DAVID SIMMONDS CONSULTANCY

URBAN, REGIONAL AND TRANSPORT PLANNING

Annex A

A96 BUSINESS CASE SUPPORT WIDER IMPACTS CALCULATIONS

LATIS Lot 3 Project Note 11

Prepared for Transport Scotland

Prepared by

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Abbreviations

Abbreviation	Meaning
DELTA	Land-use/economic modelling package developed by DSC
DfT	Department for Transport
DSC	David Simmonds Consultancy Limited
GDP	gross domestic product
TEE	Transport Economic Efficiency [appraisal], ie standard cost-benefit analysis of transport schemes
TELMoS	Transport/Economic/Land-use Model of Scotland
TMfS	Transport Model for Scotland
REM	Regional Economic Model (within TELMoS)
STAG	Scottish Transport Appraisal Guidance
WEBs	Wider Economic Benefits
WebTAG	DfT's web-based Transport Appraisal Guidance

1 INTRODUCTION

1.1 Context

1.1.1 Task Order A8148965 requires David Simmonds Consultancy (DSC) to undertake the following tasks:

- the creation of a revised Do-Minimum case for the period 2027-2037;
- running five do something tests based on 2032 costs provided by Jacobs
- Wider Economic Impact (WEI) calculations; and
- preparation of inputs for the main Strategic Business Case report: This report has included the tables and figures identified by Jacobs in emails received on 21st March.

1.1.2 This note describes the approach used in calculating the Wider Impacts of the five options in the A96 Support and presents the results which include tables and graphs for Employment, GVA, Population and the Wider Economic Benefits.

1.1.3 A new reference case has been created with new Do Minimum costs in 2032 and 2037. This is described as the Do-Minimum case. The options will be compared against it.

1.1.4 The five options are:

- Test CS = Option 4 - Targeted Trunk Road Improvements and New (Single Carriageway) Bypasses on A96, referred to as HSin;
- Test CT = Option 2: Rail service enhancements to allow a 15 minute frequency into both cities during peak periods with a 30 minute frequency for services into both cities, referred to as RCom;
- Test CU = Option 6 - A96 Full Dualling, Refered to as Hdual;
- Test CV = Option 5 - Dual Carriageway Bypasses and Dualling of Heavily Trafficked Sections of the A96 plus Targeted Trunk Road Improvements, referred to as OPT 5; and
- Test CW = Option 1 - Rail Enhancements / Rolling Stock Improvements to Provide an End-To-End Travel Time of Around 1hr 45mins; referred to as R145 in the reporting of outputs.

1.1.5 There were no changes made to the land-use model inputs as part of this exercise. All land-use model runs had the same assumptions on economic and demographic growth and identical planning policy inputs. Only the transport model assumptions (as described above) varied between the tests.

1.1.6 The analysis reported in this note compares the land use model outputs from the reference case and each of the option runs; the difference in outputs between the

reference case and each option will be the result of the changes made within the transport model.

1.2 Structure of the note

1.2.1 This Note reports on

- The Wider Economic Impacts (definitions and calculations) – Section 2
- The Methods Adopted – Section 3
- The presentation of Results – Section 4
- Conclusion – Section 5.

2 THE CALCULATION OF WIDER ECONOMIC BENEFITS

2.1 Background

2.1.1 The Department for Transport's WebTAG Unit 2.8 explains that in the presence of imperfect markets, wider impacts are not estimated as part of transport user benefits and must therefore be estimated separately. They provide guidance on how to appraise the wider impacts including:

- agglomeration (WB1)
- more (or less) people working (GP1); and
- the move to more (or less) productive jobs (GP3).

2.1.2 (The identifiers WB1 etc are those originally used by DfT, and differ slightly from current WebTAG terms.)

2.1.3 The term agglomeration refers to the concentration of economic activity within an area. In turn, this may affect the levels of productivity of firms and workers in the area. Changes in accessibility within an area can influence the level of agglomeration. The WEBs estimation calculates the impact of transport on agglomeration and the subsequent effect on the economy in money units.

2.1.4 More people in work are a result of the costs and benefits that are impacted on individuals by transportation. The cost of travel affects decisions on whether or not to work. Changes in transport costs may affect the overall labour supply in the economy. The WEB calculation estimates the extent to which these changes in labour supply affect the economy in GDP terms.

2.1.5 Finally the move to more productive jobs relates to the influence that, transport and accessibility have on location decisions of firms and employees. This impact is based upon the premise that employers are often more or less productive in different locations and that employment trends in different areas will therefore have implications for productivity. The extent to which workers are employed in their most productive uses, in high productive jobs, will ultimately affect the economy. The resulting benefits in GDP terms of moves to more productive jobs are estimated in the WEBs computation.

2.2 Other information of Wider Impacts

2.2.1 GP1 and GP3 in our work have the same meanings as in the original Department for Transport (2005) paper which introduced the present kinds of wider benefits.

2.2.2 It classified benefits into

- "GP" benefits which contribute to GDP (the impact on national accounts, if it could be identified, would show that were better off as a results of implementing the scheme) and
- "WB" benefits which contribute to welfare (people would say they were better off if they could directly compare the with-scheme against the without-scheme situation)

2.2.3 Some of the individual measures can be counted in both categories; others can be counted in one but not the other; and others appear fully in one and partly in the other.

2.2.4 GP1, (the gain in GDP due to "increase in labour force participation") and GP3 (the increase in labour productivity due to the relocation of jobs to higher-productivity locations) are both counted primarily as changes in GDP. Neither appears directly in the WB benefits as originally specified by DfT, because it was assumed that any welfare benefits to the individuals affected were already captured in the conventional (TEE) transport appraisal.

2.2.5 However, any such benefits to the individual are based on incomes after tax (eg if someone travels further to get to a better-paying job, it is because they expect to be better off after tax). The extra taxes paid by people who decide to work, or to take more productive jobs, because of the scheme, count as welfare gains, if only because they could reduce the amount of tax that other people have to pay. So the DfT specification is that a proportion of GP1 and GP3, representing the extra "tax take" from the additional people in work and from the people who've moved to more productive (higher-paying) jobs, is calculated and counted as WB4.

2.2.6 The average tax rate is defined as 30% (in TAG unit A2.1) so WB4 is 30% of the sum of GP1 and GP3.

2.2.7 WB3 is completely separate: this is increased output in imperfectly competitive markets. DfT guidance is to calculate this as an extra 10% of the conventional benefits in terms of time savings and reliability benefits for business travel (including goods movement). This is best calculated from the time/relability benefits by purpose in the transport appraisal, so whilst it's part of the wider benefits we do not calculate it in the DELTA WEBs programs.

2.2.8 The DfT approach to "moves to more productive jobs" is focussed on forecasting the national effect, which in this context seems to mean the net effect on the economy of GB. All job moves are treated as if they were moves from or to a hypothetical areas of average productivity. The results is that increased jobs in an area of blow average productivity appear as negative benefits and a decrease in jobs in such an area appears as positive benefits.

2.2.9 We find it more informative (and more intuitive) to look at the overall change in GVA by area that results from changes in job location. In this GP3 version (used for the 5 options), we have multiplied the change in jobs by the productivity (GVA per jobs) in that area. This means that any area which gains jobs will show a positive GP3 benefit, and any area which loses jobs will show a negative. The net benefit to Scotland is the same as in the standard calculation. The numbers by area are much larger but easier to explain. The size of the numbers is due to significant

job relocation and very high values of GVA/job (somewhere around £70,000/year) in 2037.

2.2.10 In the GP3 version used for the A96 support as described above, we have only added the value 1 to the DfT Productivity Index for the Scottish districts thereby assuming that the average productivity index is 1 rather than 0.

2.2.11 The DfT relative productivity of the districts to the average is there not disturbed in any way.

3 METHODS

3.1 Overview

3.1.1 A full description for calculating wider economic impacts is contained in Project Note 8 (Transport Scotland document A6370484).

3.1.2 In this note we report upon the calculation of the following wider economic impacts:

- agglomeration (WI1);
- more (or less) people working (GP1); and
- the move to more (or less) productive jobs (GP3).

3.1.3 For this Task we have used the logsum approach in calculating the weighted generalised costs.

3.1.4 The weighted costs have been used to calculate the benefits for the transport years 2032 and 2037.

3.1.5 These benefits have been interpolated between these 2 years (2032, 2037) and extrapolated beyond 2037.

3.1.6 The Net Present Benefits are then calculated on each of the Wider Impacts by discounting over a 60 year period from 2032 to 2091.

3.2 Preparing generalised costs for WEBs calculations

3.2.1 This approach uses the logsum averaging of generalised costs over modes which is routinely produced as part of TELMoS itself. The calculations are carried out by the DELTA package AC12 program and the outputs – the logsum average generalised cost between each pair of zones (including intrazonals) for each purpose and car-ownership level – is written to file GENC<><>.DAT for each year of each test.

3.2.2 For the GP1 (more people in work) calculations, the input file PRPW<><>.csv was prepared by reformatting the GENC<><>.DAT outputs for purpose "commuting", and car ownership level 2 (one car).

3.2.3 For the WI1 (agglomeration) calculations, the input file PRPE<year><test>.csv was produced by reformatting the GENC<><>.DAT outputs for purpose "business travel" and car ownership level 3 (2+ cars) (on the assumption that business travellers have a high level of car availability).

3.2.4 For both PRPW and PRPE files, the logsum average generalised cost calculated by AC12 is based on

- the generalised costs for car and public transport received from the transport model,
- the generalised costs for walking calculated (from distances) within TELMoS, and
- the coefficients which TELMoS uses to represent expected mode choice in its accessibility calculations.

3.2.5 Note that the logsum average is not affected by the numbers of trips using the modelled modes; it is worked out strictly from the generalised costs and the coefficients. The logsum average represents the "expected average generalised cost" given the generalised cost of each mode and the sensitivity to generalised cost differences which is implied by the coefficients. It has the characteristics that

- if one mode is much better than the other two, the "expected average generalised cost" will be equal to the generalised cost for that mode – since the model will implicitly forecast that everyone will choose that mode;
- if two modes are comparably good and better than the third, or if all three are comparably good, the "expected average generalised cost" will be somewhat better (less) than the minimum generalised cost among those good modes. This is because the model implicitly assumes that in such a case, other characteristics not represented in generalised cost will come into play (eg better opportunities to work/drink/sleep on the train, or greater freedom to stop along the way in a car) which will for each traveller result in a slightly better outcome than the generalised cost itself would indicate;
- an improvement in any one of three modes will always produce an improvement in the "expected average" providing it is of some relevance. (An irrelevant improvement, such as 10 minute improvement in the walking time from Aberdeen to Glasgow, will have no effect at all.) This is not always the case with a trip-weighted average, where an improvement in an inferior mode can lead to an increase in the average cost because it increases the weight (the number of trips) on the mode with the higher cost.

3.3 Calculating Net Present Values

3.3.1 The Agglomeration (WB1), More people in Work (GP1) and moves to more productive jobs (GP3) benefits are interpolated between the year of scheme implementation 2032 and the model future transport year 2037.

3.3.2 A 2% growth index is applied in the extrapolation of the 2037 benefits for the years beyond 2037

3.3.3 A discount rate of 3.5% is used to discount the benefits up till 2039. A discount rate of 3.0% is used for years 2040 and beyond.

3.3.4 The conversion from average to marginal productivity means that the GP1 results need to be multiplied by a parameter that "captures the lower productivity of new entrants to the labour force", specified by DfT at 0.69.

3.3.5 The benefits are summed over the 60 year period from year of implementation 2032.

4 RESULTS

4.1 Overview

4.1.1 Wider Economic Benefits have been calculated for the following five packages:

- Option 1 - Rail Enhancements / Rolling Stock Improvements to Provide an End-To-End Travel Time of Around 1hr 45mins; referred to as R145 in the reporting of outputs;
- Option 2: Rail service enhancements to allow a 15 minute frequency into both cities during peak periods with a 30 minute frequency for services into both cities; referred to as RCom;
- Option 4 - Targeted Trunk Road Improvements and New (Single Carriageway) Bypasses on A96; referred to as HSin;
- Option 5 - Dual Carriageway Bypasses and Dualling of Heavily Trafficked Sections of the A96 plus Targeted Trunk Road Improvements; referred to as OPT 5;
- Option 6 - A96 Full Dualling. Refered to as Hdual.

4.1.2 In each case the benefits are calculated relative to the "do minimum".

4.1.3 Five model runs were undertaken of TMfS12 and TELMoS12. These are summarised in Table 4.1. For each scheme one test was run.

Table 4-1 Summary of test runs

Test Code for TELMoS:12 test	Title	Details of Model run post 2032
CY	Do-Minimum	-TMfS run in 2032 with 'Do-minimum schemes -TELMoS run 2033-2037
DA	HSin	-TMfS run in 2032 with HSin option -TELMoS run 2033-2037
DC	RCom	-TMfS run in 2032 with RCom option -TELMoS run 2033-2037
CZ	HDual	-TMfS run in 2032 with HDual option -TELMoS run 2033-2037
DB	Opt5	-TMfS run in 2032 with the OPT5 option -TELMoS run 2033-2037

Test Code for TELMoS:12 test	Title	Details of Model run post 2032
DD	R145	-TMfS run in 2032 with R145 option -TELMoS run 2033-2037

4.1.4 The results are presented in tables below. The column headings are:

- WB1 – the agglomeration benefits
- GP1 - the impact of more people in work on GDP
- MPIW – the increase in people in work
- GP3 – the impact of move to more productive jobs.

4.1.5 With the exception of the MPIW data, all the data in table are in £ (pounds) and undiscounted.

4.1.6 Note that

- In the tables, the GP1 results are gross values, assuming that the marginal workers drawn into employment are of average productivity and counting their production in full; however in the NPV calculations the GP1 values have been factored by a ratio 0.69.
- the GP3 results are likewise gross values, counting the extra production in full.

4.2 Presentation of results

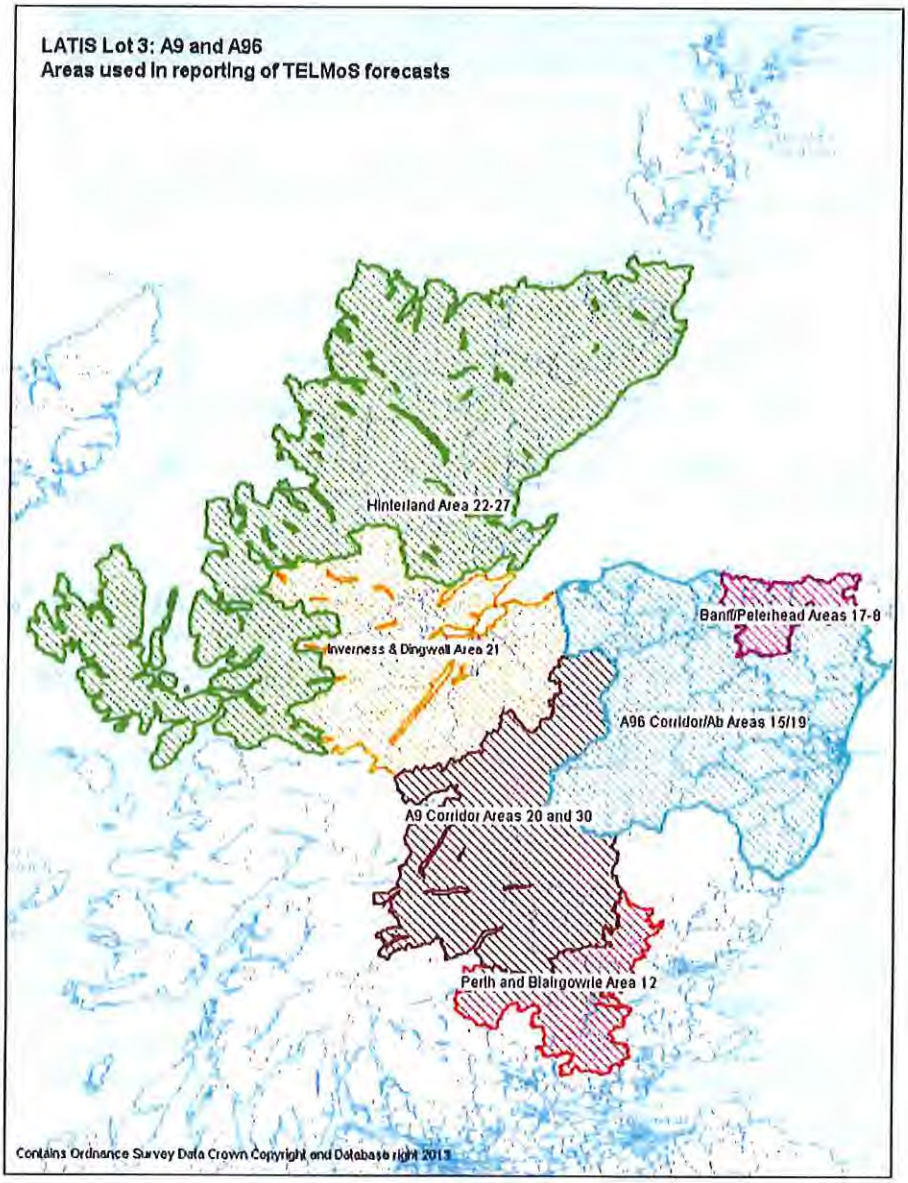
4.2.1 The WEB programs, described above, have been run in the forecast years when the transport model was run (ie 2027, 2032 and 2037). The benefits for intermediate years have been interpolated based on the transport-year calculation of benefits.

4.2.2 The reporting focuses upon a similar aggregation of DELTA Areas to that used in reporting the land use impacts of the three model runs in Project Note 5. To re-cap, these are:

- Inverness and Dingwall (Area 21)
- Perth and Blairgowrie (Area 12)
- Areas along the route of the A96 (Area 15)
- Aberdeen: (Area19)
- Areas forming Inverness' hinterland: Areas 22 to 27
- Other Areas in proximity to the A96: Areas 17 and 18

4.2.3 These areas are shown in Figure 4-1.

Figure 4-1 TELMoS Areas



4.3 Accessibility Outputs

4.3.1 The accessibility changes resulting from the options are mapped to illustrate the areas which have improved accessibilities. The mapped accessibilities are origin accessibility measures weighted by manual and non-manual workers in car owning households.

4.3.2 As expected the single carriage way improvements and the Commuter rail investments are having improved accessibility in the A96 corridor and the Aberdeen areas.

4.3.3 The A96 dualling and the Option 5 have very high accessibility improvements in the A96 corridor (Moray) and the Aberdeen Areas. There is also a very significant improvement in connectivity to the highlands resulting from the options

4.3.4 The R145 performs relatively poorly in terms of connectivity to the northern parts of Scotland.

4.3.5 The figures 4.2 to 4.6 below represent the spatial distribution of change in origin accessibility weighted by Manual and Non-Manual workers in one car and two plus car households in 2037.

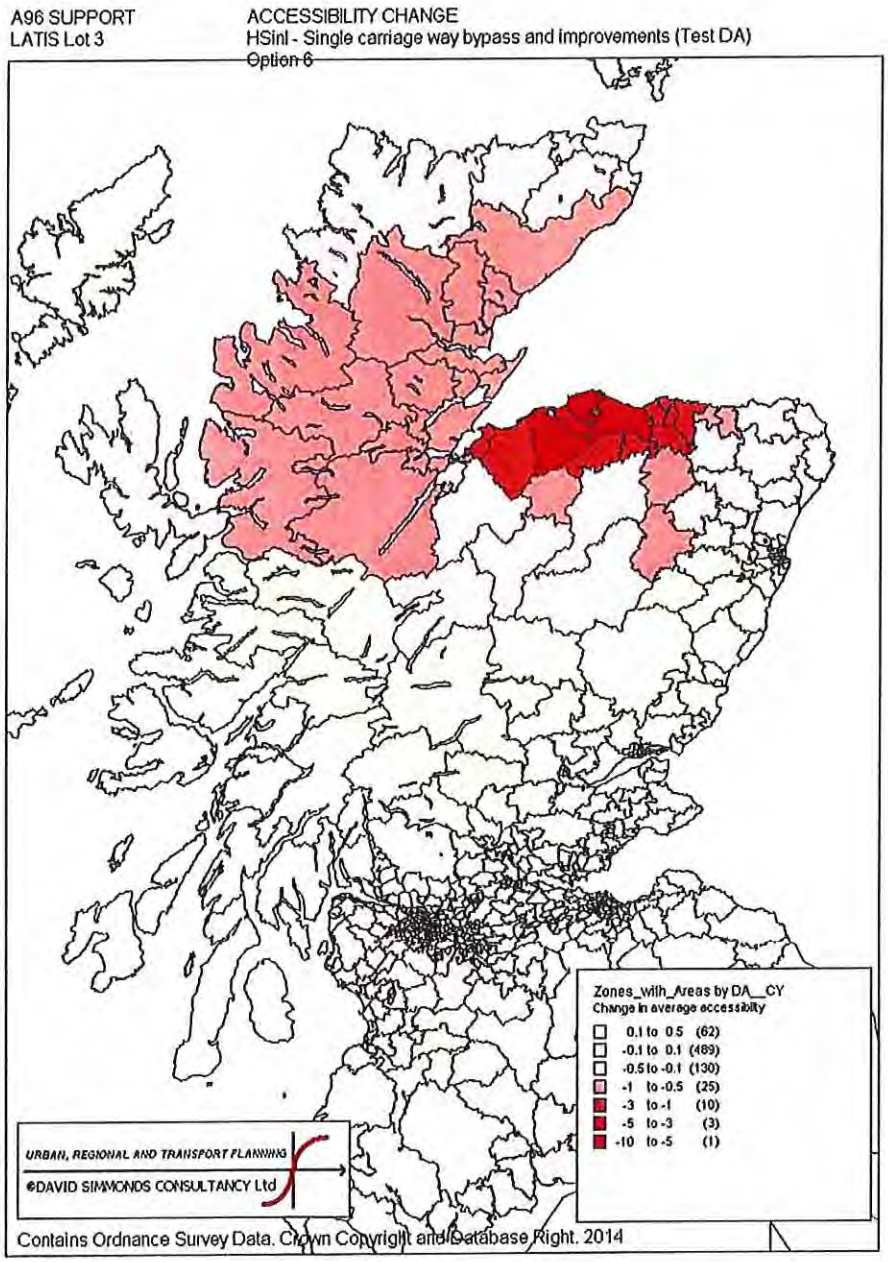


Figure 4-2 Change in weighted accessibility for origin zones in the Single carriage way improvement (HSin) option

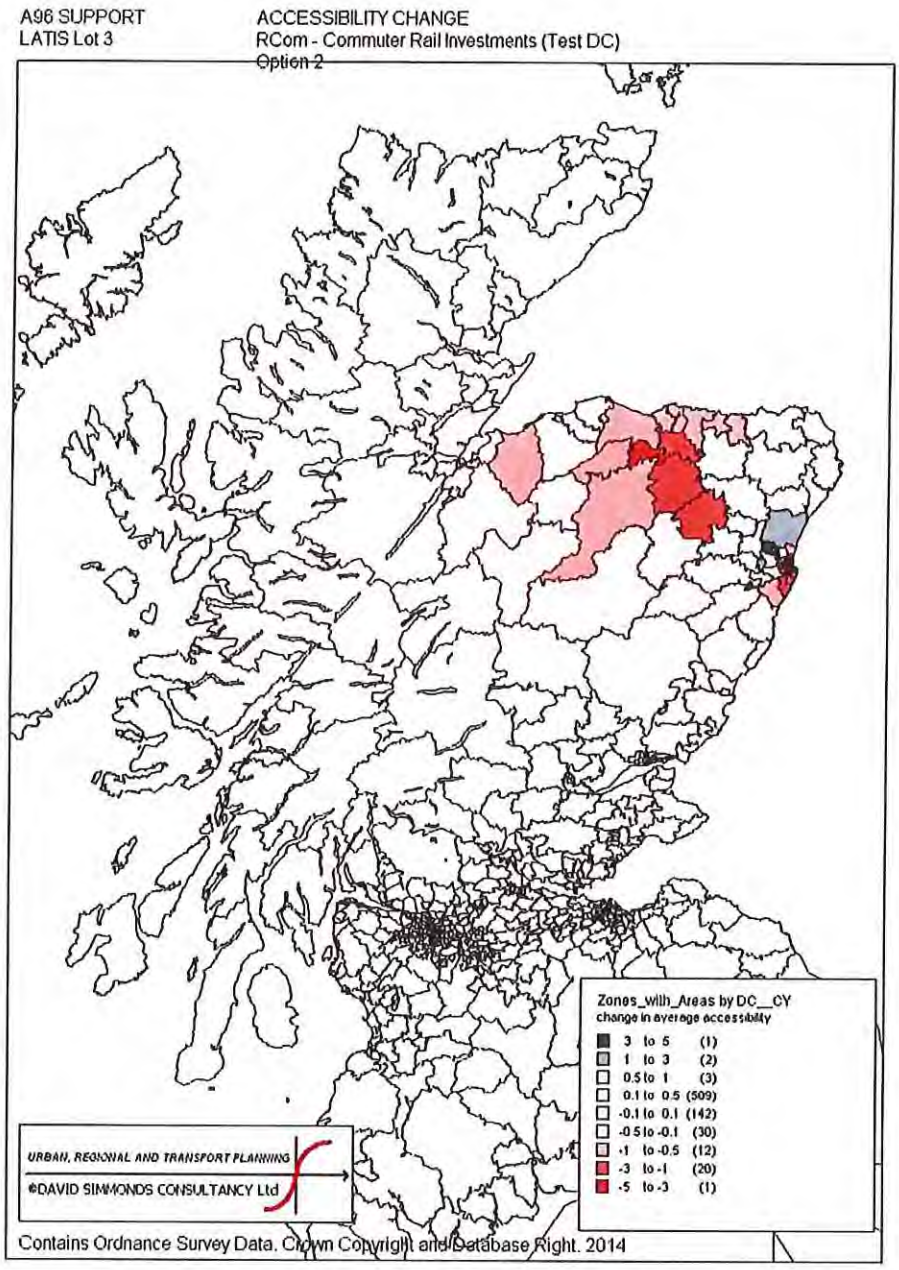


Figure 4-3 Change in weighted accessibility for origin zones in the Commuter rail improvement (RCom) option

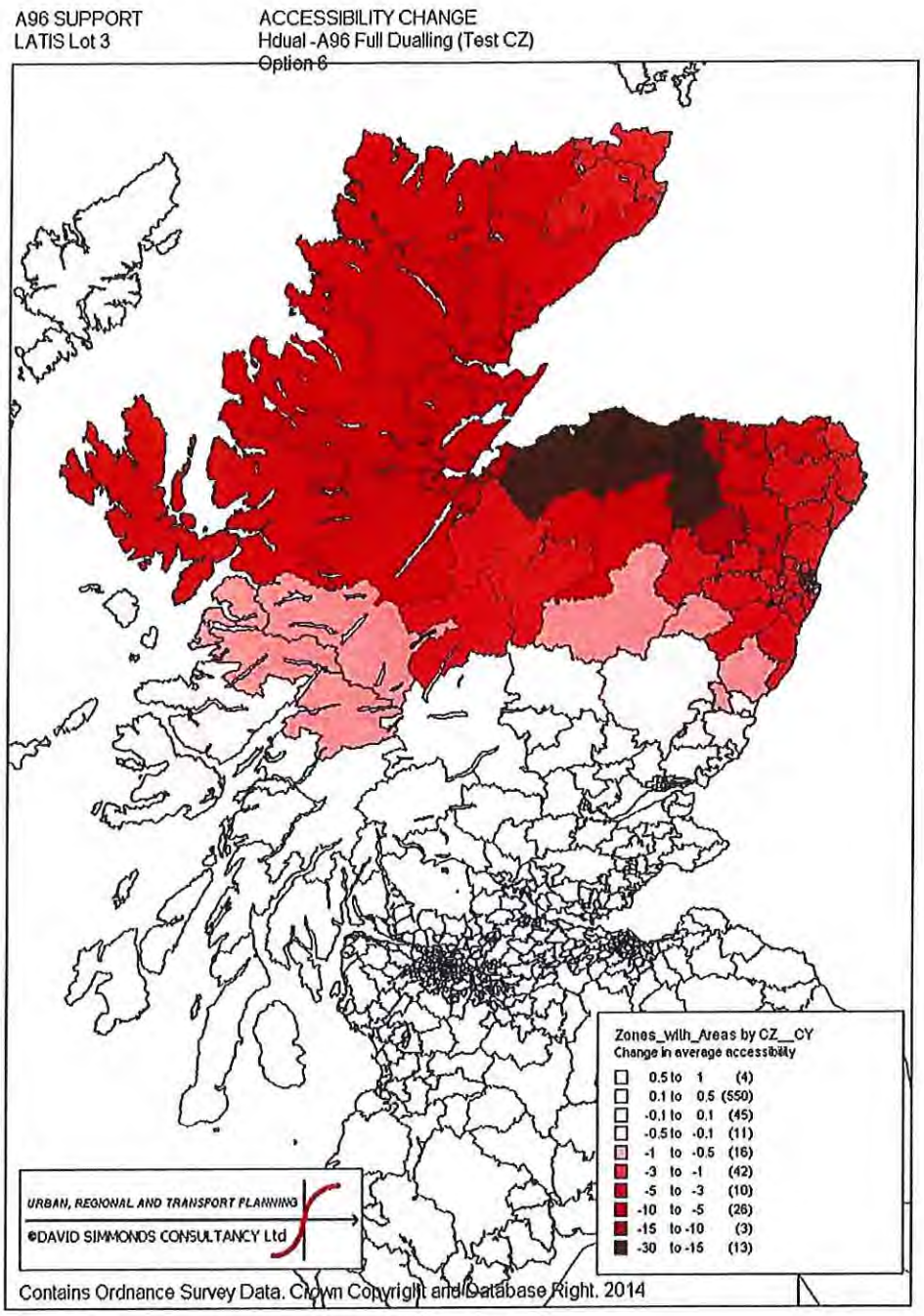


Figure 4-4: Change in weighted accessibility for origin zones in A96 Dualling (HDual)

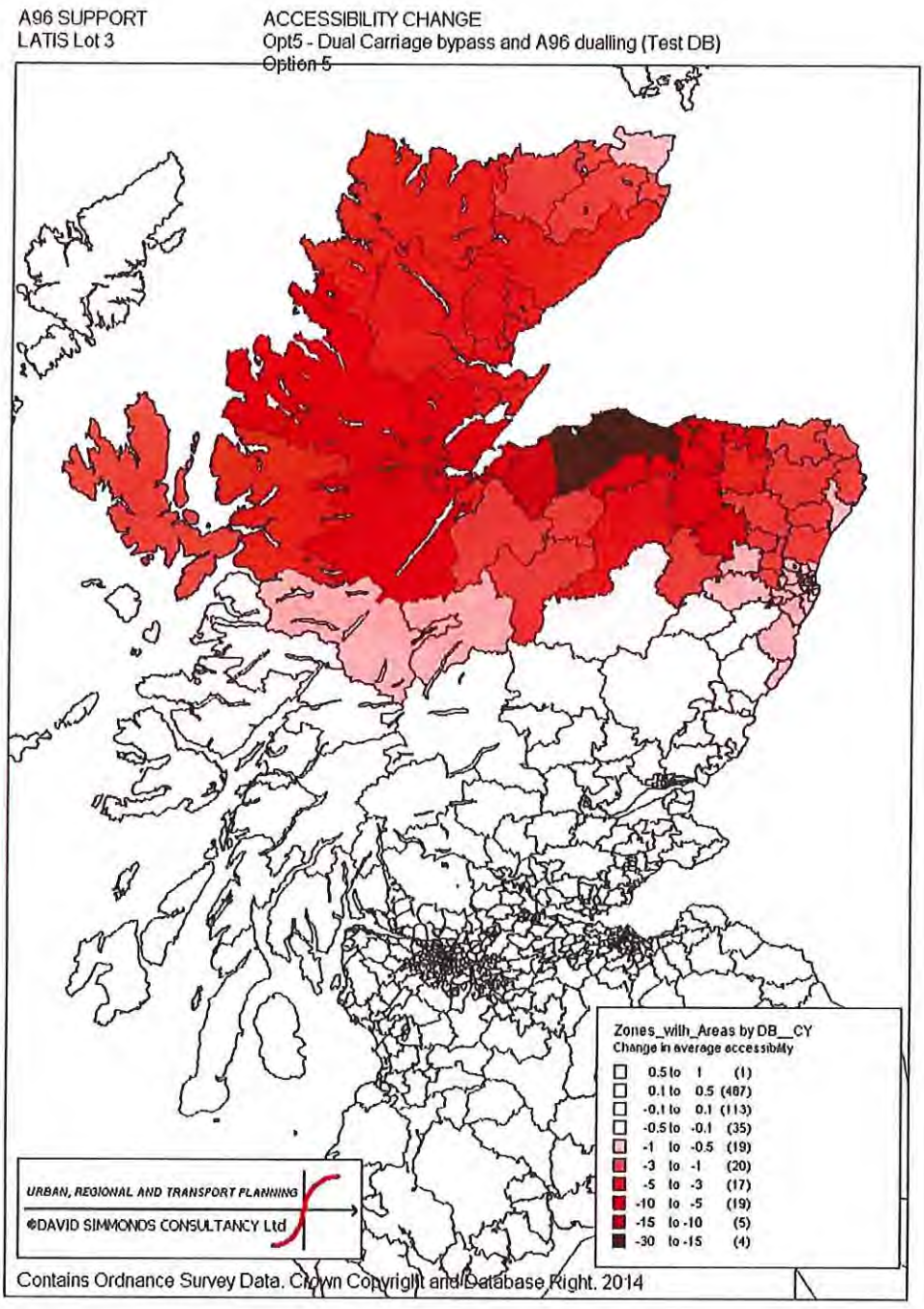


Figure 4-5: Change in weighted accessibility for origin zones in Option 5