Appendix 1:
Details of the comprehensive rural bus network cost model

Purpose:

To produce indicative costs to provide rural England with a comprehensive 'Swiss-style' bus service fit for the Climate Emergency: 'Every Village, Every Hour'.

Notes and disclaimer:

The method outlined below is intended to give an approximation of what it would cost to achieve a 'Swiss-style' bus network, starting from the present situation in England.

This approach should not be taken to represent the detailed network design that might be adopted if planning a 'Swiss-style' network from scratch.

All model outputs should be taken as indicative rather than precise. No responsibility can be taken for the use of this model by any third party.

Methodology in outline:

1. The model takes 4 rural local authority districts, as examples of the 3 different levels of rurality defined by the official Department for Environment, Food and Rural Affairs rural urban classification (RUC), and creates a ‘Swiss-style’ bus network for them.

2. The four districts in the model are Cherwell (Oxfordshire, RUC3), Eden (Cumbria, RUC1), East Lindsey (Lincolnshire, RUC1) and North Devon (RUC2). Two markedly different examples of districts in the most rural category (RUC1) were included in order to provide an indication of the probable range of costs.

3. The network in each example district is based on a set of ‘arterial services’ on routes that have potential for full commercial viability once there is recovery to pre-coronavirus conditions. These are mostly inter-urban services operating approximately hourly in daytimes in pre-Covid conditions with no financial support beyond present bus service operator grant and concessionary fare reimbursement.

4. ‘Capillary services’ have been added to complement the 'arterial' services in each example district, on routes designed to take in all villages of significant size.

5. For the purposes of the Swiss service frequency standards, a ‘village’ would usually mean 300 people or more, but as little as 100 in certain circumstances.

6. ‘Village’ is not an officially defined term in England, so the Office for National Statistics NOMIS Official Labour Market Statistics website has been used to provide base maps of ‘built-up areas’ (BUAs) as defined for 2011 Census purposes.

7. Many villages that would get bus service provision in Switzerland fall below the continuity of development required by the Census definition of BUA. To catch villages missed by the BUA definition but locally viewed as requiring a service, all existing bus or minibus services with route maps or timetables available on the web were mapped, including those running just once-per-week at 'safety net' frequencies, some of which are operated with volunteer drivers.

8. In instances where some BUAs remain unconnected after mapping even the most infrequent known services, extra routes have been added to connect to arterial services or to local hub towns.

9. We estimate that this approach approximately equates to Swiss-style coverage of every village above 200-300 residents.

10. The vehicle distance ('bus-kilometres') that must be driven to operate this network of services in each district was measured and costed, with different options for fare levels, frequency, days and hours of operation.

11. This expenditure was then scaled up to cover all rural areas of England, extrapolating costs in each RUC category for the whole of England on the basis of the spend per head of population required to provide the modelled bus service.

12. The model also includes an option to add a level of demand-responsive transport (DRT) to provide services for places and times not covered by the scheduled service network. The model allows application of equivalent of Lincolnshire’s entire CallConnect budget (£5.5m/yr), or half of it, or none of it.

Details of modelling and rationale for choices of parameters

Definition of the 'central cost estimate' model output

The following settings of the model 'Input Choices' tab were used to generate the 'central cost estimate' quoted in the accompanying report: twice-hourly arterial services, once-hourly capillary services, 6am-midnight, 7 days per week and all bank holidays, commercial fares on arterials and 15% cost recovery on capillaries, commercial operators providing all types of service, with 50% Lincolnshire CallConnect budget applied to provide infill to uncovered dwellings and hours extension by DRT .

Definition of 'rural'

The aim of the modelling is to cost a vision that would provide all the 24 million people who live in rural England integrated public transport connections within rural areas and from rural areas to the nearest urban centres. For these purposes we have taken rural England to include categories 1-3 of the official DEFRA district-level rural-urban classification, as below.

- RUC 1: Mainly Rural (rural including hub towns >=80%)
- RUC 2: Largely Rural (rural including hub towns 50-79%)
- RUC 3: Urban with Significant Rural (rural including hub towns 26-49%)

This relatively broad definition of 'rural' has been adopted for two reasons: a) to include the many people who live in RUC3 areas who would regard themselves as living in a rural area; b) in recognition of the fact that rural transport systems do not only make connections between the different rural parts of districts or counties, their most crucial role is to connect more remote areas with local and regional centres (that may be categorised as urban towns or cities). So, for example, Bern Canton sets a standard that bus services to villages must provide residents with access to the nearest major centre without interchange or with at most one change.

Choice of example districts

We consulted experts who have long personal experience of running rural bus operations. Our discussions aimed to identify counties and districts for which it would be feasible to map out a core set of inter-urban arterial bus routes, using present commercial services as an indicator of routes with financial viability, with the intention to use these as the basis for complementary capillary services to villages, operating either as direct additional services into the hub towns, or as 'feeders' to connect with arterials at nodes between the hub towns.

We also sought examples that ranged across the three rural levels of the official rural-urban classification (RUC1, RUC2, RUC3). For RUC1, the most rural category, we sought two different examples, to try to span the differences between lower and higher density population districts and districts with and without significant topographic control of settlement distribution. We included East Lindsey district of Lincolnshire, as the most-studied and longest-standing example in England of an existing 'feeder-plus-arterial' network. Lincolnshire County Council's approach to providing rural public transport has for the last two decades centred around a semi or wholly demand-responsive model in conjunction with a policy of bolstering the key inter-urban arterials. For this reason, it appears that East Lindsey probably has a rather thinner network of scheduled capillary services than that apparent in the other districts taken as examples. We therefore considered parish population statistics to try to identify significant villages that may have been omitted from the network and added some additional capillary routes. It is nevertheless probable that our method has identified a somewhat lower percentage of significant villages in Lincolnshire than in the other examples, with fewer capillary routes mapped as a result and with consequent reduction in the cost produced. We consider that East Lindsey to represents a low bound on potential cost for RUC1 districts and it is used as the basis for the 'low estimate' model output for England. Eden District of Cumbria is the other RUC1 district, characterised by a considerably lower population than East Lindsey and fewer substantial towns that provide 'hubs' that enable commercially viable inter-urban arterial services. Eden District is therefore taken as a high bound on costs in RUC1 districts per head of population, and is used as the basis for the 'high estimate' model output for England. The average cost per capita of Eden District and East Lindsey District was used to generate the 'average estimate' model output for England.

Parameters for determination of 'baseline' annual operating cost for 6-day 'core hours' bus operation

The model generates cost estimates on the basis of a cost per vehicle-km. This was chosen as a universal metric on the grounds that costs per vehicle-km are collected by the Department for Transport (DfT) and are publicly available in DfT bus statistical tables, and that estimation of bus route km was a more practical option within the resources available than the full assessment of the number of vehicles required, which necessitates a significant degree of knowledge of local conditions, restrictions and possibilities. However, in the course of the work it became apparent through dialogue with Devon County Council that the DfT statistical tables (which aggregate rural and urban areas, but which in terms of bus-km are dominated by the large number of bus services in urban areas) significantly over-state the cost per vehicle km for rural areas, where running speeds are higher due to the comparatively lower levels of congestion. To overcome this issue an approximate assessment of the vehicle requirement to run the capillary routes mapped across East Lindsey District was kindly undertaken by an experienced rural bus operator conversant with the area (Ben Colson, ex-CEO of Norfolk Green, recognised as one of the bus companies best at developing the rural market to its maximum potential, prior to its absorption into Stagecoach). This assessment took as its basis a 'free-flowing' overall average vehicle speed of c.30kph. The resulting vehicle requirement enabled a more accurate cost per vehicle-km to be calculated, and furthermore allowed an assessment of the reduced level of costs that could result from deploying smaller vehicles to these routes.

Operating costs per vehicle-km have therefore been determined in two complementary ways: top-down and bottom-up.

The top-down costing uses the £2.28 per bus-km cost provided by DfT statistical table BUS0403a Operating Revenue (which includes commercial margins). This costing was applied to the Cherwell District example, which as an RUC3 district ('Urban with Significant Rural - rural including hub towns 26-49%)' is considered to be an average 'English non-metropolitan area' as per the category definition in the DfT bus table for the purposes of bus operating costs, for which the primary determinant is traffic congestion levels.

The bottom-up costing drew on the assessment of vehicle requirements to fulfil the East Lindsey mapped network of capillary services. This vehicle requirement was then used to calculate a per-vehicle-km cost to be used in the model. Modifying factors, as described below, were applied to the bottom up costing to arrive at a figure that includes all operating costs (e.g. spare fleet capacity required to cover maintenance) to create a comparable basis to the DfT figure, which includes all costs since it is an aggregated figure for total annual operational costs. The resulting per-km cost was then applied to the RUC1&2 districts East Lindsey, Eden, North Devon (for which the DfT costs for 'English non-metropolitan areas' were judged to be inapplicable because these areas are subject to much less cost increase from congestion delays). Assumptions and modifying factors for the bottom-up calculations are listed below.

Bottom-up vehicle-km cost assumption: Operating cost of a full-size single-decker per annum of £150,000 to cover all fixed and all variable costs, and including depreciation costs on purchase of a modern Euro VI vehicle and a commercial margin.

Bottom-up vehicle-km cost assumption: Operating cost of a 21-seater per annum of £100,000 to cover all fixed and all variable costs, and including depreciation costs on purchase of a modern Euro VI vehicle and a commercial margin. 21-seaters were judged to be the logical vehicle choice because low-floor minibuses to meet disability regulations are in very short supply and commanding a large premium, and 21-seaters offer capacity to cover busier capillary routes and some school run applications if routings are designed with that in mind.

Bottom-up vehicle-km cost assumption: For the above operating costs, 6-day operation of a 12-hour timetable could be achieved (with one hour additional positioning time).

Bottom-up vehicle-km cost assumption: A cost reduction is assumed to be available from running smaller vehicles on some capillary routes. A factor of £100,000/£150,000 is applied, according to the proportion of capillaries in the districts analysed where present services are one per day or less and where a full-size single decker is unlikely to be needed and a 21-seater is therefore a viable option. It is assumed that arterials require full size single deckers and that these will meet requirements in RUC1 & 2 areas.

Top-down vehicle-km cost assumption: The £/bus-km figure in the DfT statistical table BUS0403a Operating Revenue for 'English non-metropolitan areas' is assumed to cover a mix of single and double decker deployment suitable for RUC3 areas such as the example Cherwell District.

Bottom-up vehicle-km cost assumption: Bottom-up calcs for RUC1&2 areas have recieved an 18% allowance for extra capacity to cover scheduled and unscheduled maintenance days. This is judged to be sufficient to cover full 7-day working. (Fleet size margins are already factored in to the DfT £/km figures which are at national aggregate level, so no adjustment is needed for RUC3 areas.)

Bottom-up vehicle-km cost assumption: Extra capacity to keep hourly services and connections despite congestion has been factored into the bottom-up calculations for RUC1&2 areas. The starting bottom-up calculation assumes zero congestion, and so requires an allowance for peak hour traffic in the country towns and summer congestion from tourist traffic in Cumbria, Lincs and Devon, where the coastal corridor routes may be particularly subject to congestion. RUC1 area congestion cost uplift is 10% and RUC2 area congestion cost uplift is 20%.

Top-down vehicle-km cost assumption: We assume that the RUC3 Oxfordshire Cherwell district is not more congested than the average 'English non-met', which is the DfT category of £/km applied to this district as an RUC3 area. But a small uplift of 5% is applied because a properly connecting 'Swiss-style' timetable requires greater reliability thus more time in the schedule.

Adjustment to both bottom-up and top-down vehicle-km baseline costs: Extra time will be required in timetables for dwell times to allow 'Swiss-style' two-way exchange at connections of capillaries with arterials (or to trains or arterial-to-arterial). Assumed that capillaries arrive 3 mins before, depart 3 mins after arterials, with connections both ends of a 30 minute route run, adding a total 12 min dwell time (20%) to each hourly run. It is assumed that arterials connecting with capillaries arrive after capillaries and dwell just 1 min, with connections every 15 mins of route, but with 6 minute dwell for arterial-arterial connections every hour of running, adding total 9 mins dwell time (15%) per hour of run. Since the base costing was based upon a vehicle requirement based on an assumed vehicle average speed, this factor that directly decreases average speed is applied to the whole costing (not just the proportion that is time-based).

Adjustment to both bottom-up and top-down vehicle-km baseline costs: It is anticipated that there would probably be an increase in costs due to the widescale upgrade on the scale proposed tightening the market for staff and for contracted bus services. A 10% cost increase has been added on basis that if big commercial operators take a bigger role in order to meet the demand, margins might be expected to change from c.6% to c.12% and that rising staff costs would raise costs above that.

Adjustment to both bottom-up and top-down vehicle-km baseline costs: Extra capacity will be required to run school services without disrupting clockface timetabling. This capacity is needed at peak times therefore is expensive. Nordhesse Verkehrsverbund costs per vehicle km for school services are double (or more) other contracts. However, the model assumes that only 30% of present school transport budgets are replaced by the network, so a comparatively small 5% adjustment is made here.

Parameters applied for user input choices on the core hours baseline cost per vehicle km

The model includes a user input choice to opt for capillary and/or arterial services to be operated by a not-for-dividend municipal bus company. The not-for-divided cost per km is set midway between the commercial margin (as per DfT table BUSO4O3a tab), and zero margin (as per the DfT table BUS0408a tab) because the DfT table of bus operating costs only includes depreciation against historic prices. This allows insufficient income to buy new buses, just accounting for inflation, and in practice new vehicle costs rise as specifications are raised to achieve lower emissions and better disabled access.

Parameters applied to extend the core hours baseline cost per vehicle km to extra hours and days of operation

Timetabled operating hours of 0700-1900 Mon-Sat are taken as the baseline during which core inter-urban bus services are assumed to be commercially viable at an hourly frequency. However, see below for corrective factor applied to the districts where some commercial services are running higher frequencies, longer hours and more days.

Timetabled operating hours of 0700-1900 Mon-Sat are also taken as the 'core hours' baseline during which standard wage rates are payable.

It is assumed that vehicle positioning time, which may require an additional hour of movements in addition to the baseline timetabled hours of operation, is part of the baseline costs.

Since a relatively small proportion of buses run outside core hours, the average cost per vehicle-km recorded by DfT is assumed to be close to the core hours rate.

The model is based on service frequencies that remain the same (Swiss-style, clockface) throughout the day - i.e. no reduced early morning or evening services.

As a baseline for wage costs it is assumed that wages (all staff, not just drivers) constitute 60% of the costs of core hours operation.

Beyond core hours, staff costs are assumed to require an hourly premium on core hour rates of 50% for work after 10pm at night and for 'rest-day' working on Sundays and Bank Holidays. A 25% premium is applied for timetabled operating hours 6am-7am and 7pm-10pm Monday-Saturday.

Parameters applied to calculate income from fares

For the arterial routes, since these have been chosen on the basis that they are already commercially viable for 6-day, daytime hourly operation (or are so close to commercial viability that they would become commercially viable with the wider network upgrade envisaged) the approach to estimation of fare income has been to estimate the present fare income as a proportion of operating costs (using operational costs per bus-km calculated as above), using likely parameters for the proportion of fare-paying users on rural routes, as discussed below. Thus, the baseline assumption for calibration of the model's output of fare income is that, with present levels of commercial fares, the arterial inter-urban routes at hourly frequencies during 'core hours' and 6-day operation should produce a model output that is zero extra cost above present spend.

The present fare income as a proportion of present operating cost for core inter-urban routes operating present hourly frequency in core hours is taken to be 46%. This figure considers DfT bus statistical table BUS0501a which provides data for 'Non-metropolitan areas of England' for bus operator income from fares, concessionary fare reimbursement, Bus Service Operators Grant (BSOG) and direct contractual payments for tendered services, with a modifying assumption that in the rural areas under consideration, which have markedly older populations, about half of the income after subtracting Bus Service Operators' Grant (BSOG) is likely to come from concessionary fare reimbursement, with the remaining half being the paid-for fare income.

For RUC 1 areas, this 'core-hours' fare income has been extrapolated to higher levels of service frequency, and extension to early mornings and evenings and Sundays and Bank Holidays, using researched values of bus user response to increased supply ('elasticity to supply').

The elasticity to supply applied to the RUC1 areas is +0.5. This figure is set between the short-term and long-term elasticities of +0.4 and +0.7 reported by Paulley et al (2006) *The demand for public transport: the effects of fares, quality of service, income and car ownership* and thus probably represents a medium-run response over 3-5 years. The Paulley et al. study reports much higher elasticity to bus supply where evening and Sunday services are upgraded (from what are usually very sparse services beforehand). It also reports higher elasticity to longer bus journeys, of the length likely to be more commonly made in rural areas. The assumptions are therefore cautious about the increase in fare revenue that could result from service increases on arterial routes.

Modifications to this normal elasticity to supply were applied to the RUC2 and RUC3 districts to account for the fact that a proportion of the arterial routes are already operating at higher frequencies and longer hours on a commercial basis - i.e. the model needs to be calibrated such that when input choices above the 'core hours' and baseline hourly frequency are used, it treats any services known to be fully commercial under those extended hours and increased frequencies as having an elasticity to supply of +1.0 so that the increased fare income fully supports the additional costs of the service at the higher operating frequency and longer hours. Neither of the RUC 2 or 3 districts used as examples in the model have arterial networks that are entirely commercially viable above core hours and baseline hourly frequencies, so in practice the adjustment has to be based on an assessment of the proportion of the arterial routes known to be operating at higher frequencies and longer hours. Further details of the district-by-district route-level variation in levels of commercial viability used to modify elasticities are given in the model spreadsheet tab 'Assumptions and resulting factors'

No additional patronage increase has been assumed as a result of having increased feeder services. Standard elasticities do not take account of the 'network effect' of providing a much more complete network that enables many entirely new journeys to be made. Since a certain level of network completeness is essential to make new categories of journey practicable, it is likely that the network completion effect is also a 'threshold effect' - i.e. an effect that doesn't apply linearly, but takes effect step-wise when certain missing links in the network are filled in. Network completion effects are not factored into the model. It is, nevertheless, evident from continental European comparators that networks designed to maximise connectivity under a fully-regulated guiding mind achieve higher trips per capita, per bus km operated, than comparable UK examples. Omission of any network effect therefore means that the modelled estimation of potential fare income is cautious (i.e. low rather than high).

The model works so that extra BSOG and extra concessionary fare reimbursement resulting from extra services and consequent extra patronage are calculated as extra cost to public purse.

For the capillary services, the above approach is not possible, so two levels of possible fare income have been built into the model as user input choices, so that the user can estimate the effect of different levels of cost recovery. The two levels of cost recovery are 15% and 35% of operating costs. These are based on comparison with the levels of cost recovery in Bern Canton, for services to the Canton's smallest villages. 15% is the minimum level of cost recovery that Bern Canton usually permits on a route serving only a small village. 35% is the target level of cost recovery that Bern Canton aims for on a route serving only a small village.

Estimation of present public funding of transport services in the example districts, and how much of it can be replaced by the modelled services

In the calculation of costs above present expenditure, the model assumes that a coordinated system on the scale presented would be able to cover about 30% of school transport needs, recognising that special educational needs and disability (SENDS) transport is a large part of school pupil transport budgets (Special Educational Needs Disability transport is consuming 65% of pupil transport budgets according to ADCS (2016) Home to school transport: survey of local authority spend 2015/16) and may require special vehicle specifications, door-to-door service and staff training. Nevertheless, it is possible that a high specification of vehicle for the infill DRT services costed into the model could efficiently pick up more of these requirements.

For present concessionary fare spending per capita, the model uses DfT Table BUS0832a figures (as per the tab of the model spreadsheet) for current spend, unless a local authority have directly provided more recent figures to us in the course of this study.

In the model's example district of East Lindsey, where there is presently a very significant level of Demand-Responsive Transport (DRT), the cost of that DRT provision is subtracted from any level of DRT chosen as a model input choice by the model user to back-up and extend the choices for scheduled services. The model allows the user to apply 100%, 50% or 0% of the present DRT spend in Lincolnshire (provided under a scheme called CallConnect), measured on a head-of-population basis.

Our modelling has not allowed for any saving on the present NHS non-emergency patient transport spend. This partly arises from the experience of two of the districts modelled, which lie within councils that were part of the Department for Transport's pilots of 'Total Transport' (Devon and Lincolnshire). This concept represents the logic of bringing within a single umbrella and budget the management of publicly funded transport services for education, non-emergency health appointments, and wider 'community transport'. The pilot counties have been able to bring together a number of services, but in the timescales of the pilots, NHS non-emergency transport provision proved largely intractable, a result of institutional and contractual obstacles as well as practical problems. For patients who need help not only because they are remote from public transport but because for physical reasons they need a door-to-door service, increased scheduled services are anyway not sufficient. Demand-responsive services designed to infill the scheduled network may be able to undertake some of the provision required, if equipped with high-specification vehicles able to receive wheelchairs and driven by staff with appropriate training to assist patients to and from the vehicle at each end, but this possible saving has not been factored into the model. The sums involved are significant (e.g. £8.1m per year is spent on non emergency patient transport within Devon), so there is, in the medium term and beyond, a significant saving that may be attainable if there were comprehensive scheduled service provision and demand-responsive infill of the sort modelled in this study.

Note on role of the railway

For the present exercise, we have not been able to consider the potential for rail improvements. A 'Swiss-style' rural public transport system would fully integrate network planning and timetabling across all modes, including rail. In Switzerland, buses are fully integrated into a national timetable that is founded on the railway timetable but that extends across all modes. Britain's rail privatisation legislation (1993 Railways Act) made no provision for a railway 'guiding mind' that could achieve the same for Britain, and instead gives priority to the commercial priorities of franchisees over the integration of services. Although Network Rail's System Operator department produces a national rail timetable, it has no over-arching power to produce the best possible national timetable and has to find the best compromise it can that works within the legal agreements between the Department for Transport and the commercial train operators. It was beyond the scope of the present work to estimate costings for rural rail improvements to enable frequencies to achieve a properly integrated network. Data on this is all the more limited because so many local authorities are, perforce, largely disengaged from Network Rail and operators about improvements that require infrastructure change, because achieving improvements requires too much of their stretched human resource and potentially a large proportion of their transport budgets. Integrating rail improvements would also have made the step from 'here-to-there' a longer term prospect, whereas bus frequency upgrades can provide improvements within a few years. Thus, the model takes the rail network as it is.

For most of the districts chosen as examples, rail impinges rather little on the commerciality of bus routes or their routing. Barnstaple-Exeter rail is the most notable exception, probably replacing what would be a commercially viable bus service via a more direct route than Tiverton, and in theory there is potential to plan a network around improving that rail line. But the present line has very low line speeds, and doubling it for passing and increasing line speeds is a major task. Moreover, for areas around Barnstaple the ‘pull’ to Barnstaple is better taken by direct buses, and in the districts nearer Exeter, the bus routes direct from villages to Exeter make diversion towards the railway unappealing. The argument for facilitating bus-rail movement to Exeter from the eastern/southern part of the North Devon district, particularly for onward exchange from Exeter to the rest of England, is somewhat stronger (and one of the proposed routes from South Molton would assist with that). Nevertheless, the exceptionally low line speeds mean that the addition of a time penalty of a slow bus journey on the small roads to link to the line, make it hard for this bus-rail interconnection to be an attractive-looking travel option.

Factors considered and rejected as possible modifying factors on baseline costs

Lack of vehicles available for cascading to rural areas: This is an issue but became an issue before this project was conceived, resulting from PSVAR (Public Service Vehicle Accessibiity Regulations). The model assesses additional costs for a Swiss-style bus system and treats the PSVAR cost as a cost that is already in the system.

Increase in vehicle purchase costs due to the demand increase from upgrading to the Swiss-style network modelled: The estimated vehicle bottom-up calculations factor in the full costs of efficient modern vehicles at Euro VI standard and it is considered that this is a suitable cost for the vehicle market that would exist even with a much more substantial rural network boosting the market.

Switching the bus fleet to zero emissions vehicles (ZEVs) in order to address climate change: Considered to be beyond the scope of this model, which aims to show the cost of Swiss-style service levels. It is presently hard to predict when price parity ZEV buses with fossil fuelled vehicles will be achieved. The industry has committed to buy only ZEVs or ULEVs from 2025, which carries cost implications (https://www.theguardian.com/uk-news/2019/sep/09/uk-bus-firms-vow-to-buy-only-ultra-low-or-zero-emission-vehicles-from-2025).

Possible ongoing need for more vehicle space per passenger due to coronavirus, and continued coronavirus impact on patronage: The model assumes pre-Covid patronage is restored.

Bias from Lincolnshire and Devon being 'good' local authorities that have prioritised bus expenditure and thus retained lots of services, so the uplift cost from providing more services (which require more BSOG expenditure, more concessionary fares expenditure) is comparatively less than it would be for some other local authorities: Considered to be balanced by the Cumbria and Oxfordshire examples, which in terms of cuts in bus expenditure in recent years lie at the other end of the spectrum.

DfT introduction of stricter regulation for Community Transport: This cost increase pre-dates this study so is not an additional cost of moving to the Swiss-style bus network modelled.