

Westhill Traffic Capacity Study

Aberdeenshire Council

S-Paramics Initial Testing Results





WESTHILL TRAFFIC CAPACITY STUDY

Description: **Westhill Traffic Capacity Study**

Date: **03 June 2009**

Primary Author: **Julie Sey**

1st Review: **Callum Guild** Project Manager

2nd Review: **Peter Stewart** Project Director

Distribution: **Peter MacCallum** Aberdeenshire Council
Mark Peters Aberdeenshire Council
Bob Nicol SIAS

SIAS Limited
13 Rose Terrace
Perth PH1 5HA
UK

tel: 01738 621377
fax: 01738 632887
perth@sias.com
www.sias.com



SIAS Limited
13 Rose Terrace
Perth PH1 5HA
UK

tel: 01738 621377
fax: 01738 632887
perth@sias.com
www.sias.com



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1 INTRODUCTION

1.1 Introduction

- 1.1.1 Aberdeenshire towns have sustained significant growth over recent years. In particular, the town of Westhill is earmarked in planning terms as having potential for further growth.
- 1.1.2 Aberdeenshire Council has requested that SIAS Limited (SIAS) undertake an assessment of the traffic impact of proposed development sites in Westhill, using the Westhill S-Paramics traffic model originally developed in 2004.
- 1.1.3 On the advice of Aberdeenshire Council, the model considers Local Plan content to 2010 then considers, in isolation, each of the potential development areas outlined by Aberdeenshire Council to assess the impact on the road network of various 2016 forecast scenarios.
- 1.1.4 The overall aim of the study was to assess the traffic impact of each of the proposed development sites on the road network and, also under advice from Aberdeenshire Council, identify conceptual designs for network improvements which may aid performance of the road network.

1.2 Objectives

- 1.2.1 The primary purpose of this assessment is to aid and inform Aberdeenshire Council on the potential impact on the road network of various development scenarios. However, traffic modelling can never be precise and it is not presented as such, because it involves assumptions about the future and about the behaviour of people.
- 1.2.2 The principal objectives of this study were to:
- Evaluate the road network impact of the potential development areas
 - Evaluate the conceptual supporting infrastructure options proposed by Aberdeenshire Council
 - Suggest opportunities for all modes, particularly public transport, pedestrians and cyclists (provided in Appendix B)

1.3 Westhill Model Background

- 1.3.1 The Base Westhill S-Paramics model was completed in 2005 using observed data from 2004 and is representative of 2004 conditions. Since that time, at the request of Aberdeenshire Council, SIAS has undertaken a range of tests, which contain varying levels of development. The model scenarios include a 2006 Base model update; which is the 2004 Base with the inclusion of Tesco and Broadstraik Housing and a 2008 Do-Minimum model. The 2006 Base model supersedes the original 2004 Base.
- 1.3.2 The Westhill models represent the following AM and PM peak periods:
- AM Peak Period 07:00 – 10:00
 - PM Peak Period 15:30 – 18:30
- 1.3.3 The peak hours for the Westhill models were calculated from the original survey data as:
- AM Peak Hour 07:45 – 08:45
 - PM Peak Hour 16:45 – 17:45



1.3.4 Figure 1.1 shows the Westhill study area.

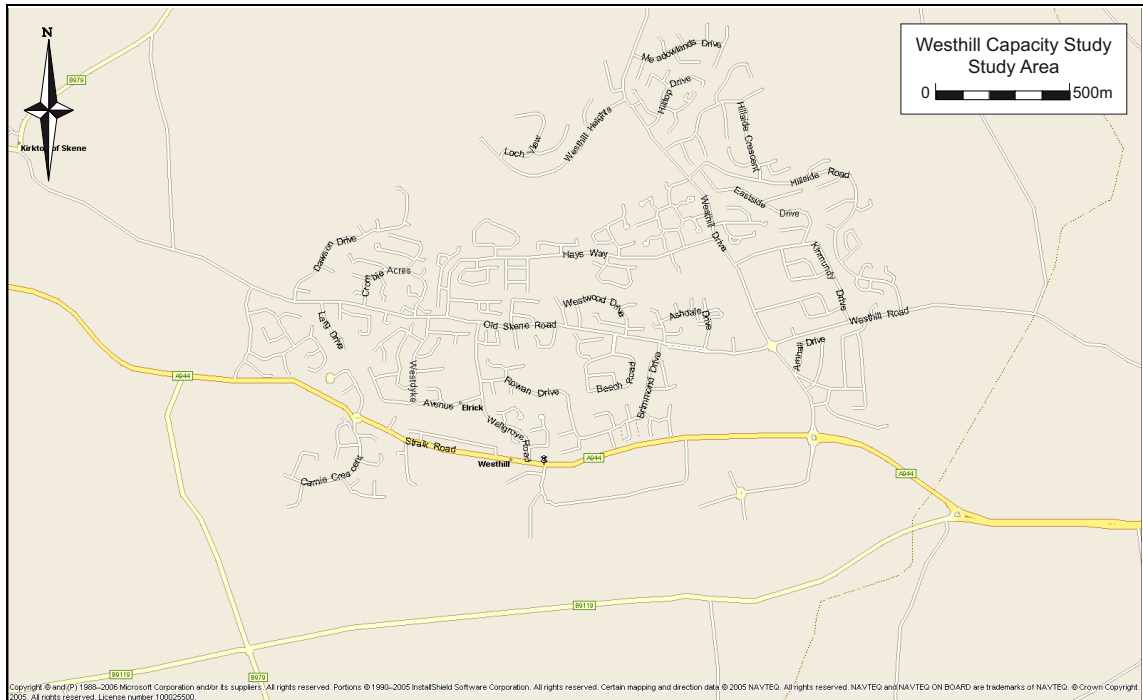


Figure 1.1 : Study Area

1.4 Test Scenarios

1.4.1 The scenarios requested by Aberdeenshire Council which have been tested as part of this study are detailed in Table 1.1.

Table 1.1 : Test Scenarios

Test	Model Content
Test 1	2010 Do Minimum
Test 1a	Test 1 plus infrastructure improvements at Arnhall, Six Mile Fork and CarnieRoundabout
Test 2	Test 1a plus NRTF low growth to 2016
Test 3	Test 2 plus Arnhall Phase 2 Extension and Arnhall Phase 3
Test 4	Test 2 plus development to south of the B9119, and 200 housing unit extension at Broadshade
Test 4a	Test 4 plus upgrade part of the B9119 to dual carriageway
Test 5	Test 3 plus Test 4
Test 5a	Test 3 plus Test 4a

1.4.2 The test scenarios detailed in Table 1.1 have been evaluated using mean travel time and vehicle release statistics, in addition to model observations.

1.5 Review of Previous Work

1.5.1 A review was carried out of all previous work undertaken. This involved checking the development content of previously modelled scenarios and cross referencing this with the local plan content and emerging planning applications.



1.5.2 Previous work which has been utilised in this study includes:

- *Westhill Option Testing – 2006 Base Model Development* (Ref. 66754, Nov 2006)
- *Westhill Option Testing – 2008 Do-Minimum Model Development* (Ref. 66295, Sep 2006)
- *Westhill Option Testing* (Ref. 68195, Aug 2007)
- *Westhill Enterprise Drive/Straik Road/Wellgrove Road Signalisation – Junction Design* (Ref.68831, Dec 2007)

1.5.3 The 2008 Do-Minimum was developed from the 2006 Base model. Table 1.2 details the developments included in the 2008 Do-Minimum:

Table 1.2 : 2008 Do-Minimum Content

Zone	Development	Office (sqm)	Industrial (sqm)	Housing (units)	Total
	500 Arnhall Business Park Extension	17500	17500		35000
	502 & 505 Silvertrees Business Park	4500	4500		9000
	503 Westhill Business Park Extension	11250	11250		22500
	506 Burnland Farm Housing			160	160
	59 Broadstraik Housing			327	327
	504 Broadshade Housing			125	125

1.5.4 The planning application extracts supplied by Aberdeenshire Council identified the infrastructure to support the above developments, including:

- New accesses for Silvertrees Business park and Westhill Business Park Extension from B9119
- New roundabout on Old Skene Road to provide access to Broadshade Housing Development.

1.5.5 The developments listed in Table 1.2 are illustrated by zone location in Figure 1.2.

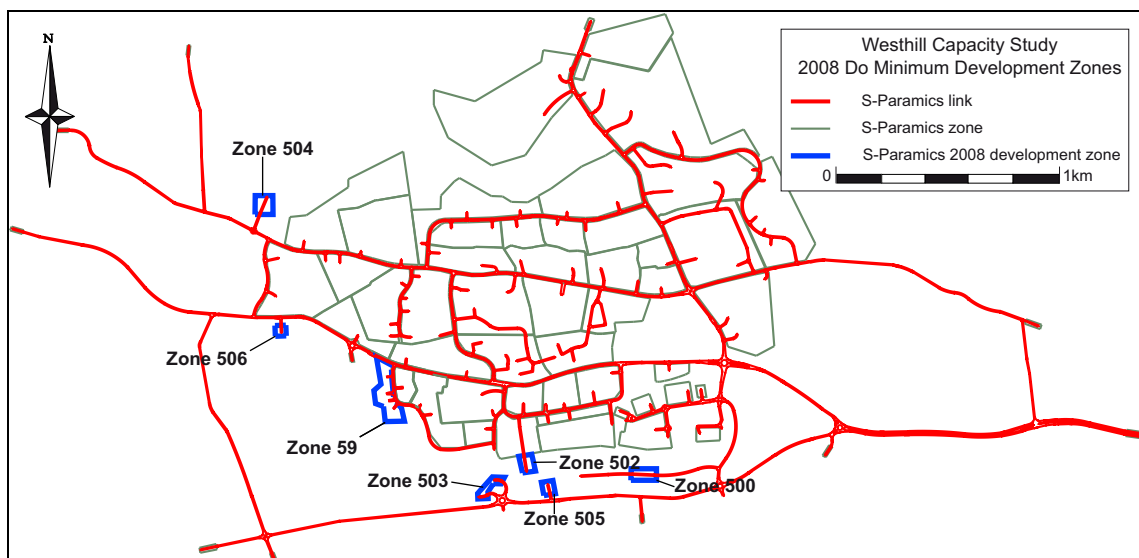


Figure 1.2 : 2008 Do-Minimum Development Zone Locations





2 2010 DO-MINIMUM (TEST 1)

2.1 Network Infrastructure

- 2.1.1 The 2010 Do-Minimum model has been developed from the existing 2008 Do-Minimum model, though changes in the detail for previously included committed developments have been supplied by Aberdeenshire Council.
- 2.1.2 A new junction layout at Straik Road/Enterprise Drive/Wellgrove Road has been included in the 2010 Do-Minimum. The new design includes traffic signals and straightening of the section of Straik Road between Enterprise Drive and Wellgrove Road.
- 2.1.3 The traffic signal timings applied in the model were carried forward from the previous December 2007 testing and are shown in Figure 2.1.

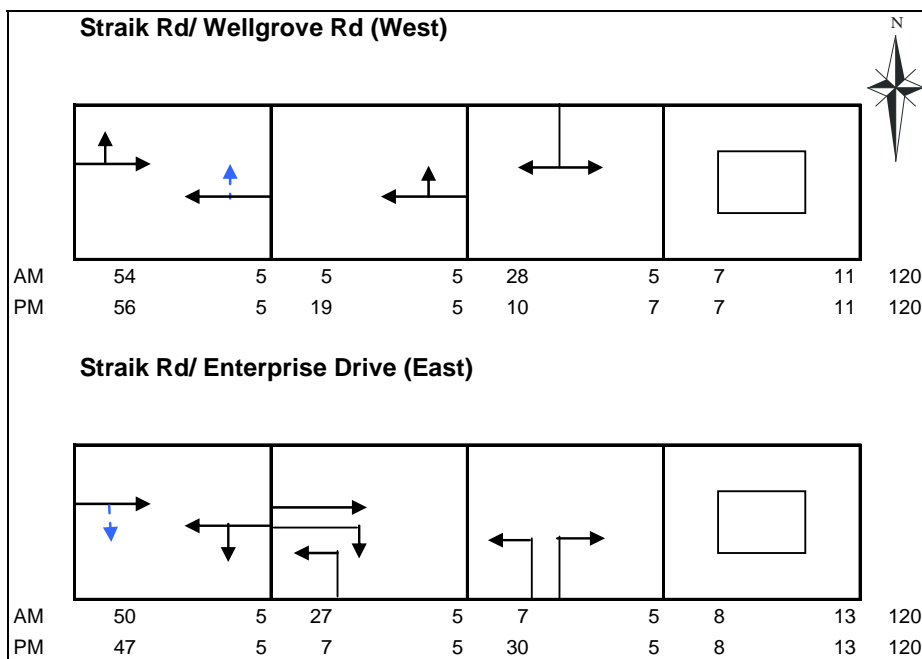


Figure 2.1 : Straik Road/Enterprise Drive/Wellgrove Road Signals

- 2.1.4 Aberdeenshire Council advised that the link road from the B9119 to Endeavour Drive be open in all test scenarios. Following initial calibration of this route in the 2010 Do-Minimum, the cost factor on the link road has been reduced from 1.0 to 0.9 in order to reflect anticipated routing in the area.



2.1.5 The location of the new signal controlled junction and the link road are shown in Figure 2.2.

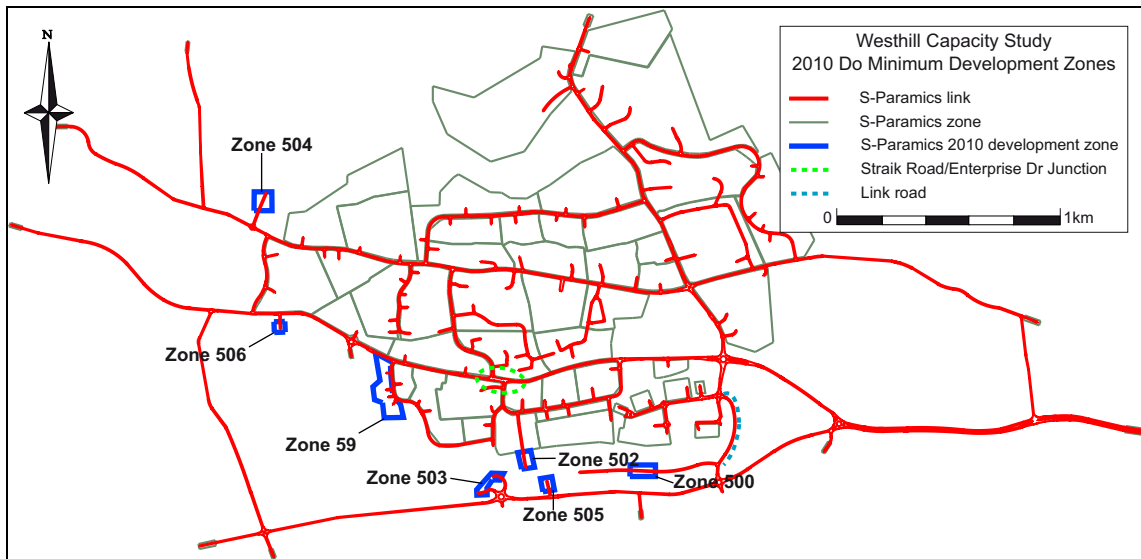


Figure 2.2 : 2010 Development Zone and Infrastructure Change Locations

2.2 2010 Development Content

- 2.2.1 As indicated previously, the 2010 Do-Minimum model is based on the previous 2008 Do-Minimum model. Aberdeenshire Council have advised that, since the 2008 Do-Minimum model was developed, the composition and size of several of the committed developments have changed. There is now considerably more office development than originally modelled.
- 2.2.2 Table 2.1 shows the revised committed developments included in the 2010 Do-Minimum. All development areas included in the 2010 Do-Minimum were present in the 2008 Do-Minimum model.

Table 2.1 : 2010 Committed Developments

Development	Office (sqm)	Industrial (sqm)	Housing (units)	Total
Arnhall Business Park Extension	55107			55107
Silvertrees Business Park	3770	6550		10320
Westhill Business Park Extension	15882	6902		22784
Broadshade Housing			250	250
Burnland Farm Housing			354	354
Broadstraik Housing			327	327



2.2.3 Trip rates were obtained from TRICS in order to update the vehicle trip totals based on the new development areas. The trip rates used were:

Table 2.2 : Trip Rates

		AM Peak (07:00 - 10:00)			PM Peak (15:30 - 18:30)		
		In	Out	Total	In	Out	Total
Office	Arnhall	2.638	0.54	3.178	0.688	2.355	3.043
	Westhill	2.684	0.51	3.198	0.587	2.249	2.836
	Silvertrees	2.771	0.537	3.308	0.614	2.355	2.969
Industrial	Westhill	2.149	1.259	3.408	0.984	1.889	2.873
	Silvertrees	2.149	1.259	3.408	0.984	1.889	2.873
Housing	Burnland	0.41	0.976	1.386	1.087	0.728	1.815
	Broadstraik	0.41	0.976	1.386	1.087	0.728	1.815
	Broadshade	0.41	0.976	1.386	1.087	0.728	1.815

2.2.4 NRTF low growth has been applied between 2004 and 2010 to base traffic travelling in both directions between the A944 (Aberdeen) and the B9119. Network classification was assumed to be Inter Urban General. The following growth was applied:

- Cars/LGVs 1.035
- HGVs 1.042

2.2.5 AM and PM trip totals for the 2010 Do-Minimum are shown in Table 2.3.

Table 2.3 : 2010 Committed Development Vehicle Trip Totals

2010 Do Min	Development	AM	PM
2006 Base		12,549	15,218
	Growth to 2010	99	93
	Arnhall Phase 2	1,751	1,677
	Silvertrees	348	389
	Westhill Business Park Extension	744	649
	Broadshade Housing	348	455
	Burnland Housing	491	641
	Broadstraik Housing	188	244
Total Developments		3,870	4,055
New Trips Added		3,021	3,231
Total Matrix		15,668	18,541
% Increase from 2006 Base		25%	22%

2.2.6 Table 2.3 shows that the number of new vehicle trips added is less than the total new trips generated by the developments. The traffic demand matrix was adjusted to minimise double counting and allow internal trips to occur between the new housing and existing employment and vice versa. This reduced the number of new trips which were added to the network.

2.2.7 The Broadstraik housing development was partially developed in the 2004 base. The trip totals in Table 2.3 represent the additional development since 2004. Vehicle trip totals for this development in the 2004 base were:

- AM peak – 265



- PM peak - 350

This brings the total number of vehicle trips for this development to 453 in the AM peak and 594 in the PM peak.

2.3 Test 1 Model Observations

- 2.3.1 In the AM peak, a queue of eastbound traffic is observed on the A944 from Six Mile Fork back to Arnhall 07:30 - 08:20. Queueing from Arnhall extends up Westhill Drive reaching the extents of the model by 08:25. On the B9119 queueing is observed westbound 07:45 - 08:45. Queueing is also observed on the B979 northbound 08:20 - 09:00.
- 2.3.2 In the PM peak, queueing from Arnhall is observed to extend onto Endeavour Drive past Tesco from 16:55. Northbound traffic on the new link road cuts across Endeavour Drive resulting in queues into Tesco throughout the model period. Traffic on the link road also reduces opportunities for vehicles to take egress from the Arnhall Phase 2 development.
- 2.3.3 Queues are observed at Six Mile Fork on B9119 and A944 Westbound. Queueing on the B9119 westbound from Carnie Roundabout extends to 1km.
- 2.3.4 The PM peak gridlocks at Arnhall Roundabout at approximately 17:45.

2.4 2010 Do-Minimum plus Infrastructure Improvements (Test 1a)

- 2.4.1 Observation of the 2010 Do-Minimum model found that the model gridlocked in the PM peak due to congestion Arnhall Roundabout.
- 2.4.2 In order to proceed with the study, and following discussion with Aberdeenshire Council, it was necessary to make some network infrastructure improvements. Improvements were introduced at Arnhall junction, Six Mile Fork, and Carnie Roundabout.
- 2.4.3 The improvements proposed were carried forward from previous testing of these junctions, undertaken in August 2007 (*Westhill Option Testing*, Ref. 68195).
- 2.4.4 The conceptual layout of Arnhall signal junction is shown in Figure 2.3.



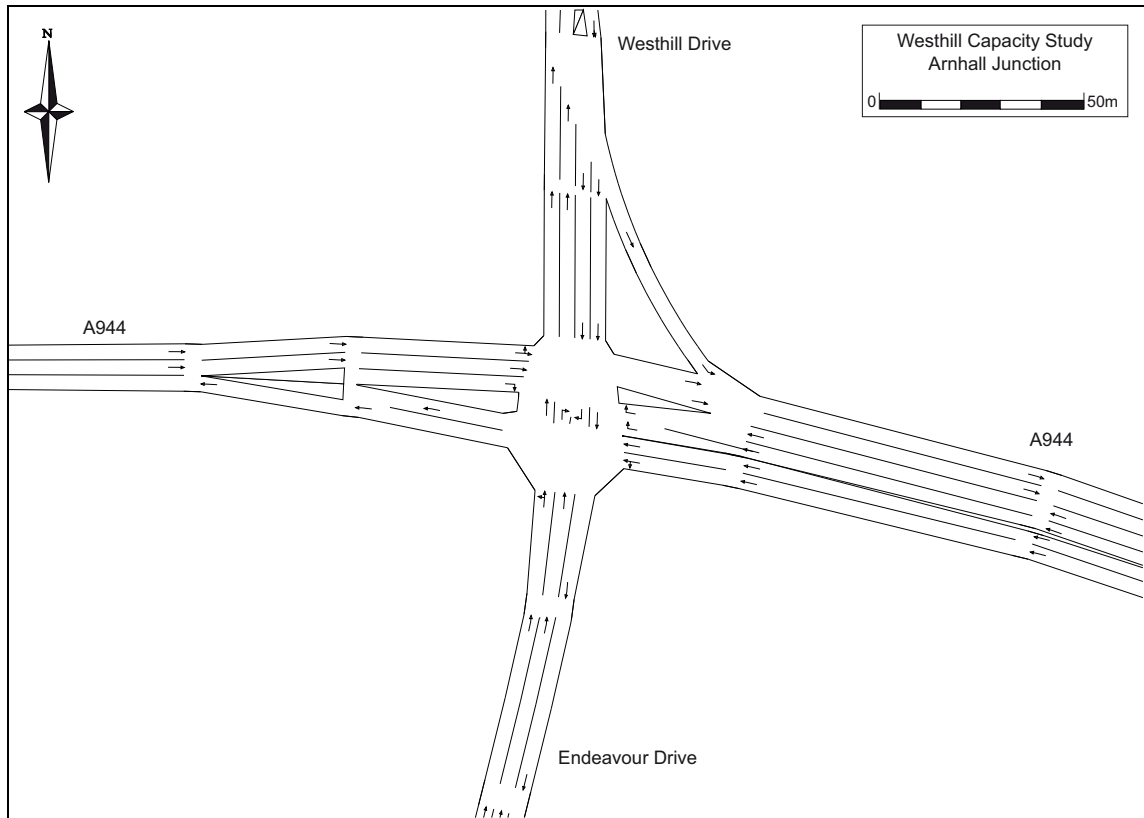


Figure 2.3 : Arnhall Junction

- 2.4.5 As modelled in a previous study (August 2007), a short length of dedicated right turn lane is provided approaching Arnhall Eastbound and a controlled pedestrian crossing is provided on the left slip lane from Westhill Drive.
- 2.4.6 The signal stages used at Arnhall junction are shown in Figure 2.4. The junction is double cycled to a 240s cycle time and all signal timing information was adopted from the previous testing in August 2007. This effectively calls a full pedestrian stage every second cycle. The detailed infrastructure and operational design for this junction will require further consideration. No consideration of land ownership or utilities has been made at this time.



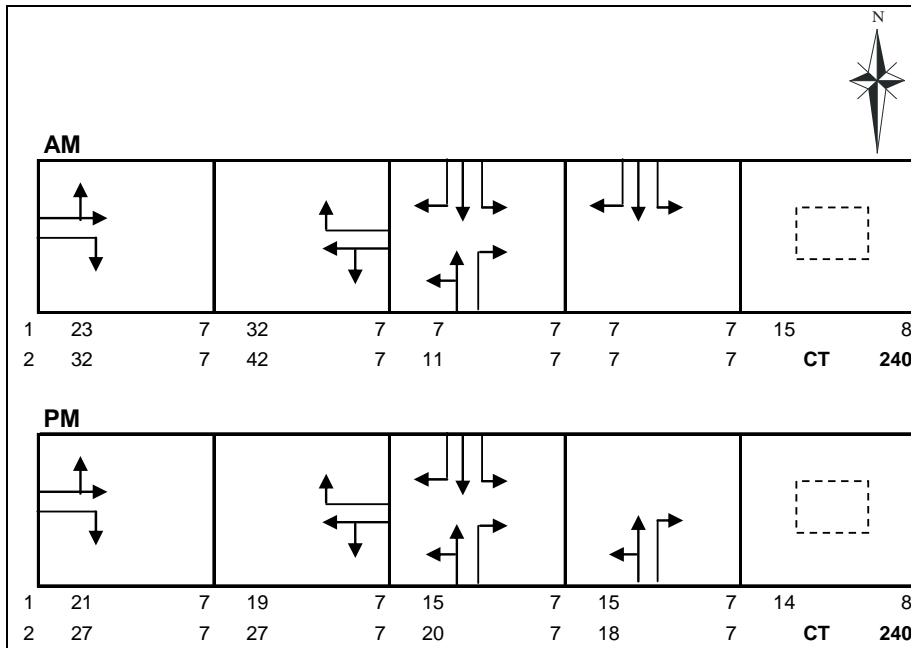


Figure 2.4 : Arnhall Signal Stages

2.4.7 The Six Mile Fork conceptual junction layout is shown in Figure 2.5.

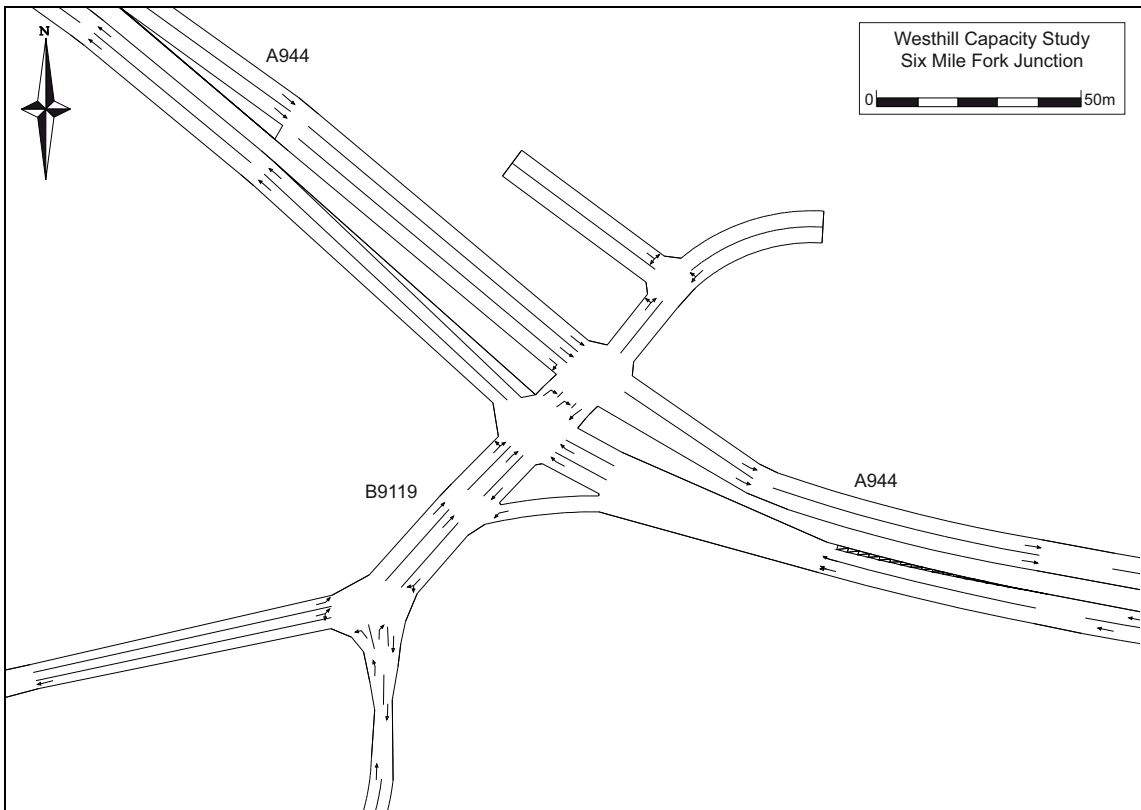


Figure 2.5 : Six Mile Fork Junction

2.4.8 As modelled previously (August 2007), a north arm has been added to the junction to allow improved access to existing developments and a short length of dedicated right turn lane has been provided, approaching the junction Westbound on the A944.



2.4.9 The signal stages used at Six Mile Fork are shown in Figure 2.6. The junction has five cycles on a 600s cycle time and all signal information was taken from the previous testing (August 2007). This effectively calls a full pedestrian stage every fifth cycle. The detailed infrastructure and operational design for this junction will require further consideration. No consideration of land ownership or utilities has been made at this time.

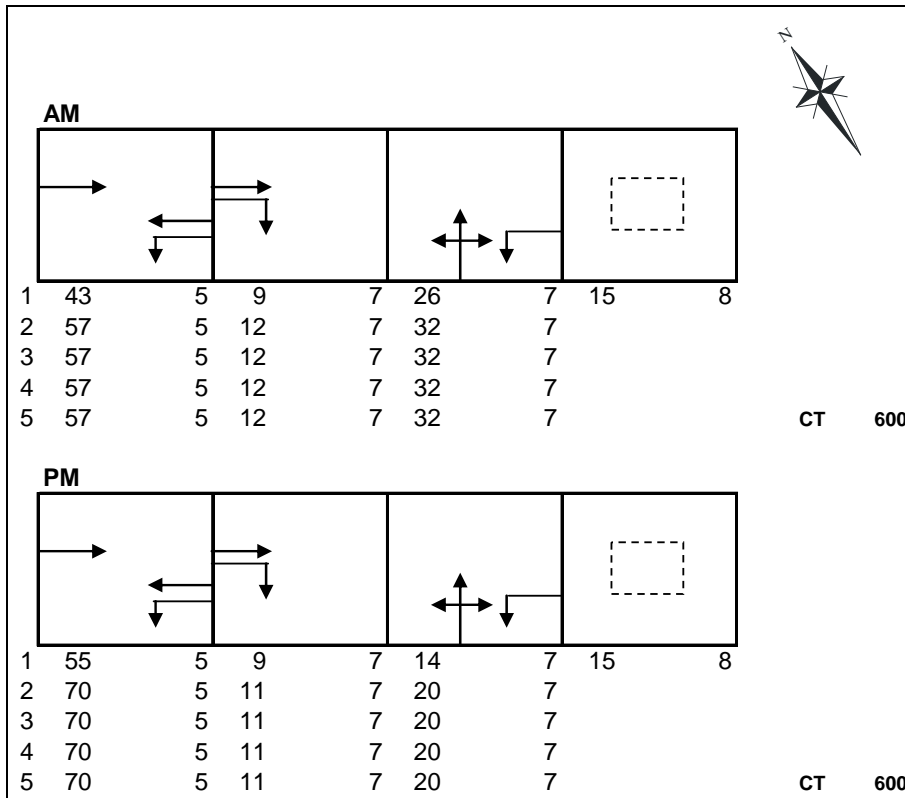


Figure 2.6 : Six Mile Fork Signal Stages

2.4.10 At Carnie Roundabout, the two lane approaches from the B979 southbound and the B9119 westbound have been increased to approximately 50m, and the B979 northbound approach has been increased to approximately 25m. This will be subject to future detailed design. No consideration of lands ownership has been made at this stage.

2.5 Test 1a Model Observations

2.5.1 In the AM peak, a southbound queue is observed on Westhill Drive from Arnhall, reaching approximately 1.5km by 08:30. This is reduced from Test 1, where the queue reached the extents of the model.

2.5.2 In the PM peak, the queue from Arnhall extends past Tesco on Endeavour Drive by 17:00. The maximum number of unreleased vehicles in Tesco is approximately 220 at 17:55. A queue of approximately 1-1.5km is observed at Carnie Roundabout on the B9119 westbound from 17:10 - 18:00. The Test 1a model runs clear by the end of the AM and PM modelled periods. This is significantly improved from Test 1 where the model gridlocked at approximately 17:45.



2.6 Test 1 Mean Travel Time

2.6.1 As a general indicator of congestion the mean travel time for all vehicles in the network was calculated. Table 2.4 gives the mean travel time for Tests 1 and 1a, and compares them to the 2006 base.

2.6.2 It should be noted that in all cases the mean travel time only takes into account traffic on the modelled road network, it does not include delay for vehicles stuck in zones due to congestion. All mean travel time results are an average of five S-Paramics model runs.

Table 2.4 : Test 1 Mean Travel Time

Test	Network	Mean Travel Time (min:sec)	
		AM	PM
	2006 Base	04:10	03:17
1	2010 Do-Minimum	05:46	Gridlocked
1a	2010 Do-Minimum + Improvements	04:21	05:46

2.6.3 Table 2.4 shows that the mean travel time for vehicles increases from 4min 10s in the AM 2006 Base to 5min 46s in the AM 2010 Do-Minimum. With the infrastructure improvements this mean travel time is reduced by approximately 1min to 4min 21s.

2.6.4 In the PM peak Test 1 gridlocked, but with the infrastructure improvements the network operated, with the mean travel time increasing from 3min 17s in the 2006 Base to 5min 46s in Test 1a.

2.7 Test 1 Unreleased Vehicles

2.7.1 The time which traffic is unable to join the model network due to congestion is not accounted for in the mean travel time statistic. In order to quantify this, the total number of unreleased vehicles has been collected at half hourly intervals throughout the AM and PM peak periods.

2.7.2 Figure 2.7 shows the number of unreleased vehicles in the AM peak.

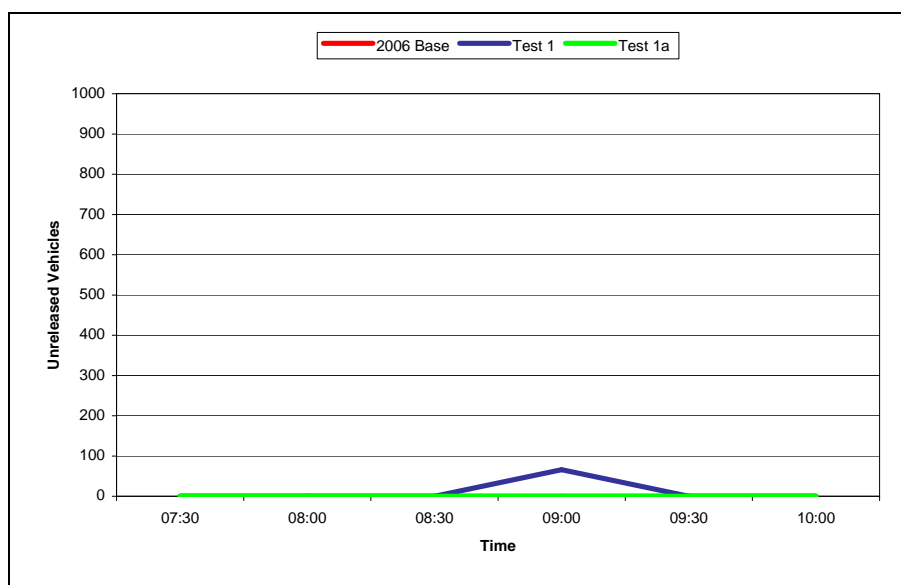


Figure 2.7 : Test 1 AM Unreleased Vehicles



2.7.3 Figure 2.8 shows the number of unreleased vehicles in the PM peak.

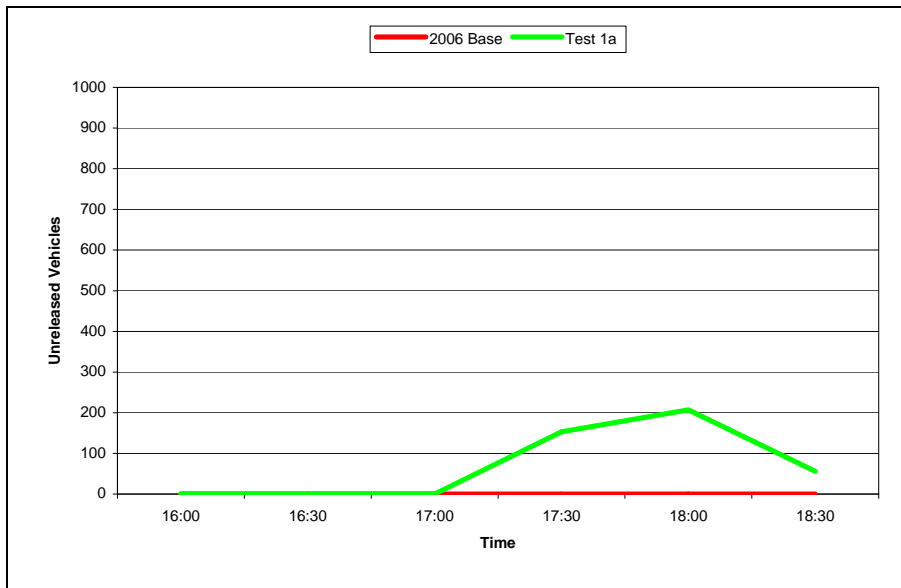


Figure 2.8 : Test 1 PM Unreleased Vehicles

2.7.4 Figures 2.7 and 2.8 show that there are no unreleased vehicles in the 2006 Base in either peak period. Test 1 had 66 unreleased vehicles in the AM peak, on the B9119 to the west of the model. In the PM peak the Test 1 model gridlocked. Test 1a had no unreleased vehicles in the AM peak and had a total of approximately 200 unreleased vehicles in the PM peak.

2.7.5 Table 2.5 shows the locations of unreleased vehicles in the PM peak.

Table 2.5 : Test 1 PM Unreleased Vehicle Locations

Queue Location	Test 1	Test 1a
Tesco	✓	✓
Arnhall Business Park	✓	✓
Arnhall Phase 2	✓	

2.8 Test 1 Summary

2.8.1 The 2010 Do-Minimum scenario represents an increase in traffic of 24% in the AM peak and 21% in the PM peak from the 2006 Base.

2.8.2 With the existing road network infrastructure, significant problems of congestion are observed at Arnhall and Six Mile Fork roundabouts, particularly in the PM peak as congestion at Arnhall Roundabout causes the model to gridlock.

2.8.3 The introduction of traffic signals at Arnhall and Six Mile Fork (Test 1a) significantly reduces congestion in the network and both the AM and PM peaks are observed to operate. This improvement is reflected in the mean travel times, which reduce by approximately 1min 20s in the AM peak compared to Test 1, which is an increase of 11s from the 2006 Base. In the PM peak, Test 1a is observed to have a mean travel time which is 2min 29s longer than the 2006 Base. Test 1 could not be compared as the model gridlocked in the PM peak.





3 2016 DO-MINIMUM (TEST 2)

3.1 Introduction

3.1.1 Test 2: 2010 Do-Minimum plus NRTF low growth applied between 2010 and 2016 to traffic travelling in both directions between the A944 (Aberdeen) and the B9119. Network classification was assumed to be Inter Urban General. The following growth was applied:

- Cars/LGVs 1.068
- HGVs 1.091

3.2 Test 2 Traffic Demand

3.2.1 Table 3.1 shows the Test 2 trip totals including growth to 2016.

Table 3.1 : 2016 Test 2 Trip Summary

Test 2	Development	AM	PM
2006 Base		12,549	15,218
2010 Do Min		15,668	18,541
	Growth to 2016	95	89
Total Developments		0	0
New Trips Added		95	89
Total Matrix		15,763	18,631
Increase from 2006 Base		26%	22%

3.3 Test 2 Model Observations

3.3.1 In both the AM and PM peaks, operation of the model and queueing observed was similar to Test 1a.

3.4 Test 2 Mean Travel Time

3.4.1 Table 3.2 gives the mean travel times for Test 2. The 2006 base and Test 1a are shown for comparison.

Table 3.2 : Test 2 Mean travel Time

Test	Network	Mean Travel Time (min:sec)	
		AM	PM
2006 Base		04:10	03:17
1a	2010 Do-Minimum + Improvements	04:21	05:46
2	2016 Do-Minimum	04:33	05:54

3.4.2 Table 3.3 shows that mean travel time for Test 2 increases by 12s in the AM peak compare to Test 1a and 8s in the PM peak.



3.5 Test 2 Unreleased Vehicles

3.5.1 There were no vehicles unable to join the network due to congestion in the AM peak in Test 2.

3.5.2 Figure 3.1 shows the number of unreleased vehicles in the PM peak.

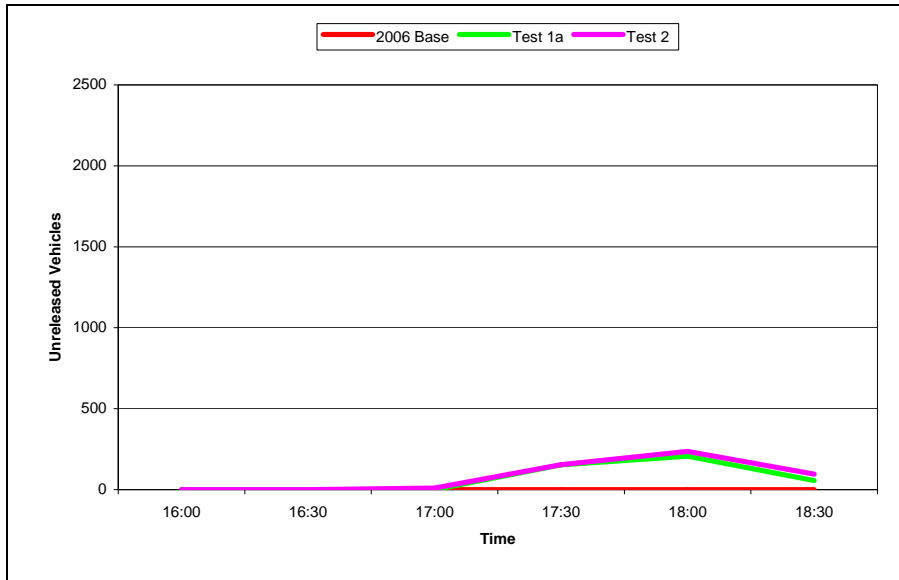


Figure 3.1 : Test 2 PM Unreleased Vehicles

3.5.3 Figure 3.1 shows that the number of unreleased vehicles is similar in Test 2 and Test 1a, which corresponds with the mean travel time results.

3.5.4 In the PM peak in Test 2, unreleased vehicles were queued into Tesco and Arnhall Business Park.

3.6 Test 2 Summary

3.6.1 The addition of 95 trips in the AM peak and 89 in the PM is observed to have no significant effect on the operation of the network.

3.6.2 A preliminary assessment of the traffic signal arrangement at Arnhall indicated that by removing the pedestrian stage and providing 'walk with traffic' pedestrian crossing facilities the junction could possibly be optimised further, but would probably not cause a significant reduction in congestion in the Arnhall area. This may require future consideration at detailed design stage.



4 ARNHALL PHASE 2 EXTENSION AND PHASE 3 (TEST 3)

4.1 Introduction

4.1.1 Test 3: 2016 Do-Minimum (Test 2) plus Arnhall Phase 2 Extension and Arnhall Phase 3.

4.1.2 Figure 4.1 shows the location of the two zones. Zone 509 is Phase 2 Extension and zone 510 is Phase 3.

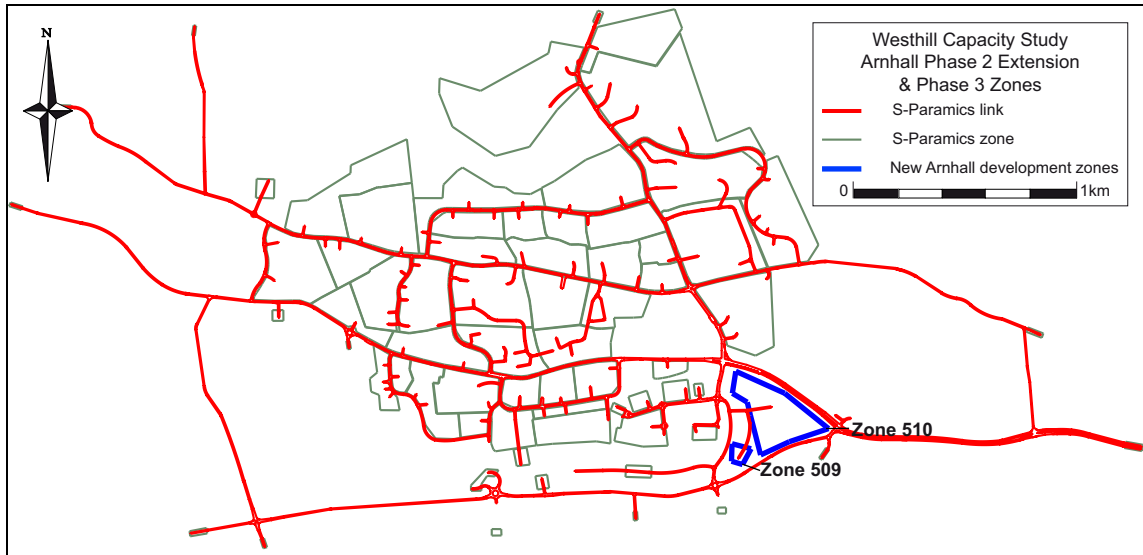


Figure 4.1 : Arnhall Phase 2 Extension and Phase 3

4.2 Test 3 Traffic Demand

4.2.1 SIAS was supplied with Transport Assessment extracts by Aberdeenshire Council for both developments which provided peak hour trip totals and distributions:

- Extension to Arnhall Phase 2 Business Park, Westhill, Transport Assessment, Fairhurst, September 2008
- Proposed Arnhall Phase 3 Business Park, Westhill, Transport assessment, Fairhurst, February 2007

4.2.2 The peak hour trip totals were factored to peak period using factors calculated from the traffic release profiles. The factors used were:

- AM in – 2.047 out – 1.906
- PM in – 2.182 out – 1.531



4.2.3 The Test 3 trip totals are shown in Table 4.1.

Table 4.1 : 2016 Test 3 Vehicle Trip Summary

Test 3	Development	AM	PM
2006 Base		12,549	15,218
2010 Do Min		15,668	18,541
	Growth to 2016	95	89
	Arnhall Phase 2 Extension	164	124
	Arnhall Phase 3	956	803
Total Developments		1,121	927
New Trips Added		1,121	927
Total Matrix		16,884	19,556
Increase from 2006 Base		35%	29%

4.2.4 As shown in Table 4.1, all vehicle trips generated by the developments were assumed to be new trips. The trip distribution supplied in the transport assessments indicates that all trips to originate/destinate outwith Westhill and this distribution has been applied in the model.

4.2.5 The distribution of trips extracted from the TA's is detailed as follows:

- 65% A944 East
- 21% A944 West
- 10% Westhill Drive
- 4% B9119 West

4.2.6 Both Arnhall Phase 2 Extension and Arnhall Phase 3 developments were assigned the same traffic release profile as Westhill Business Park and Westhill Business Park Extension, which were derived from the original 2004 survey data.

4.2.7 Vehicle types for the two new developments were assumed to be 98% cars and 2% HGVs, which is consistent with previous testing.

4.3 Test 3 Model Observations

4.3.1 In the AM peak, the southbound queue on Westhill Drive from Arnhall reaches the extents of the model by 08:30.

4.3.2 Queueing is also observed on the B979 northbound and B9119 eastbound by 09:00

4.3.3 In the PM peak, the queue from Arnhall is observed to extend past the roundabout on Endeavour Drive, into Tesco by 16:55.

4.3.4 Northbound traffic on the new link road cuts across Endeavour Drive and prevents traffic getting out at the roundabout, this results in significant queueing in Tesco (approx 310 unreleased vehicles at 18:25). Link road traffic also causes queueing into Arnhall Phase 2 (approx 155 unreleased vehicles at 17:30) and Arnhall Phase 3 (approx 220 unreleased vehicles at 17:45).

4.3.5 The queue from Carnie Roundabout on the B9119 is observed to reach approximately 1-1.5km between 17:15 - 18:00.



4.4 Test 3 Mean Travel Time

4.4.1 The mean travel times for Test 3 as shown in Table 4.2. Mean travel times for the 2006 base and Test 1a are shown for comparison.

Table 4.2 : Test 3 Mean Travel Times

Test	Network	Mean Travel Time (min:sec)	
		AM	PM
2006 Base		04:10	03:17
1a	2010 Do-Minimum + Improvements	04:21	05:46
3	Test 2 + Arnhall Phase 2 Ext and Phase 3	05:36	07:21

4.4.2 Table 4.2 shows that the addition of Arnhall Phase 2 Extension and Arnhall Phase 3 results in an increase in mean travel time to 5min 36s in the AM peak and 7m 21s in the PM peak.

4.5 Test 3 Unreleased Vehicles

4.5.1 There were no unreleased vehicles in the AM peak in Test 3. The number of unreleased vehicles in the PM peak is shown in Figure 4.2.

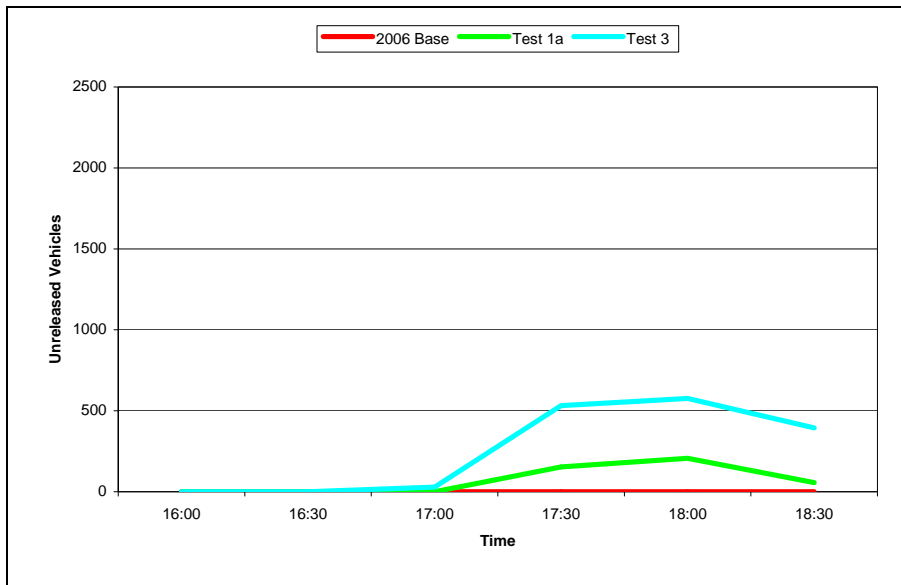


Figure 4.2 : Test 3 PM Unreleased Vehicles

4.5.2 Figure 4.2 shows that the number of vehicles unable to join the model network due to congestion in Test 3 reaches approximately 580 at 18:00, compared to approximately 200 vehicles in Test 1a at the same time.



4.5.3 Table 4.3 shows the location of unreleased vehicles in the PM peak.

Table 4.3 : Test 3 PM Unreleased Vehicle Locations

Queue Location	Test 3
Tesco	✓
Arnhall Business Park	✓
Arnhall Phase 2 (not Phase 2 Extension)	✓
Arnhall Phase 3	✓

4.6 Test 3 Summary

- 4.6.1 The developments of Arnhall Phase 2 Extension and Arnhall Phase 3 introduce 1,121 new trips to the model in the AM peak and 927 in the PM peak. This represents an increase of 34% from the 2006 base in the AM peak and 27% in the PM peak.
- 4.6.2 The addition of the Arnhall Phase 2 extension and Arnhall Phase 3 development cause an increase in queueing on the B979 northbound, the B9119 eastbound and on the link road from the B9119 to Endeavour Drive.
- 4.6.3 In the PM peak the introduction of the developments and the resultant increase in traffic using the link road causes problems for traffic trying to get out of Arnhall Phase 2 and Phase 3 and traffic queues into these developments for much of the PM peak.



5 2016 DEVELOPMENT (TEST 4)

5.1 Introduction

5.1.1 Test 4: 2016 Do-Minimum model (Test 2) plus proposed 2016 development. Test 4 does **not** include Arnhall Phase 2 extension or Arnhall Phase 3.

5.1.2 At the request of Aberdeenshire Council, two developments were included to form the 2016 Test 4. The two developments were:

- Housing 200 Unit extension of Broadshade
- Employment 30Ha South of B9119 feeding onto the two roundabouts west of Six Mile Fork

5.1.3 Figure 5.1 shows the location of the 2016 developments.

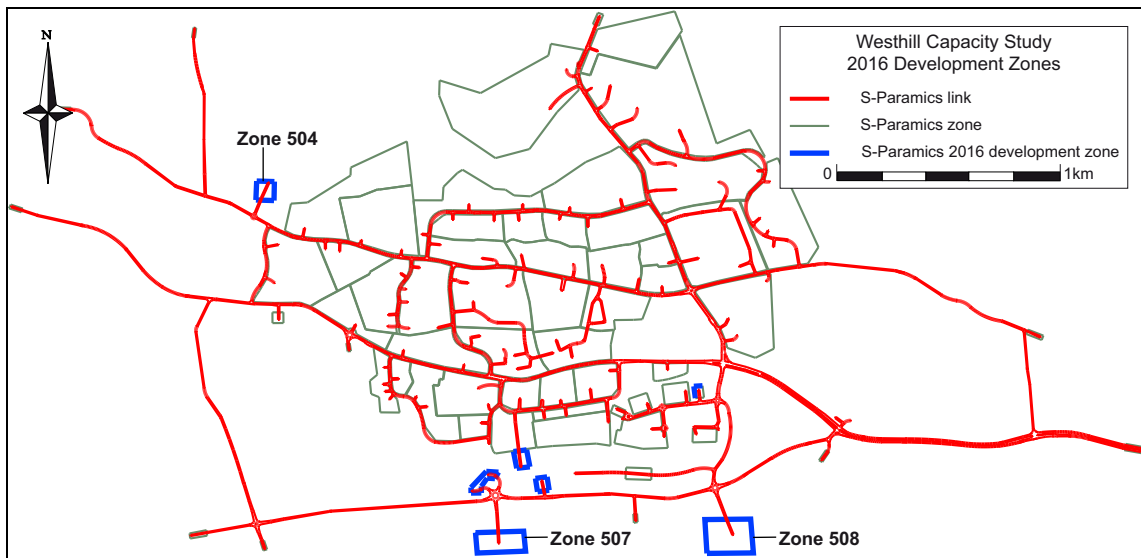


Figure 5.1 : 2016 Development Locations

5.1.4 The 200 units of housing to be included for 2016 were added to the existing Broadshade zone (zone 504). The trip distribution and traffic release profile for the existing Broadshade development has been applied to the new trips.

5.1.5 Aberdeenshire Council advised that the new employment development to the South of Westhill covers an area of 30Ha, with a build density of 50% at 6,500m² GFA per hectare of business use and warehousing and 50% at 3,000m² GFA per hectare of business use and warehousing. The development was split into two zones (507 and 508) to ensure use of two proposed accesses onto the B9119.



5.2 Test 4 Traffic Demand

5.2.1 The total new development vehicle trips for the 2016 Test 4 model are summarised in Table 5.1.

Table 5.1 : 2016 Test 4 Vehicle Trip Summary

Test 4	Development	AM	PM
2006 Base		12,549	15,218
2010 Do Min		15,668	18,541
	Growth to 2016	95	89
	Development South of B9119	4,087	3,550
	Broadshade Housing Ext	292	363
Total Developments		4,379	3,913
New Trips Added		3,520	3,653
Total Matrix		19,284	22,284
Increase from 2006 Base		54%	46%

5.2.2 Table 5.1 shows that the number of new vehicle trips added is less than the total new vehicle trips generated by the developments. The traffic demand matrix was adjusted to minimise double counting and allow internal trips to occur between the new housing and existing employment and vice versa. This reduced the number of new vehicle trips which were added to the network.

5.2.3 The trip distribution from Westhill Business Park Extension (zone 503) was applied to the new employment area. The traffic release profile from Westhill Business Park Extension was also applied to the new development zones.

5.2.4 For the new employment development, 2% of external vehicle trips were assumed to be heavy goods vehicles, which is consistent with the Arnhall developments in Test 3.

5.3 Test 4 Model Observations

5.3.1 In the AM peak, queueing is observed on the B9119 eastbound by 07:40. The queue from Carnie Roundabout extends approximately half way up the B979 by 07:50 and the whole length of the B979 by 08:15. By 09:00 significant congestion is observed throughout Westhill and there are approximately 1,050 unreleased vehicles in external zones.

5.3.2 In the PM peak, traffic from the new development south of the B9119 have difficulty getting out onto the B9119, with vehicles queued back into the zones by 17:00. The continual flow of traffic on the link road also prevents vehicles getting out of Arnhall Phase 2.

5.3.3 By 17:30 there are approximately 1,000 unreleased vehicles in the new employment development zones, approximately 250 unreleased vehicles in Arnhall Phase 2 and 130 in Tesco.

5.3.4 By 18:00 there are approximately 1,500 unreleased vehicles in the new employment development zones, and 200 in Tesco.

5.4 Test 4a – Upgrade part of B9119

5.4.1 As an additional test, the B9119 between Six Mile Fork and the Westhill Business Park access roundabout was upgraded to dual carriageway in both directions.



- 5.4.2 In the AM peak the dual carriageway was observed to cause a slight reduction in congestion on the B9119, but congestion throughout the rest of the network remained similar to Test 4.
- 5.4.3 In the PM peak there were no noticeable improvements in network operation with the introduction of the dualling between Six Mile Fork and the Westhill Business Park access roundabout.

5.5 Test 4 Mean Travel Time

- 5.5.1 The mean travel times for Test 4 and 4a are shown in Table 5.2. Mean travel times for the 2006 Base and Test 1a are shown for comparison.

Table 5.2 : Test 4 Mean Travel Times

Test	Network	Mean Travel Time (min:sec)	
		AM	PM
	2006 Base	04:10	03:17
1a	2010 Do-Minimum + Improvements	04:21	05:46
4	Test 2 + 2016 Developments	19:59	09:43
4a	Test 4 + Duall part of B9119	14:23	09:17

- 5.5.2 Table 5.2 shows a significant increase in mean travel time (over 15min) in the AM peak compared to the 2006 Base and 2010 Do-Minimum (Test 1a). The upgrade of part of the B9119 to dual carriageway (Test 4a) reduced the mean travel time by 5min 36s.
- 5.5.3 In the PM peak, mean travel time is observed to increase by approximately 4min compared to Test 1a. This increase in mean travel time is less significant than the AM peak due to the higher number of vehicles which are unable to join the model network due to congestion. The introduction of the dual section of the B9119 reduced the mean travel time by 26s.

5.6 Test 4 Unreleased Vehicles

- 5.6.1 The total number of unreleased vehicles in Test 4 and Test 4a in the AM peak are shown in Figure 5.2.



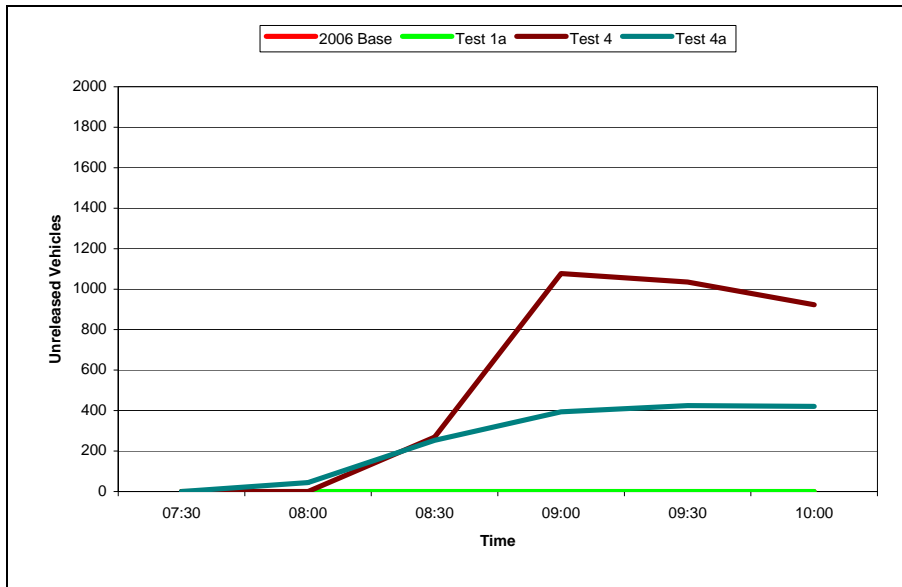


Figure 5.2 : Test 4 AM Unreleased Vehicles

Table 5.3 shows the location of unreleased vehicles in the AM peak for Tests 4 and 4a.

Table 5.3 : Test 4 AM Unreleased Vehicle locations

Queue Location	Test 4	Test 4a
B9119 (W)	✓	✓
B979 (S)	✓	
A944 (E)	✓	
A944 (W)	✓	✓
Broadshade Housing	✓	✓
Burnland Housing	✓	
Development South of B9119		✓
Westhill Drive	✓	
Tesco		✓
Old Skene Rd	✓	

5.6.2 Figure 5.2 shows that in the AM peak, the introduction of the dual section of the B9119 reduces the number of unreleased vehicles from approximately 1,030 in Test 4 to approximately 420 in Test 4a.

5.6.3 The total number of unreleased vehicles in Test 4 and Test 4a in the PM peak are shown in Figure 5.3.



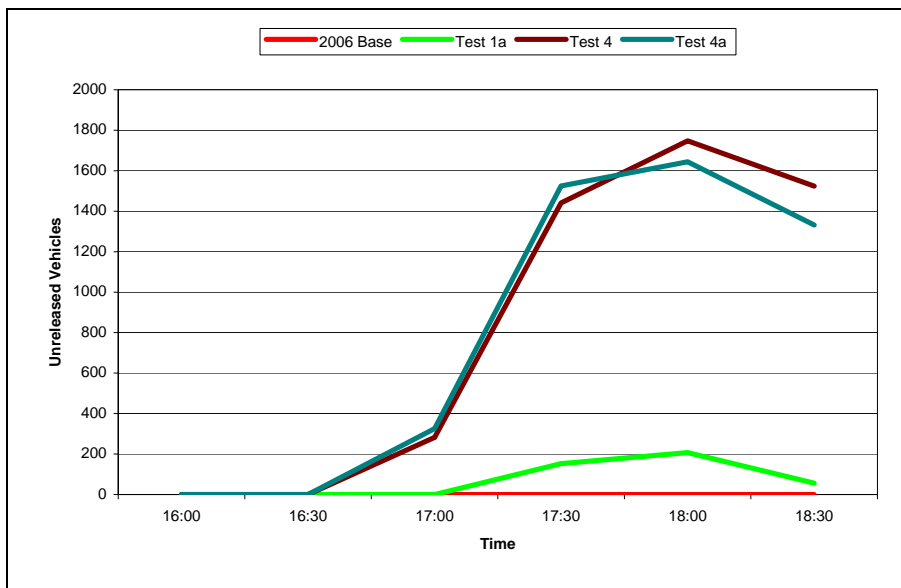


Figure 5.3 : Test 4 PM Unreleased Vehicles

Table 5.4 shows the location of unreleased vehicles in the PM peak for Test 4.

Table 5.4 : Test 4 PM Unreleased Vehicle locations

Queue Location	Test 4	Test 4a
B979 (S)	✓	✓
Tesco	✓	✓
Development South of B9119	✓	✓
Arnhall Phase 2 (not Phase 2 Ext)	✓	✓
Rd to Easter Ord (from Six Mile Fork)	✓	✓

5.6.5 Figure 5.3 shows that in the PM peak there are approximately 1,750 vehicles unable to join the model network due to congestion in Test 4 at 18:00. This reduces to approximately 1,650 in Test 4a when the B9119 is upgraded.

5.7 Test 4 Summary

5.7.1 The development south of the B9119 and the additional housing at Broadshade introduce 3,504 new trips to the model in the AM peak and 3,638 in the PM peak. This represents an increase of 53% from the 2006 base in the AM peak and 45% in the PM peak.

5.7.2 In the AM peak significant congestion is observed throughout the model network, due to the increase in traffic. The mean travel time is increased by over 15min compared to Test 2.

5.7.3 In the PM peak, the high east/west movement along the B9119 restricted egress from the new employment development to the south of the B9119. Vehicles were also queued in Tesco and Arnhall Phase 2.

5.7.4 Upgrading part of the B9119 to dual carriageway was observed to improve congestion on the B9119 in the AM peak. In the PM peak the, dual carriageway did not improve the egress



problem at the new development. The two access points for the new development are via roundabouts, which have a continual heavy east-west flow of traffic thus cutting across the access to the developments.



6 TEST 5 – TEST 3 PLUS TEST 4

6.1 Introduction

6.1.1 Test 5: combination of Test 3 (Arnhall Phase 2 extension and Arnhall Phase 3) and Test 4 (additional 2016 developments). Test 5 uses the same network as Test 2, so includes the infrastructure improvements at Arnhall, Six Mile Fork and Carnie Roundabout.

6.2 Test 5 Traffic Demand

6.2.1 The total traffic demands included in Test 5 are summarised in Table 6.1.

Table 6.1 : 2016 Test 5 Vehicle Trip Summary

Test 5	Development	AM	PM
2006 Base		12,549	15,218
2010 Do Min		15,668	18,541
	Growth to 2016	95	89
	Arnhall Phase 2 Extension	164	124
	Arnhall Phase 3	956	803
	Development South of B9119	4,087	3,550
	Broadshade Housing Ext	292	363
Total Developments		5,500	4,840
New Trips Added		4,641	4,580
Total Matrix		20,404	23,209
Increase from 2006 Base		63%	53%

6.2.2 Table 6.1 shows that Test 5 contains a 61% increase in total traffic in the AM peak and a 51% increase in the PM peak, compared to the 2006 Base.

6.3 Test 5 Model Observations

6.3.1 In the AM peak, significant congestion is observed on all roads leading into Westhill. The B9119 eastbound is observed to be queued from the roundabout at the south of the new link road back past Carnie roundabout by 08:00, and up the B979. The A944 Westbound is observed to be queued from Six Mile Fork with the queue extending off the network by approximately 210 vehicles at 08:30.

6.3.2 The queue from Arnhall is observed to extend up Westhill Drive and off the network with approximately 90 unreleased vehicles at 08:30. The entire length of the B979 in the model is queued southbound by 08:30. The A944 approaching the model from the West is also observed to have significant congestion, with approximately 70 vehicles unable to join the network due to congestion at 08:30.

6.3.3 By 09:00 there are approximately 315 unreleased vehicles on the A944 (west), 240 on the B9119, 365 on the A944 (east) and 258 unreleased vehicles on Westhill Drive.

6.3.4 In the PM peak traffic from the new development south of the B9119 is observed to have difficulty egressing to the B9119, with vehicles queued back into the zones by 17:00. Congestion on the link road also prevents traffic getting out of Arnhall Phase 2. At 17:00 there are also vehicles queued into Tesco and into Arnhall Phase 3.



- 6.3.5 By 17:30 there are observed to be approximately 1,000 unreleased vehicles in the new employment development zones, approximately 380 unreleased vehicles in Arnhall Phase 2, 150 in Tesco and 190 in Arnhall Phase 3. The westbound queue from Carnie roundabout extends back to Six Mile Fork.
- 6.3.6 By 18:00 there are approximately 1,370 unreleased vehicles in the new employment development zones, 440 in Arnhall Phase 2, 230 in Tesco and 270 in Arnhall Phase 3. The queue on Westhill Drive is observed to reach approximately 1.5m by 18:00, and the westbound queue from Arnhall extends back through Six Mile Fork for an additional 1km.

6.4 Test 5a – Test 5 plus Upgrade of B9119

- 6.4.1 An additional test was carried out with the upgrade of the B9119 which was included in Test 4a.
- 6.4.2 In the AM peak, the dual section is observed to reduce congestion on the B9119. All other areas of the model remain congested as per Test 5. The dualling of the B9119 further restricts egress from the link road and the model gridlocks at the roundabout at the south of the link road at approximately 09:45.
- 6.4.3 In the PM peak, the introduction of the dualling between Six Mile Fork and the Westhill Business Park access roundabout is observed to reduce congestion on the B9119.

6.5 Test 5 Mean Travel Time

- 6.5.1 The mean travel times for Test 5 and 5a are shown in Table 6.2. Mean travel times for the 2006 Base and Test 1a are shown for comparison.

Table 6.2 : Test 5 Mean Travel Times

Test	Network	Mean Travel Time (min:sec)	
		AM	PM
2006 Base		04:10	03:17
1a	2010 Do-Minimum + Improvements	04:21	05:46
5	Test 3 + 4	19:12	10:59
5a	Test 3 + 4a	Gridlocked	09:54

- 6.5.2 The mean travel time results show a significant increase in the AM peak in Test 5, with a mean travel time of 19min and 12s. In the PM peak the increase in mean travel time does not appear to be as significant, but this is due to the high number of vehicles unable to join the network due to congestion, as the time spent off the network is not included in the mean travel time calculation. The mean travel time is reduced by approximately 1min with the introduction of the dual section of the B9119 in the PM peak. In the AM peak the model gridlocked at the roundabout at the south of the link road so no statistics were extracted.



6.6 Test 5 Unreleased Vehicles

6.6.1 The number of vehicles unable to join the network due to congestion in the AM peak in Test 5 is shown in Figure 6.1.

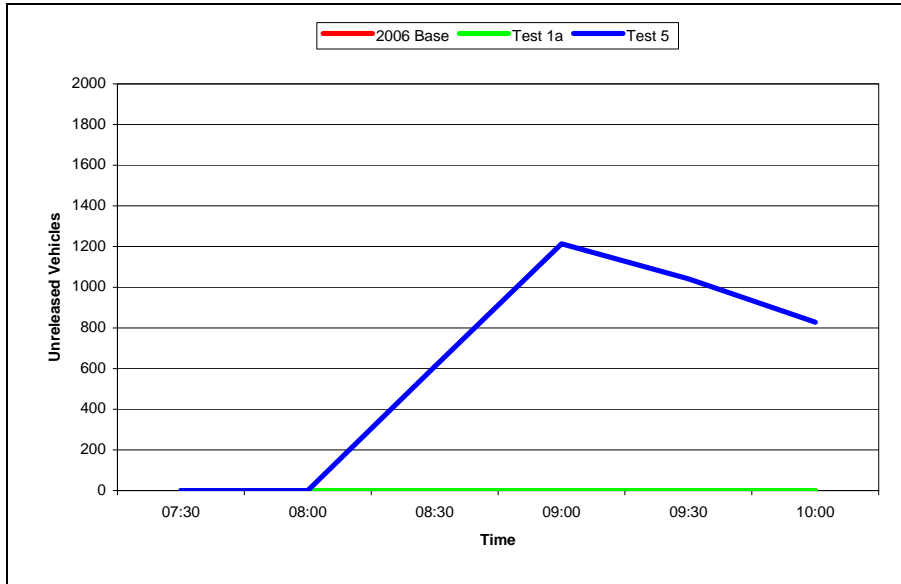


Figure 6.1 : Test 5 AM Unreleased Vehicles

6.6.2 The location of unreleased vehicles in the AM peak in Test 5 and 5a are shown in Table 6.3.

Table 6.3 : Test 5 AM Unreleased Vehicle Locations

Queue Location	Test 5
B9119 (W)	✓
B979 (S)	✓
A944 (E)	✓
A944 (W)	✓
Broadshade Housing	✓
Westhill Drive	✓
Tesco	✓
Development South of B9119	✓

6.6.3 Figure 6.1 shows that in the AM peak the number of unreleased vehicles reaches a peak of 1,214 at 09:00 in Test 5. In Test 5a the model gridlocked so no statistics were extracted.



6.6.4 The number of vehicles unable to join the network due to congestion in the PM peak in Test 5 is shown in Figure 6.2.

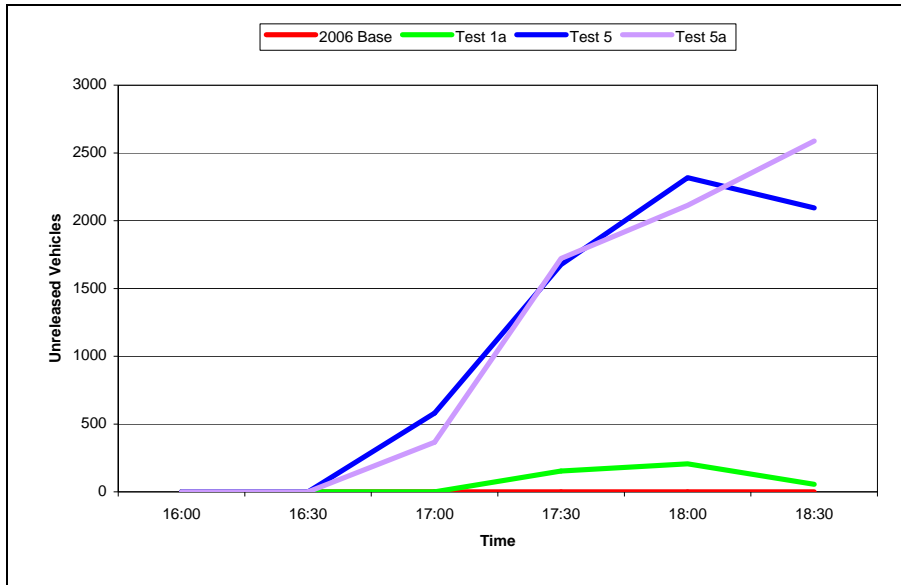


Figure 6.2 : Test 5 PM Unreleased Vehicles

6.6.5 The locations of unreleased vehicles in the PM peak in Test 5 are shown in Table 6.4.

Table 6.4 : Test 5 PM Unreleased Vehicle Locations

Queue Location	Test 5	Test 5a
Tesco	✓	✓
Development South of B9119	✓	✓
Arnhall Phase 2 (not Phase 2 Ext)	✓	✓
Arnhall P3	✓	✓
Rd to Easter Ord (from Six Mile Fork)	✓	✓
Westhill Shopping Centre	✓	

6.6.6 Figure 6.2 shows that in the PM peak the number of vehicles queued off the network in Test 5 is observed to reach a maximum of 2,320 at 18:00. The maximum number of unreleased vehicles in Test 5a is approximately 2,590 at 18:30.

6.7 Test 5 Summary

6.7.1 Adding both the Test 3 and Test 4 developments into the 2016 Do-Minimum model results in a total increase in traffic from the 2006 base of 61% in the AM peak and 51% in the PM peak.

6.7.2 In the AM peak queues form around Arnhall, Six Mile Fork and Carnie Roundabout. The network becomes congested due to the significant increase in traffic.

6.7.3 In the PM peak the main areas of congestion are the B9119 around the new development, the link road and area surrounding Arnhall Phase 3 and queuing related to Arnhall junction. In the PM peak there are a significant number of vehicles unable to join the network due to congestion (approximately 2,320 at 18:00).



- 6.7.4 Including the dualled section of the B9119 from Test 4 reduces queue lengths in this location in the AM peak, however, the network gridlocks at the roundabout at the south of the link road at approximately 09:45, due to the dual section restricting egress from the link road. In the PM peak the extra lane does not provide any significant benefits due to the high westbound flow, which has to merge back to one lane after the roundabout at Westhill Business Park Extension.





7 PROVISIONAL SCHEME COSTS

7.1 Introduction

7.1.1 Provisional cost estimates were carried out by Mouchel for the following infrastructure improvements:

- Arnhall Roundabout – upgrade to signal controlled junction
- Dual from Arnhall to Six Mile Fork
- Six Mile Fork - upgrade to signal controlled junction
- Carnie Roundabout improvements
- Dual section of B9119

7.2 Summary Costs

7.2.1 Mouchel have developed all costings using SPON'S 2009, and considering:

- Optimism Bias 44% (DMRB Stage 2)
- Contingencies Allowance 20%
- Utilities Allowance 10%

7.2.2 The summary costs provided in Table 7.1 are given as indicative general costs to include all aspects of construction.

Table 7.1 : Westhill Provisional Scheme Costs

Infrastructure	Indicative Cost Estimate	
Arnhall Roundabout	£	1,414,641.00
Dual from Arnhall to SMF	£	1,964,169.00
B9119 Dual	£	7,242,872.00
Carnie Improvements	£	204,184.00
Six Mile Fork	£	1,734,768.00
 Total Works	 £	 12,560,634.00
 Excluding B9119	 £	 5,317,763.00

7.2.3 Full detailed breakdowns of all costs are provided in Appendix A.





8 SUMMARY

- 8.1.1 Model testing has been carried out as an initial appraisal of the Westhill road network operation, under agreement with Aberdeenshire Council.
- 8.1.2 With the existing road network in place the 2010 Do-Minimum model (Test 1) gridlocks in the PM peak due to congestion at Arnhall roundabout.
- 8.1.3 With Arnhall and Six Mile Fork roundabouts changed to signal controlled junctions (Test 1a) the network operates well with the 2010 Do-Minimum development content, in both the AM and PM peaks, although egress from Tesco is still congested in the PM peak.
- 8.1.4 The 2016 Do-Minimum model (Test 2) operates in a similar way to Test 1a, as the NRTF growth applied is less than 100 trips over each peak period.
- 8.1.5 The addition of the Arnhall Phase 2 extension and Arnhall Phase 3 developments in Test 3 causes an increase in congestion throughout the network due to the 37% increase in traffic demand in the AM peak and 28% increase in the PM peak compared to the 2006 Base. In the PM peak the Test 3 developments cause an increase in traffic using the link road, which results in traffic queuing into Arnhall Phase 2 and Tesco for much of the PM peak.
- 8.1.6 Test 4 includes the new employment development to the south of the B9119 and an additional 200 housing units at Broadshade. In the AM peak the network becomes congested due to the volume of traffic associated with the new developments (53% increase from 2006 Base).
- 8.1.7 The most significant problem for traffic in the PM peak for Test 4 is the difficulty egressing from the new employment development to the south of the B9119, due to the heavy flow on the B9119. Traffic increase in the PM peak is 45% compared to the 2006 Base.
- 8.1.8 In Test 4a part of the B9119 between the roundabout at Westhill Business Park and Six Mile Fork was upgraded to dual carriageway. This does improve congestion on the B9119 in the AM peak, but not in the PM peak as westbound traffic has to merge back to one lane after the dual section ends.
- 8.1.9 Test 5 contains the Test 3 and Test 4 development and represents a 64% increase from the 2006 base in the AM peak and a 52% increase in the PM peak. In the AM peak the model becomes severely congested due to the traffic demand.
- 8.1.10 In the PM peak, egress from developments is a problem for Arnhall Phase 2, Arnhall Phase 3, the new development to the south of the B9119 and Tesco due to the heavy flows on the B9119 and the link road. Large volumes of traffic are queued off the model network throughout the PM peak.
- 8.1.11 Inclusion of the dualled section of the B9119 from Test 4a further restricts egress from the link road and the model gridlocks at the roundabout at the south of the link road. The dual section does not have any significant benefits in the PM peak.
- 8.1.12 None of the Westhill testing to date has included the influence of the Aberdeen Western Peripheral Route (AWPR). No analysis has been undertaken in this study to determine what impact the AWPR could have on the local Westhill network.



- 8.1.13 Further work would be required to determine the exact details of any proposed junction improvements and infrastructure works to facilitate future development, which in any case would be subject to the usual planning procedures.
- 8.1.14 It is difficult to predict the level of development that could be acceptable to Aberdeenshire Council and more detailed scrutiny is required than can be done at this stage.
- 8.1.15 A detailed masterplan could benefit the area and help to formulate detailed proposals to the acceptability of all landowners and respective developers.



A APPENDIX A – PROVISIONAL SCHEME COST DETAILS





INDICATIVE COST ESTIMATE - ARNHALL ROUNDABOUT TO NEW SIGNALISED JUNCTION

Estimated as per outline design provided by SIAS

	Qty	Unit	Rate	Amount
1. Preliminaries (10%)				10% of sub-total (See below)
2. Site Clearance				
General	2	ha	£3,411.36	£6,822.72
Kerbing remove to tip	2650	lin.m	£6.15	£16,297.50
Lighting remove to store	29	nr	£68.02	£1,972.58
Gully cover & frame remove to store	44	nr	£4.76	£209.44
Arrows	18	nr	£19.17	£345.06
Road markings	2000	lin.m	£1.86	£3,720.00
TOTAL				£29,367.30
3. Earthworks				
Excavation (bitu - U1)	1470	m3	£2.87	£4,218.90
Extra over excavation in Hard material	1470	m3	£9.00	£13,230.00
Disposal (bitu - U1)	1470	m3	£31.24	£45,922.80
Excavation (excluding 5A)	1580	m3	£2.87	£4,534.60
Disposal (excluding 5A)	1580	m3	£31.24	£49,359.20
Topsoiling	1000	m2	£4.62	£4,620.00
Backfilling of gullies	44	nr	£14.02	£616.88
TOTAL				£122,502.38
4. Pavements				
Full Carriageway	4220	m2	£50.00	£211,000.00
Footway	2330	m2	£20.50	£47,765.00
Planed off for tie-in	430	m2	£5.28	£2,270.40
Kerbing	1710	lin m	£12.43	£21,255.30
Edging kerbs	1050	lin m	£6.14	£6,447.00
Anti-skid	1200	m2	£19.25	£23,100.00
Paved area	1150	m2	£20.00	£23,000.00
Tactile paving	42	m2	£18.00	£756.00
TOTAL				£335,593.70
5. Drainage				
Gullies	45	nr	£271.71	£12,226.95
Pipework	350	lin.m	£61.58	£21,553.00
Chambers	6	nr	£1,182.07	£7,092.42
TOTAL				£40,872.37
6. Streetlighting				
Remove from store and reinstall columns	29	nr	£150.07	£4,352.03
Cut-Outs	29	nr	£30.00	£870.00
Ducting	600	lin.m	£30.00	£18,000.00
TOTAL				£23,222.03
7. Pedestrian Barrier				
Pedestrian Barriers	350	lin.m	£38.66	£13,531.00
TOTAL				£13,531.00

	Qty	Unit	Rate	Amount
8. Traffic Signs				
ADS signs with 3 posts	4	nr	£1,200.00	£4,800.00
Directional signs 2 posts	4	nr	£350.00	£1,400.00
Internal lit bollard	6	nr	£200.00	£1,200.00
TOTAL				£7,400.00
9. Road Markings				
Solid hatch / coloured	400	m2	£10.00	£4,000.00
Lines	1100	lin.m	£1.00	£1,100.00
Arrows	16	nr	£31.83	£509.28
TOTAL				£5,609.28
10. Pedestrian Crossings + Traffic Signals				
Pedestrian Crossing	1	nr	£25,000.00	£25,000.00
Traffic signals	1	item	£33,000.00	£33,000.00
TOTAL				£58,000.00

CONSTRUCTION COST	£636,098.06
PRELIMINARIES (10%)	£63,609.81
SUB - TOTAL	£699,707.87
PUBLIC UTILITIES (7%)	£48,979.55
TRAFFIC MANAGEMENT (10%)	£69,970.79
SUB - TOTAL	£818,658.20
CONTINGENCIES(20%)	£163,731.64
SUB - TOTAL	£982,389.84
OPTIMISM BIAS (44%)	£432,251.53
TOTAL	£1,414,641.38

Prepared by: Kevin Chin

Date: 18/02/2009

Checked and Reviewed by: Louise Trayner

Date: 27/02/2009

Approved by: Ricky Laing

Date: 03/03/2009

INDICATIVE COST ESTIMATE - ARNHALL ROUNDABOUT TO SIX MILE FORK

Estimated as per outline design provided by SIAS

	Qty	Unit	Rate	Amount
1. Preliminaries (10%)				10% of sub-total (See below)
2. Site Clearance				
General	1.8	ha	£3,411.36	£6,140.45
Kerbing remove to tip	1366	lin.m	£6.15	£8,400.90
Lighting remove to store	4	nr	£68.02	£272.08
Gully cover & frame remove to store	28	nr	£4.76	£133.28
Traffic signs inc posts remove to tip	4	nr	£42.35	£169.40
TOTAL				£15,116.11
3. Earthworks				
Excavation (bitu - U1)	2700	m3	£2.87	£7,749.00
Extra over excavation in Hard material	1200	m3	£9.00	£10,800.00
Disposal (bitu - U1)	2700	m3	£31.24	£84,348.00
Excavation (excluding 5A)	1350	m3	£2.87	£3,874.50
Disposal (excluding 5A)	1350	m3	£31.24	£42,174.00
Excavation (5A)	990	m3	£2.87	£2,841.30
Deposition (5A)	990	m3	£0.84	£831.60
Topsoiling	1000	m2	£4.62	£4,620.00
Backfilling of gullies	28	nr	£14.02	£392.56
TOTAL				£157,630.96
4. Pavements				
Full Carriageway	5632	m2	£50.00	£281,600.00
Resurfacing	2950	m2	£35.00	£103,250.00
Footway	511	m2	£20.00	£10,220.00
Planned off for resurfacing	2950	m2	£5.28	£15,576.00
Kerbing	1930	lin m	£12.43	£23,989.90
Edging kerbs	543	lin m	£6.14	£3,334.02
Anti-skid	260	m2	£19.25	£5,005.00
Import suitable fill to central reserve	1025	m3	£25.44	£26,076.00
TOTAL				£469,050.92
5. Drainage				
Gullies	55	nr	£271.71	£14,944.05
Pipework	400	lin.m	£61.58	£24,632.00
Chambers	9	nr	£1,182.07	£10,638.63
Culvert extension	1	item	£100,000.00	£100,000.00
TOTAL				£150,214.68
6. Streetlighting				
Remove from store and reinstall columns	4	nr	£150.07	£600.28
Cut-Outs	4	nr	£30.00	£120.00
Ducting	80	lin.m	£30.00	£2,400.00
TOTAL				£3,120.28
7. Road Restraint System				
Tensioned double sided corrugated beam	483	lin.m	£150.00	£72,450.00
Terminals	2	nr	£2,000.00	£4,000.00
TOTAL				£76,450.00

	Qty	Unit	Rate	Amount
8. Traffic Signs				
ADS signs with 3 posts	2	nr	£1,200.00	£2,400.00
Directional signs 2 posts	2	nr	£350.00	£700.00
TOTAL				£3,100.00
9. Road Markings				
Lines	900	lin.m	£1.00	£900.00
Arrows	4	nr	£31.83	£127.32
TOTAL				£1,027.32

CONSTRUCTION COST	£875,710.27
PRELIMINARIES (10%)	£87,571.03
SUB-TOTAL	£963,281.29
PUBLIC UTILITIES (8%)	£77,062.50
TRAFFIC MANAGEMENT (10%)	£96,328.13
SUB-TOTAL	£1,136,671.93
CONTINGENCIES (20%)	£227,334.39
SUB - TOTAL	£1,364,006.31
OPTIMISM BIAS (44%)	£600,162.78
TOTAL	£1,964,169.09

Prepared by: Kevin Chin

Date: 20/02/2009

Checked and Reviewed by: Louise Trayner

Date: 27/02/2009

Approved by: Ricky Laing

Date: 03/03/2009

INDICATIVE COST ESTIMATE - B9119 UPGRADE TO D2AP
Estimated as per DMRB standards

	Qty	Unit	Rate	Amount
1. Preliminaries (10%)				10% of sub-total (See below)
2. Site Clearance				
General	3.8	ha	£3,411.36	£12,963.17
Kerbing remove to tip	3500	lin.m	£6.15	£21,525.00
Gully cover & frame remove to store	92	nr	£4.76	£437.92
Masonry boundary wall remove to store	2100	m3	£62.00	£130,200.00
TOTAL				£165,126.09
3. Earthworks				
Excavation (bitu - U1)	3945	m3	£2.87	£11,322.15
Extra over excavation in Hard material	2000	m3	£9.00	£18,000.00
Disposal (bitu - U1)	3945	m3	£31.24	£123,241.80
Excavation (excluding 5A)	1970	m3	£2.87	£5,653.90
Disposal (excluding 5A)	1970	m3	£31.24	£61,542.80
Excavation (5A)	1690	m3	£2.87	£4,850.30
Deposition	1690	m3	£0.84	£1,419.60
Topsoiling	16900	m2	£4.62	£78,078.00
Backfilling of gullies	92	nr	£14.02	£1,289.84
Remove from store & relay masonry stone boundary wall	2100	m3	£354.00	£743,400.00
TOTAL				£1,048,798.39
4. Pavements				
Full Carriageway	16900	m2	£50.00	£845,000.00
Resurfacing	9970	m2	£35.00	£348,950.00
Planned off for tie-in & resurfacing	9970	m2	£5.28	£52,641.60
Kerbing	6620	lin m	£12.43	£82,286.60
Import suitable fill to central reserve	580	m3	£25.44	£14,755.20
TOTAL				£1,343,633.40
5. Drainage				
Gullies	183	nr	£271.71	£49,722.93
Pipework	3000	lin.m	£61.58	£184,740.00
Chambers	16	nr	£1,182.07	£18,913.12
Culvert extension		item	£100,000.00	£100,000.00
TOTAL				£353,376.05
6. Road Restraint System				
Double sided corrugated beam	1600	lin.m	£150.00	£240,000.00
Terminal	2	nr	£2,000.00	£4,000.00
TOTAL				£240,000.00
7. Traffic Signs				
ADS signs with 3 posts	4	nr	£1,200.00	£4,800.00
Directional signs 2 posts	4	nr	£350.00	£1,400.00
TOTAL				£6,200.00

8. Road Markings

	Qty	Unit	Rate	Amount
Hatch / coloured	850	m2	£10.00	£8,500.00
Lines	9600	lin.m	£1.00	£9,600.00
Arrows	4	nr	£31.83	£127.32
TOTAL				£18,227.32

CONSTRUCTION COST	£3,175,361.25
PRELIMINARIES (10%)	£317,536.12
SUB - TOTAL	£3,492,897.37
PUBLIC UTILITIES (10%)	£349,289.74
TRAFFIC MANAGEMENT (10%)	£349,289.74
SUB - TOTAL	£4,191,476.85
CONTINGENCIES(20%)	£838,295.37
SUB - TOTAL	£5,029,772.22
OPTIMISM BIAS (44%)	£2,213,099.78
TOTAL	£7,242,871.99

Prepared by: Kevin Chin

Date: 21/02/2010

Checked and Reviewed by: Louise Trayner

Date: 27/02/2009

Approved by: Ricky Laing

Date: 03/03/2009

INDICATIVE COST ESTIMATE - CAIRNIE ROUNDABOUT WIDENING
Estimated as per outline design provided by SIAS

	Qty	Unit	Rate	Amount
1. Preliminaries (15%)				15% of Sub-total (See below)
2. Site Clearance				
General	0.6	ha	£3,411.36	£2,046.82
Kerbing remove to tip	330	lin.m	£6.15	£2,029.50
Gully cover & frame remove to store	11	nr	£4.76	£52.36
Arrows	12	nr	£19.17	£230.04
Road markings	400	lin.m	£1.86	£744.00
TOTAL				£5,102.72
3. Earthworks				
Excavation (bitu - U1)	18	m3	£2.87	£51.66
Extra over excavation in Hard material	18	m3	£9.00	£162.00
Disposal (bitu - U1)	18	m3	£31.24	£562.32
Excavation (excluding 5A)	177	m3	£2.87	£507.99
Disposal (excluding 5A)	177	m3	£31.24	£5,529.48
Excavation (5A)	76	m3	£2.15	£163.40
Deposition (5A)	76	m3	£0.84	£63.84
Topsoiling	505	m2	£4.62	£2,333.10
Backfilling of gullies	11	nr	£14.02	£154.22
TOTAL				£9,528.01
4. Pavements				
Full Carriageway	540	m2	£55.00	£29,700.00
Planing off for tie-in	90	m2	£5.28	£475.20
Burn off existing anti-skid	510	m2	£8.47	£4,319.70
Kerbing	285	lin m	£12.43	£3,542.55
Anti-skid	950	m2	£19.25	£18,287.50
TOTAL				£56,324.95
5. Drainage				
Gullies	11	nr	£271.71	£2,988.81
Pipework	100	lin.m	£61.58	£6,158.00
Raising / lowering of covers	3	nr	£47.85	£143.55
TOTAL				£9,290.36
6. Traffic Signs				
ADS signs with 3 posts	3	nr	£1,200.00	£3,600.00
Directional signs 2 posts	3	nr	£350.00	£1,050.00
TOTAL				£4,650.00
7. Road Markings				
Hatch	65	lin.m	£1.00	£65.00
Lines	250	lin.m	£1.00	£250.00
Arrows	13	nr	£31.83	£413.79
TOTAL				£728.79
			CONSTRUCTION COST	£85,624.83
			PRELIMINARIES (15%)	£12,843.72
			SUB - TOTAL	£98,468.55

PUBLIC UTILITIES (10%)	£9,846.85
TRAFFIC MANAGEMENT (10)%	£9,846.85
SUB - TOTAL	<u>£118,162.26</u>
CONTINGENCIES (20%)	£23,632.45
SUB - TOTAL	<u>£141,794.71</u>
OPTIMISM BIAS (44%)	£62,389.67
TOTAL	<u>£204,184.39</u>

Prepared by: Kevin Chin

Date: 19/02/2009

Checked and Reviewed by: Louise Trayner

Date: 27/02/2009

Approved by: Ricky Laing

Date: 03/03/2009

INDICATIVE COST ESTIMATE - SIX MILE FORK TO NEW SIGNALISED JUNCTION
Estimated as per outline design provided by SIAS

	Qty	Unit	Rate	Amount
1. Preliminaries (10%)				10% of sub-total (See below)
2. Site Clearance				
General	1.4	ha	£3,411.36	£4,775.90
Kerbing remove to tip	830	lin.m	£6.15	£5,104.50
Gully cover & frame remove to store	33	nr	£4.76	£157.08
Lighting remove to store	15	nr	£68.02	£1,020.30
Bollards remove to store	8	nr	£25.00	£200.00
Traffic signs remove to tip	6	nr	£39.36	£236.16
TOTAL				£11,493.94
3. Earthworks				
Excavation (bitu - U1)	1100	m3	£2.87	£3,157.00
Extra over excavation in Hard material	600	m3	£9.00	£5,400.00
Disposal (bitu - U1)	1100	m3	£31.24	£34,364.00
Excavation (excluding 5A)	550	m3	£2.87	£1,578.50
Disposal (excluding 5A)	550	m3	£31.24	£17,182.00
Excavation (5A)	471	m3	£2.87	£1,351.77
Deposition	471	m3	£0.84	£395.64
Topsoiling	4710	m2	£4.62	£21,760.20
Backfilling of gullies	33	nr	£14.02	£462.66
Perforate existing carriageway	1425	m3	£6.05	£8,621.25
TOTAL				£94,273.02
4. Pavements				
Full Carriageway	4710	m2	£50.00	£235,500.00
Resurfacing	3010	m2	£35.00	£105,350.00
Footway	1430	m2	£20.50	£29,315.00
Planed off for tie-in & resurfacing	3200	m2	£5.28	£16,896.00
Kerbing	1465	lin m	£12.43	£18,209.95
Edging kerb	560	lin m	£6.14	£3,438.40
Anti-skid	1210	m2	£19.25	£23,292.50
TOTAL				£432,001.85
5. Drainage				
Gullies	49	nr	£271.71	£13,313.79
Pipework	350	lin.m	£61.58	£21,553.00
Chambers	8	nr	£1,182.07	£9,456.56
TOTAL				£44,323.35
6. Streetlighting				
Remove from store and reinstall columns	15	nr	£150.07	£2,251.05
Cut-Outs	15	nr	£30.00	£450.00
Ducting	500	lin.m	£30.00	£15,000.00
TOTAL				£17,701.05
7. Road Restraint System				
Double sided corrugated beam	170	lin.m	£150.00	£25,500.00
Terminal	4	nr	£2,000.00	£8,000.00
TOTAL				£33,500.00

	Qty	Unit	Rate	Amount
8. Pedestrian Barriers				
Pedestrian barriers	360	lin.m	£38.66	£13,917.60
TOTAL				£13,917.60
9. Traffic Signs				
ADS signs with 3 posts	1	nr	£1,200.00	£1,200.00
Directional signs 2 posts	3	nr	£350.00	£1,050.00
Internal lit bollard	6	nr	£200.00	£1,200.00
TOTAL				£3,450.00
10. Road Markings				
Hatch / coloured	50	m2	£10.00	£500.00
Lines	1000	lin.m	£1.00	£1,000.00
Arrows	12	nr	£31.83	£381.96
TOTAL				£1,881.96
11. Pedestrian Crossings + Traffic Signals				
Pedestrian Crossing	3	item	£25,000.00	£75,000.00
Traffic signals	1	item	£33,000.00	£33,000.00
TOTAL				£108,000.00

CONSTRUCTION COST	£760,542.77
PRELIMINARIES (10%)	£76,054.28
SUB - TOTAL	£836,597.05
PUBLIC UTILITIES (10%)	£83,659.71
TRAFFIC MANAGEMENT (10%)	£83,659.71
SUB - TOTAL	£1,003,916.46
CONTINGENCIES (20%)	£200,783.29
SUB - TOTAL	£1,204,699.75
OPTIMISM BIAS (44%)	£530,067.89
TOTAL	£1,734,767.65

Prepared by: Kevin Chin

Date: 21/02/2009

Checked and Reviewed by: Louise Trayner

Date: 27/02/2009

Approved by: Ricky Laing

Date: 03/03/2009

B APPENDIX B – WESTHILL LOCAL ACCESSIBILITY APPRAISAL





Aberdeenshire Council Aberdeenshire Towns - Westhill Local Accessibility Appraisal

<i>Date :</i>	24 March 2009	<i>Distribution :</i>	
<i>Author :</i>	Graeme Low	Peter MacCallum	Aberdeenshire Council
<i>Reviewer:</i>	Emma Gilmour	Mark Peters	Aberdeenshire Council
<i>Reference :</i>	TPATCWCS/71006	Bob Nicol	SIAS Limited
		Peter Stewart	SIAS Limited

SIAS Limited www.sias.com

37 Manor Place, Edinburgh EH3 7EB, Tel: 0131 225 7900, Fax: 0131 225 9229
13 Rose Terrace, Perth PH1 5HA, Tel: 01738 621377, Fax: 01738 632887
 Room 7, 1st Floor, George House, 36 North Hanover Street, Glasgow G1 2AD, Tel: 0141 572 8321
 49 Frederick Road, Edgbaston, Birmingham B15 1HN, Tel: 0121 454 5654, Fax: 0121 454 7656
 70 Cowcross Street, London EC1M 6EJ, Tel: 020 7336 6653

1 INTRODUCTION

SIAS Ltd (SIAS) has been commissioned by Aberdeenshire Council under the term commission to provide transport consultancy advice with regard to the development of the following Aberdeenshire towns:

- Inverurie
- Kintore
- Westhill
- Stonehaven

As part of these studies, S-Paramics is being used to assess the impact of future expansion on the existing and committed road network in the vicinity of the towns. In addition, the accessibility of potential future development sites is to be appraised using Accession accessibility modelling software.

The accessibility appraisal has been based on existing bus service details and has not investigated the accessibility of the sites in terms of rail travel due to the local nature of the studies. It is, however, suggested that this should be undertaken as part of the detailed appraisal of the potential development sites.

In addition, the impact of committed or potential future infrastructure improvements (including new Park & Ride sites) could be appraised with regard to the potential development sites, however this has not been included in this study.

This Technical Note summarises the results of the accessibility appraisal of two potential development sites in Westhill.

2 POTENTIAL DEVELOPMENT SITES

2.1 Introduction

Westhill has a population of around 10,000 and is located 13km to the west of Aberdeen. Direct bus services provide connection between the town and Aberdeen City Centre, with the A944 providing access to the city.



The A944 routes through the centre of Westhill dividing the primarily residential area to the north of the road from the large employment area which is located to the south.

Aberdeenshire Council has requested that the accessibility of two development sites be appraised. It is intended to extend the existing Broadshade residential area, which is located to the west of Westhill, as part of the development of the town. In addition, it is intended to develop a site which is located to south of the town and the B9119, for employment use.

2.2 Potential Development Sites

The site which has been referenced as the Broadshade site is located on the western edge of Westhill. The development will expand the existing residential area and be accessed from the A944 via the existing road infrastructure. The nearest bus stops are located on Broadstraiik Road to the south-east of the site.

The site which has been referred to as the B9119 site, is located to the south of Westhill. Aberdeenshire Council has aspirations to develop the site for employment use as an effective extension to the Arnhall Business Park. The nearest bus stops are located in the business park to the north-west of the site. There are also bus stops located at the B979/B9119 roundabout, which are served by services which travel south on the B979 from Westhill and west along the B9119 without passing the development site. The location of the sites is shown in Figure 2.1.

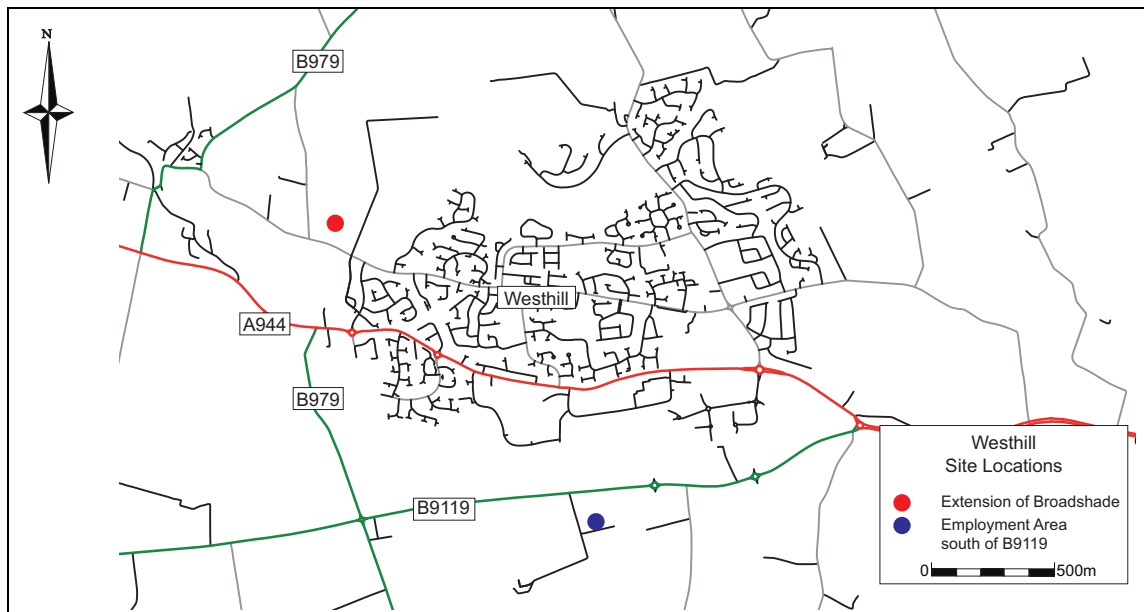


Figure 2.1 : Site Locations

3 ACCESSIBILITY APPRAISAL

3.1 Accession Modelling

Accession is a software package which was developed on behalf of the Department for Transport as a joint venture between MVA and Citilabs. The software enables the accessibility of an area to be appraised and has been approved by the Government for use in accessibility planning.

The software operates as a Geographical Information System (GIS) which brings together a number of data sources (including road network and public transport service information) to enable the accessibility of a potential development site or area to be appraised. ATCO Cif



public transport service data (exported 11 February 2009) has been supplied by Aberdeenshire Council for use in the Aberdeenshire town studies.

Accessibility analysis calculations are generally based on travel time and results can be displayed graphically as contours or presented in a tabular format.

Accession can be used to undertake 'Local Accessibility' calculations which enable the accessibility of public transport services to be appraised for a particular area. 'Network Accessibility' calculations enable the accessibility of a destination to be determined from a user defined area. This study has made use of both local and network accessibility calculations.

The accessibility of the development sites have been appraised in terms of their proximity to local bus services in the morning peak (07:00 – 09:00) and off-peak (12:00 – 14:00) weekday periods. While it is acknowledged that the future developments will be supported by improvements to the public transport network to ensure they comply with national and local planning policy, in the first instance, the use of existing service information will enable an appraisal of the sites accessibility to be undertaken.

The parameters which have been used to inform the local accessibility analysis are as follows:

- Average walk speed – 4.8km/h
- Straight line walk distance factor – 1.2
- Maximum walk distance – 10min

The analysis has been undertaken to appraise the accessibility of the sites to 1, 2 and 4 buses per hour in the weekday peak and off-peak periods. A 60min service frequency would represent a minimum standard and a 15min frequency is considered to represent a high level of service frequency.

Network accessibility calculations have been undertaken to determine the accessibility of the potential development sites on foot, cycle and by bus. The parameters which have been used to inform the network accessibility analysis are as follows:

- Average walk speed – 4.8km/h
- Average cycle speed – 16km/h
- Straight line walk distance factor – 1.2
- Maximum connection distance – 1.0km
- Minimum time calculation undertaken
- All wait time included

For the purpose of this study it has been assumed that pedestrians and cyclists would be prepared to travel a maximum of 20min to access the development site or to access local amenities from the site.

In addition, the accessibility of the town to the centre of Aberdeen, has been appraised in the peak and off-peak periods. A maximum journey time of 50min has been assumed for the purpose of this study to provide an additional parameter against which to assess the accessibility of the potential development sites.

Census population data has been applied to the network accessibility appraisal to determine the magnitude of existing (based on 2001 data) residents living within a 20min walk or cycle of the sites to provide an additional indicator of the site's accessibility.



3.2 Accessibility Appraisal – Local Accessibility

3.2.1 Public Transport Accessibility – Weekday Peak

Figures 3.1 – 3.3 confirm the availability of bus services in the morning weekday peak period which has been assumed to be 07:00 – 09:00 for the purpose of this appraisal. National planning policy guidance suggests that 400m (equivalent to a 5min walk) represents a convenient distance which residents would be prepared to walk to access a bus service, however, given the rural nature of a number of the development sites, this appraisal has set a maximum journey time of 10min or 800m.

Figure 3.1 shows the proportion of Westhill which is accessible to a bus service which operates with a minimum of a 60min frequency in the morning peak. The majority of Westhill and both development sites, are shown to be located within a 10min walk of an existing bus service in the weekday peak. The Broadshade residential development is predicted to be within a 6min walk of an existing bus service and the B9119 site within a 9min walk of an existing bus services. The accessibility appraisal highlights that there are no bus stops in the vicinity of the site and that no services currently route along the B9119 past the development site. It is considered that while the diversion of an existing service could be used to serve the Broadshade site, it is expected that a new service will require to be introduced to ensure that the B9119 is accessible by bus.

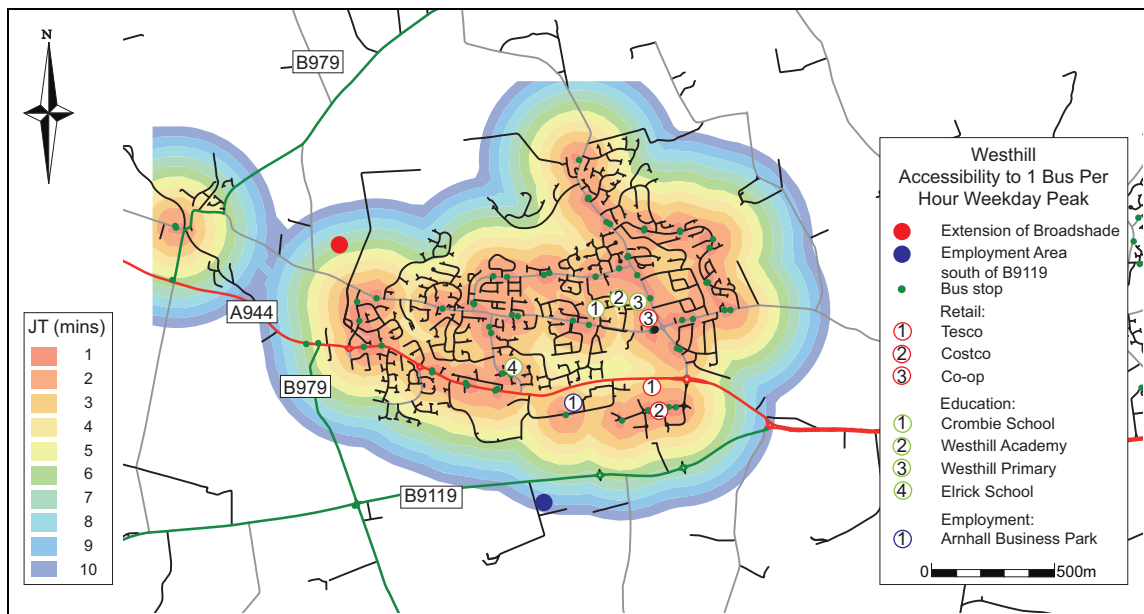


Figure 3.1 : Weekday Peak Accessibility to a 60min bus service

Figure 3.2 shows the proportion of Westhill which is accessible to a bus service which operates with a minimum of a 30min frequency in the morning peak. The contour plot is virtually unchanged from the output which detailed the accessibility of Westhill to a 60min service frequency. The central area of the Arnhall Business Park is shown to be outwith a 5min walk of a 30min frequency service, although it remains within an 8min walk of a 30min service. The Broadshade site is shown to remain within a 6min walk of a 30min service frequency bus service, however, the B9119 site is shown to be located outwith a 10min walk of a 30min service.



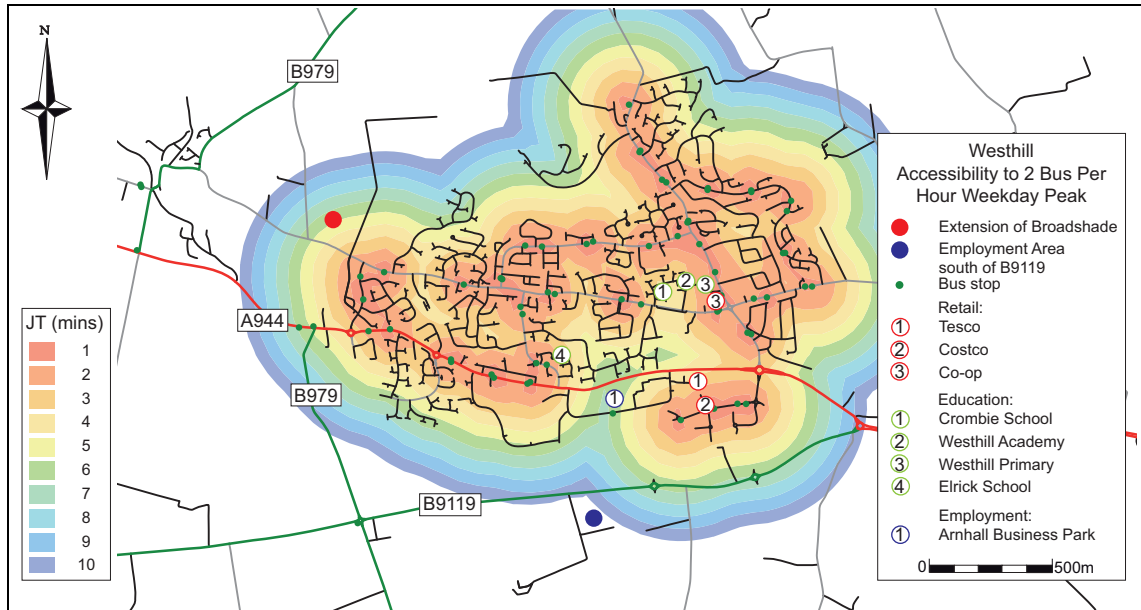


Figure 3.2 : Weekday Peak Accessibility to a 30min bus service

Figure 3.3 shows the proportion of Westhill which is accessible to a 15min frequency in the morning peak. It can be seen that the majority of the residential areas of Westhill are accessible to a 15min service in the weekday peak. The Broadshade site is again shown to have a good level of accessibility as it is located within a 6min walk of a 15min service frequency. The B9119 site is located outwith a 10min walk of an equivalent service frequency.

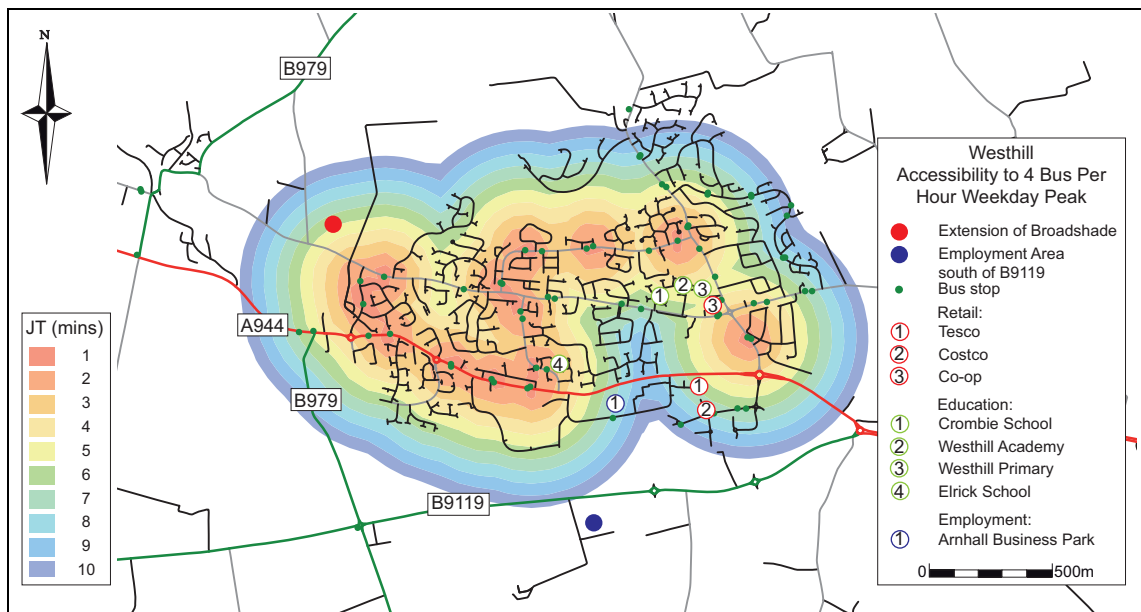


Figure 3.3 : Weekday Peak Accessibility to a 15min bus service

3.2.2 Public Transport Accessibility – Weekday Off-Peak

Figures 3.4 – 3.6 show the availability of bus services outwith the peak (12:00 – 14:00). The figures confirm that a similar level of service is provided in the off-peak period when compared to the peak.

Figure 3.4 shows the proportion of Westhill which is accessible to a bus service which operates with a minimum of a 60min frequency in the off-peak period. The majority of Westhill is



shown to be located within a 10min walk of an existing bus service in the off-peak period. The Broadshade residential development is predicted to be within a 6min walk of existing bus service, however, the B9119 site is shown to be outwith a 10min walk of an existing bus services. The accessibility appraisal highlights that there are no bus stops in the vicinity of the site and that no services currently route along the B9119 past the development site.

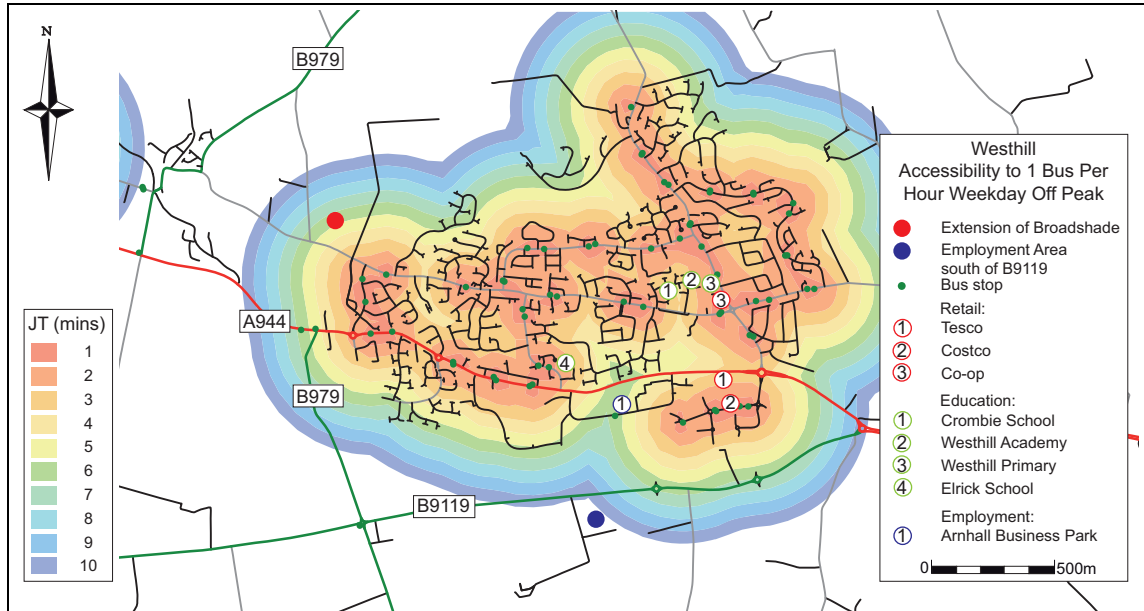


Figure 3.4 :Off-Peak Accessibility to a 60min bus service

Figure 3.5 shows the proportion of Westhill which is accessible to a bus service which operates with a minimum of a 30min frequency in the off-peak period. The contour plot is unchanged from the output which detailed the accessibility of Westhill to a 60min service frequency. The Broadshade site is shown to be more accessible by bus when compared to the B9119 site.

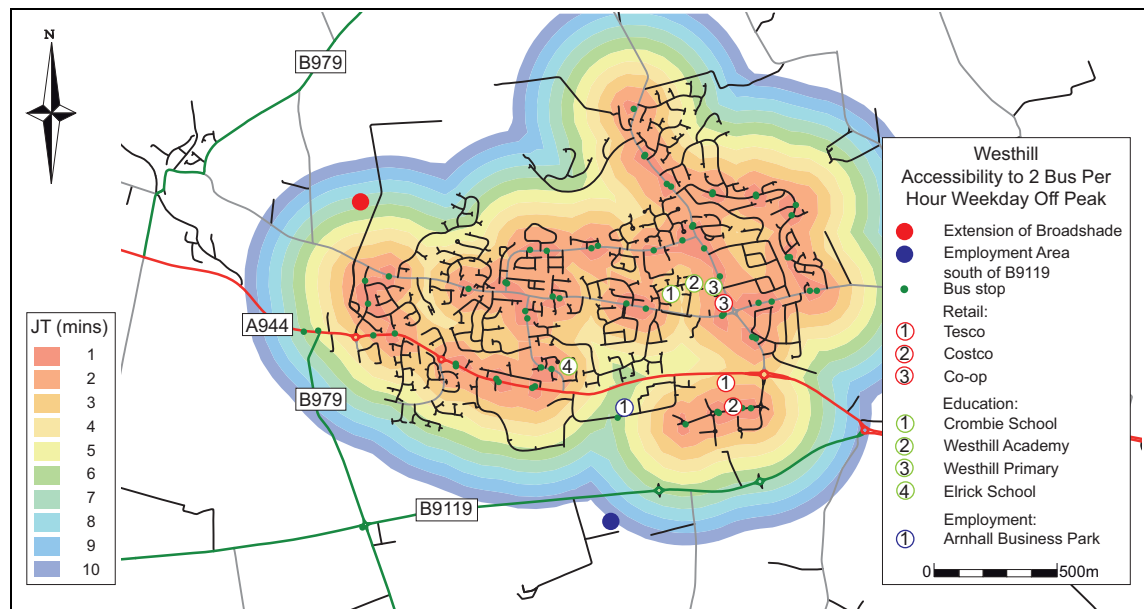


Figure 3.5 : Off-Peak Accessibility to a 30min bus service

Figure 3.6 shows the proportion of Westhill which is accessible to a bus service which operates with a minimum of a 15min frequency in the off-peak period. It can be seen that the majority of the residential areas of Westhill are accessible to a 15min service in the off-peak period. The Broadshade site is shown to have a good level of accessibility as it is located within a 6min



walk of a 15min service frequency. The B9119 site is located outwith a 10min walk of an equivalent service frequency.

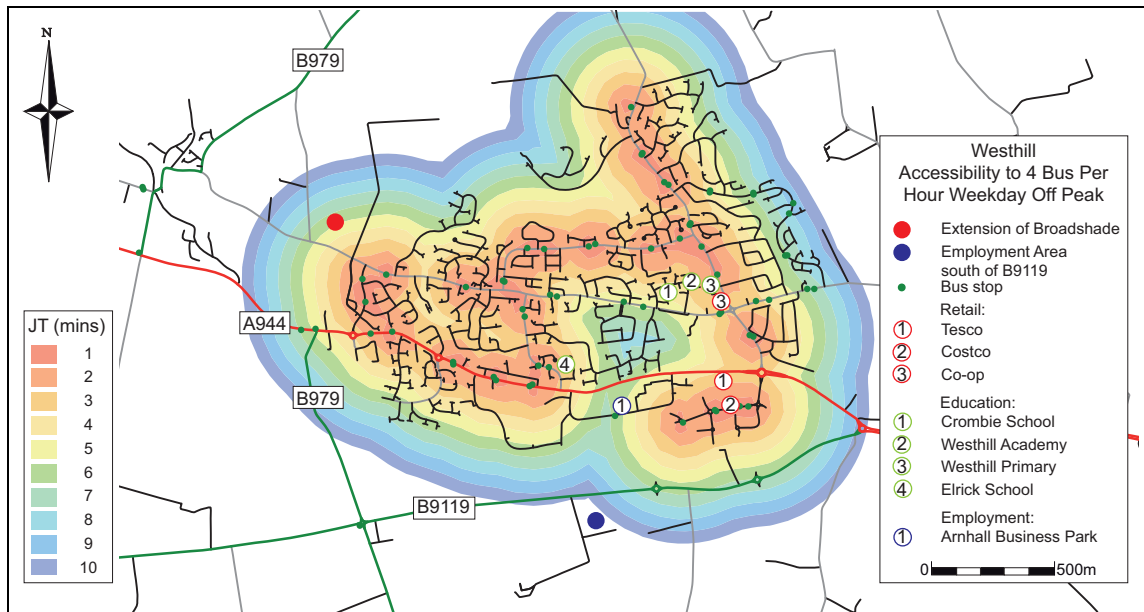


Figure 3.6 : Off-Peak Accessibility to a 15min bus service

3.3 Accessibility Appraisal – Network Accessibility

3.3.1 Pedestrian and Cycle Accessibility

Figures 3.7 – 3.10 show the accessibility to local amenities on foot and by cycle of the two development sites. For the purpose of this study, the approximate location of the sites was assumed. Given the expected size of a number of the development sites, the location of the centre of the site could vary from that which has been assumed. It is however, expected that the assumed site centroid locations will enable a robust appraisal of the accessibility of the sites to be made.

Figure 3.7 shows the predicted accessibility of the Broadshade site on foot. As can be seen from the output, a large proportion of Westhill is shown to be within a 20min walk of the site, however, none of the town’s main amenities are located within a convenient walk of the site. It is considered that improvements to the pedestrian network in the vicinity of the site are unlikely to generate significant improvements in accessibility given the location of the site on the north-western edge of Westhill.



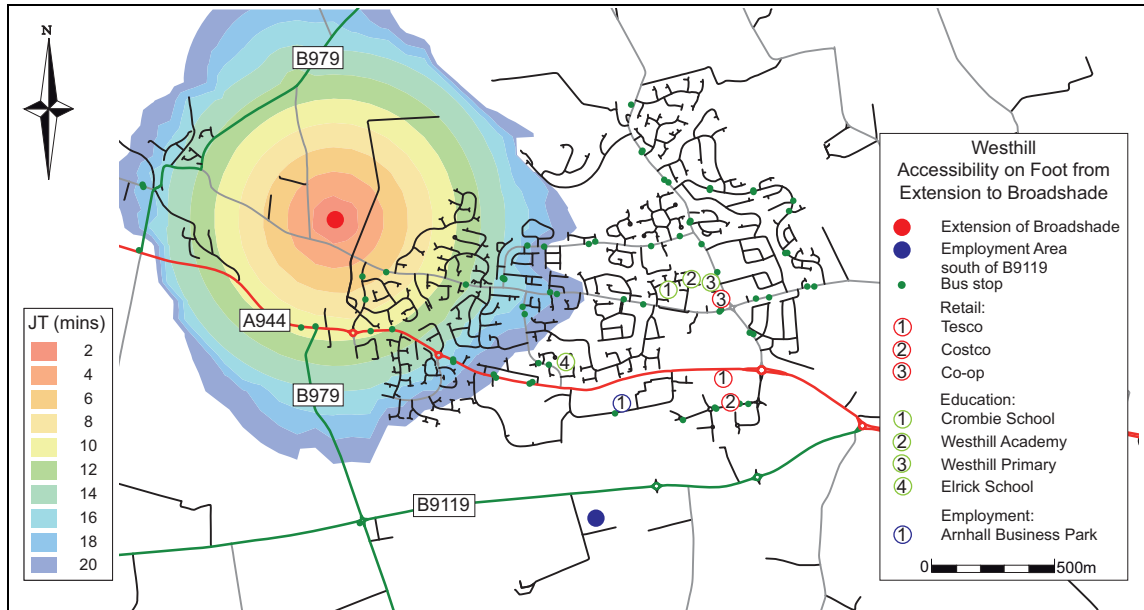


Figure 3.7 : Pedestrian Accessibility from Broadshade site

The accessibility of the B9119 site on foot is shown in Figure 3.8. The site is shown to be located within a 20min walk of a large proportion of Westhill. The site is located adjacent to the Arnhall Business Park and is shown to be located within a convenient walk of the nearby Tesco superstore. Only a small proportion of Westhill residents are shown to live within a 20min walk of the development site, mainly due to the location of the site on the southern edge of the town. The A944 is expected to present a barrier to movement between the site and the main residential area which is located to the north of the A944, however, introducing improvements on the pedestrian network in the vicinity of the site is unlikely to significantly increase the accessibility of the site on foot.

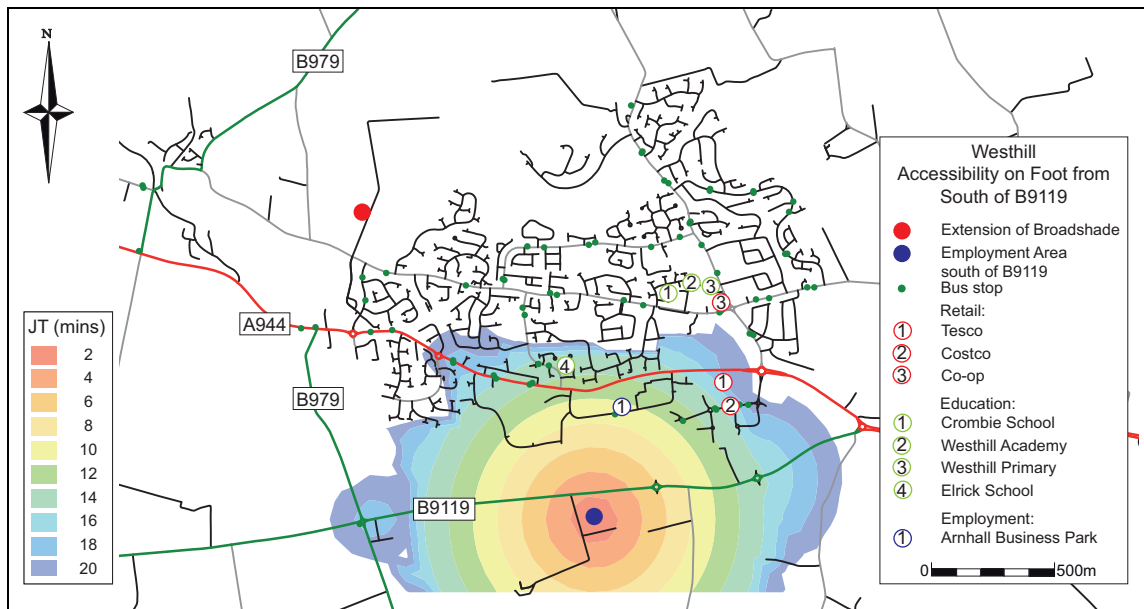


Figure 3.8 : Pedestrian Accessibility from the B9119 site

Figure 3.10 predicts the accessibility of the Broadshade site by cycle with all Westhill amenities, including all schools and retail amenities are located within a 14min cycle of the site. In addition, the Arnhall Business Park is located around a 10 – 12min cycle from the site.



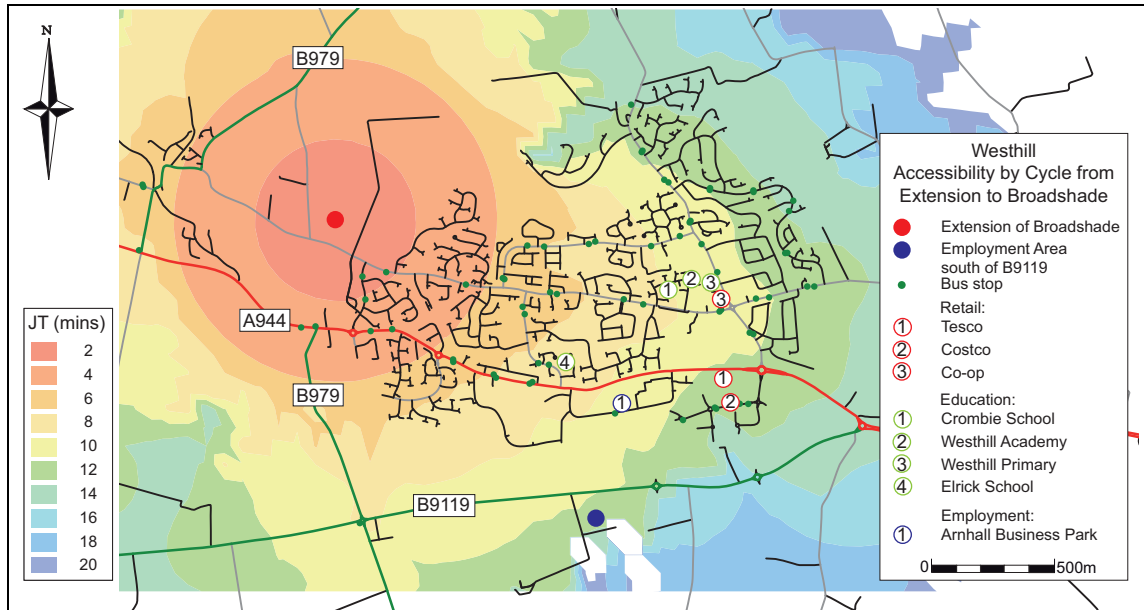


Figure 3.9 : Cycle Accessibility from Broadshade site

The accessibility of the B9119 site by cycle is shown in Figure 3.11. The size of Westhill results in the majority of residents predicted to live within a 14min cycle of the site. Convenient linkage must be provided between the site and existing residential area of Westhill to ensure the site is accessible in accordance with the results of the accessibility appraisal.

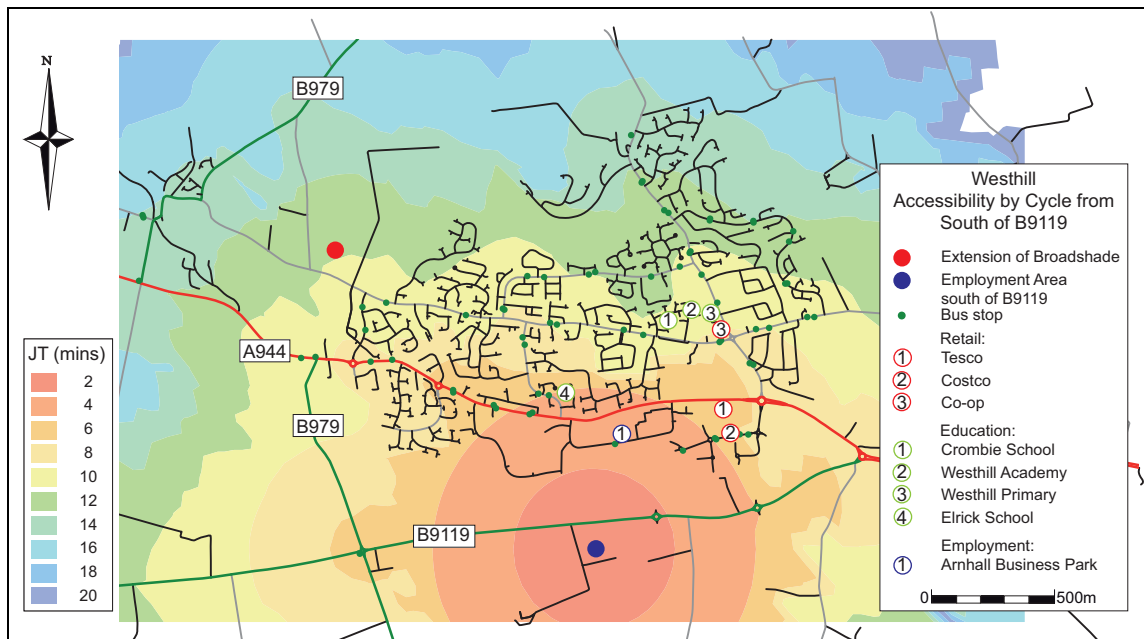


Figure 3.10 : Cycle Accessibility from the B9119 site

3.3.2 Census Population Data Analysis

Tables 3.1 and 3.2 summarise the results of the accessibility appraisal with regard to the proximity of the sites to existing Westhill residents.



Table 3.1 :Accessibility to Broadshade Site

Pedestrian Accessibility		Cycle Accessibility	
Journey Time (mins)	Population	Journey Time (mins)	Population
8	426	4	1,537
10	443	6	1,825
12	362	8	2,312
14	605	10	1,510
16	564	12	2,550
18	627	14	289
20	335	16	127
Total	3,362	18	204
		20	63
		Total	10,417

Table 3.2 : Accessibility to B9119 Site

Pedestrian Accessibility		Cycle Accessibility	
Journey Time (mins)	Population	Journey Time (mins)	Population
12	140	4	330
14	397	6	851
16	344	8	1,684
18	118	10	3,894
20	182	12	2,314
Total	1,181	14	992
		16	225
		18	127
		Total	10,417

The above results suggest that the greatest number of Westhill residents (3,362) live within a 20min walk of Broadshade site, with 1,181 residents living within a 20min walk of the B9119 site.

The size of Westhill results in the whole town being within a 20min cycle of both development sites. A 10min cycle time has been used to provide a suitable comparison of the site's accessibility. Both sites are located within a 10min cycle of around 7,000 Westhill residents, with a greater population shown to live within a 6min cycle of the Broadshade site when compared to the B9119 site. The results of the appraisal highlights the relatively remote location of the B9119 site in relation to existing Westhill residents.

3.4 Bus Accessibility to Aberdeen

Figures 3.13 and 3.14 show the accessibility of Westhill to the centre of Aberdeen by bus with a maximum journey time of 50min displayed for the morning peak and off-peak scenarios. The results of the appraisal suggests that it would require a journey time of around 50min to access Aberdeen from both sites in the morning peak. Outwith the peaks, the journey time is reduced to 35min from the Broadshade site and 45min from the B9119 site. This reflects the lack of bus services currently operating in the vicinity of the B9119 site.



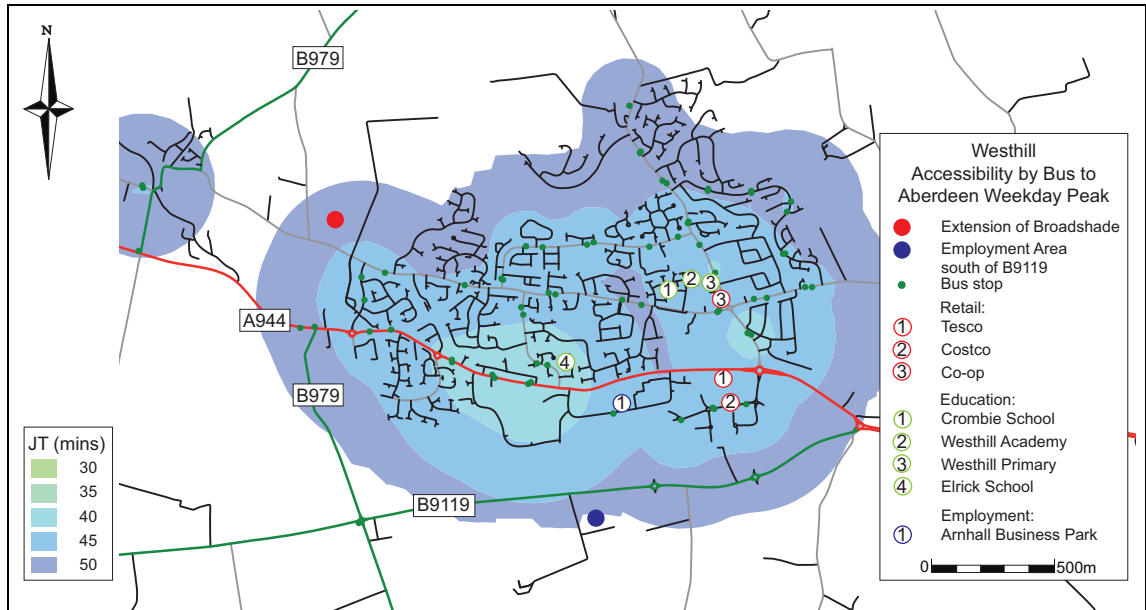


Figure 3.11 : Weekday Peak Accessibility to Aberdeen

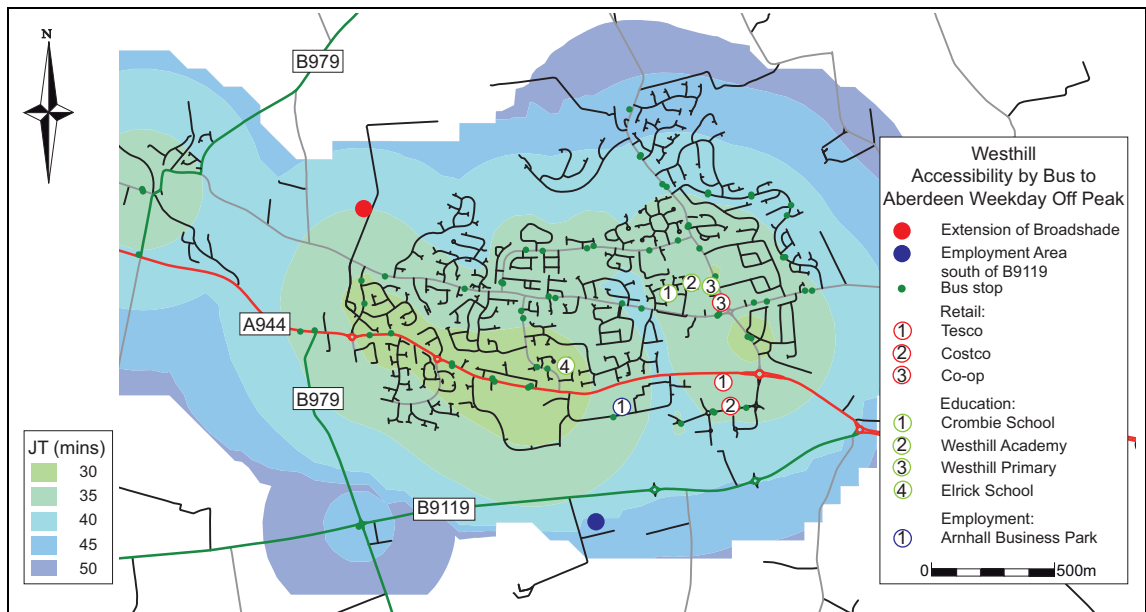


Figure 3.12 : Weekday Off-Peak Accessibility to Aberdeen

4 SUMMARY AND CONCLUSIONS

4.1 Summary

SIAS has been commissioned by Aberdeenshire Council under the term commission to provide consultancy advice with regard to the development of Westhill.

The accessibility of the following potential development sites has been appraised:

- Extension to Broadshade (residential development)
- South of B9119 (employment development)



Accession software has been used to appraise the accessibility of the above sites by bus, cycle and on foot. ATCO Cif public transport data which was exported 11 February 2009, and 2001 Census population data has been used to inform this appraisal.

4.2 Conclusions

The Broadshade site is shown to be accessible to existing bus services, however, it is expected that services will have to be diverted into the site to ensure that the site is fully accessible by bus in accordance with planning policy. The development site's location results in it being located outwith a convenient walk of the majority of local amenities including all schools and the Arnhall Business Park.

The B9119 site is shown to be accessible on foot for a proportion of Westhill residents, although the accessibility could potentially be improved by the introduction of direct linkage between the site and main residential area which is located to the north of the B944. The site is in a relatively remote location from existing bus services and it is expected that the development of the site will require the introduction of new or diverted bus services to ensure the site is accessible by bus.

4.3 Further Work

It is suggested that the impact of future infrastructure and service improvements should be tested to provide a detailed appraisal of the accessibility of the development sites.

