	842	876	1478
2pm to 3pm	455	856	416	617	871	1473
4pm to 5pm	518	518	889	889	1407	1407
5pm to 6pm	577	611	773	1044	1350	1655
9pm to 10pm	111	473	98	299	209	772
10pm to 11pm	110	311	108	509	218	820

Table 15.12 Location: Humber Road between the junction with A160 and Rosper Road

	Northbound traffic		**Southbound traffic**		**Two-way traffic**	
Time Period	Base flow (veh/hr)	Base flows & AMEP flows (veh/hr)	Base flow (veh/hr)	Base flows & AMEP flows (veh/hr)	Base flow (veh/hr)	Base flows & AMEP flows (veh/hr)
5am to 6am	327	980	240	534	567	1514
6am to 7am	396	722	329	917	725	1639
7am to 8am	783	783	230	230	1013	1013
8am to 9pm	504	944	217	309	721	1253
1pm to 2pm	335	661	278	931	613	1592
2pm to 3pm	308	961	316	642	624	1603

Time Period	Northbound traffic		Southbound traffic		Two-way traffic	
	Base flow (veh/hr)	Base flows & AMEP flows (veh/hr)	Base flow (veh/hr)	Base flows & AMEP flows (veh/hr)	Base flow (veh/hr)	Base flows & AMEP flows (veh/hr)
4pm to 5pm	246	246	592	592	838	838
5pm to 6pm	246	302	559	999	805	1301
9pm to 10pm	102	690	124	450	226	1140
10pm to 11pm	57	383	94	747	151	1130

15.5.24 The evening peak hour is shown to be between 5pm and 6pm as this is shown to have the highest number of vehicles per hour when the additional development flows are included when considering directional flow and two-way flows. Therefore this period is to be used as the peak hour.

15.5.25 The highest number of vehicles in the morning peak hour, however, varies between 6am to 7am and 8am to 9am. Due to the shift times and delivery restraints there is no development traffic predicted between 7am and 8am therefore it is not considered appropriate to conduct assessments without the need to add traffic directly related to AMEP.

15.5.26 In order to further analyse the network during the morning peak, traffic flows have been compiled for more locations within the study area. These include the A180, A160, Rosper Road and A1173. Please see *Table 4.3* of *Annex 15.1*.

15.5.27 From the analysis presented, it can be seen that when considering the two-way flows the peak hour is more often 8am to 9am than 6am to 7am. It should also be noted that committed development flows are only available for the 8am to 9am period. These factors result in the identification of 8am to 9am as the peak hour.

Road Safety

15.5.28 The historical Personal Injury Accident (PIA) records have been obtained from NLC and NELC on the local and strategic highway network of interest for the previous five year period, and an assessment of the vehicle type and severity of the recorded PIAs is provided below. The data provided by NLC and NELC can be seen in *Appendix B* on *Annex 15.1*.

15.5.29 For the highway network within North Lincolnshire, it can be seen in *Table 15.13* from that the majority of accidents in the area (when

assessed by route distance) are on the A160 rather than on the local highway network. It can also be seen that between the two different categories of road there is relatively little difference between the proportion of serious and slight accidents. There have been no fatal accidents on either category of road in the past five years.

Table 15.13 Accidents in North Lincolnshire

Severity	Total Area	A160	Other Roads
Slight	45 (76%)	21 (80%)	25 (76%)
Serious	14 (24%)	5 (20%)	8 (24%)
Fatal	0 (0%)	0 (0%)	0 (0%)
Total	**59**	**26**	**33**

15.5.30 An analysis of accidents in the area has been conducted to assess if any clusters exist. Only five locations could be found where more than two accidents had taken place. Of these there appeared to be a consistent theme at four locations, these were as follows:

- A160/A180 westbound mainline east of junction – 2 accidents where drivers failed to look correctly;
- A160/A1077 junction – drivers misjudged the bend on the A160, in one of the cases this was attributed to fatigue;
- A160/Eastfield Road Junction – Of the accidents at this location two were attributed to failing to observe the traffic signals, while one was attributed to not looking; and
- A160/Rosper Road – the accidents at this location were attributed to drivers not looking correctly, however one of these was related to alcohol consumption and aggressive driving.

15.5.31 Of the remaining accidents there appears to be no pattern relating to location or cause. The vast majority are related to poor turning manoeuvres at the junction of minor roads.

15.5.32 Accident data was also received from North East Lincolnshire Council (NELC), this covers the area around Immingham and on the A180. The results for this area are presented below covering the A180 and local highway networks from 2005 to 2011. The assessment area covered the A180 from the Europarc roundabout to the A1173 junction, the A1173 to Manby Road junction in Immingham and Pelham Road in Immingham.

15.5.33 From the data received from NELC, three sections have not been included in the analysis, as follows:

- Between the A180 / A1173 Stallingborough Interchange and the A180 / A160 Brocklesby Interchange as no AMEP trips are predicted to use this section,

- East of the Europarc junction on the A180, as this is outside of the highway study area; and

- The B1210 Stallingborough Road, as no AMEP trips are predicted to use this link.

15.5.34 It can be seen in *Table 15.14* that the A180 had a high proportion of accidents and a higher proportion of these were severe, which is unsurprising given that this is the busiest route. Like the North Lincolnshire data it can be seen that the proportion of slight to severe and fatal accidents is constant between the A180 and other routes in the area. It can be seen that there was only one fatal accident in the six year period, however this only represented 1% of all accidents in the area.

Table 15.14 Accidents in North East Lincolnshire

Severity	Total Area	A180	Other Roads
Slight	66 (86%)	24 (80%)	42 (54%)
Serious	10 (13%)	5 (17%)	5 (6%)
Fatal	1 (1%)	1 (3%)	0 (0%)
Total	**77**	**30**	**47**

15.5.35 As above, an analysis of accidents has been conducted to establish if any clusters exist. Clustering could be found at four locations however a common causation could only be found at one site. This was the approach to Kiln Lane Roundabout on the A1173 where drivers approaching from the A180 have failed to look correctly.

15.6 IMPACTS

Traffic Impacts

Construction Phase

15.6.1 A brief summary of the number of trips associated with the construction of AMEP, against the base traffic flows, including the

committed developments, is provided in *Table 15.15* and *Table 15.16* below.

Table 15.15 Traffic flows during the morning peak hour 8am to 9am

Link	Base flows	Base flows & committed development flows	Base flows, committed development and AMEP construction flows
A180 east of M180 – E/B	1778	2872	2892
A180 east of M180 – W/B	1178	1695	1715
A160 north of junction with A180 – N/B	617	1247	1267
A160 north of junction with A180 – S/B	501	890	910
A160 east of junction with A1077 – E/B	652	1282	1302
A160 east of junction with A1077 – W/B	474	917	937
A160 west of junction with A1173 – E/B	469	652	672
A160 west of junction with A1173 – W/B	265	632	652
Humber Road east of junction with A160 – E/B	504	678	698
Humber Road east of junction with A160 – W/B	217	625	645
Rosper Road south of access – N/B	247	452	472
Rosper Road south of access – S/B	128	172	192

Table 15.16 Traffic flows during the morning peak hour 5pm to 6pm

Link	Base flows	Base flows & committed development flows	Base flows, committed development and AMEP construction flows
A180 east of M180 – E/B	1145	1670	1690
A180 east of M180 – W/B	1597	2144	2164
A160 north of junction with A180 – N/B	577	999	1019
A160 north of junction with A180 – S/B	773	1336	1356
A160 east of junction with A1077 – E/B	487	963	983
A160 east of junction with A1077 – W/B	869	1432	1452
A160 west of junction with A1173 – E/B	438	793	813
A160 west of junction with A1173 – W/B	423	635	655
Humber Road east of junction with A160 – E/B	246	665	685
Humber Road east of junction with A160 – W/B	559	690	710
Rosper Road south of access – N/B	236	330	350
Rosper Road south of access – S/B	239	370	390

15.6.2 The increase in vehicles during the network peak hours along the expected delivery route is 20 HGVs per hour (or 40 two-way trips). This is not expected to cause a significant negative effect on the existing road network therefore it is concluded that any junction mitigation identified would not have to be in place at the outset of the construction programme.

15.6.3 There will be no vehicle trips associated with construction employees during the morning and evening peak hours, due to the shift start and finish times, and therefore there will be no impact.

Operational Phase

15.6.4 A brief summary of the number of trips associated with the development, against the base traffic flows, including the committed developments, is provided in *Table 15.17* and *Table 15.18* below.

Table 15.17 Traffic flows during the morning peak hour 8am to 9am

Link	Base flows	Base flows & committed development flows	Base flows, committed development and AMEP flows	Base flows, committed development and AMEP flows after netting off
A180 east of M180 – E/B	1778	2872	3214	3183
A180 east of M180 – W/B	1178	1695	1766	1762
A160 north of junction with A180 – N/B	617	1247	1589	1549
A160 north of junction with A180 – S/B	501	890	961	956
A160 east of junction with A1077 – E/B	652	1282	1640	1600
A160 east of junction with A1077 – W/B	474	917	992	987
A160 west of junction with A1173 – E/B	469	652	1010	969
A160 west of junction with A1173 – W/B	265	632	707	702
Humber Road east of junction with A160 – E/B	504	678	1234	1170
Humber Road east of junction with A160 – W/B	217	625	741	733
Rosper Road south of access – N/B	247	452	1009	945
Rosper Road south of access – S/B	128	172	288	280

Link	Base flows	Base flows & committed development flows	Base flows, committed development and AMEP flows	Base flows, committed development and AMEP flows after netting off
A1173 south of junction with A160 – N/B	390	713	911	888
A1173 south of junction with A160 – S/B	195	568	609	606
A1173 south of junction with Kings Road – N/B	514	713	852	852
A1173 south of junction with Kings Road – S/B	379	564	593	593
A1173 north of junction with A180 – N/B	809	1529	1666	1666
A1173 north of junction with A180 – S/B	421	650	679	679
A180 east of junction with A1173 – E/B	1411	1784	1813	1813
A180 east of junction with A1173 – W/B	1167	1577	1714	1714
A1136 south of junction with A180 – N/B	470	470	501	501
A1136 south of junction with A180 – S/B	460	460	466	466

Table 15.18 Traffic flows during the evening peak hour 5pm to 6pm

Link	Base flows	Base flows & committed development flows	Base flows, committed development and AMEP flows	Base flows, committed development and AMEP flows after netting off
A180 east of M180 – E/B	1145	1670	1713	1707
A180 east of M180 – W/B	1597	2144	2486	2456
A160 north of junction with A180 – N/B	577	999	1042	1034

Link	Base flows	Base flows & committed development flows	Base flows, committed development and AMEP flows	Base flows, committed development and AMEP flows after netting off
A160 north of junction with A180 – S/B	773	1336	1678	1640
A160 east of junction with A1077 – E/B	487	963	1008	1000
A160 east of junction with A1077 – W/B	869	1432	1790	1752
A160 west of junction with A1173 – E/B	438	793	838	830
A160 west of junction with A1173 – W/B	423	635	993	955
Humber Road east of junction with A160 – E/B	246	665	735	723
Humber Road east of junction with A160 – W/B	559	690	1246	1184
Rosper Road south of access – N/B	236	330	400	388
Rosper Road south of access – S/B	239	370	927	865
A1173 south of junction with A160 – N/B	345	734	759	755
A1173 south of junction with A160 – S/B	455	695	893	870
A1173 south of junction with Kings Road – N/B	422	622	640	640
A1173 south of junction with Kings Road – S/B	664	792	931	931
A1173 north of junction with A180 – N/B	389	723	740	740
A1173 north of junction with A180 – S/B	949	1573	1710	1710
A180 east of junction with	1214	1553	1690	1690

Link	Base flows	Base flows & committed development flows	Base flows, committed development and AMEP flows	Base flows, committed development and AMEP flows after netting off
A1173 – E/B				
A180 east of junction with A1173 – W/B	1546	1950	1967	1967
A1136 south of junction with A180 – N/B	454	454	458	458
A1136 south of junction with A180 – S/B	731	731	762	762

15.6.5 The traffic flows for each of the scenarios identified in *Table 15.17* and *Table 15.18* are shown in *Figure 6.5* to *Figure 6.6* of *Annex 15.1*, for the peak hour flows on the highway network.

15.6.6 The netting off of trips associated with the existing uses at the AMEP site, has been agreed with NLC and the HA, providing the relocated use is included as a committed development.

15.6.7 A Framework Travel Plan (FTP) for the development has been prepared and is reproduced in *Annex 15.2*. Travel Plan reductions can be applied to the projected traffic flows in *Tables 15.17 - 15.18* to take into account the proposed minibus services that each occupier at AMEP will be obligated to provide to transport employees to and from the site.

15.6.8 Although the exact nature of the minibus services that will be provided by each occupier is unknown at this stage, in order to estimate the likely trip reduction, and include a target for single occupancy vehicles in the FTP, a number of assumptions have been made.

15.6.9 The assumptions used for this are as follows, and the calculations are shown in *Appendix N* of *Annex 15.1.*

- One or two minibuses (eight, 12 or 16 seats) have been assigned to each factory/office. Some of the buildings with less employees have been grouped together i.e. SP8 and SP9.
- An average of approximately 1 minibus space per 15 employees across the AMEP site.

- A 60% level of patronage.

- Minibuses would operate to arrive for, and depart after one of the shift stagger times.

- Occupiers with both day shift and either 2-shift or 3-shift working, will be able to utilise their minibus to transport employees for all journeys (see *Table 6.17* in *Annex 15.1* for an indicative timetable).

15.6.10 In reality, minibuses are likely be shared by different occupiers, with a Site Wide Co-Ordinator, managing their utilisation, to ensure maximum efficiency. Ultimately, this will depend on who uses the service, where they live and how long each minibus will need to make each journey, and until the site is operational, these factors cannot be determined.

15.6.11 The resulting traffic flows for the morning and evening peak periods are shown in *Figure 6.9* and *Figure 6.10* of *Annex 15.1*. The trip generation identified in these figures has been set as a baseline target within the FTP.

15.6.12 The percentage impacts of AMEP traffic flows against the 'base + committed developments' scenario are shown in *Table 15.19* and *Table 15.20*

Table 15.19 Traffic flows during the morning peak hour 8am to 9am

Link	Base flows & committed development flows	Base flows, committed development and AMEP flows after netting off and Travel Plan reductions	Percentage increase	Impact magnitude
A180 east of M180 – E/B	2872	3112	8.4%	Moderate
A180 east of M180 – W/B	1695	1747	3.1%	Slight
A160 north of junction with A180 – N/B	1247	1478	18.5%	Major
A160 north of junction with A180 – S/B	890	941	5.7%	Moderate

Link	Base flows & committed development flows	Base flows, committed development and AMEP flows after netting off and Travel Plan reductions	Percentage increase	Impact magnitude
A160 east of junction with A1077 – E/B	1282	1525	19.0%	Major
A160 east of junction with A1077 – W/B	917	971	5.9%	Moderate
A160 west of junction with A1173 – E/B	652	894	37.1%	Major
A160 west of junction with A1173 – W/B	632	686	8.5%	Moderate
Humber Road east of junction with A160 – E/B	678	1054	55.5%	Major
Humber Road east of junction with A160 – W/B	625	709	13.4%	Moderate
Rosper Road south of access – N/B	452	829	83.4%	Major
Rosper Road south of access – S/B	172	256	48.8%	Major
A1173 south of junction with A160 – N/B	713	847	18.8%	Moderate
A1173 south of junction with A160 – S/B	568	598	5.3%	Moderate
A1173 south of junction with Kings	713	823	15.4%	Moderate

Link	Base flows & committed development flows	Base flows, committed development and AMEP flows after netting off and Travel Plan reductions	Percentage increase	Impact magnitude
Road – N/B				
A1173 south of junction with Kings Road – S/B	564	587	4.1%	Slight
A1173 north of junction with A180 – N/B	1529	1638	7.1%	Moderate
A1173 north of junction with A180 – S/B	650	673	3.5%	Slight
A180 east of junction with A1173 – E/B	1784	1807	1.3%	Slight
A180 east of junction with A1173 – W/B	1577	1686	6.9%	Moderate
A1136 south of junction with A180 – N/B	470	494	5.1%	Moderate
A1136 south of junction with A180 – S/B	460	465	1.1%	Slight

Table 15.20 Traffic flows during the evening peak hour 5pm to 6pm

Link	Base flows & committed development flows	Base flows, committed development and AMEP flows after netting off and Travel Plan reductions	Percentage increase	Impact magnitude
A180 east of M180 – E/B	1670	1698	1.7%	Slight
A180 east of M180 – W/B	2144	2385	11.2%	Moderate
A160 north of junction with A180 – N/B	999	1025	2.6%	Slight
A160 north of junction with A180 – S/B	1336	1569	17.4%	Major
A160 east of junction with A1077 – E/B	963	991	2.9%	Slight
A160 east of junction with A1077 – W/B	1432	1677	17.1%	Major
A160 west of junction with A1173 – E/B	793	821	3.5%	Slight
A160 west of junction with A1173 – W/B	635	880	38.6%	Major
Humber Road east of junction with A160 – E/B	665	709	6.6%	Moderate
Humber Road east of junction with A160 – W/B	690	1068	54.8%	Major
Rosper Road south of access – N/B	330	374	13.3%	Moderate

Link	Base flows & committed development flows	Base flows, committed development and AMEP flows after netting off and Travel Plan reductions	Percentage increase	Impact magnitude
Rosper Road south of access – S/B	370	749	102.4%	Major
A1173 south of junction with A160 – N/B	734	750	2.2%	Slight
A1173 south of junction with A160 – S/B	695	829	19.3%	Moderate
A1173 south of junction with Kings Road – N/B	622	636	2.3%	Slight
A1173 south of junction with Kings Road – S/B	792	902	13.9%	Moderate
A1173 north of junction with A180 – N/B	723	737	1.9%	Slight
A1173 north of junction with A180 – S/B	1573	1682	6.9%	Moderate
A180 east of junction with A1173 – E/B	1553	1662	7.0%	Moderate
A180 east of junction with A1173 – W/B	1950	1964	0.7%	Slight
A1136 south of junction with A180 – N/B	454	457	0.7%	Slight

Link	Base flows & committed development flows	Base flows, committed development and AMEP flows after netting off and Travel Plan reductions	Percentage increase	Impact magnitude
A1136 south of junction with A180 – S/B	731	755	3.3%	Slight

15.6.13 Although many of the percentage impacts shown in *Table 15.19* and Table 15.20 are below the threshold for a significant impact, as defined bythe IMEA or HA guidelines, junction capacity assessments have been undertaken at junctions where there are 30 or more two way AMEP vehicle trips, in accordance with the *DfT Guidance on Transport Assessment*, refer to *Paragraph 15.3.5*.

15.6.14 It should be noted that in order to satisfy NLC and the HA that a robust approach has been used for the assessment of MEP impact on the highway network, a sensitivity test has been undertaken to show what might happen to the traffic flows if some of the arrivals and departures from the shift stagger time were to overlap.

15.6.15 The period which has been chosen to present this is the lunchtime (1pm-3pm) shift stagger, as the total base traffic flows across this period are generally higher than the combination of the 5am-6am and 6am-7am periods.

15.6.16 For the sensitivity test, it has been assumed that 50% of the arrivals for the 2.30pm shift arrive in the 1pm-2pm hour, and 50% of the departures from the 1.30pm shift depart in the 2pm-3pm hour. *Table 6.22* and *Table 6.23* of *Annex 15.1* show the results of the two sensitivity tests.

15.6.17 It is shown that in the majority of cases, the sensitivity test traffic flows are less (significantly in most cases) than the highest 'Base + MEP flows' in either of the network peak hours. However, some of the sensitivity test flows at the Rosper Road / Humber Road and A160 / A1173 junctions, are higher than the highest 'Base + MEP flows' network peak flows. Therefore, to ensure a robust assessment, these will be taken account of in the junction capacity assessments for the two junctions, by adding on 255 MEP arrivals to the 8am-9am assessment, and 178 departures to the 5pm-6pm assessment

15.6.18 *Table 6.24* and *Table 6.25* of *Annex 15.1* show the adjusted AMEP flows used in the capacity assessments of the two junctions described in *Paragraph 15.6.17*.

15.6.19 The junctions that have been modelled in the assessment are:

- A1173 / Manby Rd;
- Chase Hill Rd / Rosper Rd / Clough Lane;
- Rosper Rd / Humber Rd;
- A160 / Top Rd / Harbrough Rd;
- A160 / A1173 / Humber Rd;
- Eastfield Rd / Chase Hill Rd;
- A1173 / Kings Rd;
- A1173 / North Moss Lane / Kiln Lane;
- A180 / A1173;
- A180 / A1136 / Europarc ;
- A160 / A1077; and
- A160 / Eastfield Rd.

15.6.20 The results for the existing junction layouts or committed layouts, where junction improvements have been agreed with the relevant highway authority in relation to other consented developments, are detailed below. The junction layouts used in the assessments are provided in *Appendix F* of *Annex 15.1* and the junction model outputs in *Appendix O* of *Annex 15.1.*

15.6.21 Merge / diverge assessments have also been undertaken at two grade separated junctions along the A180; the junction with the A160 (Brocklesby Interchange) and the junction with the A1173 (Stallingborough Interchange).

A1173 / Manby Road

15.6.22 This junction has recently been modified making the A1173 the major arm through the junction and Manby Road the minor arm. This is the layout used in the model. The results are shown in Table 15.21.

Table 15.21 PICADY results for A1173 / Manby Rd

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
From Manby Rd turning left	25.8	0	19.2	0
From Manby Rd turning right	7.0	0	4.0	0
Turning right into Manby Rd	0.4	0	2.3	0
Base flows & committed development flows				
From Manby Rd turning left	47.7	1	33.6	1
From Manby Rd turning right	9.6	0	5.8	0
Turning right into Manby Rd	10.8	0	19.6	0
Base flows, committed development & AMEP flows				
From Manby Rd turning left	55.2	1	34.3	1
From Manby Rd turning right	10.6	0	6.5	0
Turning right into Manby Rd	12.8	0	24.8	0

15.6.23 The results of the model show that the junction operates within all scenarios and therefore no mitigation is required.

Chase Hill Road / Rosper Road / Clough Lane

15.6.24 The existing layout of the junction has been used in the model. The results are shown in *Table 15.22*.

Table 15.22 PICADY results for Chase Hill Rd / Rosper Rd / Clough Lane

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
From Clough Lane turning left	6.5	0	15.2	0
From Clough Lane turning right	12.3	0	15.8	0
Turning right into Clough Lane	13.7	0	7.5	0
Base flows & committed development flows				
From Clough Lane turning left	6.6	0	16.0	0
From Clough Lane turning right	13.4	0	17.3	0
Turning right into Clough Lane	13.9	0	7.9	0
Base flows, committed development & AMEP flows				
From Clough Lane turning left	11.8	0	39.0	1
From Clough Lane turning right	16.1	0	19.0	0
Turning right into Clough Lane	40.8	0	11.0	0

15.6.25 This junction is shown to operate within capacity in all scenarios and therefore no mitigation is required.

Rosper Road / Humber Road

15.6.26 This junction has been modelled using the proposed layout, shown in *Appendix F* of *Annex 15.1*. It is proposed to signalise the junction with two lanes on each approach. The results are shown in *Table 15.23*.

Table 15.23 LINSIG results for Rosper Rd / Humber Rd

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
Rosper Road left	10.0	1	4.4	1
Rosper Road right	19.5	2	30.3	4
Humber Road east ahead	9.5	1	29.9	4
Humber Road east right	4.9	0	23.8	2
Humber Road west ahead	20.2	3	15.0	2
Humber Road west left	17.6	2	8.0	1
Base flows & committed development flows				
Rosper Road left	11.6	1	4.6	1
Rosper Road right	35.0	3	51.1	7
Humber Road east ahead	35.5	5	29.3	4
Humber Road east right	11.5	1	51.5	3
Humber Road west ahead	19.2	3	46.3	8
Humber Road west left	30.4	4	13.5	2
Base flows, committed development & AMEP flows				
Rosper Road left	14.0	1	3.2	0
Rosper Road right	70.0	6	93.0	26
Humber Road east ahead	33.9	4	42.3	6
Humber Road east right	46.3	1	91.0	8
Humber Road west ahead	18.4	2	66.7	12
Humber Road west left	73.9	15	25.9	3

15.6.27 This junction is likely to be one of the main routes into the site therefore it will need upgrading in order to increase the capacity. Using the base flows it is shown to operate within capacity, however, with the addition of committed development traffic and the AMEP development traffic the junction is predicted to operate above capacity on some arms resulting in some longer queues. Further mitigation for this junction is required.

A160 / Top Road / Habrough Road

15.6.28 The model has been built using the proposed layout for the junction. It is proposed that the A160 west approach will be flared creating 3 lanes and the westbound exit will be widened to create 2 lanes for a short distance. The results are shown in *Table 15.24*.

Table 15.24 ARCADY results for A160 / Top Rd / Habrough Rd

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
A160 Ulceby Road	25.9	0	18.6	0
Top Road	21.4	0	31.1	0
A160 Humber Road	13.8	0	36.3	1
Habrough Road	22.5	0	12.0	0
Base flows & committed development flows				
A160 Ulceby Road	50.9	1	36.7	1
Top Road	33.7	1	53.5	1
A160 Humber Road	31.5	1	59.6	2
Habrough Road	29.3	0	19.6	0
Base flows, committed development & AMEP flows				
A160 Ulceby Road	60.6	2	37.8	1
Top Road	40.9	1	54.4	1
A160 Humber Road	33.9	1	72.3	3
Habrough Road	30.4	0	26.9	0

15.6.29 The roundabout operates within capacity in all scenarios therefore no additional mitigation is required.

A160 / A1173 / Humber Road

15.6.30 The existing layout of the junction has been used in the model. The results are shown in *Table 15.25.* The junction operates within capacity when the base flows are modelled. When the committed development and AMEP flows are added the junction is shown to be approaching capacity on the Humber Road arm in the evening peak with a degree of saturation of 89.7 percent.

15.6.31 Although this junction generally operates within capacity with the additional AMEP traffic, mitigation is required to address the Humber Road arm.

Table 15.25 ARCADY results for A160 / A1173 / Humber Rd

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
A160 Humber Road	25.4	0	22.8	0
Industrial Units	0.3	0	0.0	0
Humber Road	15.1	0	38.1	1
A1173 Manby Road	19.0	0	17.2	0
Depot	0.9	0	1.7	0
Base flows & committed development flows				
A160 Humber Road	37.1	1	43.7	1
Industrial Units	0.3	0	0.1	0
Humber Road	46.4	1	48.0	1
A1173 Manby Road	37.0	1	36.6	1
Depot	1.2	0	2.1	0
Base flows, committed development & AMEP flows				
A160 Humber Road	63.2	2	45.4	1
Industrial Units	0.4	0	0.1	0
Humber Road	52.7	1	89.7	8
A1173 Manby Road	48.8	1	41.8	1
Depot	1.5	0	2.6	0

Eastfield Road / Chase Hill Road

15.6.32 The model has been built using the proposed layout for the junction. It is proposed that a four arm roundabout will be introduced at this location creating a new access to a proposed development. The results are shown in Table 15.26.

15.6.33 This junction is shown to be within capacity in all scenarios although no development traffic was predicted to use this junction.

Table 15.26 ARCADY results for Eastfield Rd / Chasehill Rd

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
Chase Hill Road west	17.0	0	2.9	0
New Access	0.0	0	0.0	0
Chase Hill Road east	9.2	0	19.0	0
Eastfield Road	7.6	0	12.3	0
Base flows & committed development flows				
Chase Hill Road west	49.3	1	10.5	0
New Access	17.6	0	33.0	1
Chase Hill Road east	25.6	0	47.0	1
Eastfield Road	39.8	1	28.0	0
Base flows, committed development & AMEP flows				
Chase Hill Road west	49.3	1	10.5	0
New Access	17.6	0	33.0	1
Chase Hill Road east	25.6	0	47.0	1
Eastfield Road	39.8	1	28.0	0

A1173 / Kings Road

15.6.34 The existing layout of the junction has been used in the model. The results are shown in *Table 15.27*.

Table 15.27 ARCADY results for A1173 / Kings Rd

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
A1173 north	36.9	1	43.5	1
Kings Road	9.7	0	24.9	0
A1173 south	34.6	1	29.1	0
Base flows & committed development flows				
A1173 north	63.7	2	54.0	1
Kings Road	19.5	0	44.5	1
A1173 south	49.7	1	45.5	1
Base flows, committed development & AMEP flows				
A1173 north	65.6	2	62.0	2
Kings Road	19.7	0	47.9	1
A1173 south	57.3	1	46.5	1

15.6.35 The roundabout operates within capacity in all scenarios therefore no mitigation is required.

A1173 / North Moss Lane / Kiln Lane

15.6.36 The existing layout of the junction has been used in the model. The results are shown in *Table 15.28*.

Table 15.28 ARCADY results for A1173 / North Moss Lane / Kiln Lane

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
A1173 north	35.6	1	53.6	1
North Moss Lane	15.7	0	51.5	1
Kiln Lane	0.3	0	0.0	0
A1173 west	55.3	1	27.3	0
Base flows & committed development flows				
A1173 north	73.0	3	68.9	2
North Moss Lane	29.3	0	116.1	83
Kiln Lane	0.3	0	0.0	0
A1173 west	104.5	52	50.6	1
Base flows, committed development &AMEP flows				
A1173 north	73.0	3	78.5	3
North Moss Lane	30.0	0	125.9	119
Kiln Lane	0.3	0	0.0	0
A1173 west	112.0	108	51.3	1

15.6.37 There is a clear tidal movement to the vehicle flows at this junction mainly due to the committed development traffic. In the morning vehicles come from A180 and in the evening they travel towards it. This results in the A1173 west arm of the roundabout being over capacity during the morning peak hour and North Moss Lane being over capacity during the evening peak hour.

15.6.38 Further mitigation for this junction has been considered.

A180 / A1173 (Stallingborough Interchange)

15.6.39 The existing layout of the junction has been used in the model. The results are shown in *Table 15.29*.

Table 15.29 ARCADY results for A180 / A1173

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
A180 west	10.4	0	2.5	0
A1173	24.9	0	56.2	1
A180 east	30.3	0	17.4	0
Base flows & committed development flows				
A180 west	33.7	1	7.8	0
A1173	42.6	1	68.5	2
A180 east	49.3	1	32.8	1
Base flows, committed development & AMEP flows				
A180 west	35.1	1	7.9	0
A1173	43.9	1	73.3	3
A180 east	54.9	1	33.6	1

15.6.40 The roundabout operates within capacity in all scenarios therefore no mitigation is required.

A180 / A1136 / Europarc (Great Coates Interchange)

15.6.41 The existing layout of the junction has been used in the model. The results are shown in *Table 15.30* and *Table 15.31.*

Table 15.30 ARCADY results for A180 / A1136 Europarc northern roundabout

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
A180 eastbound off-slip	14.8	0	18.0	0
Europarc	5.9	0	35.8	1
Bridge link road	20.2	0	8.2	0
Base flows & committed development flows				
A180 eastbound off-slip	14.8	0	18.0	0
Europarc	5.9	0	35.8	1
Bridge link road	20.2	0	8.2	0
Base flows, committed development & AMEP flows				
A180 eastbound off-slip	18.5	0	19.1	0
Europarc	6.0	0	36.2	1
Bridge link road	33.4	1	8.2	0

Table 15.31 ARCADY results for A180 / A1136 Europarc southern roundabout

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
Bridge link road	16.8	0	39.2	1
A180 westbound off-slip	16.9	0	17.9	0
A1136	25.4	0	25.3	0
Base flows & committed development flows				
Bridge link road	16.8	0	39.2	1
A180 westbound off-slip	16.9	0	17.9	0
A1136	25.4	0	25.3	0
Base flows, committed development & AMEP flows				
Bridge link road	17.1	0	40.6	1
A180 westbound off-slip	16.9	0	18.1	0
A1136	26.7	0	25.5	0

15.6.42 Both the roundabouts that make up the dumbbell arrangement at the Europarc junction with the A180 are shown to operate within capacity during the morning and evening peaks in all scenarios.

A160 / A1077

15.6.43 The model has been built using the proposed layout for the junction. It is proposed to introduce single lane dualling with a kerbed central reservation. Within the central reserve measures to regularise the priority arrangement have been included by channelising the central area to create a priority arrangement. This gives priority to vehicles turning right out of the A1077 over those vehicles turning right into the A1077. PICADY does not have the capability to model this type of junction and LINSIG's priority modelling is not deemed suitable in this instance therefore VISSIM has been used to model this junction as it is possible within the micro-simulation environment to model the give way movements of arms against both the mainline and right turn pocket.

15.6.44 To compare the operation of each scenario a number of network performance statistics were recorded, these included the following:

- Total delay time;
- Average delay time per vehicle; and
- Average speed of all vehicles at (or passing through) the junction.

15.6.45 The results are shown in *Table 15.32*.

Table 15.32 VISSIM results for A160 / A1077

Network Perfarmance Statistics	Scenario			
	AM Base & committed development flows	AM Base & committed development flows	PM Base & committed development flows	PM Base & committed development flows
Total delay time (hrs)	2.617	4.017	2.934	3.641
Average delay time per vehicle (hrs)	3.234	4.399	3.257	3.656
Average speed at the junction (mph)	42.693	40.295	42.484	41.702

15.6.46 The table above and the screen shots of the VISSIM can be found in *Appendix O* of *Annex 15*.1 show that the modifications proposed to this junction can accommodate AMEP traffic in addition to the base and committed development traffic therefore no further mitigation is required.

A160 / Eastfield Road

15.6.47 The model has been built using the proposed layout for the junction. It is proposed to widen Eastfield Road north in order to create a second lane at the signal location whilst maintaining the left filter lane. Both lanes will be allocated to right turning traffic with the nearside lane also for straight ahead traffic. The results are shown in *Table 15.33*.

Table 15.33 LINSIG results for A160 / Eastfield Rd

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows				
A160 west ahead	26.7	7	19.3	4
A160 west right	15.3	1	13.1	1
Eastfield Rd north right	25.2	2	28.0	3
Eastfield Rd north right & ahead	27.4	2	32.9	4
A160 east ahead & left	13.3	3	33.8	8
A160 east right	27.1	2	28.8	1
Eastfield Rd south	26.1	2	33.1	3
Base flows & committed development flows				
A160 west ahead	41.1	11	45.5	11
A160 west right	11.9	1	13.1	1
Eastfield Rd north right	36.2	3	42.0	6
Eastfield Rd north right & ahead	39.2	3	47.6	7
A160 east ahead & left	36.8	9	48.6	12
A160 east right	40.9	4	42.9	2

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Eastfield Rd south	40.6	3	48.1	3
Base flows, committed development & AMEP flows				
A160 west ahead	48.0	15	38.7	11
A160 west right	14.3	1	13.1	1
Eastfield Rd north right	44.6	3	50.1	6
Eastfield Rd north right & ahead	48.4	4	56.7	8
A160 east ahead & left	33.0	9	57.2	17
A160 east right	49.1	4	42.9	2
Eastfield Rd south	44.7	3	53.4	3

15.6.48 This junction operates within capacity in all scenarios therefore no mitigation is required

Site Access Assessments

15.6.49 There are five accesses proposed into the site, four of which are existing priority T-junctions and one of which is to be introduced on Rosper Road. PICADY has been used to model the operation of these accesses using base, committed development and AMEP flows in the morning and evening peak hours. It is predicted that the access on Haven Road at the northern end of the site will not be used during the peak hours due to the type of industry adjacent to it and has not therefore therefore assessed.

Table 15.34 PICADY results for Site Accesses

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Access 1 – Base flows, committed development & AMEP flows				
From Access 1 onto Rosper Rd	3.6	0	19.0	0
Turning right into Access 1	15.5	0	2.1	0
Access 2 – Base flows, committed development & AMEP flows				
From Access 2 onto Rosper Rd	2.4	0	14.9	0
Turning right into Access 2	17.2	0	2.2	0
Access 3 – Base flows, committed development & AMEP flows				
From Access 3 onto Rosper Rd	2.0	0	9.5	0
Turning right into Access 3	9.0	0	1.2	0
Access 4 – Base flows, committed development & AMEP flows				
From Access 4 onto Haven Rd	6.0	0	27.8	0
Turning right into Access 4	26.0	0	3.1	0

15.6.50 All the accesses operate within capacity in all scenarios.

Merge/ Diverge Assessments

15.6.51 Details of how the traffic flows were derived for these assessments are provided in *Appendix P* in *Annex 15.1.*

A180 / A160 (Brocklesby Interchange)

15.6.52 *Table 15.35* below states the existing layout for the merge and diverge for the junction between the A180 and the A160. The A180 westbound merge is to be upgraded from a type A to a type B therefore this is considered to be in the existing scenario.

Table 15.35 A180 / A160 existing merge / diverge layout

Movement	Type	Number of lanes		
		Upstream	Downstream	Connector
A180 Eastbound diverge	A	2	2	1
A180 Eastbound merge	A	2	2	2
A180 Westbound diverge	A	2	2	1
A180 Westbound merge	B	2	2	1

15.6.53 DMRB 6.2.1 TD 22/06 has been used to assess which layout type is required for each scenario. Figure 2/3 AP has been used for the merge arrangements and figure 2/5 AP used for the diverge arrangements. *Table 15.36* and Table 15.37 show the required arrangement type and number of lanes in order that the slip lanes operate within capacity.

Table 15.36 A180 / A160 required merge / diverge layouts for morning peak hour flows

Movement	No. of vehicles per hour			Type	Number of lanes		
	Up-stream	Down-stream	Slip		Up-stream	Down-stream	Slip
Base Flows							
A180 Eastbound diverge	1689	1191	498	A	2	2	1
A180 Eastbound merge	1191	1388	197	E	1	1	1
A180 Westbound diverge	1000	881	119	-	1	1	1
A180 Westbound merge	881	1185	304	E	1	1	1
Base & Committed Development Flows							
A180 Eastbound diverge	2783	1693	1090	A	2	2	1
A180 Eastbound merge	1693	1896	203	A or D	2	2	1

Movement	No. of vehicles per hour			Type	Number of lanes		
	Up-stream	Down-stream	Slip		Up-stream	Down-stream	Slip
A180 Westbound diverge	1175	1015	160	-	1	1	1
A180 Westbound merge	1015	1702	687	E	1	2	1
Base, Committed Development & AMEP Flows							
A180 Eastbound diverge	3023	1693	1330	B	2	2	2
A180 Eastbound merge	1693	1896	203	A or D	2	2	1
A180 Westbound diverge	1175	1015	160	-	1	1	1
A180 Westbound merge	1015	1754	739	E	1	2	1

Table 15.37 A180 / A160 required merge / diverge layouts for evening peak hour flows

Movement	No. of vehicles per hour			Type	Number of lanes		
	Up-stream	Down-stream	Slip		Up-stream	Down-stream	Slip
Base Flows							
A180 Eastbound diverge	1166	796	370	-	1	1	1
A180 Eastbound merge	796	1005	209	E	1	1	1
A180 Westbound diverge	1375	1168	207	-	1	1	1
A180 Westbound merge	1168	1732	564	E	1	2	1
Base & Committed Development Flows							
A180 Eastbound diverge	1691	921	770	-	2	1	1
A180 Eastbound merge	921	1161	240	E	1	1	1
A180 Westbound diverge	1907	1678	229	A	2	2	1
A180 Westbound merge	1678	2775	1097	B	2	2	1
Base, Committed Development & AMEP Flows							
A180 Eastbound diverge	1719	921	798	-	2	1	1
A180 Eastbound merge	921	1161	240	E	1	1	1
A180 Westbound diverge	1907	1678	229	A	2	2	1
A180 Westbound merge	1678	3016	1338	#	2	2	2

15.6.54 It is shown that all merge and diverge arrangements on the A180 / A160 operate within capacity with the exception of the A180 westbound merge arrangement for the base, committed development and MEP flows in the evening peak hour. The flows are shown to fall within an area of uncertainty. The standards state that in this area the choice will

depend on the downstream provision, if there is a lane gain then use Layout E or F. In this circumstance there is no lane gain therefore Layout B is considered acceptable.

A180 / A1173 (Stallingborough Interchange)

15.6.55 *Table 15.38* shows the existing layout for the merge and diverge for the junction between the A180 and the A1173.

Table 15.38 A180 / A1173 existing merge / diverge layout

Movement	Type	Number of lanes		
		Upstream	Downstream	Connector
A180 Eastbound diverge	A	2	2	2
A180 Eastbound merge	A	2	2	2
A180 Westbound diverge	A	2	2	2
A180 Westbound merge	A	2	2	2

15.6.56 DMRB 6.2.1 TD 22/06 has been used to assess which layout type is required for each scenario. Figure 2/3 AP has been used for the merge arrangements and figure 2/5 AP used for the diverge arrangements. Table 15.39 and Table 15.40 show the required arrangement type and number of lanes in order that the slip lanes operate within capacity.

Table 15.39 A180 / A160 required merge / diverge layouts for evening peak hour flows

Movement	No. of vehicles per hour			Type	Number of lanes		
	Up-stream	Down-stream	Slip		Up-stream	Down-stream	Slip
Base Flows							
A180 Eastbound diverge	1253	1059	194	-	1	1	1
A180 Eastbound merge	1059	1406	347	E	1	1	1
A180 Westbound diverge	1167	563	604	-	1	1	1
A180 Westbound merge	563	637	74	E	1	1	1
Base & Committed Development Flows							
A180 Eastbound diverge	1772	1215	557	-	2	1	1
A180 Eastbound merge	1215	1779	564	E	1	2	1
A180 Westbound diverge	1577	616	961	-	2	1	1
A180 Westbound merge	616	771	155	E	1	1	1
Base, Committed Development & AMEP Flows							

Movement	No. of vehicles per hour			Type	Number of lanes		
	Up-stream	Down-stream	Slip		Up-stream	Down-stream	Slip
A180 Eastbound diverge	1772	1215	557	-	2	1	1
A180 Eastbound merge	1215	1802	587	E	1	2	1
A180 Westbound diverge	1686	616	1070	-	2	1	1
A180 Westbound merge	616	771	155	E	1	1	1

Table 15.40 A180 / A160 required merge / diverge layouts for evening peak hour flows

Movement	No. of vehicles per hour			Type	Number of lanes		
	Up-stream	Down-stream	Slip		Up-stream	Down-stream	Slip
Base Flows							
A180 Eastbound diverge	981	931	50	-	1	1	1
A180 Eastbound merge	931	1735	804	E	1	1	1
A180 Westbound diverge	1546	1206	340	-	1	1	1
A180 Westbound merge	1206	1351	145	E	1	1	1
Base & Committed Development Flows							
A180 Eastbound diverge	1136	988	148	-	1	1	1
A180 Eastbound merge	988	2074	1086	E	1	2	1
A180 Westbound diverge	1950	1374	576	-	2	1	1
A180 Westbound merge	1374	1861	487	E	1	2	1
Base, Committed Development & AMEP Flows							
A180 Eastbound diverge	1136	988	148	-	1	1	1
A180 Eastbound merge	988	2183	1195	E	1	2	1
A180 Westbound diverge	1964	1374	590	-	2	1	1
A180 Westbound merge	1374	1861	487	E	1	2	1

15.6.57 It is shown that all merge and diverge arrangements on the A180 / A1173 operate within capacity therefore no mitigation measures are required.

Rail

Construction Phase

15.6.58 There is a potential impact arising from increased interaction with the railway passing through the site if level crossings have to be established during construction to allow vehicle movements around the site.

Operational Phase

15.6.59 Up to five level crossings are proposed on the railway line that passes through the site. It is difficult to predict how many vehicles will need to traverse the railway line during any set period, but the movements would not be significant and will not impact on the operation of the railway line which would be under the management of the developer.

Accidents and Road Safety

Construction and Operational Phases

15.6.60 In the base scenario, the number of causation clusters of road traffic accidents in the last five years is negligible. It is likely that there will be a negative impact on road safety with the additional committed development traffic flows on the highway network, particularly as there are no highway improvement schemes that are proposed as mitigation for many previous planning approvals.

15.6.61 However, with the highway mitigation proposals identified in *Paragraphs 15.8.9* to *15.8.24* in place, the scenraio will be no worse off than the 'base + committed developments' scenario, and therefore road safety should not be compromised.

15.7 CUMULATIVE IMPACTS

15.7.1 There are potential cumulative impacts that may occur as a result of traffic generated by AMEP and other developments which are to be constructed in the local area. *Table 15.41* below lists the committed development (or those that are within the planning process and yet to be given approval), which are taken account of in the baseline assessment flows on the local and strategic highway network. Accordingly, the cumulative impact of AMEP with these developments is taken into account in the traffic impact assessment.

Table 15.41 Committed Developments

Applicant	Development	Planning Application Reference
Able UK Limited	Port and Logistics	PA/2009/0600
Able UK Limited	Able Humber Port Facility	PA/2007/0101
Drax	Heron Renewable Energy Plant	PA/2009/1269
Bioethanol Limited	Bioethanol Plant	PA/2010/0325
URSA Insulation SA	Glass Wool Manufacturing Plant	PA/2008/0988
HM Estates	Business Park	DC/1258/06/IMM

Helius Bio-Power / Fuel	Bioethanol Plant	DC/303/07/IMM
Vireol PLC	Bioethanol Plant	DC/202/08/WOL
Abengoa Bioenergy	Bioethanol Plant	DC/70/07/IMM
Magna Holdings	B1, B2 & B8 Industrial Development	DC/730/07/IMM

15.8 MITIGATION

Construction Phase

Traffic

15.8.1 Since there is no predicted significant traffic impact, no mitigation is required during the construction phase.

Rail

15.8.2 In terms of mitigating the potential for HGV movements across the railway line during construction, level crossings will be constructed as required.

Operational Phase

15.8.3 It has been agreed with NLC, the HA and NELC that mitigation measures will ensure that junctions operate as well with the AMEP development as with the 'base + committed development' traffic flows.

15.8.4 It was also requested by the HA that any junction improvements proposed on the A160 should be 'in-line' with the future proposals of the A160/A180 upgrade scheme. Therefore, any mitigation proposed is within highway boundary and does not 'go against' the future proposals.

15.8.5 The two closest junctions to the vicinity of the site, and those which AMEP has the most significant impact on are the Rosper Road / Humber Road priority junction and the Humber Road / A160 / A1173 roundabout.

15.8.6 In order to conduct a robust assessment all AMEP traffic has been the assigned through these two junctions allowing the worst case scenario to be considered. In reality, some traffic might turn right out of the site and use Chase Hill Lane and Eastfield Road to get to the A160.

15.8.7 In addition further mitigation measures are proposed at the A1173 / North Moss Lane junction in North East Lincolnshire.

15.8.8 The junction model outputs for the mitigation assessments are provided in *Appendix Q* of *Annex 15.1.*

Rosper Road / Humber Road

15.8.9 A layout has been designed that will mitigate the increase in traffic due to AMEP. Although the additional AMEP flows do not take the junction over capacity, the mitigation measures are designed so that the junction operates at a similar level to the 'base + committed development scenario'.

15.8.10 The proposed layout improves upon the committed layout and includes two right turn lanes out of Rosper Road.

15.8.11 The design of this junction is shown in *Drawing No.* NEA1114/01 in *Appendix Q* of *Annex 15.1.*

15.8.12 *Table 15.42* shows the results from LINSIG when using base, committed development and AMEP flows.

Table 15.42 LINSIG results for proposed Rosper Rd / Humber Rd

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows, committed development & AMEP flows				
Rosper Rd left & right	58.3	4	57.1	10
Rosper Rd right	64.0	4	62.6	10
Humber Rd east ahead	31.5	4	31.9	5
Humber Rd east right	44.3	1	60.7	4
Humber Rd west ahead	17.1	2	50.4	9
Rosper Rd left & right	68.8	12	19.6	3

15.8.13 It is shown that implementation of the proposed mitigation measures would result in the junction operating at a similar level to the 'base + committed developments' scenario.

15.8.14 This proposed junction layout shows that the increase in traffic due to the AMEP, as well as the committed development flows, can be accommodated within the highway boundary.

Humber Road / A160 / A1173

15.8.15 A proposed layout has been designed that will mitigate the increase in traffic due to AMEP. Although the additional AMEP flows do not take the junction over capacity, the mitigation measures are designed so that the junction operates at a similar level to the 'base + committed development scenario'.

15.8.16 The proposed layout shows a two lane approach on the Humber Road arm.

15.8.17 The proposed layout is shown in *Drawing No.* NEA1114/02 in *Appendix Q* of *Annex 15.1*. ARCADY has been used to model the proposed layout and Table 15.43 shows the results when using base, committed development and AMEP flows.

Table 15.43 ARCADY results for proposed Humber Rd / A160 / A1173

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows, committed development & AMEP flows				
A160 Humber Road	63.3	2	45.4	1
Industrial Units	0.4	0	0.1	0
Humber Road	43.5	1	74.0	3
A1173 Manby Road	48.9	1	41.8	1
Depot	1.5	0	2.6	0

15.8.18 The results show that the proposed layout allows the junction to operate with capacity in both the morning and evening peak hours.

A1173 / North Moss Lane / Kiln Lane

15.8.19 A proposed layout has been designed that will mitigate the increase in traffic due to AMEP. The addition of the committed development flows to the base flows already results in the junction being over capacity. The mitigation measures, however, are designed so that the junction operates within capacity when both committed development and AMEP flows are added.

15.8.20 It is proposed to introduce a second lane to the North Moss Lane approach with stacking capacity and to extend the existing second lane on the A1173 west to increase stacking space.

15.8.21 A drawing showing the proposed layout is shown in *Drawing No..* NEA1114/06 in *Appendix Q* of *Annex 15.1*. *Table 15.44* shows the results

of this model when using base, committed development and AMEP flows.

Table 15.44 ARCADY results for proposed A1173 / Morth Moss Lane / Kiln Lane

Arm	Morning peak hour		Evening peak hour	
	Degree of Saturation (%)	Max. queue length (vehs)	Degree of Saturation (%)	Max. queue length (vehs)
Base flows, committed development & AMEP flows				
A1173 north	78.6	4	78.5	4
North Moss Lane	19.9	0	79.5	4
Kiln Lane	0.3	0	0.0	0
A1173 west	89.1	8	41.2	1

15.8.22 It is shown that implementation of the proposed mitigation measures would result in the junction operating within capacity.

Rail

15.8.23 Appropriate safety measures will be in place at the rail crossings to miniminse the potential for any collisions between vehciles on the site and trains to as low as reasonably practicable.

15.9 RESIDUAL IMPACTS

Construction Phase

15.9.1 Since no significant impacts are prediceted during the construction phase, there will be no residual impacts on the local and strategic highway network.

Operational Phase

15.9.2 The mitigation proposals on the local and strategic highway network result in a 'no worse-off' situation in terms of junction capacity with the 'base + committed development' traffic flows. Therefore, no residual impacts have been identified.

15.10 CONSLUSIONS AND SUMMARY

15.10.1 An assessment of the impact of AMEP has been undertaken using the IEMA Guidelines, in terms of changes to traffic conditions on the local highway network and their potential for delays and congestion, and accidents and road safety.

15.10.2 The trip generation for AMEP has been identified using first principles and has been developed through consultation with NLC and the HA. The trip generation was amended by netting off trips associated with the existing consent at the proposed site, and also by reducing trips to take account of the Framework Travel Plan Framework, and subsequent occupier Travel Plans.

15.10.3 Although it is acknowledged that the sustainable transport options to travel to and from the site are limited, there are residential areas within close proximity to the site, from which potential employees could walk or cycle to and from the site. There are also rail services within cycling distance of the site, so it is possible to make combined cycle and rail journeys.

15.10.4 The PIA records from NLC and NELC from the previous five years have been anlaysed and no significant clusters identified.

15.10.5 The base traffic flows on the local and strategic highway network have been derived using traffic surveys undertaken on behalf of the Highways Agency for the A160/A180 upgrade work. An additional traffic survey was commissioned at the A180 / Europarc Great Coates Interchange.

15.10.6 It has been agreed that since a large number of committed developments (some of which have not yet gained planning approval) are included in the assessment, no traffic growth has been applied or future year assessment been undertaken.

15.10.7 Junction capacity assessments have been undertaken at junctions with more than 30 two-way AMEP trips, and mitigation has been proposed where the MEP traffic has an impact on junction capacity. The junction improvement proposals mitigate AMEP traffic only, as agreed by all parties.

15.10.8 Improvement options are proposed at the following junctions:

- Rosper Road / Humber Road (traffic signals);
- Humber Road / A160 / A1173 (additional lane on one approach); and
- A1173 / North Moss Lane / Kiln Lane (additional lane on each approach)

15.10.9 In conclusion there are no highway reasons why permission for the proposed development should not be granted, subject to agreement on and implementation of the identified mitigation measures.