

## 10.3 Development of Freight Holders Club

Measure title: **10.4 Priority Access for Clean Goods Vehicles**  
**10.5 Urban Consolidation Centre**

City: **Norwich**

Project: **SMILE**

Measure number: **10.3, 10.4 & 10.5**

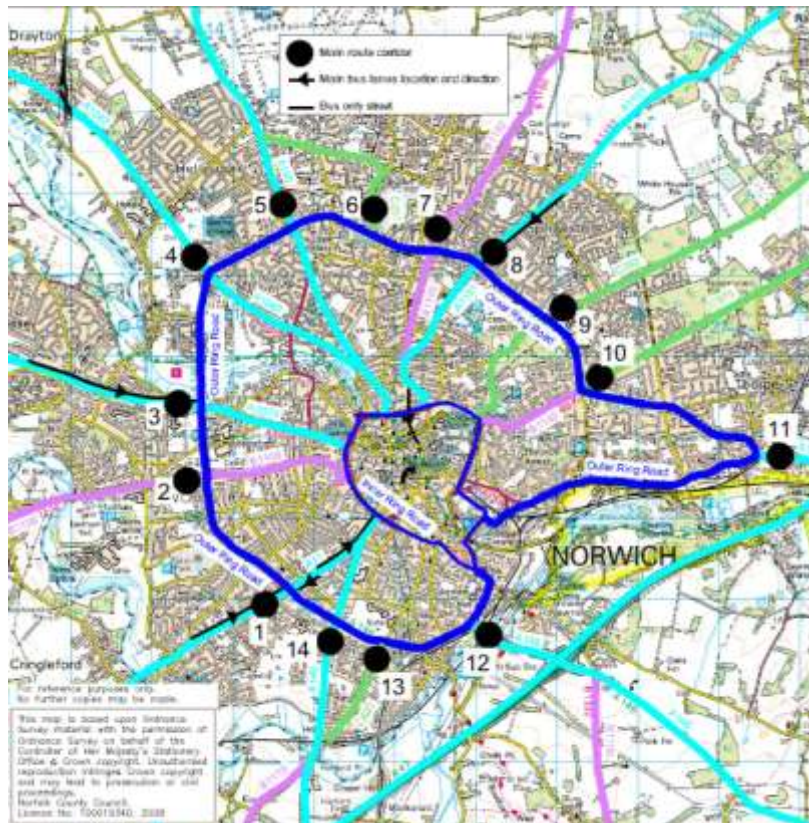
### A Introduction

The broad objective of the CIVITAS SMILE project is to improve urban air quality in participating cities and create a sustainable, safe and flexible traffic system. It aims to do this through the promotion of bio fuels, clean vehicles and intelligent travel.

Norwich is a relatively compact urban area with a radial pattern of main road corridors into its centre. Its location relative to other UK urban centres means that the majority of longer distance freight movements emanate from the west, south-west and south. Only a number of these radial routes have bus priority measures and these are generally in an inbound direction and are not always continuous.

The city's core commercial and retail area is located within its Inner Ring Road. Inside the Inner Ring Road there is a 7.5 Gross Vehicle Weight Restriction at all times although an exemption is permitted for loading/unloading. The pedestrian areas also prohibit all motor vehicle access, except for loading/unloading between 6pm and 10am.

Whilst congestion is experienced on the main radial routes at peak times, at off peak times vehicles can access the Inner Ring Road from the edge of the built-up area in approximately 4-10 minutes.



Measure 10.3 aimed to establish a freight stakeholders club so that operator delivery and collection needs could be determined with a view to examining whether some of these could

be combined. Emphasis of the stakeholders club was to improve communication between operators and also with the County Council.  
Measure 10.4 aimed to examine whether the provision of priority measures (such as bus lanes) could be provided for those freight vehicles that adopted bio fuels or cleaner fuelled vehicles. During the project this original aim was amended to allow the use of appropriate bus lanes by consolidation centre vehicles instead.

Measure 10.5 aimed to establish a demonstration consolidation project.

## **A1 Objectives**

The overall objectives are for all three measures were:

- **Objective 1** - get a number freight operators to adopt cleaner vehicle principles.
- **Objective 2** - reduce the number and size of vehicles delivering into Norwich.
- **Objective 3** - reduce freight emissions in Norwich.

Objectives for Measure 10.3 (Freight Stakeholders Club) were:

- Seek agreement of logistic companies to participate in the Stakeholders Club,
- Seek agreement and participation of retailers and manufacturers served by the logistic companies participating in the club,
- Promote meetings between urban freight providers, users and local authorities,
- To ensure that vehicles entering the city central core are suitable for use on the constrained road network,
- Promote information exchange between operators.

Objectives for Measure 10.4 (Priority Access for Clean Goods Vehicles) were:

- Reduce congestion,
- Reduce emissions,
- Gain political acceptance to loss of road space & priority for freight movements.

Objectives for 10.5 Measure (Freight Consolidation Centre) were:

- Implement a demonstration site, where deliveries could be consolidated together for delivery into Norwich using fewer vehicles,
- To optimise the use and payloads of those freight vehicles moving within the city, relieving congestion and reducing emissions per tonne of freight moved,
- Reduce congestion,
- Reduce of structural damage to roads,
- Reduce of emissions & noise.

## **A2 Description**

### **10.3 Development of Freight Stakeholders Club**

The measure tried to establish a freight stakeholder group which could work together to develop a strategic freight initiative in the Norwich urban area so that demonstration projects based on clean goods vehicles could be implemented. This work package was a means to demonstrate the extent to which the establishment of a stakeholder group could help to meet

urban freight objectives.

It attempted to involve key private sector haulage, logistics and freight distributors, together with freight shippers and receivers to establish delivery and collection needs and identify where these could be made more efficient.

- **Task 1** Undertook initial enquiries with freight operators serving Norwich to identify their willingness to join stakeholder group.
- **Task 2** Established strategic freight stakeholder group.
- **Task 3** Attempted to work with strategic freight stakeholder group to identify areas where the results of the integration of resources could be demonstrated.

#### **10.4 Priority Access for Clean Goods Vehicles**

The original aim was to allow goods vehicles which met pre-determined clean vehicle standards to use transport priority lanes. One demonstration project would be implemented covering an undetermined proportion of the priority lanes in the urban area. This work package was a means to demonstrate the effectiveness of opening up facilities to assist goods operators who respect clean urban transport principles.

Vehicles using the lanes would be low emission engines, using either new or retro-fitted older vehicles. Vehicles running only on locally produced bio-fuels could also be considered as "clean". In a geographical area where production of bio-fuels is developing such action would have helped promote the local economy.

- **Task 1** Identified route network and determined most suitable priority lanes to be used in measure.
- **Task 2** Examined technology and attempted to establish how clean vehicles would be identified and methods for the exclusion of other vehicles from the priority lanes.
- **Task 3** Initiated and implemented statutory procedures to allow implementation of measure.
- **Task 4** Implemented demonstration site.

#### **10.5 Freight Consolidation Centre**

The aim was to establish an urban consolidation centre to facilitate the use of clean and energy efficient goods vehicles in the urban area. This element of the work package would be used to demonstrate the suitability of an urban consolidation centre in contributing towards meeting clean urban transport objectives.

The consolidation centre would need significant storage warehousing available with good fast and direct transport links to the central core of the City; as well as the national trunk and primary road network.

**Task 1** Worked with organisations operating existing consolidation centres to more fully understand their current operational methods and identify a demonstration site.

**Task 2** Used consultation and tender process to enter agreement with an existing company to operate the consolidation centre.

**Task 3** Worked with logistic company to establish a demonstration site. Publicised the existence of the facility, both locally and nationally, and actively promoted its use.

## B Measure implementation

### B1 Innovative aspects

#### Innovative Aspects:

- New conceptual approach,
- New organisational arrangements or relationships.

The innovative aspects of the measure are:

- **New conceptual approach, regionally** - Dialogue, co-operation and willingness to work towards common aims has traditionally been lacking in urban freight transport planning. This element of the work package aimed to demonstrate whether better results could be achieved
- **New organisational relationships, regionally** -The feasibility of establishing clean vehicle criteria and monitoring to prevent abuse by other goods vehicles has not previously been carried out in Norwich
- **New organisational arrangements, nationally** - The linkage of consolidation facilities with clean and energy efficient urban delivery vehicles. The approach taken of working in partnership with an existing service is different to that previously employed in the UK.

### B2 Situation before CIVITAS

Norfolk has undertaken freight studies which have recommended the above approach but work has not proceeded beyond preliminary discussions with freight organisations. Goods vehicles are not allowed to use transport priority lanes and there is no urban consolidation centre.

No work has previously been undertaken with regard to encouraging private freight operators to undertake eco-driving as a means of reducing emissions. Consideration had been given to providing grants to operators to retro-fit clean vehicles but the use of priority access restrictions to encourage this has not been tried.

### B3 Actual implementation of the measure

The measure was implemented in the following stages:

#### Measure 10.3, 10.4 and 10.5 Combined

**Stage 1: Scoping of the work and identifying issues** (Aug 2005 – Mar 2006) –  
*Determination of how measures were to be implemented.*

**Stage 2: Identifying companies interested in participation** (Mar 2006 – October 2006 2007) – *A large consultation exercise was undertaken to identify those freight companies that were interested in participating in the measures. This consultation included all the measures involving freight. Consultations included an internet based virtual exhibition, adverts in trade magazines, and letters/e-mails distributed to freight companies. The companies were invited to view the internet exhibition and express an interest in participating with any of the measures 10.3, 10.4, 10.5 or 12.8.*

### **Measure 10.3 Freight Stakeholders Club**

**Stage 3: Further development with interested parties** (Mar 2007 – Jan 2008) – *Further communication with interested parties to determine form and participation levels of stakeholders club. This included e-mails, telephone conversations and invitations to working group meetings but it was difficult to get people to attend.*

**Stage 4: Forming stakeholders club** (Feb 2008 - Present) – *Using the stakeholders club as consultation forum when the need arises, because of problems getting members to attend regular meetings.*

### **Measure 10.4 Priority Access for Clean Goods Vehicles**

**Stage 3: Further development of proposals** (Oct 2006 – Mar 2007) – *Examination of the standard of existing bus lanes to determine most appropriate lanes for use by goods vehicles. The narrow width of all existing bus lanes, together with public and political opinion, was an issue. Devised revised proposals based upon results of investigation. New proposals were to allow the use of certain bus lanes by consolidation centre vehicles only (see section B4 below). As a result of the new proposals, the measure could not move forward until location of the consolidation centre was known. This is because the bus lanes that the consolidation centre vehicles would most frequently use needed to be identified.*

**Stage 4: Preliminary consultations** (Nov 2007 – May 2008) – *Undertook initial consultation with stakeholders (police, local councillors, cycle forums) to identify views on the proposals. Developed a code of conduct and training needs for drivers using the bus lane. Also sought political approval to implement measure.*

**Stage 5: Implementing measure** (Feb 2008 – Aug 2008) – *Implementation of Traffic Regulation Order to allow use of bus lane, together with the associated signing, vehicle liveries and driver training. Additional vehicle liveries were provided to aid enforcement. Drivers using the bus lane were required to undergo specific training before using the bus lane.*

### **Measure 10.5 Freight Consolidation Centre**

**Stage 3: Obtained preferred partner for measure:** (Oct 2006 – Mar 2007) – *The companies interested in this measure were short listed using an assessment of the location and facilities that they could offer for a consolidation centre. The short listed companies (3 in number) were invited to tender to be the partner in the project. The tender process included interviews with representatives of the companies.*

**Stage 4: Promotion of consolidation centre** (Mar 2007 – July 2008) – *The preferred partner to operate the consolidation centre was helped to set up its operations. Funding was provided to allow the operator to employ a manager for the consolidation centre, who would attempt to develop a customer base for it.*



## **B4 Deviations from the original plan**

The deviations from the original plan comprised:

### **Measure 10.3 Freight Stakeholders Club**

**Scope of stakeholders club** – There was a difficulty providing a stakeholders club that would have regular meetings. This was because of an apathy about what the club could achieve and company representatives had other work commitments. Suitable dates could not be found. Some representatives, although interested in the concept, did not want to commit to regular meetings. Instead the stakeholders club would be used to promote the CIVITAS measures, particularly the consolidation centre. It would also be used as a consultation forum when such consultations needed to be undertaken. Members have been sent information on other CIVITAS measures and were invited to contribute towards the interim review of the Local Transport Plan.

### **Measure 10.4 Priority Access for Goods Vehicles**

The original proposal was to allow the use of bus lanes in Norwich by environmentally friendly vehicles. Feasibility work into this proposal identified a number of issues.

- Difficulty identifying those vehicles that meet the emission standards and those that did not. The age of the vehicle, and therefore its registration number, is a guide to the emission standard of a vehicle but is not the definitive answer. This is because older vehicles may have been retrofitted with pollution reducing equipment or be using biofuels. The fact that there is no external indication of whether a goods vehicle is permitted to use a bus lane makes enforcement difficult by the police,
- New vehicles automatically meet the current Euro standard, and most freight operators have an on-going programme of vehicle renewal. Therefore a point would be reached where all goods vehicles would be eligible to use the bus lane unless the Traffic Regulation Order was continually amended to reflect the latest emission standard. This would be dependant on new emission standards being set on a regular basis and leads to a lack of control of over the number of HGVs using the bus lanes
- The lack of bus lanes of a suitable width to allow use by significant numbers of HGVs
- Concerns about a large number of HGVs mixing with cyclists within the narrow bus lanes.

As a result of the above issues the measure objective was revised so that only vehicles operating out of the consolidation centre would be allowed to use the bus lanes on the most suitable corridor into Norwich. This revised proposal had a number of advantages:

- The number of vehicle deliveries using the bus lanes would be limited to approximately 2 to 5 times a day

- The vehicles would have consolidation centre livery on their sides, making identification of vehicles that could legitimately use the bus lane easier
- The drivers of the consolidation centre vehicles would be known and their driving behaviour in the bus lane monitored. Drivers would also have appropriate training to make them more aware of the presence of cyclists.

Consolidation centre vehicles were also allowed to use the bus only streets of Castle Meadow and part of Red Lion Street. Allowing the use of the bus lanes on the other radial routes was not considered appropriate because the length of diversions to use these was greater than any benefit they could provide. The provision of other freight priorities, at traffic signals for example, was not considered appropriate as it would have a detrimental effect on other transport modes, particularly buses.

### **Measure 10.5 Freight Consolidation Centre**

**Operation of the consolidation centre** – although not a variation to the original proposals, the preferred partner for the centre was able to show that it could operate the consolidation centre as part of its existing business. This meant that its existing warehouse facilities and vehicle operations could be utilised and the partner did not require the commitment of longer term subsidies. In the short term this would make obtaining customers more difficult because the partner only had limited retail customers. However, it made the project more sustainable in the future, particularly once the CIVITAS funding had ceased.

## **B5 Inter-relationships with other measures**

There are very close relationships between measures 10.3, 10.4 and 10.5. All were looking to help reduce goods vehicle deliveries into Norwich by the use of a consolidation centre. Measure 10.3, the freight stakeholders club, aimed to promote the consolidation centre. Measure 10.4 aimed to allow the use of a bus lane by consolidation centre vehicles, which would help delivery times and also raise its profile.

There is also a link to measure 12.8 customised traffic and travel information service for freight operators.

## C Evaluation – methodology and results

### C1 Measurement methodology

#### C1.1 Impacts and Indicators

METEOR / GUARD INPUTS				
NO.	EVALUATION CATEGORY	INDICATOR	DESCRIPTION	DATA /UNITS
	<b>ENERGY</b>			
3		Vehicle fuel efficiency	Fuel used per vkm, per vehicle type	MJ/vkm, quantitative, derived or measurement
	<b>ENVIRONMENT</b>			
8		CO2 emissions	CO2 per vkm	G/vkm, quantitative, derived
9		CO emissions	CO per vkm	G/vkm, quantitative, derived
10		NOx emissions	NOx per vkm	G/vkm, quantitative, derived
11		Small particulate emissions	Pm10 per vkm	G/vkm, quantitative, derived
	<b>SOCIETY</b>			
13		Awareness level	Degree to which the awareness of the policies/measures has changed	Index, qualitative, collected, survey
	<b>TRANSPORT</b>			
21		Vkm by vehicle type - peak	Total trips length per vehicle per day	Vkm per day, quantitative, derived
22		Vkm by vehicle type -off peak	Total trips length per vehicle per day	Vkm per day, quantitative, derived
23		Average vehicle speed - peak	Average vehicle speed over total network	Km/hr, quantitative, derived
24		Average vehicle speed - off peak	Average vehicle speed over total network	Km/hr, quantitative, derived

Detailed description of the indicator methodologies:

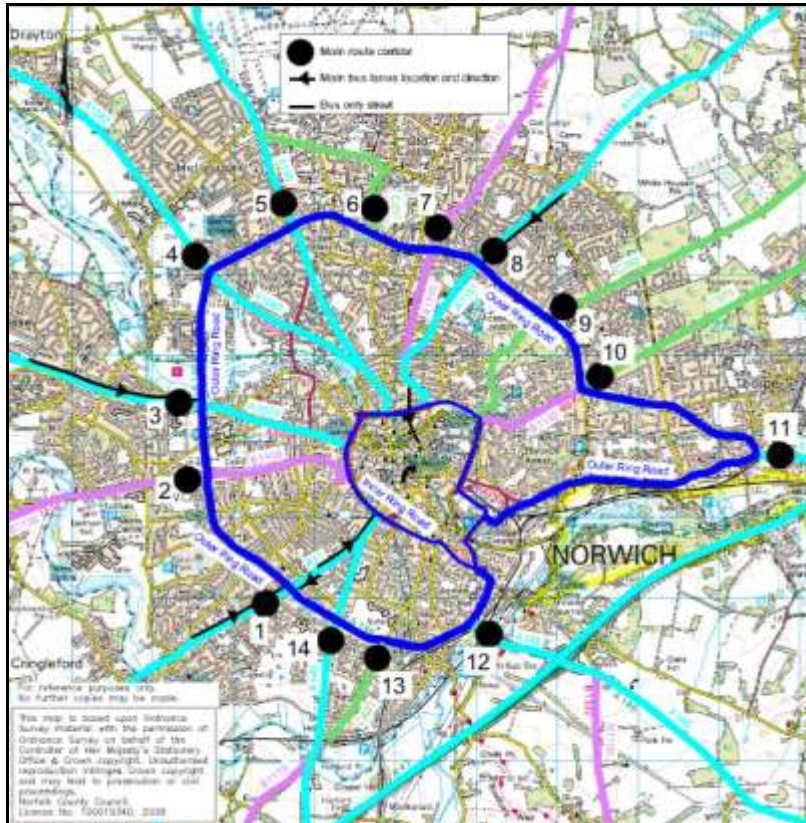
- **Indicator 1 vehicle fuel efficiency** – The consolidation of loads should reduce fuel consumption by reducing the number of delivery trips. The number of vehicles delivering into the consolidation centre has been recorded and assessed against the number of consolidation centre vehicle deliveries into the city centre. The use of the bus lanes should improve vehicle fuel efficiency by reducing the need for ‘stop-start’ manoeuvres associated with driving in a traffic queue. Vehicle journey time surveys have been used to identify the effects of using a bus lane on the time spent in queued traffic. The surveys identify average vehicle speeds in free flow conditions and whilst in the traffic queues. An estimate of fuel efficiency has been made using the vehicle speed information.
- **Indicator 2 CO2, CO, NOx and particulate emissions** – The estimated effects on emissions as a result of the consolidation centre and using the bus lanes have been measured similar to Indicator 1 above.
- **Indicator 3 awareness level** – Telephone surveys were undertaken in May/June 2007 and June/July 2008 to determine the public awareness of the CIVITAS measures for Norwich.
- **Indicator 4 average vehicle km per vehicle** - The number of vehicles delivering into the consolidation centre has been recorded and assessed against the number of consolidation centre deliveries into the city centre.
- **Indicator 4 average vehicle speed** – Average vehicle speeds have been measured using the journey time surveys described for Indicator 1.



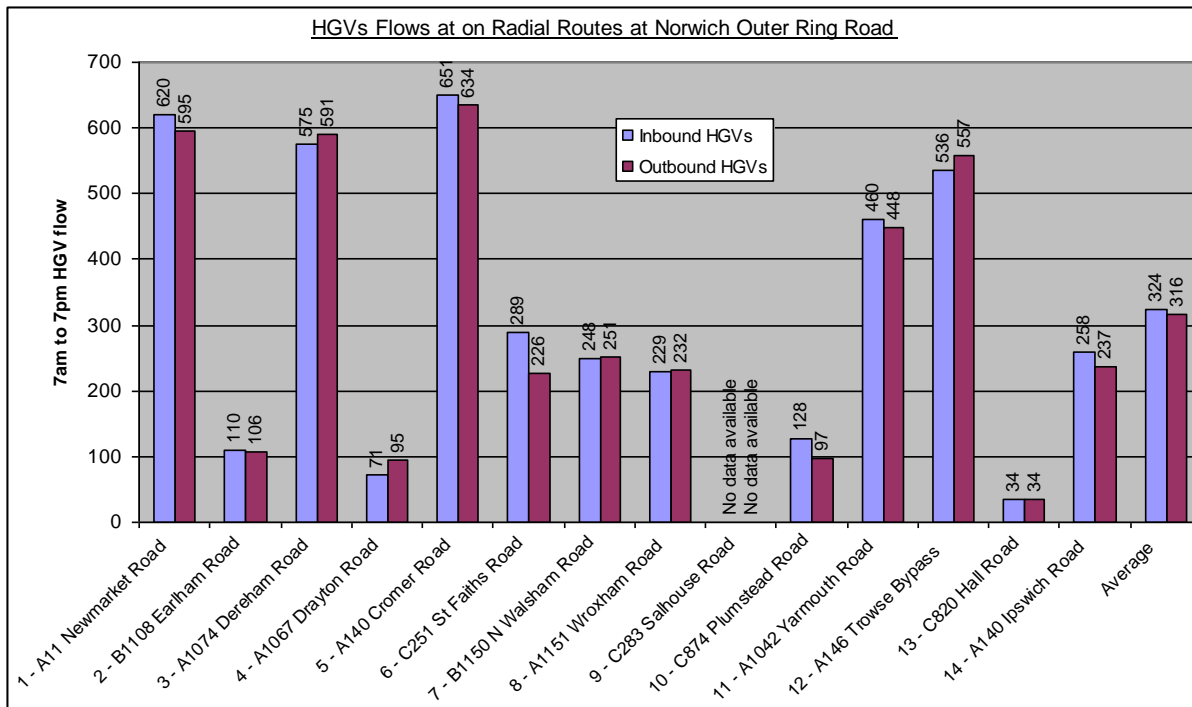
## C1.2 Establishing a baseline

### Overall

Presently all deliveries into Norwich are being undertaken on an individual basis and without the use of bus lanes. These deliveries generally use the main radial routes into Norwich. These routes are shown below:



The graphs below show the 7am to 7pm HGV flow on the main radial routes to the outbound side of the Outer Ring Road. The data comes from surveys undertaken at differing dates between 2005 and 2007. However, they do give an indication of the importance of the A11 corridor, relative to the other radial routes.



The consolidation centre is located on the A11, approximately 20 miles from Norwich. It is the A11 Newmarket Road corridor into Norwich that would be used by the consolidation centre vehicles as this is the most direct route. Accordingly it is the inbound bus lanes on the A11 Newmarket Road that consolidation centre vehicles were permitted to use. Using the above graph it is estimated that the A11 Newmarket Road corridor accommodates approximately 14% of total HGV flow into Norwich.

Base line data and evaluation of the measures has therefore been modelled for the A11 Newmarket Road corridor. For the purpose of this evaluation the corridor has been split into 2 distinct sections:

- **Section 1 Consolidation Centre to Unthank Road (distance = 26.92 km)** – the majority of this route is 2 lane dual carriageway. No bus lanes are present on this section. The national speed limit applies to this section.
- **Section 2 Unthank Road to Inner Ring Road (distance = 2.95km)** – this section is single carriageway with an inbound bus lane present for much of its length. A 30mph or 40mph speed limit is in force along its length.



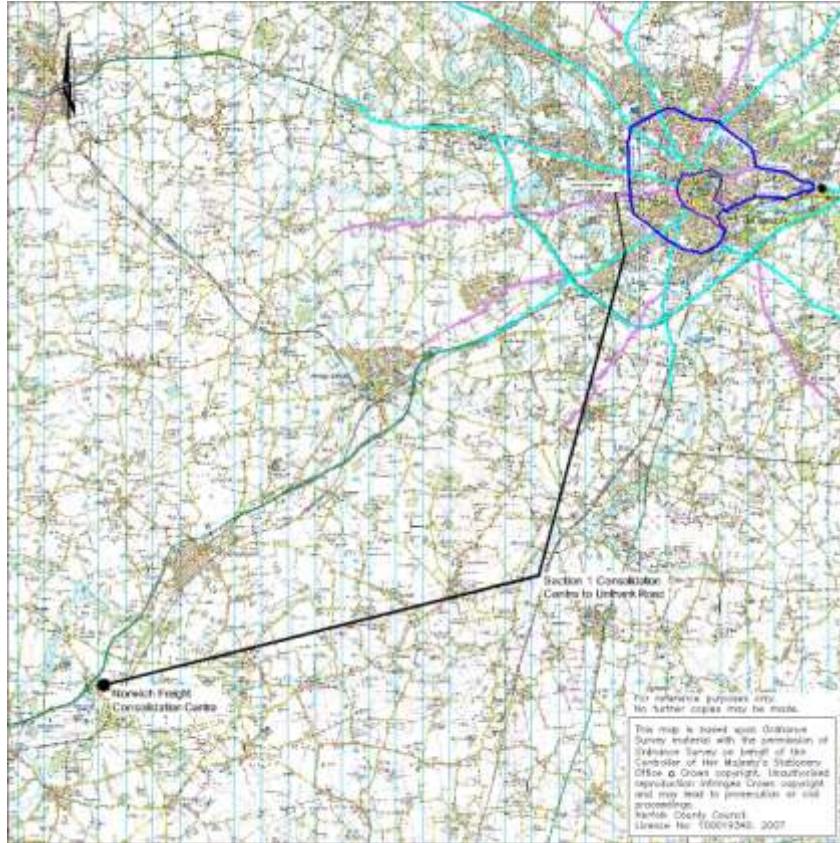
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Manual classified vehicle counts were undertaken between 7am and 7pm on Friday 29 September 2006 on the A11 Newmarket Road corridor. This gave an indication of the typical proportions of HGVs that are using the route. The survey also recorded vehicle registration plates which gave an indication of the vehicle's age. Using this information an approximate estimate of the proportion of vehicles achieving each EURO standard has been calculated.

	Rigid HGV 2 Axles	Rigid HGV 3 Axles	Rigid HGV 4 Axles	<b>Rigid Total</b>	Artic HGV 3/4 Axles	Artic HGV 5 Axles	Artic HGV 6+ Axles	<b>Artic Total</b>	<b>Total</b>	<b>%age</b>
Pre EURO 1	6	2	1	<b>9</b>	0	2	0	<b>2</b>	<b>11</b>	<b>2.2%</b>
EURO 1	17	7	2	<b>26</b>	0	4	0	<b>4</b>	<b>30</b>	<b>6.1%</b>
EURO 2	59	16	13	<b>88</b>	12	17	15	<b>44</b>	<b>132</b>	<b>27.0%</b>
EURO 3	145	16	9	<b>170</b>	31	47	57	<b>135</b>	<b>305</b>	<b>62.2</b>
EURO 4	6	1	0	<b>7</b>	1	1	3	<b>5</b>	<b>12</b>	<b>2.5%</b>
<b>Total</b>	<b>233</b>	<b>42</b>	<b>25</b>	<b>300</b>	<b>44</b>	<b>71</b>	<b>75</b>	<b>190</b>	<b>490</b>	<b>100.0%</b>

Information obtained from vehicle registration survey undertaken 7am to 7pm on Friday 29 September 2006

### **Indicator 3 Energy**

Using the above traffic flow information and the assumed proportions of the EURO standard for vehicles defined above the current fuel consumption by HGVs between 7am and 7pm on Newmarket Road (Section 2) has been calculated.

	Rigid HGV 2 Axles	Rigid HGV 3 Axles	Rigid HGV 4 Axles	Artic HGV 3/4 Axles	Artic HGV 5 Axles	Artic HGV 6+ Axles	<b>Total</b>
Total (vehs)	233	42	25	44	71	75	<b>490</b>
Fuel consumption (veh/km)	0.311	0.311	0.426	0.426	0.426	0.426	<b>NA</b>
Distance (km)	2.95	2.95	2.95	2.95	2.95	2.95	<b>NA</b>
Fuel consumption (l)	213.8	38.5	31.4	55.3	89.3	94.3	<b>522.6</b>

The above fuel consumption figures have been calculated using the calculation  $L = a + bv + cv^2 + dv^3$  taken from the Department of Transport's 'Transport Analysis Guidance (TAG) Unit 3.5.6 - Values of time and Operating Costs (Feb 2007)'.

L = Fuel consumption in litres/km

v = Speed in km/h

a/b/c/d are parameters derived by AEA Technology's National Environment Technology Centre based upon laboratory testing of different vehicle types.

The parameters are:

Parameter	a	b	c	d
Rigid vehicles over 3.5tonnes with 2 or 3 axles (i.e. HGV 2R and HGV 3R)	0.76833752	-0.02257303	0.00031766	-0.0000013544
Rigid vehicles with 4 or more axles and all articulated HGVs (HGV 4R, HGV 3/4A, HGV 5A and HGV 6A)	1.02443156	-0.03021812	0.00044285	-0.0000020059

The value 'v' has been calculated as 34.6km (21.5mph) - i.e. the average speed of vehicles on Newmarket Road between 7am and 7pm without using bus lanes from journey time surveys detailed in '**Indicator 21 to 24 Transport**'

**Between 7am and 7pm on the A11 Newmarket Road it is estimated that inbound HGV travel consumes approximately 522.6 litres or 0.361 litres/Vkm.**

### **Indicator 8 to 11 Environment**

Using the above traffic flow information and the assumed proportions of the EURO standard for vehicles defined above the current emissions by HGVs between 7am and 7pm on the Newmarket Road (Section 2) have been calculated. The emissions have been estimated assuming an average speed of 34.6km (21.5mph) - i.e. the average speed of vehicles on Newmarket Road between 7am and 7pm without using bus lanes from journey time surveys detailed in '**Indicator 21 to 24 Transport**'.

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Vehicle Type	CO2	CO	NOx	Particulates
Emissions per HGV 2R vehs (G/vkm)	631.2	1.289	2.928	0.201
Distance (km)	2.95	2.95	2.95	2.95
Number of HGV 2R vehs (No)	233	233	233	233
<b>Total HGV 2R emissions (G)</b>	<b>433855.3</b>	<b>886.0</b>	<b>2012.6</b>	<b>138.2</b>
Emissions per HGV 3R vehs (G/vkm)	973.5	1.779	4.187	0.170
Distance (km)	2.95	2.95	2.95	2.95
Number of HGV 3R vehs (No)	42	42	42	42
<b>Total HGV 3R emissions (G)</b>	<b>120616.7</b>	<b>220.4</b>	<b>518.8</b>	<b>21.1</b>
Emissions per HGV 4R vehs (G/vkm)	1195.5	1.843	5.328	0.177
Distance (km)	2.95	2.95	2.95	2.95
Number of HGV 4R vehs (No)	25	25	25	25
<b>Total HGV 4R emissions (G)</b>	<b>88168.1</b>	<b>136.0</b>	<b>393.0</b>	<b>13.1</b>
Emissions per HGV 3/4A vehs (G/vkm)	1142.2	1.751	5.141	0.182
Distance (km)	2.95	2.95	2.95	2.95
Number of HGV 3/4A vehs (No)	44	44	44	44
<b>Total HGV 3/4A emissions (G)</b>	<b>148257.6</b>	<b>227.3</b>	<b>667.3</b>	<b>23.6</b>
Emissions per HGV 5A vehs (G/vkm)	1291.4	1.493	6.251	0.212
Distance (km)	2.95	2.95	2.95	2.95
Number of HGV 5A vehs (No)	71	71	71	71
<b>Total HGV 5A emissions (G)</b>	<b>270483.7</b>	<b>312.7</b>	<b>1309.3</b>	<b>44.4</b>
Emissions per HGV 6A vehs (G/vkm)	1293.0	1.184	6.632	0.241
Distance (km)	2.95	2.95	2.95	2.95
Number of HGV 6A vehs (No)	75	75	75	75
<b>Total HGV 6A emissions (G)</b>	<b>286076.3</b>	<b>262.0</b>	<b>1467.3</b>	<b>53.3</b>
<b>All vehicle total emissions</b>	<b>1347457.7</b>	<b>2044.4</b>	<b>6368.3</b>	<b>293.7</b>
<b>Emissions(G/vkm)</b>	<b>932.170</b>	<b>1.414</b>	<b>4.406</b>	<b>0.203</b>

The emissions estimates have been calculated using Appendix E of the NERA document 'Lorry Track and Environmental Costs (August 2000)' which details the unit emission figures for different vehicles types of varying EURO standard.

**Indicator 21 to 24 Transport**

The table below shows the number and proportion of HGVs currently travelling inbound on Newmarket Road.

	Rigid HGV 2 Axles	Rigid HGV 3 Axles	Rigid HGV 4 Axles	<b>Rigid Total</b>	Artic HGV 3/4 Axles	Artic HGV 5 Axles	Artic HGV 6+ Axles	<b>Artic Total</b>	<b>Total</b>	<b>%age</b>
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Information obtain from vehicle registration survey undertaken 7am to 7pm on Friday 29 September 2006



Vehicles journey time surveys undertaken in May 2008 and September 2008 were used to determine the average speed of vehicles using to A11 Newmarket Road corridor in Norwich. The results are given below:

	Distance (km)	AM Peak Average Journey Time (mins:secs)	AM Peak Average Speed (km/h)	PM Peak Average Journey Time (mins:sec)	PM Peak Average Speed (km/h)	Interpeak Average Journey Time (mins:sec)	Interpeak Average Speed (km/h)	Overall Average Speed (km/h)
Consolidation Centre to Unthank Road	26.92	22:20	72.3	22:17	72.5	22:15	72.6	<b>72.5</b>
Unthank Road to Inner Ring Road (without bus lanes)	2.95	6:59	25.3	4:35	38.6	4:27	39.8	<b>34.6</b>
Consolidation Centre to Inner Ring Road (without bus lanes)	29.87	29:19	61.1	26:52	66.7	26:42	67.1	<b>65.0</b>
Unthank Road to Inner Ring Road (using bus lanes)	2.95	5:09	34.4	4:19	41.0	4:27	39.8	<b>38.4</b>
Consolidation Centre to Inner Ring Road (using bus lanes)	29.87	27:29	65.2	26:36	67.4	26:42	67.1	<b>66.6</b>

### C1.3 Building the business-as-usual scenario

Norfolk County Council has been undertaking monitoring of transport since 2002 on a number of radial routes and the Inner/Outer Ring Roads in Norwich.

For all radial routes the latest figures show:

- An average decrease in traffic crossing the Outer Ring Road by 0.8% since 2002
- An decrease in traffic crossing the Outer Ring Road by 0.5% in 2008
- The overall proportion of HGVs crossing the Outer Ring Road has fallen from 4% to 2% since 1995.

For Newmarket Road the figures show:

- An average decrease in traffic crossing the Outer Ring Road by 0.8% since 2002.

Therefore it can be seen that there has been a small downward trend in vehicle and HGV flow using the radial routes. This is most likely a result of previous transport interventions such as improved Park and Ride facilities and other public transport improvements.

## C2 Measure results

The results are presented under sub headings corresponding to the areas used for indicators – economy, energy, environment, society and transport.

### General

Records from the operation of the consolidation centre recorded the vehicles delivering into the consolidation centre and the number of deliveries that it then made into the city centre. The results for each month are shown below and form the basis for the overall evaluation of the measure.

	Deliveries into NFCC by various vehicles						Deliveries from by NFCC vehicles into Norwich					
	HGV 2R	HGV 3R	HGV 4R	HGV 3/4A	HGV 5A	HGV 6A	HGV 2R	HGV 3R	HGV 4R	HGV 3/4A	HGV 5A	HGV 6A
Nov 2007	0	0	0	0	0	4	4	NA	NA	NA	NA	NA
Dec 2007	0	0	0	0	0	4	4	NA	NA	NA	NA	NA
Jan 2008	0	0	0	0	0	4	4	NA	NA	NA	NA	NA
Feb 2008	0	0	0	0	0	4	4	NA	NA	NA	NA	NA
Mar 2008	0	0	0	0	0	8	8	NA	NA	NA	NA	NA
Apr 2008	0	0	0	0	0	10	10	NA	NA	NA	NA	NA
May 2008	0	0	0	0	0	8	8	NA	NA	NA	NA	NA
June 2008	0	0	0	0	0	8	8	NA	NA	NA	NA	NA
July 2008	0	0	0	0	0	11	11	NA	NA	NA	NA	NA
August 2008	0	0	0	0	0	8	8	NA	NA	NA	NA	NA
September 2008	0	0	0	0	0	9	9	NA	NA	NA	NA	NA
October 2008	0	0	0	0	0	10	10	NA	NA	NA	NA	NA
Annual total	0	0	0	0	0	88	88	NA	NA	NA	NA	NA

It can be seen from the data that in its first year of operation 88 HGVs visited the consolidation centre. Initially the low number of retailer participation in the project has resulted in no consolidation of loads. However, an assessment has still been made, as benefits could be achieved from the replacement of larger HGVs by a smaller consolidation centre vehicles.

## C2.1 Energy

### Energy Effects of Measure 10.5 (Freight Consolidation Centre) Alone

For the purposes of evaluation it has been assumed that the vehicles recorded delivering to the consolidation centre would have continued the additional 29.87km into the city centre. However, as a result of the consolidation centre these movements have been replaced by the consolidation centre vehicles. The 29.87km journey between the Consolidation Centre and the Inner Ring Road has been split into two distinct sections:

- **Section 1 Consolidation Centre to Unthank Road (distance = 26.92 km)** – the majority of this route is 2 lane dual carriageway. No bus lanes are present on this section. The national speed limit applies to this section.
- **Section 2 Unthank Road to Inner Ring Road (distance = 2.95km)** – this section is single carriageway with an inbound bus lane present for much of its length. A 30mph and 40mph speed limit is in force along its length.

Vehicle's journey time surveys undertaken in May 2008 and September 2008 were used to determine the average speed of vehicles using to A11 Newmarket Road corridor in Norwich. The overall result are shown earlier in this report. As all consolidation centre vehicles are currently travelling during the morning peak period it is these speeds that have been used in the calculations:

	Distance (km)	AM Peak Average Journey Time (mins:secs)	AM Peak Average Speed (km/h)
<b>Consolidation Centre to Unthank Road</b>	<b>26.92</b>	<b>22:20</b>	<b>72.3</b>
Unthank Road to Inner Ring Road (without bus lanes)	2.95	6:59	25.3
Unthank Road to Inner Ring Road (using bus lanes)	2.95	5:09	34.4

Therefore the average speed from Consolidation Centre to Unthank Road (Section 1) is **72.3km/h**. From Unthank Road to the Inner Ring Road (Section 2) without using bus lanes it is **25.3km/h**.

**10.3 Development of Freight Stakeholders Club  
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Using these figures the average fuel consumption for each vehicle type has been estimated to be.

	Average Speed (km/h)	HGV 2R	HGV 3R	HGV 4R	HGV 3/4A	HGV 5A	HGV 6A	NFCC Veh
Consolidation Centre to Unthank Road fuel consumption (l/km)	72.3	0.285	0.285	0.396	0.396	0.396	0.396	0.285
Unthank Road to Inner Ring Road without using bus lanes fuel consumption (l/km)	25.3	0.379	0.379	0.511	0.511	0.511	0.511	0.379

There above figures have been calculated using the calculation  $L = a + bv + cv^2 + dv^3$  taken from the Department of Transport's 'Transport Analysis Guidance (TAG) Unit 3.5.6 - Values of time and Operating Costs (Feb 2007)'.  
L = Fuel consumption in litres/km  
v = Speed in km/h  
a/b/c/d are parameters derived by AEA Technology's National Environment Technology Centre based upon laboratory testing of different vehicle types.

L = Fuel consumption in litres/km

v = Speed in km/h

a/b/c/d are parameters derived by AEA Technology's National Environment Technology Centre based upon laboratory testing of different vehicle types.

The parameters are:

Parameter	a	b	c	d
Rigid vehicles over 3.5tonnes with 2 or 3 axles (i.e. HGV 2R and HGV 3R)	0.76833752	-0.02257303	0.00031766	-0.0000013544
Rigid vehicles with 4 or more axles and all articulated HGVs (HGV 4R, HGV 3/4A, HGV 5A and HGV 6A)	1.02443156	-0.03021812	0.00044285	-0.0000020059

From these assumptions the effects of the consolidation centre (without using bus lanes) on annual fuel consumption are given below.

	HGV 2R	HGV 3R	HGV 4R	HGV 3/4A	HGV 5A	HGV 6A	Total	NFCC Veh
<b>Base Line Scenario Nov 2007 to Oct 2008</b>								
Base line scenario - number of vehicle movements that delivered to the consolidation centre but would have originally continued into the city centre	0	0	0	0	0	88	88	NA
Base line scenario - fuel consumption per vehicle at 72.3km/h from Consolidation Centre to Unthank Road (l/vkm)	0.285	0.285	0.396	0.396	0.396	0.396	-	NA
Distance from Consolidation Centre to Unthank Road (km)	26.92	26.92	26.92	26.92	26.92	26.92	-	NA
Base line scenario – 88 vehicles fuel consumption at 72.3km/h from Consolidation Centre to Unthank Road (l)	0	0	0	0	0	938.1	938.1	NA
Base line scenario - fuel consumption per vehicle at 25.3km/h from Unthank Road to Inner Ring Road (l/vkm)	0.379	0.379	0.511	0.511	0.511	0.511	-	NA
Distance from Unthank Road to Inner Ring Road (km)	2.95	2.95	2.95	2.95	2.95	2.95	-	NA
Base line scenario – 88 vehicles fuel consumption at 25.3km/h from Unthank Road to Inner Ring Road (l)	0	0	0	0	0	132.7	132.7	NA
Base line scenario – total 88 vehicles fuel consumption from Consolidation Centre to Inner Ring Road (l)	0	0	0	0	0	1070.8	1070.8	NA
<b>New Scenario Nov 2007 to Oct 2008</b>								
New scenario – number of vehicle trips by Consolidation Centre Vehicles to Inner Ring Road	NA	NA	NA	NA	NA	NA	NA	88
New scenario - fuel consumption per vehicle at 72.3km/h from Consolidation Centre to Unthank Road (l/vkm)	NA	NA	NA	NA	NA	NA	NA	0.285
Distance from Consolidation Centre to Unthank Road (km)	NA	NA	NA	NA	NA	NA	NA	26.92
New scenario – 88 vehicles fuel consumption at 72.3km/h from Consolidation Centre to Unthank Road (l)	NA	NA	NA	NA	NA	NA	NA	675.2

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New scenario - fuel consumption per vehicle at 25.3km/h from Unthank Road to Inner Ring Road (l/vkm)	NA	NA	NA	NA	NA	NA	NA	0.379
Distance from Unthank Road to Inner Ring Road (km)	NA	NA	NA	NA	NA	NA	NA	2.95
New scenario – 88 vehicles fuel consumption at 25.3km/h from Unthank Road to Inner Ring Road (l)	NA	NA	NA	NA	NA	NA	NA	98.4
New scenario – total 88 vehicles fuel consumption from Consolidation Centre to Inner Ring Road (l)	NA	NA	NA	NA	NA	NA	NA	773.6
Overall Effects Nov 2007 to Oct2008								
Effects of Consolidation Centre on total fuel consumption (l)	Reduction of 297.2 litres between Nov 2007 to October 2008							

**Between November 2007 and October 2008 (1 year period) the estimated fuel consumption reduction was 297.2 litres and a result of the Consolidation Centre. This equates to 0.113 l/vkm.**

**Energy Effects of Measure 10.4 (Priority Access for Goods Vehicles) Alone**

From previous calculations the average speed from Consolidation Centre to Unthank Road in the am peak period is 72.3km/h. From Unthank Road to the Inner Ring Road without using bus lanes it is 25.3km/h. From Unthank Road to the Inner Ring Road using the bus lanes it is 34.4km/h.

The assumed average fuel consumption at these speed is given below.

	Average Speed (km/h)	NFCC vehicle fuel consumption (l/vkm)
Consolidation Centre to Unthank Road	72.3	0.285
Unthank Road to Inner Ring Road without using bus lanes	25.3	0.379
Unthank Road to Inner Ring Road using bus lanes	34.4	0.313

Using the assumed fuel consumption figures an overall comparison of the effects of Newmarket Road bus lane is given below.

Vehicle Type	NFCC Vehicle
Number of trips Nov 2007 to Oct 2008	88
Consolidation Centre to Unthank Road	
Average Speed from Consolidation Centre to Unthank Road (km/h)	72.3
Fuel consumption per vehicle at speed (l/vkm)	0.285
Distance from Consolidation Centre to Unthank Road (km)	26.92
Fuel consumption for 88 vehicles from Consolidation Centre to Unthank Road (l)	675.2
Unthank Road to Inner Ring Road without using bus lanes	
Average Speed from Unthank Road to Inner Ring Road without using bus lanes (km/h)	25.3
Fuel consumption per vehicle at speed (l/vkm)	0.379
Distance from Unthank Road to Inner Ring Road (km)	2.95
Fuel consumption for 88 vehicles from Unthank Road to Inner Ring Road without using bus lanes (l)	98.4
Unthank Road to Inner Ring Road using bus lanes	
Average Speed from Unthank Road to Inner Ring Road using bus lanes (km/h)	34.4
Fuel consumption per vehicle at speed (l/vkm)	0.313
Distance from Unthank Road to Inner Ring Road (km)	2.95
Fuel consumption for 88 vehicles from Unthank Road to Inner Ring Road using bus lanes (l)	81.3
Overall Effects Nov 2007 to Oct 2008	
Overall Effects on fuel consumption from Nov 2007 to October 2008 (l)	Reduction of 17.1 litres

**Between November 2007 and October 2008 (1 year period) the estimated fuel consumption reduction was 17.1 litres as a result of the use of the bus lane. This equates to 0.006 l/vkm.**

#### **Energy Effects of Measure 10.3 (Freight Stakeholders Club) Alone**

The freight stakeholders club has had no effect on fuel consumption. It was unable to provide a forum whereby operators consolidated their own loads. Any limits effects it may have had on the use of the consolidation centre have been included in the calculations for the consolidation centre.



**Summary of Energy Effects of All Three Measures Combined**

The table below gives a summary of the effects on fuel consumption resulting from the different measures from Nov 2007 to October 2008:

Measure	Overall Effects (Litres)	Effects per Veh (Litres/vkm)*
<b>Measure 10.5 (Freight Consolidation Centre)</b> Effect on fuel consumption resulting from consolidation centre	297.2 reduction	0.113 reduction
<b>Measure 10.4 (Priority Access for Cleans Goods Vehs)</b> Effect on fuel consumption resulting from bus lane	17.1 reduction	0.006 reduction
<b>Measure 10.3 (Freight Stakeholders Club)</b> Effect on fuel consumption resulting from stakeholders club	no change	no change
<b>All measure combined effects</b>	<b>314.3 reduction</b>	<b>0.119 reduction</b>

\* based on 88 vehicles travelling the 29.87km distance between consolidation centre and Inner Ring Road.

**Comment**

Despite the limited consolidation of loads, Measure 10.5 is still having a positive effect on fuel consumption. This is because the consolidation centre vehicle (a Euro 3, 2 axle rigid) is replacing a delivery which would have original been undertaken by a large articulated vehicle.

The effects of using the Newmarket Road bus lanes is much less. This is because:

- The length of bus lane available is small compared to the overall journey length. Only 10% of the overall journey can make use of priority measures
- Even though the HGVs can use the bus lane the benefits are reduced because these vehicles can still be slowed by buses waiting at bus stops and cyclists which they are unable to overtake.

**C2.2 Environment**

**Emissions Effects of Measure 10.5 (Freight Consolidation Centre) Alone**

From previous calculations the average speed from Consolidation Centre to Unthank Road is **72.3km/h**. From Unthank Road to the Inner Ring Road without using bus lanes it is **25.3km/h**.

For the purpose of this part of the evaluation the average vehicle emissions for each vehicle type, at the calculated average speed, are estimated to be.

Vehicle Type	Speed (km/h)	HGV 2R	HGV 3R	HGV 4R	HGV 3/4A	HGV 5A	HGV 6A	NFCC Vehicle
CO2 emissions (g/vkm)	72.3	528.5	720.5	841.4	816.9	914.4	1026.6	528.9
CO2 emissions (g/vkm)	25.3	733.9	1127.5	1377.8	1311.7	1455.0	1430.1	734.4
CO emissions (g/vkm)	72.3	1.115	1.357	1.451	1.361	1.146	0.964	1.107
CO emissions (g/vkm)	25.3	1.586	2.136	2.217	2.115	1.848	1.513	1.546
NOx emissions (g/vkm)	72.3	2.144	2.944	3.843	3.692	4.558	4.513	1.773
NOx emissions (g/vkm)	25.3	3.595	4.999	6.300	6.114	7.501	8.057	2.993
Particulate emissions (g/vkm)	72.3	0.134	0.120	0.121	0.122	0.130	0.126	0.110
Particulate emissions (g/vkm)	25.3	0.252	0.208	0.216	0.222	0.261	0.299	0.207

The emissions estimates have been calculated using Appendix E of the NERA document ‘Lorry Track and Environmental Costs (August 2000)’ which details the unit emission figures for different vehicles types of varying EURO standard. For calculations on emissions, the proportion of vehicles having each EURO standard has been based upon the results of the vehicle registration survey undertaken on Newmarket Road on Friday 29 September 2006.

**10.3 Development of Freight Stakeholders Club  
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These proportions are given below.

Standard	%age	Standard	%age	Standard	%age	Standard	%age	Standard	%age
Pre EURO 1	2.2%	EURO 1	6.1%	EURO 2	27.0%	EURO 3	62.4%	EURO 4	2.2%

The consolidation centre vehicles delivering into the city centre are all EURO 3 standard vehicles.

From these assumptions the effects of the consolidation centre on emissions are show in the following tables.

CO2 Emissions

	HGV 2R	HGV 3R	HGV 4R	HGV 3/4A	HGV 5A	HGV 6A	Total	NFCC Vehs
<b>Base Line Scenario Nov 2007 to Oct 2008</b>								
Base line scenario - number of vehicles movement that delivered to the Consolidation Centre but would have originally continued into the city centre	0	0	0	0	0	88	88	NA
Base line scenario – CO2 emissions per vehicle at 72.3km/h from Consolidation Centre to Unthank Road (g/vkm)	528.5	720.5	841.4	816.9	914.4	1026.6	-	NA
Distance from Consolidation Centre to Unthank Road (km)	26.92	26.92	26.92	26.92	26.92	26.92	26.92	NA
Base line scenario – 88 vehicles CO2 emissions at 72.3km/h from Consolidation Centre to Unthank Road (g)	0	0	0	0	0	243197.4.3	243197.4.3	NA
Base line scenario –CO2 emissions per vehicle at 25.3km/h from Unthank Road to Inner Ring Road (g/vkm)	733.9	1127.5	1377.8	1311.7	1455.0	1430.1	-	NA
Distance from Unthank Road to Inner Ring Road (km)	2.95	2.95	2.95	2.95	2.95	2.95	2.95	NA
Base line scenario – 88 vehicles CO2 emissions at 25.3km/h from Unthank Road to Inner Ring Road (g)	0	0	0	0	0	371254.0	371254.0	NA
Base line scenario – total 88 vehicles CO2 emissions from Consolidation Centre to Inner Ring Road (g)	0	0	0	0	0	280322.8.3	280322.8.3	NA
<b>New Scenario Nov 2007 to Oct 2008</b>								
New scenario – number of vehicle trips by Consolidation Centre Vehicles to Inner Ring Road	NA	NA	NA	NA	NA	NA	NA	88
New scenario – CO2 emissions per vehicle at 72.3km/h from Consolidation Centre to Unthank Road (g/vkm)	NA	NA	NA	NA	NA	NA	NA	528.9
Distance from Consolidation Centre to Unthank Road (km)	NA	NA	NA	NA	NA	NA	NA	26.92
New scenario – 88 vehicles CO2 emissions at 72.3km/h from Consolidation Centre to Unthank Road (g)	NA	NA	NA	NA	NA	NA	NA	125294.2.9
New scenario – CO2 emissions per vehicle at 25.3km/h from Unthank Road to Inner Ring Road (g/vkm)	NA	NA	NA	NA	NA	NA	NA	734.4
Distance from Unthank Road to Inner Ring Road (km)	NA	NA	NA	NA	NA	NA	NA	2.95
New scenario – 88 vehicles CO2 emissions at 25.3km/h from Unthank Road to Inner Ring Road (g)	NA	NA	NA	NA	NA	NA	NA	190650.2
New scenario – total CO2 emissions from Consolidation Centre to Inner Ring Road (g)	NA	NA	NA	NA	NA	NA	NA	144359.3.1
<b>Overall Effects Nov 2007 to Oct 2008</b>								
Effects of Consolidation Centre on CO2 emissions (g)	Reduction of 1359635.2g between Nov 2007 to Oct 2008							

**Between November 2007 and October 2008 (1 year period) the estimated CO2 emission reduction was 1359635.2g as a result of the consolidation centre. This equates to 517.255 g/vkm.**

Measure title:

**10.3 Development of Freight Stakeholders Club  
10.4 Priority Access for Clean Goods Vehicles  
10.5 Urban Consolidation Centre**

City: **Norwich**

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CO Emissions

	HGV 2R	HGV 3R	HGV 4R	HGV 3/4A	HGV 5A	HGV 6A	Total	NFCC Vehs
<b>Base Line Scenario Nov 2007 to Oct 2008</b>								
Base line scenario - number of vehicle movements that delivered to the consolidation but would have originally continued into the city centre	0	0	0	0	0	88	88	NA
Base line scenario – CO emissions per vehicle at 72.3km/h from Consolidation Centre to Unthank Road (g/vkm)	1.115	1.357	1.451	1.361	1.146	0.964	-	NA
Distance from Consolidation Centre to Unthank Road (km)	26.92	26.92	26.92	26.92	26.92	26.92	26.92	NA
Base line scenario – 88 vehicles CO emissions at 72.3km/h from Consolidation Centre to Unthank Road (g)	0	0	0	0	0	2283.7	2283.7	NA
Base line scenario –CO emissions per vehicle at 25.3km/h from Unthank Road to Inner Ring Road (g/vkm)	1.586	2.136	2.217	2.115	1.848	1.513	-	NA
Distance from Unthank Road to Inner Ring Road (km)	2.95	2.95	2.95	2.95	2.95	2.95	2.95	NA
Base line scenario – 88 vehicles CO emissions at 25.3km/h from Unthank Road to Inner Ring Road (g)	0	0	0	0	0	392.8	392.8	NA
Base line scenario – total 88 vehicles CO emissions from Consolidation Centre to Inner Ring Road (g)	0	0	0	0	0	2676.5	<b>2676.5</b>	NA
<b>New Scenario Nov 2007 to Oct 2008</b>								
New scenario – number of vehicle trips by Consolidation Centre Vehicles to Inner Ring Road	NA	NA	NA	NA	NA	NA	NA	88
New scenario – CO emissions per vehicle at 72.3km/h from Consolidation Centre to Unthank Road (g/vkm)	NA	NA	NA	NA	NA	NA	NA	1.107
Distance from Consolidation Centre to Unthank Road (km)	NA	NA	NA	NA	NA	NA	NA	26.92
New scenario – 88 vehicles CO emissions at 72.3km/h from Consolidation Centre to Unthank Road (g)	NA	NA	NA	NA	NA	NA	NA	2622.4
New scenario – CO emissions per vehicle at 25.3km/h from Unthank Road to Inner Ring Road (g/vkm)	NA	NA	NA	NA	NA	NA	NA	1.546
Distance from Unthank Road to Inner Ring Road (km)	NA	NA	NA	NA	NA	NA	NA	2.95
New scenario – 88 vehicles CO emissions at 25.3km/h from Unthank Road to Inner Ring Road (g)	NA	NA	NA	NA	NA	NA	NA	401.3
New scenario – total CO emissions from Consolidation Centre to Inner Ring Road (g)	NA	NA	NA	NA	NA	NA	NA	<b>3023.7</b>
<b>Overall Effects Nov 2007 to Oct 2008</b>								
Effects of Consolidation Centre on CO emissions (g)	<b>Increase of 347.2g between Nov 2007 to Oct 2008</b>							

**Between November 2007 and October 2008 (1 year period) the estimated CO emission increase was 347.2g as a result of the consolidation centre. This equates to 0.132 g/vkm.**

Measure title:

**10.3 Development of Freight Stakeholders Club  
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10.5 Urban Consolidation Centre**

City: **Norwich**

Project: **SMILE**

Measure number: **10.3, 10.4 & 10.5**

NOx Emissions

	HGV 2R	HGV 3R	HGV 4R	HGV 3/4A	HGV 5A	HGV 6A	Total	NFCC Vehs
<b>Base Line Scenario Nov 2007 to Oct 2008</b>								
Base line scenario - number of vehicles movement that delivered to the Consolidation Centre but would have originally continued into the city centre	0	0	0	0	0	88	88	NA
Base line scenario – NOx emissions per vehicle at 72.3km/h from Consolidation Centre to Unthank Road (g/vkm)	2.144	2.944	3.843	3.692	4.558	4.513	-	NA
Distance from Consolidation Centre to Unthank Road (km)	26.92	26.92	26.92	26.92	26.92	26.92	26.92	NA
Base line scenario – 88 vehicles NOx emissions at 72.3km/h from Consolidation Centre to Unthank Road (g)	0	0	0	0	0	10691.1	10691.1	NA
Base line scenario – NOx emissions per vehicle at 25.3km/h from Unthank Road to Inner Ring Road (g/vkm)	3.595	4.999	6.300	6.114	7.501	8.057	-	NA
Distance from Unthank Road to Inner Ring Road (km)	2.95	2.95	2.95	2.95	2.95	2.95	2.95	NA
Base line scenario – 88 vehicles NOx emissions at 25.3km/h from Unthank Road to Inner Ring Road (g)	0	0	0	0	0	2091.6	2091.6	NA
Base line scenario – total 88 vehicles NOx emissions from Consolidation Centre to Inner Ring Road (g)	0	0	0	0	0	12782.7	<b>12782.7</b>	NA
<b>New Scenario Nov 2007 to Oct 2008</b>								
New scenario – number of vehicle trips by Consolidation Centre Vehicles to Inner Ring Road	NA	NA	NA	NA	NA	NA	NA	88
New scenario – NOx emissions per vehicle at 72.3km/h from Consolidation Centre to Unthank Road (g/vkm)	NA	NA	NA	NA	NA	NA	NA	1.773
Distance from Consolidation Centre to Unthank Road (km)	NA	NA	NA	NA	NA	NA	NA	26.92
New scenario – 88 vehicles NOx emissions at 72.3km/h from Consolidation Centre to Unthank Road (g)	NA	NA	NA	NA	NA	NA	NA	4200.2
New scenario – NOx emissions per vehicle at 25.3km/h from Unthank Road to Inner Ring Road (g/vkm)	NA	NA	NA	NA	NA	NA	NA	2.993
Distance from Unthank Road to Inner Ring Road (km)	NA	NA	NA	NA	NA	NA	NA	2.95
New scenario – 88 vehicles NOx emissions at 25.3km/h from Unthank Road to Inner Ring Road (g)	NA	NA	NA	NA	NA	NA	NA	777.0
New scenario – total NOx emissions from Consolidation Centre to Inner Ring Road (g)	NA	NA	NA	NA	NA	NA	NA	<b>4977.2</b>
<b>Overall Effects Nov 2007 to Oct 2008</b>								
Effects of Consolidation Centre on NOx emissions (g)	<b>Reduction of 7805.5g between Nov 2007 to Oct 2008</b>							

**Between November 2007 and October 2008 (1 year period) the estimated NOx emission reduction was 7805.5g as a result of the consolidation centre. This equates to 2.969 g/vkm.**

Particulate Emissions

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10.5 Urban Consolidation Centre**

Measure title:

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	HGV 2R	HGV 3R	HGV 4R	HGV 3/4A	HGV 5A	HGV 6A	Total	NFCC Vehs
<b>Base Line Scenario Nov 2007 to Oct 2008</b>								
Base line scenario - number of vehicle movements that delivered to the Consolidation Centre but would have originally continued into the city centre	0	0	0	0	0	88	88	NA
Base line scenario – particulate emissions per vehicle at 72.3km/h from Consolidation Centre to Unthank Road (g/vkm)	0.134	0.12	0.121	0.122	0.130	0.126	-	NA
Distance from Consolidation Centre to Unthank Road (km)	26.92	26.92	26.92	26.92	26.92	26.92	26.92	NA
Base line scenario – 88 vehicles particulate emissions at 72.3km/h from Consolidation Centre to Unthank Road (g)	0	0	0	0	0	298.5	298.5	NA
Base line scenario – particulate emissions per vehicle at 25.3km/h from Unthank Road to Inner Ring Road (g/vkm)	0.252	0.208	0.216	0.222	0.261	0.299	-	NA
Distance from Unthank Road to Inner Ring Road (km)	2.95	2.95	2.95	2.95	2.95	2.95	2.95	NA
Base line scenario – 88 vehicles particulate emissions at 25.3km/h from Unthank Road to Inner Ring Road (g)	0	0	0	0	0	77.6	77.6	NA
Base line scenario – total 88 vehicles particulate emissions from Consolidation Centre to Inner Ring Road (g)	0	0	0	0	0	376.1	<b>376.1</b>	NA
<b>New Scenario Nov 2007 to Oct 2008</b>								
New scenario – number of vehicle trips by Consolidation Centre Vehicles to Inner Ring Road	NA	NA	NA	NA	NA	NA	NA	88
New scenario – particulate emissions per vehicle at 72.3km/h from Consolidation Centre to Unthank Road (g/vkm)	NA	NA	NA	NA	NA	NA	NA	0.110
Distance from Consolidation Centre to Unthank Road (km)	NA	NA	NA	NA	NA	NA	NA	26.92
New scenario – 88 vehicles particulate emissions at 72.3km/h from Consolidation Centre to Unthank Road (g)	NA	NA	NA	NA	NA	NA	NA	260.6
New scenario – particulate emissions per vehicle at 25.3km/h from Unthank Road to Inner Ring Road (g/vkm)	NA	NA	NA	NA	NA	NA	NA	0.207
Distance from Unthank Road to Inner Ring Road (km)	NA	NA	NA	NA	NA	NA	NA	2.95
New scenario – 88 vehicles particulate emissions at 25.3km/h from Unthank Road to Inner Ring Road (g)	NA	NA	NA	NA	NA	NA	NA	53.7
New scenario – total particulate emissions from Consolidation Centre to Inner Ring Road (g)	NA	NA	NA	NA	NA	NA	NA	<b>314.3</b>
<b>Overall Effects Nov 2007 to Oct 2008</b>								
Effects of Consolidation Centre on particulate emissions (g)	Reduction of 61.8g between Nov 2007 to Oct 2008							

**Between November 2007 and October 2008 (1 year period) the estimated particulate emission reduction was 61.8g as a result of the consolidation centre. This equates to 0.024 g/vkm.**

**Emissions Effects of Measure 10.4 (Priority Access for Goods Vehicles) Alone**

From previous calculations the average speed from the Consolidation Centre to Unthank Road is **72.3km/h**. From Unthank Road to the Inner Ring Road without using bus lanes it is **25.3km/h**. From Unthank Road to the Inner Ring Road using the bus lanes it is **34.4km/h**.

For the purpose of this part of the evaluation the average vehicle emissions for a Consolidation Centre vehicle, at the calculated average speeds, are estimated to be.

Vehicle Type	Speed (km/h)	NFCC Vehicle	Scenario



Measure title:

**10.3 Development of Freight Stakeholders Club  
10.4 Priority Access for Clean Goods Vehicles  
10.5 Urban Consolidation Centre**

City: **Norwich**

Project: **SMILE**

Measure number: **10.3, 10.4 & 10.5**

CO2 emissions (g/vkm)	72.3	528.9	Vehicles travelling between Consolidation Centre and Unthank Road (Section 1)
CO2 emissions (g/vkm)	25.3	734.4	Vehicles travelling between Unthank Road and Inner Ring Road (Section 2) without using bus lanes
CO2 emissions (g/vkm)	34.4	631.7	Vehicles travelling between Unthank Road and Inner Ring Road (Section 2) using bus lanes
CO emissions (g/vkm)	72.3	1.107	Vehicles travelling between Consolidation Centre and Unthank Road (Section 1)
CO emissions (g/vkm)	25.3	1.546	Vehicles travelling between Unthank Road and Inner Ring Road (Section 2) without using bus lanes
CO emissions (g/vkm)	34.4	1.257	Vehicles travelling between Unthank Road and Inner Ring Road (Section 2) using bus lanes
NOx emissions (g/vkm)	72.3	1.773	Vehicles travelling between Consolidation Centre and Unthank Road (Section 1)
NOx emissions (g/vkm)	25.3	2.933	Vehicles travelling between Unthank Road and Inner Ring Road (Section 2) without using bus lanes
NOx emissions (g/vkm)	34.4	2.388	Vehicles travelling between Unthank Road and Inner Ring Road (Section 2) using bus lanes
Particulate emissions (g/vkm)	72.3	0.110	Vehicles travelling between Consolidation Centre and Unthank Road (Section 1)
Particulate emissions (g/vkm)	25.3	0.207	Vehicles travelling between Unthank Road and Inner Ring Road (Section 2) without using bus lanes
Particulate emissions (g/vkm)	34.4	0.165	Vehicles travelling between Unthank Road and Inner Ring Road (Section 2) using bus lanes

Using the estimated emissions figures and overall comparison of the Newmarket Road bus lane is given below.

CO2 Emissions

Vehicle Type	NFCC Vehicle
Number of trips Nov 2007 to Oct 2008	88
<b>Consolidation Centre to Unthank Road</b>	
Average speed from Consolidation Centre to Unthank Road (km/h)	72.3
CO2 emissions per vehicle at speed (g/vkm)	528.9
Distance from Consolidation Centre to Unthank Road (km)	26.92
CO2 emissions for 88 vehicles from Consolidation Centre to Unthank Road (g)	1252942.9
<b>Unthank Road to Inner Ring Road without using bus lanes</b>	
Average speed from Unthank Road to Inner Ring Road without using bus lanes (km/h)	25.3
CO2 emissions per vehicle at speed (g/vkm)	734.4
Distance from Unthank Road to Inner Ring Road without using bus lanes (km)	2.95
CO2 emissions for 88 vehicles from Unthank Road to Inner Ring Road without using bus lanes (g)	<b>190650.2</b>
<b>Unthank Road to Inner Ring Road using bus lanes</b>	
Average speed from Unthank Road to Inner Ring Road using bus lanes (km/h)	34.4
CO2 emissions per vehicle at speed (g/vkm)	631.7
Distance from Unthank Road to Inner Ring Road using bus lanes (km)	2.95
CO2 emissions for 88 vehicles from Unthank Road to Inner Ring Road using bus lanes (g)	<b>163989.3</b>
<b>Overall Effects</b>	
<b>Overall Effects on CO2 emissions</b>	<b>Reduction of 26660.9g</b>

**Between November 2007 and October 2008 (1 year period) the estimated CO2 emission reduction was 26660.9g as a result of the bus lane usage. This equates to 10.143 g/vkm.**

CO Emissions

Vehicle Type	NFCC Vehicle
Number of trips Nov 2007 to Oct 2008	88
<b>Consolidation Centre to Unthank Road</b>	
Average speed from Consolidation Centre to Unthank Road (km/h)	72.3
CO emissions per vehicle at speed (g/vkm)	1.107
Distance from Consolidation Centre to Unthank Road (km)	26.92
CO emissions for 88 vehicles from Consolidation Centre to Unthank Road (g)	2622.4
<b>Unthank Road to Inner Ring Road without using bus lanes</b>	
Average speed from Unthank Road to Inner Ring Road without using bus lanes (km/h)	25.3
CO emissions per vehicle at speed (g/vkm)	1.546
Distance from Unthank Road to Inner Ring Road without using bus lanes (km)	2.95
CO emissions for 88 vehicles from Unthank Road to Inner Ring Road without using bus lanes (g)	<b>401.3</b>
<b>Unthank Road to Inner Ring Road using bus lanes</b>	
Average speed from Unthank Road to Inner Ring Road using bus lanes (km/h)	34.4
CO emissions per vehicle at speed (g/vkm)	1.257
Distance from Unthank Road to Inner Ring Road using bus lanes (km)	2.95
CO emissions for 88 vehicles from Unthank Road to Inner Ring Road using bus lanes (g)	<b>326.3</b>
<b>Overall Effects</b>	
<b>Overall Effects on CO emissions</b>	<b>Reduction of 75.0g</b>

**Between November 2007 and October 2008 (1 year period) the estimated CO emission reduction was 75.0g as a result of the bus lane usage. This equates to 0.029 g/vkm.**

Measure title:

**10.3 Development of Freight Stakeholders Club  
10.4 Priority Access for Clean Goods Vehicles  
10.5 Urban Consolidation Centre**

City: **Norwich**

Project: **SMILE**

Measure number: **10.3, 10.4 & 10.5**

NOx Emissions

Vehicle Type	NFCC Vehicle
Number of trips Nov 2007 to Oct 2008	88
<b>Consolidation Centre to Unthank Road</b>	
Average speed from Consolidation Centre to Unthank Road (km/h)	72.3
NOx emissions per vehicle at speed (g/vkm)	1.773
Distance from Consolidation Centre to Unthank Road (km)	26.92
NOx emissions for 88 vehicles from Consolidation Centre to Unthank Road (g)	4200.2
<b>Unthank Road to Inner Ring Road without using bus lanes</b>	
Average speed from Unthank Road to Inner Ring Road without using bus lanes (km/h)	25.3
NOx emissions per vehicle at speed (g/vkm)	2.933
Distance from Unthank Road to Inner Ring Road without using bus lanes (km)	2.95
NOx emissions for 88 vehicles from Unthank Road to Inner Ring Road without using bus lanes (g)	<b>761.4</b>
<b>Unthank Road to Inner Ring Road using bus lanes</b>	
Average speed from Unthank Road to Inner Ring Road using bus lanes (km/h)	34.4
NOx emissions per vehicle at speed (g/vkm)	2.388
Distance from Unthank Road to Inner Ring Road using bus lanes (km)	2.95
NOx emissions for 88 vehicles from Unthank Road to Inner Ring Road using bus lanes (g)	<b>619.9</b>
<b>Overall Effects</b>	
<b>Overall Effects on NOx emissions</b>	<b>Reduction of 141.5g</b>

**Between November 2007 and October 2008 (1 year period) the estimated NOx emission reduction was 141.5g as a result of the bus lane usage. This equates to 0.054 g/vkm.**

Particulate Emissions

Vehicle Type	NFCC Vehicle
Number of trips Nov 2007 to Oct 2008	88
<b>Consolidation Centre to Unthank Road</b>	
Average speed from Consolidation Centre to Unthank Road (km/h)	72.3
Particulate emissions per vehicle at speed (g/vkm)	0.110
Distance from Consolidation Centre to Unthank Road (km)	26.92
Particulate emissions for 88 vehicles from Consolidation Centre to Unthank Road (g)	260.6
<b>Unthank Road to Inner Ring Road without using bus lanes</b>	
Average speed from Unthank Road to Inner Ring Road without using bus lanes (km/h)	25.3
Particulate emissions per vehicle at speed (g/vkm)	0.207
Distance from Unthank Road to Inner Ring Road without using bus lanes (km)	2.95
Particulate emissions for 88 vehicles from Unthank Road to Inner Ring Road without using bus lanes (g)	<b>53.7</b>
<b>Unthank Road to Inner Ring Road using bus lanes</b>	
Average speed from Unthank Road to Inner Ring Road using bus lanes (km/h)	34.4
Particulate emissions per vehicle at speed (g/vkm)	0.165
Distance from Unthank Road to Inner Ring Road using bus lanes (km)	2.95
Particulate emissions for 88 vehicles from Unthank Road to Inner Ring Road using bus lanes (g)	<b>42.8</b>
<b>Overall Effects</b>	
<b>Overall Effects on Particulate emissions</b>	<b>Reduction of 10.9g</b>

**Between November 2007 and October 2008 (1 year period) the estimated particulates emission reduction was 10.9g as a result of the bus lane usage. This equates to 0.004 g/vkm.**

**Emissions Effects of Measure 10.3 (Freight Stakeholders Club) Alone**

The freight stakeholders club has had no effect on emissions. It was unable to provide a forum whereby operators consolidated their own loads. Any limits effects it may have had on the use of the Consolidation Centre have been included in the calculations for the consolidation centre.

**Summary of Emission Effects of All Three Measures Combined**

The table below gives a summary of the effects on emissions resulting from the different measures from Nov 2007 to October 2008:

Measure	Overall effects CO2 (g)	Overall effects CO (g)	Overall effects NOx (g)	Overall effects PM10 (g)
<b>Measure 10.5 (Freight Consolidation Centre)</b> Effect on emissions resulting from consolidation centre	1359635.2 reduction	347.2 increase	7805.5 reduction	61.8 reduction
<b>Measure 10.4 (Priority Access for Clean Goods Vehs)</b> Effect on emissions resulting from bus lane	26660.9 reduction	75.0 reduction	141.5 reduction	10.9 reduction
<b>Measure 10.3 (Freight Stakeholders Club)</b> Effect on emissions resulting from stakeholders club	no change	no change	no change	no change
<b>All measure combined effects</b>	<b>1386296.1 reduction</b>	<b>272.2 increase</b>	<b>7947.0 reduction</b>	<b>72.7 reduction</b>

Measure	Effects per veh CO2* (g/vkm)	Effects per veh CO* (g/vkm)	Effects per veh NOx* (g/vkm)	Effects per veh PM10* (g/vkm)
<b>Measure 10.5 (Freight Consolidation Centre)</b> Effect on emissions resulting from consolidation centre	517.255 reduction	0.132 increase	2.969 reduction	0.024 reduction
<b>Measure 10.4 (Priority Access for Clean Goods Vehs)</b> Effect on emissions resulting from bus lane	10.143 reduction	0.029 reduction	0.054 reduction	0.004 reduction
<b>Measure 10.3 (Freight Stakeholders Club)</b> Effect on emissions resulting from stakeholders club	no change	no change	no change	no change
<b>All measure combined effects</b>	<b>527.398 reduction</b>	<b>0.103 increase</b>	<b>3.023 reduction</b>	<b>0.028 reduction</b>

\* based on 88 vehicles travelling the 29.87km distance between Consolidation centre and Inner Ring Road.

**Comment**

The reasons for emission savings are similar to these previously described for energy savings. Despite the limited consolidation of loads Measure 10.5 is still having a positive effect on emissions. This is because the consolidation centre vehicle (a Euro 3 2 axle rigid) delivery is replacing a delivery which would have originally been undertaken by a large articulated vehicle.

The effects of using the Newmarket Road bus lanes is much less. This is because:

- The length of bus lane available is small compared to the overall journey length. Only 10% of the overall journey can make use of priority measures
- Even though the HGVs can use the bus lane the benefits are reduced because these vehicles can still be slowed by buses waiting at bus stops and cyclists which they are unable to overtake.

### C2.3 Society

In May/June 2007 and June/July 2008 a telephone survey was undertaken. The purpose of the survey was to establish views on the CIVITAS Smile measures from people within the Norwich area. During the survey 808 valid interviews were obtained.

The results of the survey questions relating to the freight measures were as follows.

Have you heard of a freight warehousing scheme in Norwich aiming to reduce the number and size of goods vehicles delivering to the city	
Results in May/June 2007	Results in June/July 2008
<p>Yes 7%</p> <p>No 93%</p>	<p>Yes 9%</p> <p>No 91%</p>
Have you heard of the suggestion that goods vehicles from a freight warehousing scheme using newer, cleaner fuels be granted priority access measures (e.g. being allowed to use bus lanes)?	
Results in May/June 2007	Results in June/July 2008
<p>Yes 8%</p> <p>No 92%</p>	<p>No 47%</p> <p>Yes 53%</p>

#### Comment

Whilst there was only limited increase in awareness of the consolidation centre there was a significant increase in awareness of the use of the bus lanes by its vehicles. This is attributed to a number of factors:

- As a part of the Traffic Regulation Order making process (to allow the exemption for consolidation centre vehicles to use the bus lanes) a stakeholder consultation had to be undertaken
- A number of organisations actively campaigned against the proposals and this resulted in newspaper articles and discussion within local communities
- To implement the measure signing is required on site, which can be seen by every driver that travels into Norwich via the A11 Newmarket Road.

## C2.4 Transport

### Transport Effects of Measure 10.5 (Freight Consolidation Centre) Alone

#### Trip Distance

The effects on total mileage travelled resulting from the consolidation centre has previously been calculated for the assessment of energy (section C2.1). The table below summarises this.

	HGV 2R	HGV 3R	HGV 4R	HGV 3/4A	HGV 5A	HGV 6A	Total	NFCC Vehs
<b>Base line scenario Nov 2007 to Oct 2008</b>								
Base line scenario - number of vehicle movements that delivered to the consolidation centre but would have originally continued into the city centre in one year	0	0	0	0	0	88	88	NA
Distance travelled from Consolidation Centre to Inner Ring Road (km)	29.87	29.87	29.87	29.87	29.87	29.87	29.87	NA
Base line scenario – total distance travelled (km)	0	0	0	0	0	2628.6	<b>2628.6</b>	NA
<b>New scenario Nov 2007 to Oct 2008</b>								
New scenario – number of vehicle trips into Inner Ring Road by Consolidation Centre Vehicles	NA	NA	NA	NA	NA	NA	NA	88
Distance travelled from Consolidation Centre to Inner Ring Road (km)	NA	NA	NA	NA	NA	NA	NA	29.87
New line scenario – total distance travelled (km)	NA	NA	NA	NA	NA	NA	NA	<b>2628.6</b>
<b>Overall effects Nov 2007 to Oct 2008</b>								
<b>Overall effects on distance travelled (km)</b>	<b>No Change</b>							

Because the consolidation of deliveries has yet to take place there has been no change in trip distance. At present the large vehicle deliveries into the consolidation centre are effectively being replaced by smaller consolidation centre vehicles.

#### Vehicle Speed

It is estimated that the consolidation centre has had no effect on vehicle speeds.

### Transport Effects of Measure 10.4 (Priority Access for Goods Vehicles) Alone

#### Trip Distance

It is estimated that the use of the bus lane has had no effect on vehicle trip distance.

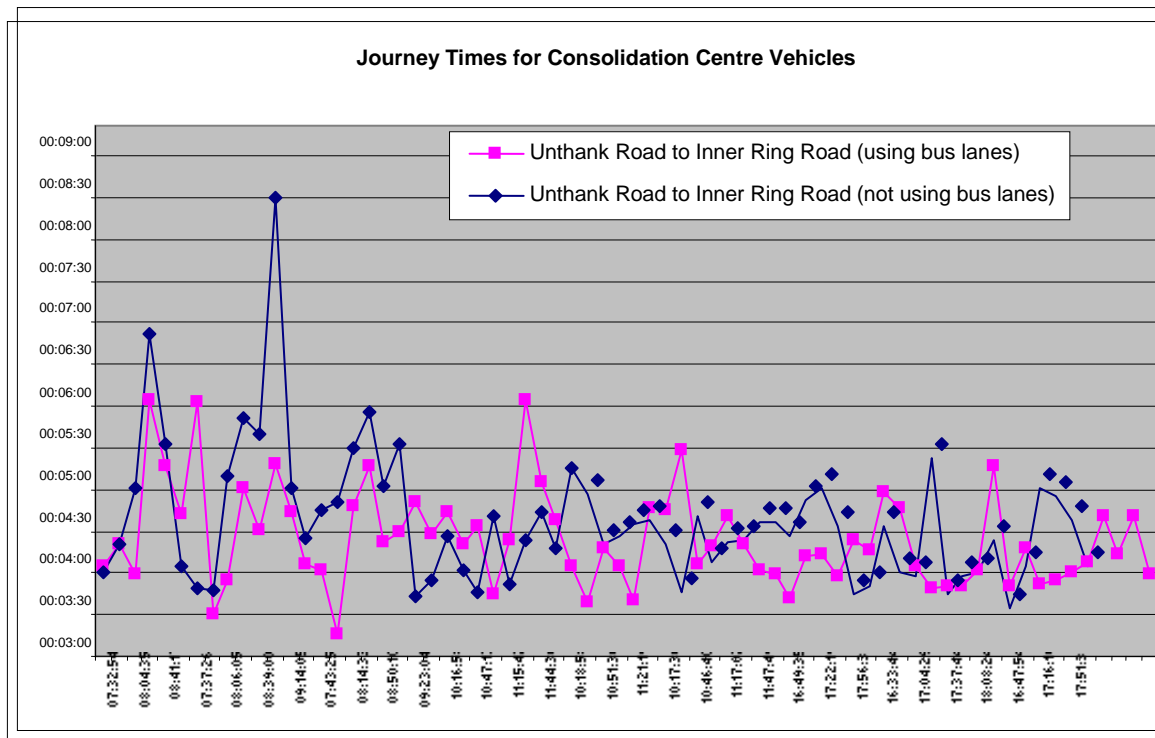
#### Vehicle Speed

The effects on vehicle speed, resulting from the use of Newmarket Road bus lanes, has previously been calculated for the assessment of energy (section C2.1). The table below summarises this.

	Distance (km)	AM Peak Average Journey Time (mins:secs)	AM Peak Average Speed (km/h)	PM Peak Average Journey Time (mins:sec)	PM Peak Average Speed (km/h)	Interpeak Average Journey Time (mins:sec)	Interpeak Average Speed (km/h)
Consolidation Centre to Unthank Road	26.92	22:20	72.3	22:17	72.5	22:15	72.6
Unthank Road to Inner Ring Road (without bus lanes)	2.95	6:59	25.3	4:35	38.6	4:27	39.8
Consolidation Centre to Inner Ring Road (without bus lanes)	<b>29.87</b>	<b>29:19</b>	<b>61.1</b>	<b>26:52</b>	<b>66.7</b>	<b>26:42</b>	<b>67.1</b>
Unthank Road to Inner Ring Road (using bus lanes)	2.95	5:09	34.4	4:19	41.0	4:27	39.8
Consolidation Centre to Inner Ring Road (using bus lanes)	<b>29.87</b>	<b>27:29</b>	<b>65.2</b>	<b>26:36</b>	<b>67.4</b>	<b>26:42</b>	<b>67.1</b>
<b>Effect of bus lane</b>	NA	<b>1:50 saving</b>	<b>4.1 faster</b>	<b>0:16 saving</b>	<b>0.7 faster</b>	<b>no change</b>	<b>no change</b>



The graph below shows the modelled journey times through the day between Unthank Road and the Inner Ring Road. It can be seen that the use of the bus lanes does provide benefit, particularly in the am peak period.



**Transport Effects of Measures 10.3 (Freight Stakeholders Club) Alone**

The freight stakeholders club has had no effect on trip distance or vehicle speeds. It was unable to provide a forum whereby operators consolidated their own loads. Any limited effects it may have had on the use of the consolidation centre have been included in the calculations for the consolidation centre.

**C2.5 Other Evaluation Indicators**

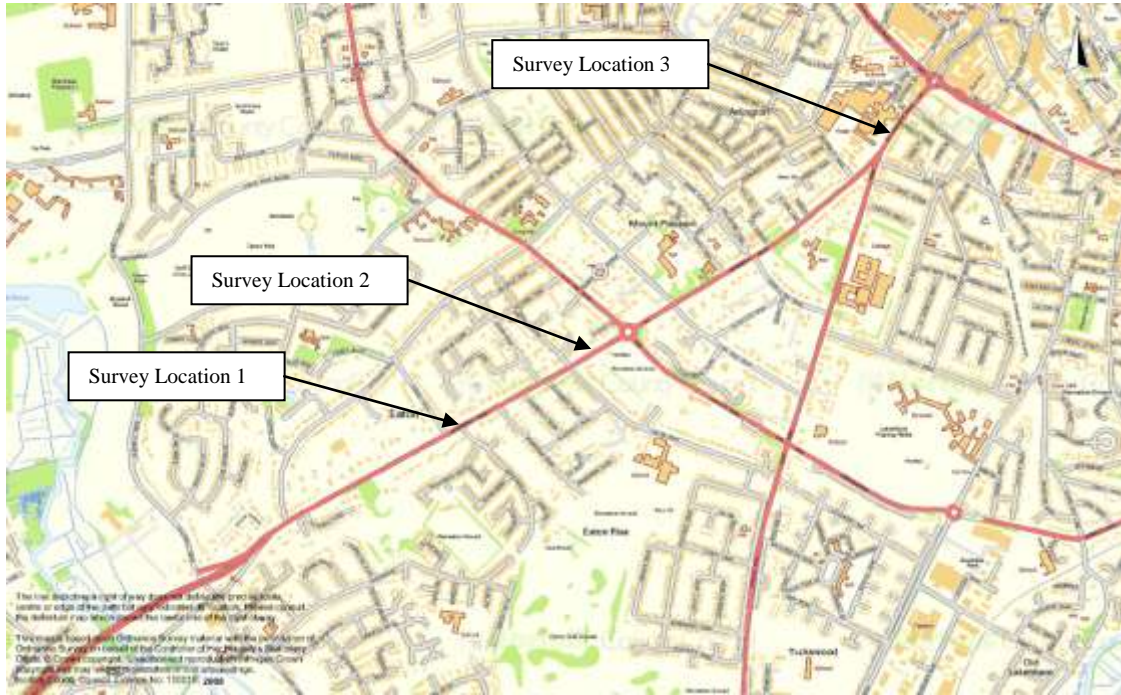
During the implementation of the bus lane measure a number of concerns were expressed by stakeholders regarding the proposals: These were:

- Allowing HGVs to use the bus lane would have a deterrent effect on cyclists and the number of cyclists using the bus lane would reduce
- Other HGV drivers may believe that they can use the bus lane and the number of HGVs in the lane would be much greater than those predicted
- Allowing HGVs to use the bus lane would be a danger to cyclists.

As part of the implementation these concerns were monitored using traffic surveys and the results were as follows:

**Effect on Cyclists of Measure 10.4 (Priority Access for Goods Vehicles)**

Before and after counts were undertaken at the following locations between 7am and 10am. The surveys recorded inbound cyclists that were using the bus lane on northwest side of Newmarket Road and the shared used cycle lane of the southeast side (present at sites 1 and 2 only).



**10.3 Development of Freight Stakeholders Club  
10.4 Priority Access for Clean Goods Vehicles  
10.5 Urban Consolidation Centre**

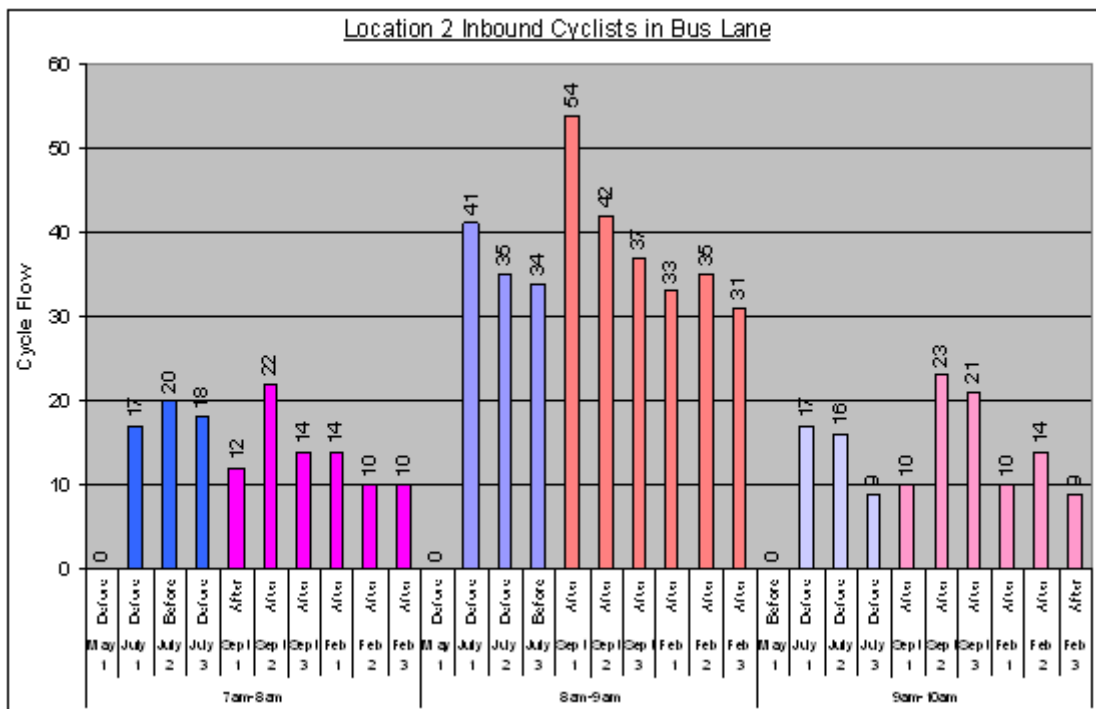
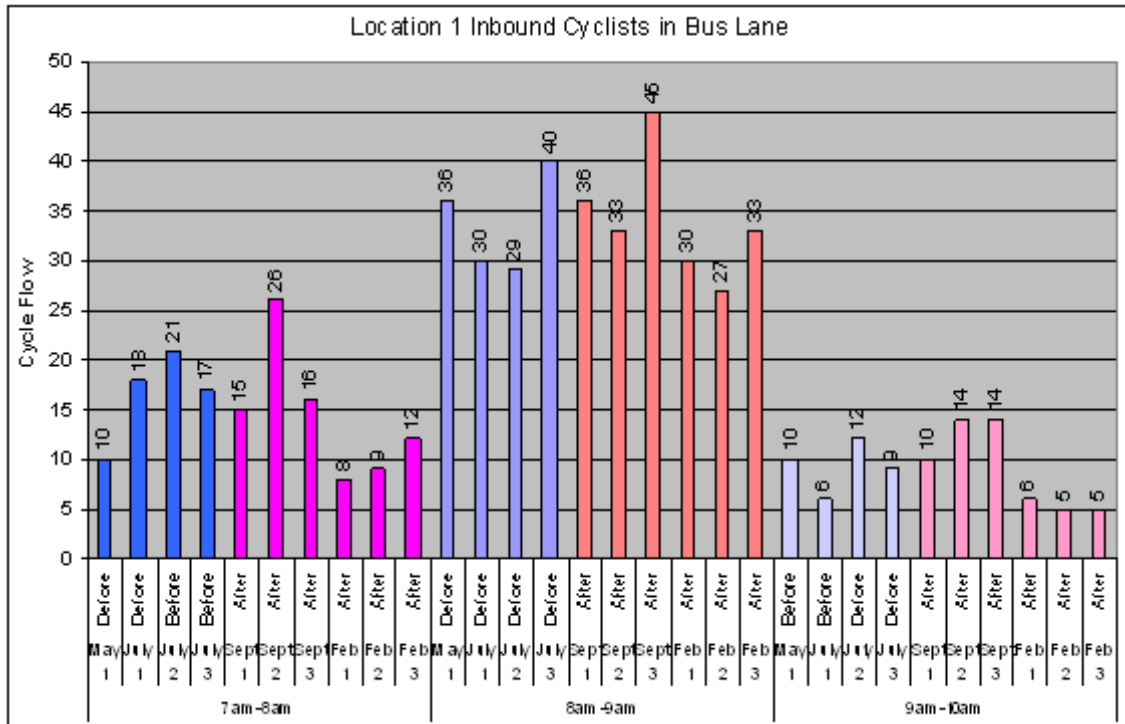
Measure title:

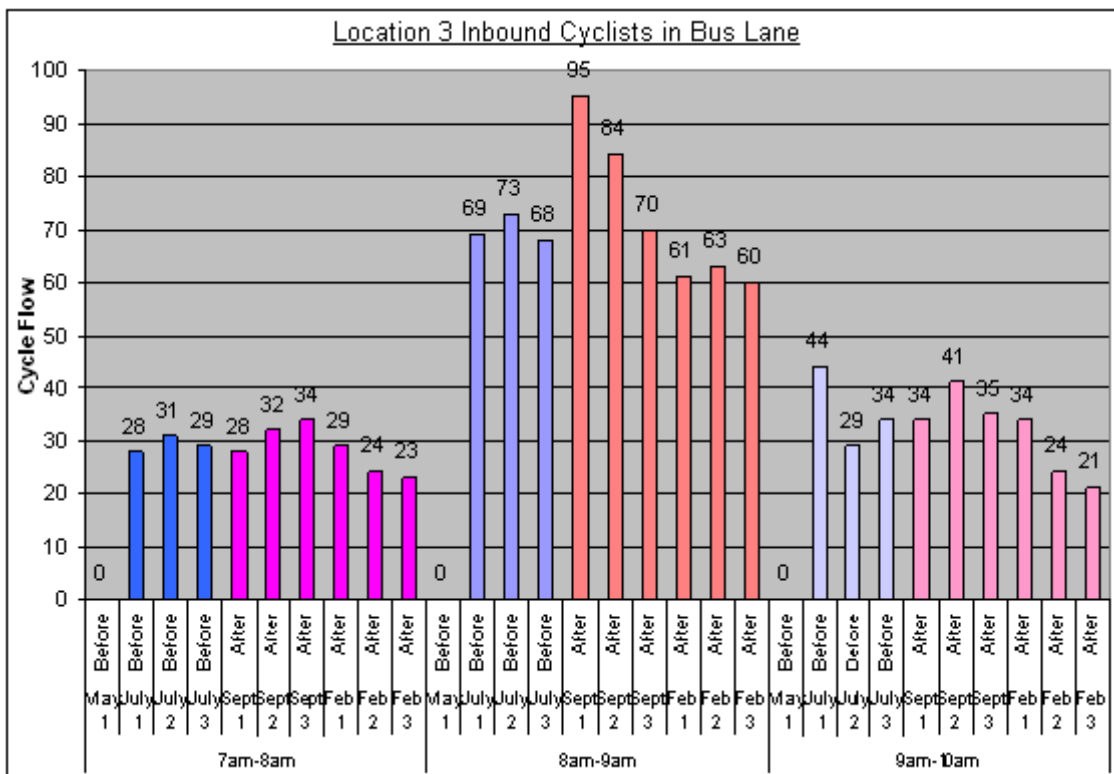
City: **Norwich**

Project: **SMILE**

Measure number: **10.3, 10.4 & 10.5**

The results were as follows:





**Comment**

There is no clear trend of cycle usage decreasing in the bus lane as a result of consolidation centre vehicles using the bus lanes on Newmarket Road. However, when considering the data the following facts should be noted:

- The number of consolidation centre deliveries in the first year as been low (88 deliveries per annum) and therefore the chance of a cyclist meeting a delivery vehicle has also been low
- There could be a seasonal variation in cycle flow to take account of with the surveys being undertaken during different months of the year. At present no ‘before and after’ data is available for comparable months
- Whilst the before surveys in July were undertaken during school time some older children (in their final year) would have undertaken their exams and no longer going to school. However most school children cycling tend to use the shared use cycle lane on the south side of the road rather than the bus lane on the north side.

**Accident Records**

Personal injury accidents involving cyclists on Newmarket Road were examined before implementation of the bus lane proposals and then monitored during their operation.

During the 3 years prior to implementation (July 2005 to July 2008) the following personal injury accidents were recorded.

Date	Time	Type	Weather	Description
6/7/07	daytime	fatal	dry	cyclist turning right from side road (on same side as bus lane) onto Newmarket road collided with an HGV travelling inbound
14/12/05	daytime	slight	dry	car turning right from Newmarket Road into side road collided with cyclist travelling outbound on Newmarket Road
12/1/05	daytime	slight	dry	cyclist collided into the back of an LGV in a side road (on same side as bus lane) and waiting to join Newmarket Road
23/11/06	daytime	slight	dry	cyclist travelling outbound on Newmarket Road left footway, entered carriageway and collided with car also travelling outbound
13/7/07	daytime	slight	dry	cyclist entering roundabout at junction with outer Ring Road and collided with car already on roundabout circulatory system

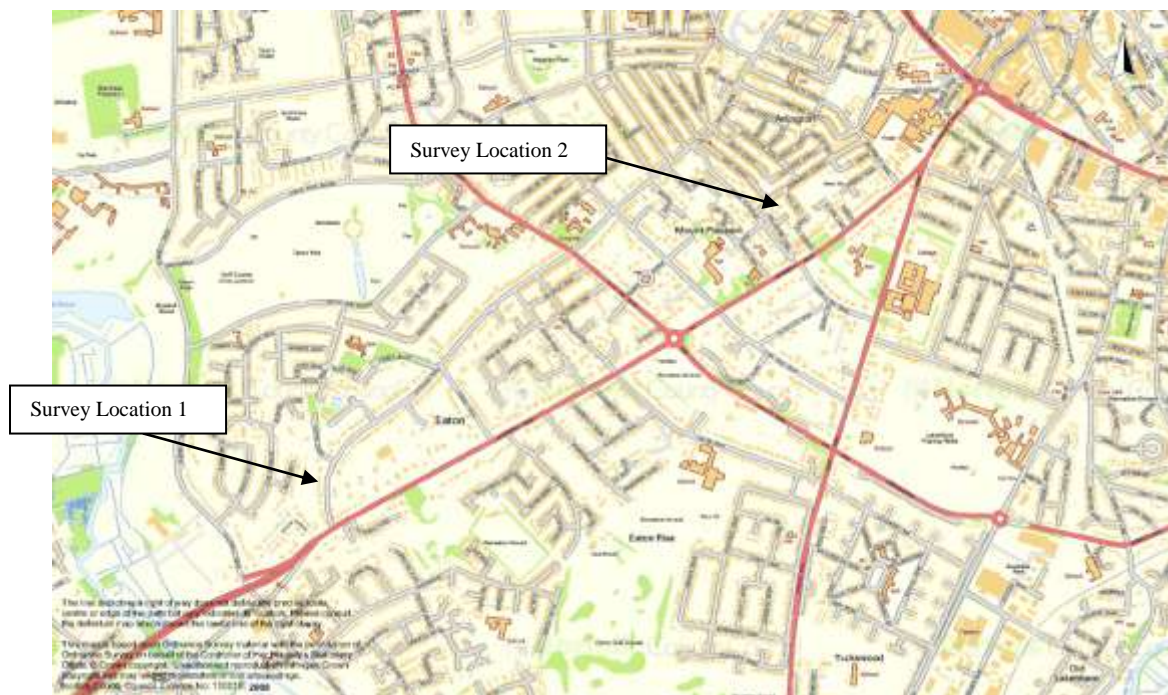
Between July 2008 and Jan 2009 the following personal injury accidents involving cyclists were recorded.

19/9/08	daytime	slight	dry	cyclists exiting footway via a controlled crossing collided with car on carriageway
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Since implementation no personal injury accidents involving cyclists have been recorded that are considered directly attributable to the consolidation centre vehicles using the bus lane.

**Effect on HGVs of Measure 10.4 (Priority Access for Goods Vehicles)**

Before and after vehicle surveys of the bus lane were undertaken at the locations shown below to determine the number of HGVs using it.





The results were as follows:

Location 1

Survey date	Before/After	7am to 7pm HGVs in Bus Lane	7am to 10am HGVs in Bus Lane
10 July 08-30 July 08	Before	8	1
18 Feb 09-2 Mar 09	After	5	1

Location 2

Survey date	Before/After	7am to 7pm HGVs in Bus Lane	7am to 10am HGVs in Bus Lane
10 July-30 July	Before	5	4
18 Feb 09-2 Mar 09	After	4	0

From the surveys undertaken there would seem little evidence of significant number so HGVs illegally using the bus lane.

### C3 Achievement of quantifiable targets

No.	Target	Rating
1	Establish Consolidation Centre	**
2	Reduce the number of HGV trips into Norwich by consolidating loads	0
3	Establish freight stakeholders club to promote consolidation centre and other freight issues	0
4	Allow the use of bus lanes in Norwich by Consolidation Centre vehicles	**
5	Reduce fuel consumption	**
6	Reduce HGV vehicle emissions	**
<b>NA = Not Assessed    0 = Not achieved    * = Substantially achieved (at least 50%)                      ** = Achieved in full    *** = Exceeded</b>		

## C4 Up-scaling of results

### Up-scaling of Measure 10.5 (Freight Consolidation Centre)

The most likely method for up-scaling of the measure will come from introducing more clients to the consolidation centre scheme. Currently only 3 retailers are using the service. However this limited use does not reflect the full market potential for the freight consolidation centre. The choice of partnering an existing logistics company, willing to operate the scheme as part of its existing business, has advantage of sustainability beyond April 2009.

For the period November 2007 to October 2008, as the scheme was still seeking clients, no consolidation of deliveries was taking place. However the use of a smaller vehicle has had some benefit as shown previously. The significant benefit of a consolidation centre will be apparent once a sufficient number of clients are participating to allow consolidation of loads.

An indicative estimate of the retailers that may be in a position to become users of the consolidation centre has been made. The following table gives a summary of the future aims of the consolidation centre up to September 2009. The methods which would help patronage include rebranding of the consolidation centre and possible consideration of increased access restrictions.

	Companies using NFCC	Total company vehicle trips	Total NFCC Trips	Net reduction in trips
Existing situation up to October 2008	3	88	88	0
Envisaged situation for 12 months after October 2008	11	544	436	108

Over the next 12 months, and identifying those retailers most likely to join the consolidation centre, it is predicted that a reduction of between 1-2 vehicles trips per week can be achieved. This would provide the following results.

	Number of trips	Total Fuel consumption (l)	Total CO2 emissions (G)	Total CO emissions (G)	Total NOx emissions (G)	Total Particulate emissions (G)
<b>Measure 10.5 (Freight Consolidation Centre)</b> Effects resulting from consolidation centre	108 reduction	2879.7 reduction	10177619.5 reduction	1567.7 reduction	54431.1 reduction	768.2 reduction
<b>Measure 10.4 (Priority Use of Bus Lane)</b> Effects resulting from bus lane	No change	1034.0 reduction	1903705.8 reduction	4083.7 reduction	6790.3 reduction	439.3 reduction
<b>Measure 10.3 (Freight Stakeholders Club)</b> Effect on emissions resulting from stakeholders club	No change	No change	No change	No change	No change	No change
<b>Net increase/reduction over 12 months</b>	<b>108 reduction</b>	<b>3913.7 reduction</b>	<b>12081325.3 reduction</b>	<b>5651.4 reduction</b>	<b>61221.4 reduction</b>	<b>1207.5 reduction</b>

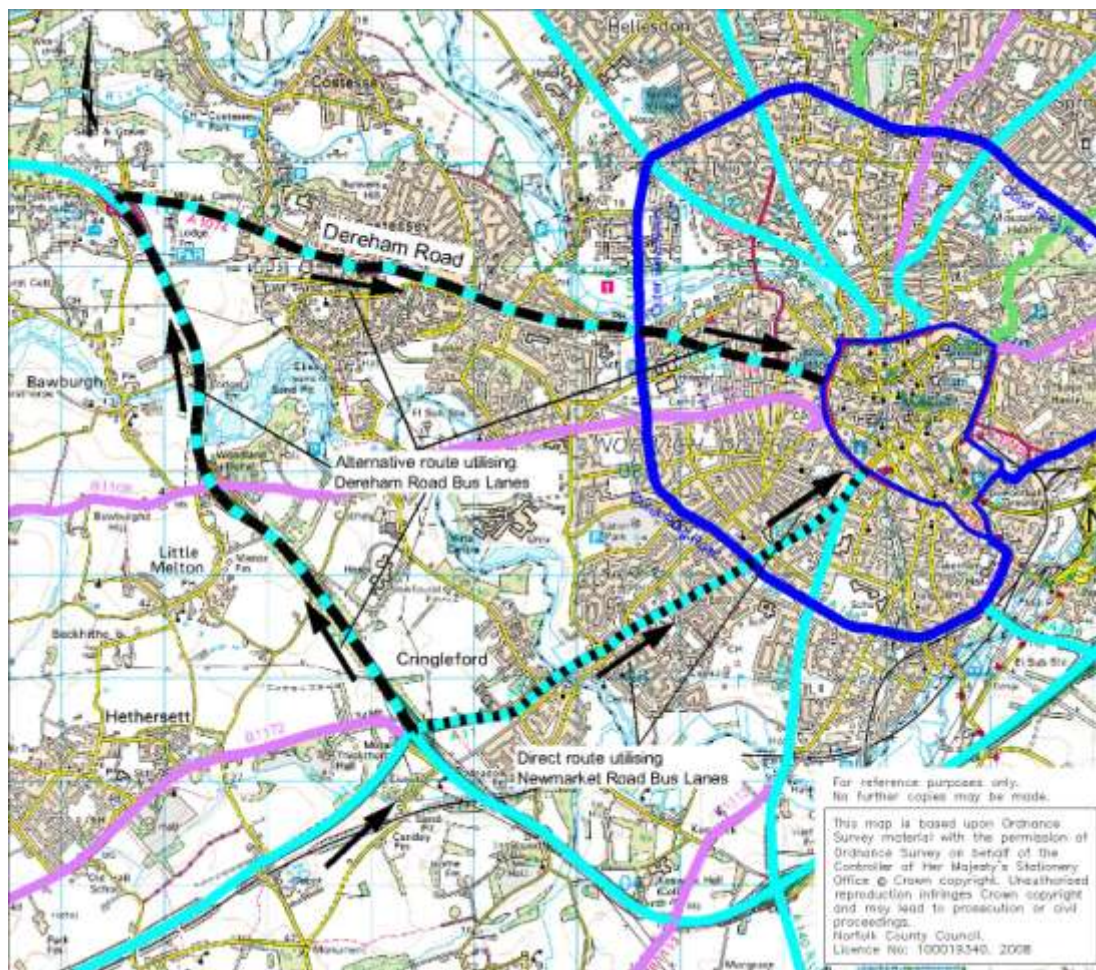
If this up scaling could continue then the potential for consolidation of deliveries would increase leading to an exponential increase in benefits as greater consolidation could take place. However, the unwillingness for retailers to change delivery contracts and the lack of difficulty experienced by existing deliveries to the city centre are the main barriers to increasing clients.

The greatest driver to increased patronage of the consolidation centre is considered to be increased restrictions to delivery times in the city centre. Current restrictions prohibited access into the main pedestrianised area of Norwich with an exemption for loading and unloading between 6pm and 10am. A reduction in the time of exemption, from 7pm to 8am for example, would mean that long distance deliveries would have difficulty arriving at these areas before 8am. However, the consolidation centre would be a potential alternative location for them to leave their loads. The short distance for consolidation centre vehicles to travel makes it easier to access the pedestrianised areas before the exemption for loading/unloading finishes.

**Up-scaling Measure 10.4 (Priority Access for Goods Vehicles)**

Whilst consolidation centre vehicles could be allowed to use other bus lanes in Norwich it is unlikely that they would be used because the benefit from using a bus lane would be offset by the additional distance travelled. Newmarket Road represents the most direct route between the consolidation centre and the city centre.

The most appropriate alternative bus lanes to use would those located on Dereham Road, as shown below.



The distance from the A11 to the Inner Ring Road are:

- 5.1km via the existing Newmarket Road route
- 13.3km via the alternative Southern By-pass and Dereham Road route

Up scaling could also be provided by allowing the use of alternative priority measures. The provision of priority at traffic signals has been considered. However, with only limited time within each signal phase giving priority to junction arms with clean HGVs would have a detrimental effect on the other arms, some of which have timetabled bus routes. The time saving to a bus (that is attempting to keep to a timetable) is considered more important than to an HGV.

There are current proposals to for the westward extension of the inbound bus lanes on Newmarket Road. This would increase the benefits for consolidation centre vehicles using the bus lanes.

### **Up-scaling Measure 10.3 (Freight Stakeholders Club)**

Whilst the freight stakeholder's club has had little effect in reducing fuel consumption and emissions it can still have a role within Norfolk. Future activities that could involve the club are:

- If potential up scaling of Measure 12.8 were considered by extending the number of operators using the customised traffic and travel information viewer, then those operators could be approached first
- The operators will be invited to contribute to the future development of transport policies and strategies within the county.

## **C5 Appraisal of evaluation approach**

Evaluation of Measures 10.3, 10.4 and 10.5 has been undertaken together because of their close association with each other during the implementation process.

A modelled approach to the evaluation, particularly regarding emissions, has been undertaken rather than undertaking measurements on site. This is because it would be difficult to attribute any changes in these to the measures when the background emissions vary greatly depending vehicle flows, weather, location etc.

However, it has resulted in a number of assumptions being made, these include:

- Vehicles are travelling at a constant speed along the route whereas in reality there would be much more 'stop-start' movements'
- Estimates have been made on the emissions of vehicles at different speeds using existing data rather than any measurements of the vehicles themselves
- Modelling has been undertaken on the inbound movements only as it is not known where the next destination for delivery vehicles would be after Norwich.

## **C6 Summary of evaluation results**

### **Key Results for Measure 10.5 (Freight Consolidation Centre)**

- **Key Result 1**

The consolidation centre only has a limited number of clients at present and this limits the amount of delivery consolidation that can be undertaken. However, the centre has had the effect of replacing some large articulated vehicle movements into the city centre with smaller 7.5T rigid vehicle movements. This has provided benefits of reduced fuel consumption and emissions.



- **Key Result 2**

If further retailers could be encouraged to use the consolidation centre then there would be a marked increase in benefits as loads could be consolidated together.

- **Key Result 3**

The preferred partner to operate the consolidation centre was chosen to provide a longer term sustainability for the project as the partner would not require significant subsidies in future years. Instead the partner would undertake the consolidation centre activities as part of its current business. A consultation and tender process was undertaken to determine who the partner should be.

- **Key Result 4**

Obtaining clients to use the consolidation centre has proved difficult. The reasons for this are considered to be:

- Delivery into Norwich may not be as difficult as first envisaged, particularly during the off peak periods
- Retail businesses are reluctant to change their existing delivery practices which they have established over a period of time. There is an element of risk for them changing, particularly when there is no significant existing problem and no financial gain to them
- Changing delivery suppliers on environmental improvement grounds was not a good enough incentive. Some retailers believed the consolidation centre delivery should be free
- The poor global economic climate currently being experienced has also made retailers reluctant to change established practices
- One method to encourage the use of the consolidation centre would be to increase the access and loading/unloading restrictions within the city centre.

### **Key Results for Measure 10.4 (Priority Access for Goods Vehicles)**

- **Key Result 1**

Only limited benefits have been found to occur as a result of the use of the Newmarket Road bus lane. Three key reasons have been identified for the small benefits that were found to occur. These are:

- The main benefits from using an inbound bus lane only occur during the am peak period
- The Newmarket Road bus lanes are generally 3.0m wide and this does not provide sufficient width for vehicles to overtake cyclists without moving into the outside lane. During the am peak time the outside lane has queued traffic resulting in vehicles staying behind the cyclists' and reducing some of the benefits provided by the bus lane. Similarly HGVs can be delayed by buses waiting at bus stops.
- The length of bus lane that can be used is small when compared to the overall journey length from the consolidation centre to the city centre.

- **Key Result 2**

An additional benefit of the bus lane was envisaged to be the higher profile for the consolidation centre vehicles. It would appear that there are greater factors influencing the decision to use the consolidation centre than the priority use of bus lanes.

- **Key Result 3**



The use of a bus lane by HGVs has produced some negative reaction, particularly from cycling organisations who believe that it is unsafe for HGVs and cyclists to mix in the bus lane.

### **Key Results for Measure 10.3 (Freight Stakeholders Club)**

- **Key Result 1**

The Freight Stakeholders Club has been unable to achieve its aims although it can still be used to achieve other aims (e.g. as a consultation forum and to help inform future proposals).

## **D Lessons learned**

### **D1 Barriers and drivers**

#### **D1.1 Barriers**

##### **Barriers for Measure 10.5 (Freight Consolidation Centre)**

- **Barrier 1**

Unwillingness of retailers to change their existing delivery contracts. Many retailers have existing delivery contracts that they are working with and are unwilling to risk changing. This barrier is increased by an uncertain economic climate which further reduces the willingness to take risks.

- **Barrier 2**

The current difficulty of delivery into Norwich is not sufficient to encourage use of the consolidation centre. The main shopping malls have delivery bays and there are only limited on-street restrictions to deliveries. More restricted delivery times in the city centre could be considered as there would be an alternative location for longer distance deliveries – i.e. the consolidation centre.

##### **Barriers for Measure 10.4 (Priority Access for Goods Vehicles)**

- **Barrier 1**

The width of existing bus lanes. A narrow bus lane reduces its potential for use and limits the scope for overtaking. This results in reduced benefits.

- **Barrier 2**

Effects on other users. Concerns have been expressed about the detrimental effect to cyclists as a result of certain HGVs using the bus lane. This reduces the public and political acceptance of such an idea.

- **Barrier 3**

The lack of existing priority measures in the correct location. It is unlikely that HGVs will make any significant diversion from the most direct route in order to use a priority measure. Having measures on the most direct route is important.

- **Barrier 4**

Unlike a bus, an HGV is not keeping to such an accurate timetable. For example, a 3 minute journey saving to a bus running at a frequency of 15 minutes could be considered significant.

However, such a 3 minutes saving on a non timetabled single delivery journey of 30 minutes is much less significant.

### **Barriers for Measure 10.3 (Freight Stakeholders Club)**

- **Barrier 1**

Apathy amongst private operators.

## **D1.2 Drivers**

### **Drivers for Measure 10.5 (Freight Consolidation Centre)**

- **Driver 1**

Environmental improvements in the core city centre, including increased access restrictions, could have a detrimental effect on retail deliveries. However, an efficient consolidation centre could provide a viable alternative for these businesses.

- **Driver 2**

Consolidation of loads could help achieve the Local Transport Plan targets for emission reduction.

- **Driver 3**

Consolidation of loads could help reduce congestion levels in the city centre.

### **Drivers for Measure 10.4 (Priority Access for Goods Vehicles)**

- **Driver 1**

Measure could help address concerns that bus lanes are an efficient use of road space, because they are empty of vehicles for large proportions of the day.

- **Driver 2**

Measure was considered a means to promote use of the consolidation centre and encourage its use.

### **Drivers for Measure 10.3 (Freight Stakeholders Club)**

- **Driver 1**

Need to improve dialogue between highway authority and freight operators.

## **D2 Participation of stakeholders**

### **Participation of Stakeholders in Measure 10.5 (Freight Consolidation Centre)**

- **Stakeholder 1**

Freight companies – The main participation in the measure has been by Foulgers Transport, the operator chosen for the project following and consultation/tender process. Other freight companies not directly involved in operating the consolidation centre have expressed concern that it would take away business from them.

- **Stakeholder 2**

Retailers - Encouraging retailers to use the consolidation centre has been difficult. The existing ease of delivering into Norwich is cited as a significant factor in retailers being unwilling to change their existing arrangements.

- **Stakeholder 3**

Logistic organisations – Organisations representing logistics and freight companies have supported the proposals.

### **Participation of Stakeholders in Measure 10.4 (Priority Access for Goods Vehicles)**

- **Stakeholder 1**

Freight companies – Some freight companies have objected to the advantage given to certain vehicles as a result of being able to use the bus lanes. They have questioned whether they can use the bus lane if they consolidate loads as part of their existing business. This has not been allowed to date because of concerns about losing control over the number of HGVs using the bus lanes.

- **Stakeholder 2**

Other stakeholders – Other representative organisations, particularly those associated with cyclists, objected to the measure. They cited safety reasons as their main objections. The bus companies did not object to the proposals

- **Stakeholder 3**

Logistic organisations – Organisations presenting logistics and freight companies did not object to the proposals.

- **Stakeholder 4**

Norfolk Constabulary – Did not object to the proposals but expressed concern that they may lead to additional HGVs illegally using the bus lane.

### **Participation of Stakeholders in Measure 10.3 (Freight Stakeholders Club)**

- **Stakeholder 1**

Freight companies – There was an apathy from freight companies to join the stakeholder's club.

## **D3 Recommendations**

### **Recommendations for Measure 10.5 (Freight Consolidation Centre)**

- **Recommendation 1**

Greater incentive is required to encourage use of the consolidation centre. This could take the form of increased access and loading/unloading restrictions in the city centre.

- **Recommendation 2**

Continue publicity and promotion of consolidation centre including the development of a new branding and logo.

**Recommendations for Measure 10.4 (Priority Access for Goods Vehicles)**

• **Recommendation 1**

Continued monitoring of bus lane to help the decision on whether the measure should be made permanent or not.

**Recommendations for Measure 10.3 (Freight Stakeholders Club)**

• **Recommendation 1**

Seek alternative uses for stakeholders club including participation in consultation events, and providing an input into future transport policies and strategies

**D4 Future activities relating to the measure**

See recommendations above.