# A406 VISSIM STUDY

Transport for London

DRAFT Report

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TRANSPORT FOR LONDON

# A406 VISSIM STUDY


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# 1. INTRODUCTION



# 1. Introduction

## 1.1. Background

Transport for London has proposals to improve the operation of the A406 between the junction of North Circular Road / Falloden Way and the junction of North Circular Road / Great North Road. The modifications require the widening of the carriageway to improve the lane discipline along the North Circular Road in order to reduce accidents, provide at grade controlled pedestrian crossing facilities at the junctions along this section of the A406 including Henly's Corner junction, provide priority for buses and to provide cycle facilities along the southern side of the A406.

## 1.2. Objectives of the Study

Based on the improvements, Transport for London (TfL) wished to assess the implications on the operation of the network with the removal of Heavy Goods Vehicles (HGVs), and to determine the number of years traffic growth that are released by the removal of these vehicles.

The following changes in the levels of HGVs were assessed.

- Removal of 100% of HGVs;
- Removal of 75% of HGVs;
- Removal of 50% of HGVs; and
- Removal of 25% of HGVs.

A micro-simulation model (VISSIM) has been developed for the proposed improvements for the A406 North Circular and for the Henly's Corner junction. This assessment utilises this VISSIM model to determine the implications for the removal of the HGVs.

## 1.3. Report Structure

Following this introduction, the remaining sections will cover:

- Methodology – Section 2 highlights the modelling assumption used in the study;
- Results – Section 3 discusses the results for the various scenarios tested; and
- Section 4 summaries the findings of the study.

# 2 METHODOLOGY



# 2. Methodology

## 2.1. Base Model Assumptions

The base VISSIM model was produced to assess the operation of proposals for the A406 improvements. This has been further updated for this assessment to include the recent changes to Finchley Road.

The models produced for the original assessment were based on TRANSYT analysis provided by Transport for London. These traffic flows only provided a single hours worth of traffic count data and hence the modelled period was for a single hour (0730-0830), excluding an initial model warm up period to enable vehicles to enter the network. This data was provided in Passenger Car Units (PCUs) and an assumption was made as to the proportion of Heavy Goods Vehicles was used in the production of the original model.

In order to provide a more robust assessment as to the effects of the removal of HGVs vehicles from the network a sample traffic count was undertaken at the Henly's Corner junction during the morning peak period to determine the proportion of HGVs in the total traffic flow. The sample count was undertaken for both the A406 and the side roads of Finchley Road and Regents Park Road. For the purpose of this study HGVs were defined as those vehicles which had 3 or more axles or which were considered to be in excess of 7.5 tonnes. The model was updated with the percentage of HGVs from the sample count, but with the overall number of vehicles remaining the same.

The traffic data originated from May 2001, and therefore this has been factored to 2004. A traffic growth factor has been obtained from Transport for London's '*London Travel Report 2003*'. This indicates that between 1993 and 2002 that traffic has increased by 7 percent, which equates to an average increase of 0.7% per annum. It has been assumed in determining the number of years growth freed by the removal of the HGVs that traffic would continue to grow at a similar rate.

## 2.2. HGV Sample Count

A sample count of the HGVs was undertaken on Friday 2nd April 2004, and the results of the count are shown in Table 2.1 below. The sample count was undertaken over a 20 minute period and factored to an hour.

**Table 2.1 – Summary Sample Survey**

| Approach | Total Vehicles | HGVs * | Percentage HGV |
|---|---|---|---|
| A406 Eastbound | 3039 | 279 | 9.2% |
| Regents Park Road | 1009 | 33 | 3.3% |
| A406 Westbound | 2806 | 147 | 5.2% |
| Finchley Road | 937 | 21 | 2.2% |

* Count factored from 20 minutes to 1 hour

From the sample count only a single heavy goods vehicle associated with supermarkets was evident. However, it may not always be possible to identify vehicles that are either destined or associated supermarkets from their livery.

## 2.3. Data Collection

In order to assess the various scenarios a variety of data has been collected from the models. This data has been selected to provide an indication of the performance of each scenario and to determine the level of traffic growth that can be catered for with the removal of the HGVs from the network. The parameters that have been used are detailed below.

- Degree of Saturation - Unlike traditional modelling packages such as TRANSYT, VISSIM is unable to calculate a degree of saturation. An approximation of the degree of saturation can be calculated using various outputs from VISSIM, and is accurate to within +/- 5%. This parameter is to be used only as a comparison between the various models rather than to determine the available traffic growth with the removal of HGVs.
- Vehicular Throughput - The vehicular throughputs of the junctions were measured by an assessment of the volume of traffic that travels through the network, and in particular the Henly's Corner junction. Vehicles passing over each stopline would were recorded in 5 minute segments through the model period to enable the build up of throughput to be determined over time. This would provide a direct comparison between the different scenarios in terms of vehicles travelling along and onto the A406.
- Queue Length - VISSIM is equipped with a queue length function and is able to provide the average and maximum queue length on each approach for a user defined time period. However, this parameter is limited if queues block back to upstream junctions. This parameter provides an indication as to the effects of removal of the HGVs from the network, but is not a significant factor in assessing the network performance.
- Delay in Vehicle Hours - VISSIM is able to calculate the delay per vehicle between two user-defined points. The delay within VISSIM is defined as the average total delay per vehicle in seconds. The total

delay is calculated by subtracting the theoretical (ideal travel time) from the real travel time. The theoretical time is the time that it would take to travel between two points if there were no other vehicles and no signal controls within the network.

- Emission Values - The UK version of VISSIM provides simple emissions calculations for the network as a whole. This provides information on carbon monoxide (CO) and nitrous oxide (NOx) emissions for cars, HGVs and for buses. These have been used to determine the network performance and the comparison of the different scenarios. It is understood that these parameters are non-UK based, but would provide a basis for comparison.

### 2.4. Assessment Methodology

A methodical approach has been adopted for the assessment and the following models have been created.

- Base 2004 Model: Base model with factored traffic flows from 2001 to 2004;
- Scenario 1: Base Model with 100% of HGVs removed;
- Scenario 2: 100% removal factored future year model;
- Scenario 3: Base Model with 75% of HGVs removed;
- Scenario 4: 75% removal factored future year model;
- Scenario 5: Base Model with 50% of HGVs removed;
- Scenario 6: 50% removal factored future year model;
- Scenario 7: Base Model with 25% of HGVs removed; and

Scenario 1 removes all HGVs from the model and therefore the overall traffic volume is reduced by the figures quoted in Table 2.1.

Scenario 2 factors the scenario 1 model traffic flows so that the performance of the network matches the Base 2004 model. In determining the performance of the network the parameters that have been used are the network delay and the emissions. These parameters provide global indicators rather than junction or link specific values. If junction or link parameters were used, it would be difficult to determine whether the operation of the network with Scenario 2 was equivalent to the base 2004 model as these could be equal in one location but not in another. Therefore the degrees of saturation, capacity and queue lengths have been derived to provide additional information on the effects of the removal of HGVs on the network.

The derivation of the future year model is an iterative process such that different levels of growth are applied to Scenario 1 and a network operation is homed in so that it is similar to the base 2004 model.

The number of years growth released by the removal of HGVs is determined from the assumption that traffic will continue to grow and the 0.7% per annum rate as indicated by the '*London Travel Report 2003*'.

All subsequent scenarios follow the same methodology as scenarios 1 and 2.

## 3. RESULTS



# 3. Results

### 3.1. Model assessment

The VISSIM model has been used to assess the scenarios outlined in the 'Assessment Methodology' section of this report, these were:

- Base 2004 Model: Base model with factored traffic flows from 2001 to 2004;
- Scenario 1: Base Model with 100% of HGVs removed;
- Scenario 2: 100% removal factored future year model;
- Scenario 3: Base Model with 75% of HGVs removed;
- Scenario 4: 75% removal factored future year model;
- Scenario 5: Base Model with 50% of HGVs removed;
- Scenario 6: 50% removal factored future year model; and
- Scenario 7: Base Model with 25% of HGVs removed.

VISSIM was used to collate the following data for each scenario:

- Total Vehicle delay;
- Network emissions;
- Degree of Saturation;
- Vehicular throughput; and
- Queue length.

### 3.2. 100% removal of HGV's

The key network performance characteristics of network delay and emissions for scenarios 1, 100% removal of HGV's, and scenario 2, 100% removal factored, are outlined in Tables 3.2.1 and 3.2.2. Other parameters are detailed in Tables 3.2.3 to 3.3.5 inclusive.

3.2.1. Scenario 1

The results for the total vehicle delay indicate that 100% removal of HGV from the network reduces vehicle delay by over 50%.

The levels of Carbon Monoxide reduce by approximately 30% whilst Nitrous Oxide reduces by 27%.

The degree of saturation was calculated for each approach. In the base model both the east and westbound A406 approaches were estimated to be at 144% and 103% respectively. The removal of all HGV's from the network results in a reduction in the degree of saturation; the eastbound A406 is predicted to decrease to 132% and westbound A406 to 100%.

Regents Park Road has a predicted decrease in the degree of saturation fro 72% to 65% whilst Finchley Road decreases form 81% to 70%.

The queue length on each approach is predicted to reduce, with the biggest reduction being on eastbound A406, the average queue length goes from 191 m in the base model to 37 m in scenario 1.

3.2.2. Scenario 2

The future year assessment (scenario 2), has been derived by iterative tests. From the network emissions statistics the total carbon monoxide value is the first key characteristic that reaches the same level as the base 2004 model. Scenario 2 assumes a growth factor of 12%, which is equivalent to 16 years traffic growth at the average traffic increase of 0.7% per annum.

For emissions, nitrous oxide for HGVs forms a greater proportion of the total value than that for carbon monoxide, hence for this value in the future year scenario to return to the same level as the base case, a greater increase in general traffic is required than that for carbon monoxide.

Total vehicle delay reaches approximately that of the base year model.

For the other parameters examined, these are at approximately the same level as the base case with 12% traffic growth. Graphs comparing the scenarios can be found at the end of this chapter.

| Table 3.2.1 – Total Vehicle Delay | |
|---|---|
| **Model** | **Vehicle Delay (Vehicle Hours)** |
| Base 2004 Model | 250 |
| Scenario 1 – 100% HGVs removed | 120 |
| Scenario 2 – Future year model | 249 |

| Table 3.2.2 – Network Emissions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon Monoxide (CO)** | | | | **Nitrous Oxide (NOx)** | | | |
| **Scenario** | **Car** | **HGV** | **Bus** | **Total** | **Car** | **HGV** | **Bus** | **Total** |
| Base 2004 Model | 2421284 | 38532 | 948 | 2460763 | 159103 | 45212 | 1190 | 205506 |
| Scenario 1 – 100% HGV removal | 1721092 | 0 | 873 | 1721965 | 148907 | 0 | 1154 | 150061 |
| Scenario 2 – Future Year | 2140499 | 0 | 929 | 2141428 | 166940 | 0 | 1181 | 168122 |

| Table 3.2.3 – Degree of Saturation on key links at Henly's Corner | | | | |
|---|---|---|---|---|
| | **A406 Eastbound** | **Regents Park Road** | **A406 Westbound** | **Finchley Road** |
| Base 2004 Model | 144% | 72% | 103% | 81% |
| Scenario 1 – 100% HGV removal | 132% | 65% | 100% | 70% |
| Scenario 2 – Future Year | 144% | 73% | 105% | 78% |

| Table 3.2.4 – Vehicular Throughput (vehicles) | | | | | |
|---|---|---|---|---|---|
| | **A406 Eastbound** | **Regents Park Road** | **A406 Westbound** | **Finchley Road** | **Total** |
| Base 2004 Model | 2861 | 1031 | 2673 | 961 | 7526 |
| Scenario 1 – 100% HGV removal | 2610 | 928 | 2586 | 827 | 6951 |
| Scenario 2 – Future Year | 2862 | 1039 | 2728 | 926 | 7555 |

| Table 3.2.5 – Queue Lengths (metres) on key links at Henly's Corner<br>xxx = Average, (xxx) = Maximum | | | | |
|---|---|---|---|---|
| | **A406 Eastbound** | **Regents Park Road** | **A406 Westbound** | **Finchley Road** |
| Base 2004 Model | 195 (391) | 41(87) | 30 (130) | 18(151) |
| Scenario 1 – 100% HGV removal | 41(190) | 22 (77) | 20 (63) | 14 (57) |
| Scenario 2 – Future Year | 110(313) | 37 (105) | 2 (76) | 14 (158) |

### 3.3. 75% Removal of HGV's

The next stage of the project assessed the effects of the removal of 75% of HGV from the network. The results are shown in Tables 3.3.1 to 3.3.5.

3.3.1.1 Scenario 3

The results for the total vehicle delay indicate that 75% removal of HGV from the network reduces vehicle delay by approximately 25%.

The levels of Carbon Monoxide reduce by approximately 25% whilst Nitrous Oxide reduces by 20%. The removal of 75% HGV's from the network results in a reduction in the degree of saturation on all approaches; the eastbound A406 is predicted to decrease to 135% from 144% in the base model and westbound A406 to 100% from 103%.

Regents Park Road has a predicted decrease in the degree of saturation fro 72% to 71% whilst Finchley Road decreases form 81% to 76%.

The queue length on each approach is predicted to reduce, with the biggest reduction being on eastbound A406, the average queue length goes from 191 m in the base model to 67 m in scenario 3.

3.3.2. Scenario 4

The future year assessment (Scenario 4) has been derived by iterative tests. The vehicle delay value is the first key characteristic that reaches approximately the same level as the base 2004 model.

Scenario 4 assumes a growth factor of 9%, which is equivalent to 12 years traffic growth at the average traffic increase of 0.7% per annum.

**Table 3.3.1 – Total Vehicle Delay**

| Model | Vehicle Delay (Vehicle Hours) |
|---|---|
| Base 2004 Model | 250 |
| Scenario 3 – 75% HGVs removed | 188 |
| Scenario 4 – Future year model | 233 |

**Table 3.3.2 – Network Emissions**

| | Carbon Monoxide (CO) | | | | Nitrous Oxide (NOx) | | | |
|---|---|---|---|---|---|---|---|---|
| **Scenario** | **Car** | **HGV** | **Bus** | **Total** | **Car** | **HGV** | **Bus** | **Total** |
| Base 2004 Model | 2421284 | 38532 | 948 | 2460763 | 159103 | 45212 | 1190 | 205506 |
| Scenario 3 – 75% HGV removal | 1819046 | 9242 | 869 | 1829157 | 151206 | 11842 | 1151 | 164199 |
| Scenario 4 – Future Year | 2052390 | 13311 | 923 | 2066624 | 159156 | 17682 | 1177 | 177961 |

**Table 3.3.3 – Degree of Saturation on key links at Henly's Corner**

| | A406 Eastbound | Regents Park Road | A406 Westbound | Finchley Road |
|---|---|---|---|---|
| Base 2004 Model | 144% | 72% | 103% | 81% |
| Scenario 3 – 75% HGV removal | 135% | 71% | 100% | 76% |
| Scenario 4 – Future Year | 143% | 72% | 102% | 80% |

**Table 3.3.4 – Vehicular Throughput (vehicles)**

| | A406 Eastbound | Regents Park Road | A406 Westbound | Finchley Road | Total |
|---|---|---|---|---|---|
| Base 2004 Model | 2861 | 1031 | 2673 | 961 | 7526 |
| Scenario 3 – 75% HGV removal | 2676 | 1011 | 2587 | 897 | 7171 |
| Scenario 4 – Future Year | 2831 | 1033 | 2655 | 944 | 7463 |

| Table 3.3.5 – Queue Lengths (metres) on key links at Henly's Corner<br>xxx = Average, (xxx) = Maximum | | | | |
|---|---|---|---|---|
| | **A406 Eastbound** | **Regents Park Road** | **A406 Westbound** | **Finchley Road** |
| Base 2004 Model | 195 (391) | 41(87) | 30 (130) | 18 (151) |
| Scenario 3 – 75% HGV removal | 67(221) | 28 (88) | 31 (95) | 14 (98) |
| Scenario 4 – Future Year | 198 (409) | 37(109) | 46 (137) | 15 (79) |

### 3.4. 50% Removal of HGV's

The next stage of the project is to assess the effects of the removal of 55% of HGV from the network. The results are shown in Tables 3.4.1 to 3.4.5.

3.4.1.1 Scenario 5

The results for the total vehicle delay indicate that 50% removal of HGV from the network reduces vehicle delay by approximately 18%. The levels of Carbon Monoxide reduce by approximately 10%.

The removal of 50% HGV's from the network results in a reduction in the degree of saturation on all approaches except for Regents Park Road, which remains the same. The eastbound A406 reduces to a degree of saturation of 139% and westbound A406 decreases to 98%.

The queue length on each approach is predicted to reduce, with the biggest reduction being on eastbound A406, the average queue length goes from 191 m in the base model to 52 m in scenario 5.

3.4.2. Scenario 6

The future year assessment (Scenario 6) has been derived by iterative tests. The carbon dioxide and degree of saturation parameters are the first key characteristics that reaches approximately the same level as the base 2004 model. For the other parameters examined, these are at approximately the same level as the base case with 5% growth.

Scenario 6 assumes a growth factor of 5%, which is equivalent to 7 years traffic growth at the average traffic increase of 0.7% per annum.

| Table 3.4.1 – Total Vehicle Delay | |
|---|---|
| **Model** | **Vehicle Delay (Vehicle Hours)** |
| Base 2004 Model | 250 |
| Scenario 5 – 50% HGVs removed | 229 |
| Scenario 6 – Future year model | 298 |

| Table 3.4.2 – Network Emissions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon Monoxide (CO)** | | | | **Nitrous Oxide (NOx)** | | | |
| **Scenario** | **Car** | **HGV** | **Bus** | **Total** | **Car** | **HGV** | **Bus** | **Total** |
| Base 2004 Model | 2421284 | 38532 | 948 | 2460763 | 159103 | 45212 | 1190 | 205506 |
| Scenario 5 – 50% HGVs removed | 2000227 | 26396 | 946 | 2025570 | 151594 | 30379 | 1189 | 183161 |
| Scenario 6 – Future year model | 2399914 | 30435 | 1033 | 2431382 | 160496 | 37275 | 1217 | 198988 |

| Table 3.4.3 – Degree of Saturation on key links at Henly's Corner | | | | |
|---|---|---|---|---|
| | A406 Eastbound | Regents Park Road | A406 Westbound | Finchley Road |
| Base 2004 Model | 144% | 72% | 103% | 81% |
| Scenario 5 – 50% HGVs removed | 139% | 72% | 98% | 77% |
| Scenario 6 – Future year model | 142% | 75% | 98% | 80% |

| Table 3.4.4 – Vehicular Throughput (vehicles) | | | | | |
|---|---|---|---|---|---|
| | A406 Eastbound | Regents Park Road | A406 Westbound | Finchley Road | Total |
| Base 2004 Model | 2861 | 1031 | 2673 | 961 | 7526 |
| Scenario 5 – 50% HGVs removed | 2759 | 1036 | 2550 | 918 | 7263 |
| Scenario 6 – Future year model | 2808 | 1069 | 2556 | 954 | 7387 |

| Table 3.4.5 – Queue Lengths (metres) on key links at Henly's Corner<br>xxx = Average, (xxx) = Maximum | | | | |
|---|---|---|---|---|
| | A406 Eastbound | Regents Park Road | A406 Westbound | Finchley Road |
| Base 2004 Model | 195 (391) | 41(87) | 30 (130) | 18(151) |
| Scenario 5 – 50% HGVs removed | 52 (153) | 36 (105) | 38 (123) | 15 (75) |
| Scenario 6 – Future year model | 176 (405) | 42 (105) | 39 (197) | 17 (104) |

### 3.5. 25% Removal of HGV's

The next stage of the project is to assess the effects of the removal of 25% of HGVs from the network. The results are shown in Tables 3.5.1 to 3.5.5.

3.5.1.1 Scenario 7

The results for the total vehicle delay indicate that the removal of 25% of HGV's from the network does not have a significant effect on the performance of the network. All of the results are comparable to the base year model.

| Table 3.5.1 – Total Vehicle Delay | |
|---|---|
| Model | Vehicle Delay (Vehicle Hours) |
| Base 2004 Model | 250 |
| Scenario 7 – 25% HGVs removed | 254 |

| Table 3.5.2 – Network Emissions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Carbon Monoxide (CO) | | | | Nitrous Oxide (NOx) | | | |
| Scenario | Car | HGV | Bus | Total | Car | HGV | Bus | Total |
| Base 2004 Model | 2421284 | 38532 | 948 | 2460763 | 159103 | 45212 | 1190 | 205506 |
| Scenario 7 – 25% HGVs removed | 2061090 | 25928 | 921 | 2087939 | 155763 | 33826 | 1177 | 190766 |

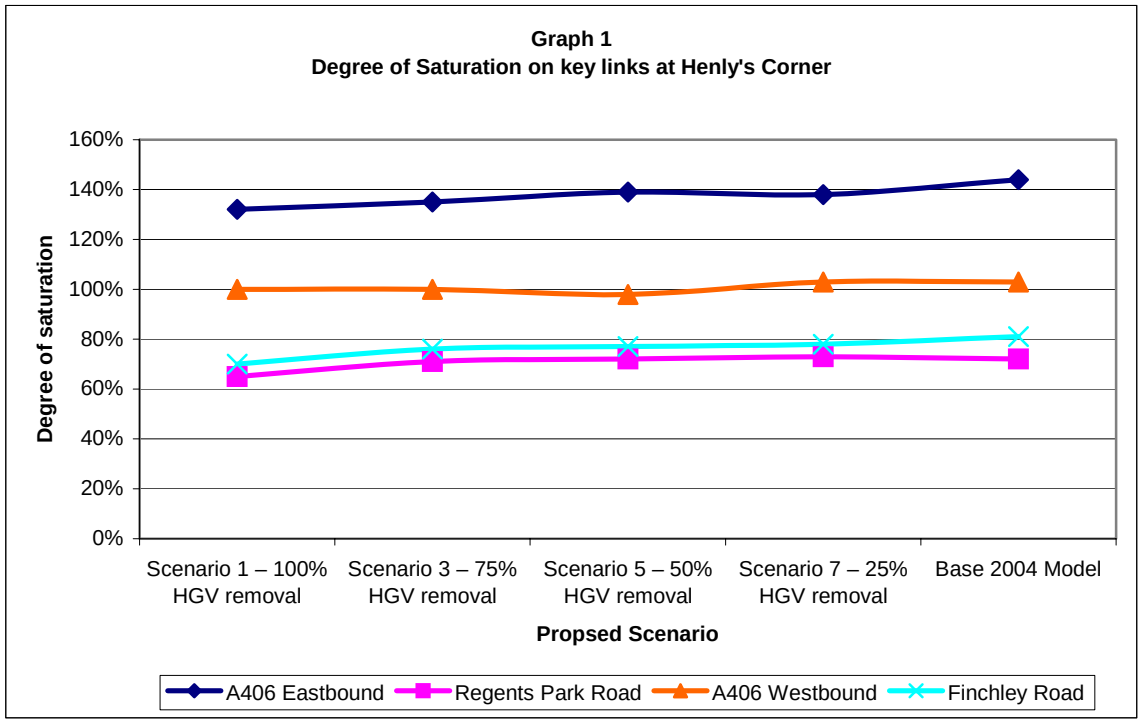
| Table 3.5.3 – Degree of Saturation on key links at Henly's Corner | | | | |
|---|---|---|---|---|
| | A406 Eastbound | Regents Park Road | A406 Westbound | Finchley Road |
| Base 2004 Model | 144% | 72% | 103% | 81% |
| Scenario 7 – 25% HGVs removed | 138% | 73% | 103% | 78% |

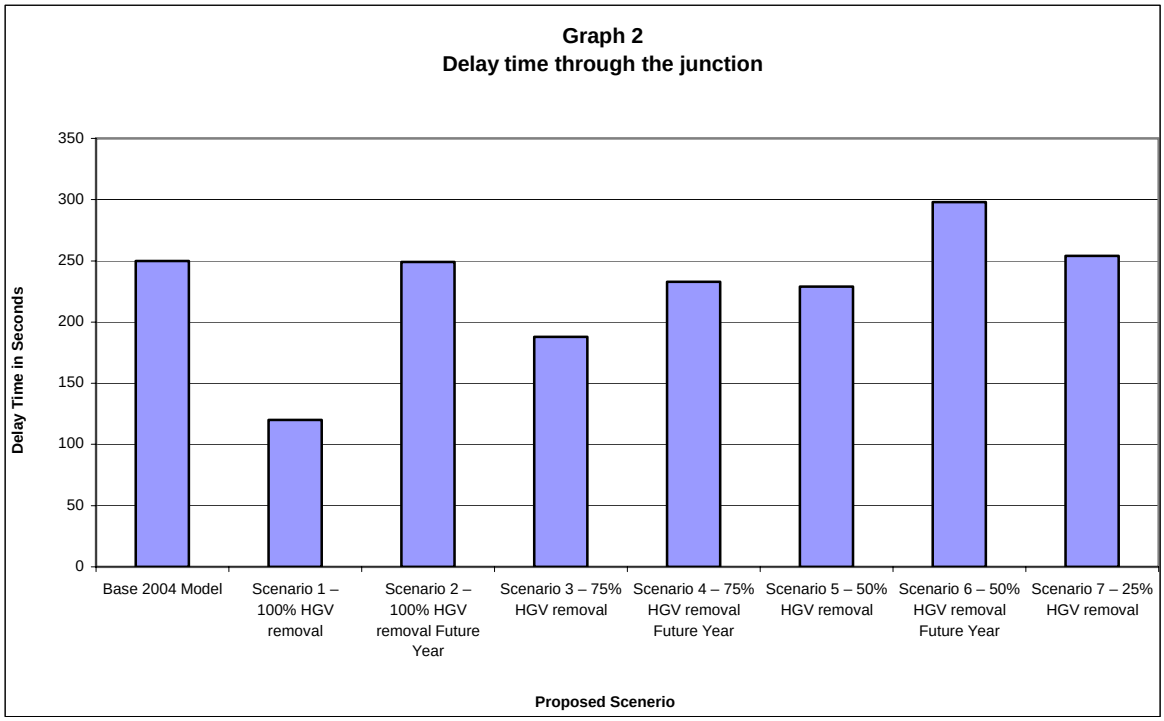
| Table 3.5.4 – Vehicular Throughput (vehicles) | | | | | |
|---|---|---|---|---|---|
| | A406 Eastbound | Regents Park Road | A406 Westbound | Finchley Road | Total |
| Base 2004 Model | 2861 | 1031 | 2673 | 961 | 7526 |
| Scenario 7 – 25% HGVs removed | 2741 | 1044 | 2666 | 921 | 7372 |

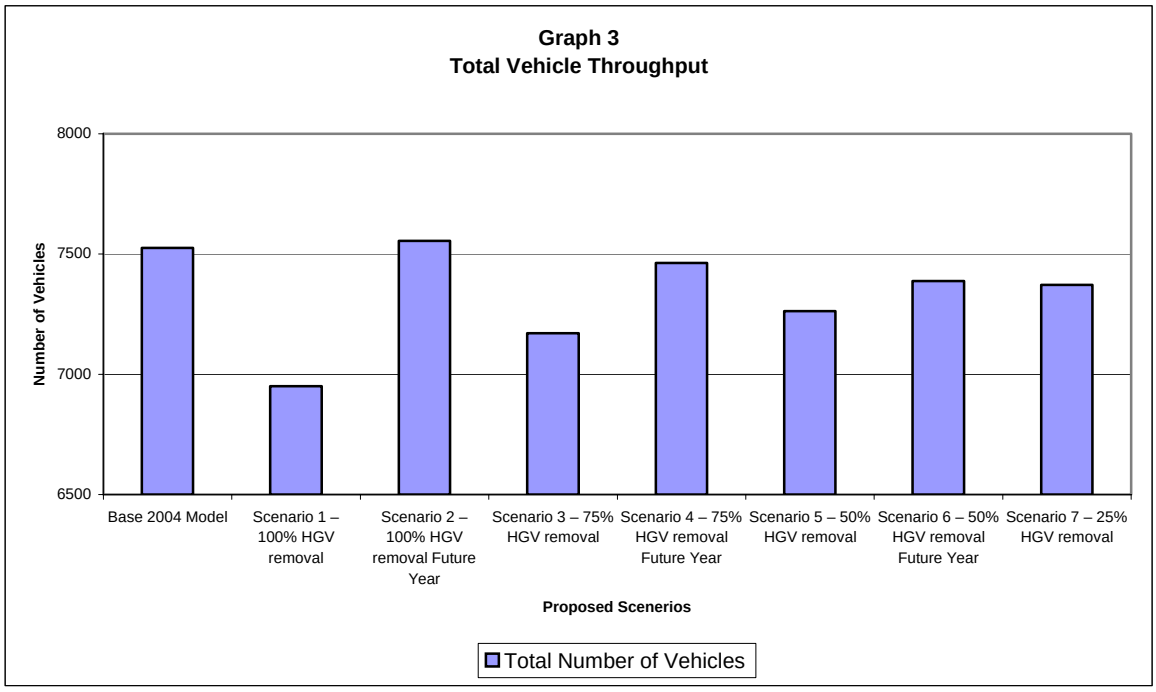
| Table 3.5.5 – Queue Lengths (metres) on key links at Henly's Corner<br>xxx = Average, (xxx) = Maximum | | | | |
|---|---|---|---|---|
| | A406 Eastbound | Regents Park Road | A406 Westbound | Finchley Road |
| Base 2004 Model | 195 (391) | 41(87) | 30 (130) | 18(151) |
| Scenario 7 – 25% HGVs removed | 180(407) | 42(109) | 29(92) | 24(180) |

## 3.6. Results Graphs

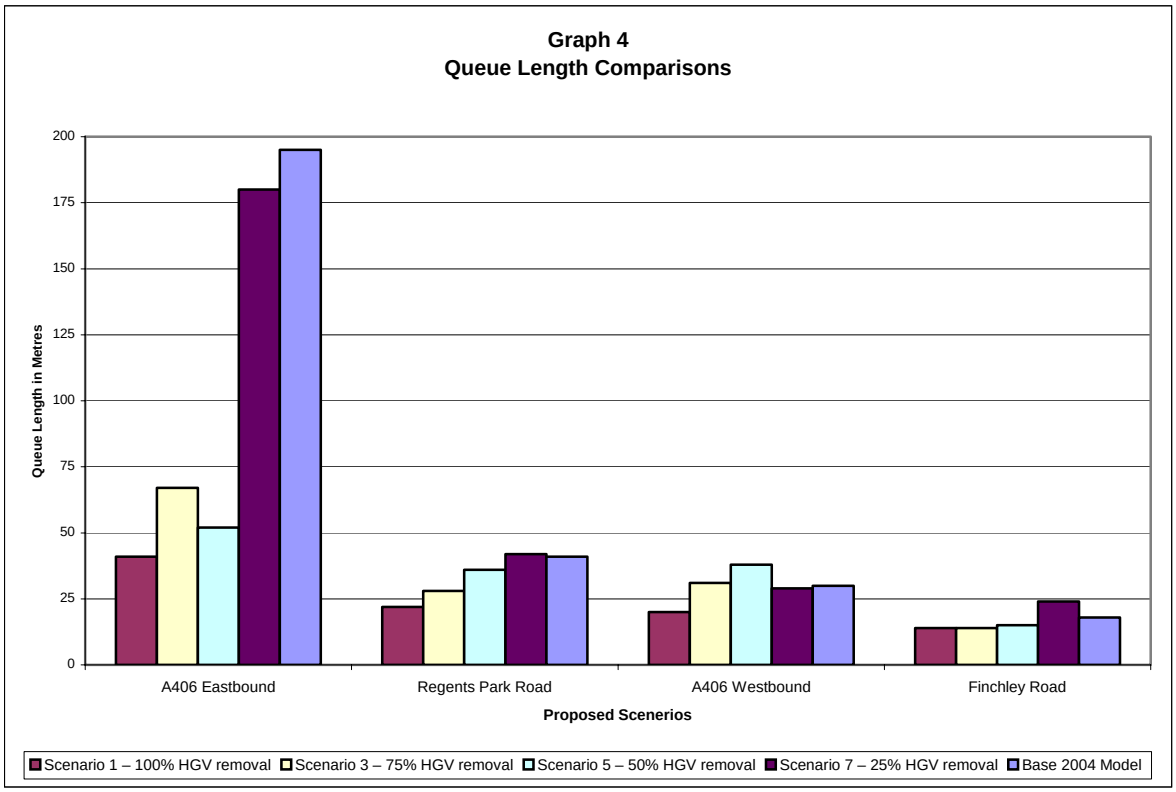
The following graphs compare the results for the scenarios.




Graph 2
Delay time through the junction
Delay Time in Seconds
350
300
250
200
150
100
50
0
Base 2004 Model
Scenario 1 – 100% HGV removal
Scenario 2 – 100% HGV removal Future Year
Scenario 3 – 75% HGV removal
Scenario 4 – 75% HGV removal Future Year
Scenario 5 – 50% HGV removal
Scenario 6 – 50% HGV removal Future Year
Scenario 7 – 25% HGV removal
Proposed Scenerio


Graph 3
Total Vehicle Throughput
Number of Vehicles
8000
7500
7000
6500
Base 2004 Model
Scenario 1 – 100% HGV removal
Scenario 2 – 100% HGV removal Future Year
Scenario 3 – 75% HGV removal
Scenario 4 – 75% HGV removal Future Year
Scenario 5 – 50% HGV removal
Scenario 6 – 50% HGV removal Future Year
Scenario 7 – 25% HGV removal
Proposed Scenerios
Total Number of Vehicles

**Graph 4**
**Queue Length Comparisons**



# 4. SUMMARY



# 4. Summary

### 4.1. Comparison of Results

The A406 network at Henly's Corner has been assessed to determine the extent of the release of spare capacity in the network with the removal of HGVs from the traffic flows. A micro-simulation model for the A406 has been used to determine the number of years of further traffic growth that could be accommodated.

Based on key network performance characteristics, of vehicle emissions and network delay, the assessment indicates that approximately 16 years worth of traffic growth could be released or a 12% increase in traffic if 100% of the HGV were to be removed. This value was determined when the first of the characteristics reached the same level as the base 2004 case assuming 0.7% traffic growth per annum. Other parameters are also approximately that of the base case.

Removing 75% of the HGV resulted in a growth factor of 9%, which is equivalent to 12 years traffic growth at the average traffic increase of 0.7% per annum.

Scenarios 5 and 6, removal of 50% of the HGV's, assumes a growth factor of 5%, which is equivalent to 7 years traffic growth.

The results indicated that the removal of 25% of the HGV does not provided any benefit to the operational performance of the network with results being comparable to that of the base year model without any factoring being applied.

Appendix 1 contains summary tables for all scenarios.

# APPENDIX 1



# Appendix 1 – Summary Tables

| Table 1 – Total Vehicle Delay | |
|---|---|
| **Model** | **Vehicle Delay (Vehicle Hours)** |
| Base 2004 Model | 250 |
| Scenario 1 – 100% HGV removal | 120 |
| Scenario 2 – 100% HGV removal Future Year | 249 |
| Scenario 3 – 75% HGV removal | 188 |
| Scenario 4 – 75% HGV removal Future Year | 233 |
| Scenario 5 – 50% HGV removal | 229 |
| Scenario 6 – 50% HGV removal Future Year | 298 |
| Scenario 7 – 25% HGV removal | 254 |

| Table 2 – Network Emissions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon Monoxide (CO)** | | | | **Nitrous Oxide (Nox)** | | | |
| | **Car** | **HGV** | **Bus** | **Total** | **Car** | **HGV** | **Bus** | **Total** |
| **Base 2004 Model** | 2421284 | 38532 | 948 | 2460763 | 159103 | 45212 | 1190 | 205506 |
| Scenario 1 – 100% HGV removal | 1721092 | 0 | 873 | 1721965 | 148907 | 0 | 1154 | 150061 |
| Scenario 2 – 100% HGV removal Future Year | 2140499 | 0 | 929 | 2141428 | 166940 | 0 | 1181 | 168122 |
| Scenario 3 – 75% HGV removal | 1819046 | 9242 | 869 | 1829157 | 151206 | 11842 | 1151 | 164199 |
| Scenario 4 – 75% HGV removal Future Year | 2052390 | 13311 | 923 | 2066624 | 159156 | 17628 | 1177 | 177961 |
| Scenario 5 – 50% HGV removal | 2000227 | 26396 | 946 | 2025570 | 151594 | 30379 | 1189 | 183161 |
| Scenario 6 – 50% HGV removal Future Year | 2399914 | 30435 | 1033 | 2431382 | 160496 | 37275 | 1217 | 198988 |
| Scenario 7 – 25% HGV removal | 2061090 | 25928 | 921 | 2087939 | 155763 | 33826 | 1177 | 190766 |

| Table 3 – Degree of Saturation on key links at Henly's Corner | | | | |
|---|---|---|---|---|
| | A406 Eastbound | Regents Park Road | A406 Westbound | Finchley Road |
| Base 2004 Model | 144% | 72% | 103% | 81% |
| Scenario 1 – 100% HGV removal | 132% | 65% | 100% | 70% |
| Scenario 2 – 100% HGV removal Future Year | 144% | 73% | 105% | 78% |
| Scenario 3 – 75% HGV removal | 135% | 71% | 100% | 76% |
| Scenario 4 – 75% HGV removal Future Year | 143% | 72% | 102% | 80% |
| Scenario 5 – 50% HGV removal | 139% | 72% | 98% | 77% |
| Scenario 6 – 50% HGV removal Future Year | 142% | 75% | 98% | 80% |
| Scenario 7 – 25% HGV removal | 138% | 73% | 103% | 78% |

| Table 4 – Vehicular Throughput (vehicles) | | | | | |
|---|---|---|---|---|---|
| | A406 Eastbound | Regents Park Road | A406 Westbound | Finchley Road | Total |
| Base 2004 Model | 2861 | 1031 | 2673 | 961 | 7526 |
| Scenario 1 – 100% HGV removal | 2610 | 928 | 2586 | 827 | 6951 |
| Scenario 2 – 100% HGV removal Future Year | 2862 | 1039 | 2728 | 926 | 7555 |
| Scenario 3 – 75% HGV removal | 2676 | 1011 | 2587 | 897 | 7171 |
| Scenario 4 – 75% HGV removal Future Year | 2831 | 1033 | 2655 | 944 | 7463 |
| Scenario 5 – 50% HGV removal | 2759 | 1036 | 2550 | 918 | 7263 |
| Scenario 6 – 50% HGV removal Future Year | 2808 | 1069 | 2556 | 954 | 7387 |
| Scenario 7 – 25% HGV removal | 2741 | 1044 | 2666 | 921 | 7372 |

| Table 5 – Queue Lengths (metres) on key links at Henly's Corner<br>xxx = Average, (xxx) = Maximum | | | | |
|---|---|---|---|---|
| | A406 Eastbound | Regents Park Road | A406 Westbound | Finchley Road |
| Base 2004 Model | 195 (391) | 41 (87) | 30 (130) | 18 (151) |
| Scenario 1 – 100% HGV removal | 41 (190) | 22 (77) | 20 (63) | 14 (57) |
| Scenario 2 – 100% HGV removal Future Year | 110 (313) | 37 (105) | 27 (76) | 14 (58) |
| Scenario 3 – 75% HGV removal | 67 (221) | 28 (88) | 31 (95) | 14 (98) |
| Scenario 4 – 75% HGV removal Future Year | 198 (409) | 37 (109) | 46 (137) | 15 (79) |
| Scenario 5 – 50% HGV removal | 52 (153) | 36 (105) | 38 (123) | 15 (75) |
| Scenario 6 – 50% HGV removal Future Year | 176 (405) | 42 (105) | 39 (197) | 17 (104) |
| Scenario 7 – 25% HGV removal | 180 (407) | 42 (109) | 29 (92) | 24 (180) |

| Table 6 – Queue Length Comparison | | | | |
|---|---|---|---|---|
| | **A406 Eastbound** | **Regents Park Road** | **A406 Westbound** | **Finchley Road** |
| | **Difference (% Change)** | **Difference (% Change)** | **Difference (% Change)** | **Difference (% Change)** |
| Scenario 1 – 100% HGV Removal | | | | |
| **07:30 – 07:45** | -56 (-26%) | -26 (-29%) | -13 (-26%) | -23 (-32%) |
| **0745 – 08:00** | -158 (-57%) | -29 (-31%) | -7 (-13%) | -46 (-51%) |
| **08:00 – 08:15** | -227 (-60%) | -9 (-13%) | -32 (-43%) | -3 (-7%) |
| **08:15 – 08:30** | -249 (-66%) | -16 (-18%) | -43 (-51%) | -5 (-10%) |
| Scenario 2 – 100% HGV Removal – Future Year | | | | |
| **07:30 – 07:45** | -37 (-17%) | 3 (3%) | -5 (-9%) | -25 (-35%) |
| **0745 – 08:00** | -103 (-37%) | -14 (-15%) | 2 (3%) | -42 (-46%) |
| **08:00 – 08:15** | -140 (-37%) | 12 (-16%) | -7 (-9%) | -1 (-3%) |
| **08:15 – 08:30** | -123 (-33%) | 2 (2%) | -25 (-30%) | -4 (-8%) |
| Scenario 3 – 75% HGV Removal | | | | |
| **07:30 – 07:45** | -7 (-3%) | -17 (-23%) | 33 (64%) | -14 (-15%) |
| **0745 – 08:00** | -137 (-49%) | -25 (-28%) | 13 (24%) | -22 (-24%) |
| **08:00 – 08:15** | -206 (-54%) | -4 (-10%) | -17 (-23%) | 5 (7%) |
| **08:15 – 08:30** | -216 (-58%) | 0 (0%) | -22 (-27%) | - 7 (-8%) |
| Scenario 4 – 75% HGV Removal – Future Year | | | | |
| **07:30 – 07:45** | 26 (12%) | -20 (-28%) | 33 (67%) | 2 (2%) |
| **0745 – 08:00** | 9 (3%) | -41 (-46%) | 49 (87%) | -20 (-21%) |
| **08:00 – 08:15** | -3 (-1%) | 4 (9%) | 24 (32%) | -3 (5%) |
| **08:15 – 08:30** | -8 (2%) | 5 (10%) | 37 (44%) | - 3 (-4%) |
| Scenario 5 – 50% HGV Removal | | | | |
| **07:30 – 07:45** | -20 (-18%) | -7 (-27%) | 11 (34%) | -1 (-7%) |
| **0745 – 08:00** | -122 (-67%) | -12 (-45%) | -20 (-36%) | -2 (-13%) |
| **08:00 – 08:15** | -88 (-33%) | 9 (29%) | -9 (-25%) | -1 (-6%) |
| **08:15 – 08:30** | -108 (-48%) | 8 (21%) | -16 (-31%) | 2 (16%) |
| | | | | |
| Scenario 6 – 50% HGV Removal – Future Year | | | | |
| **07:30 – 07:45** | -12 (-11%) | -10 (-39%) | 32 (37%) | 8 (42%) |
| **0745 – 08:00** | -57 (-31%) | -4 (-14%) | -19 (-34%) | -2 (-13%) |
| **08:00 – 08:15** | -13 (-5%) | 20 (66%) | -5 (-15%) | 2 (18%) |
| **08:15 – 08:30** | -3 (-1%) | 5 (13%) | 3 (6%) | 1 (5%) |
| Scenario 7 – 25% HGV Removal | | | | |
| **07:30 – 07:45** | 16 (14%) | 0 (0%) | 8 (24%) | 3 (16%) |
| **0745 – 08:00** | -48 (-27%) | 3 (10%) | -8 (-14%) | 6 (34%) |
| **08:00 – 08:15** | -22 (-8%) | -4 (-14%) | -3 (-9%) | 3 (30%) |
| **08:15 – 08:30** | 20 (9%) | -1 (-2%) | -11 (-22%) | 2 (16%) |
| | | | | |