Small Area Projections in Scotland using POPGROUP software
Guidance Part 3: Household projections using Derived Forecasts

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With thanks for advice from Dorothy Watson and Valerie Hale of NRS.

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Background

This guidance summarises a method used for making small area household projections in Scotland, and its practical implementation. It includes projections that model the impact of housing development scenarios. It follows closely a method developed by the Centre for Census and Survey Research at the University of Manchester. The method has not been evaluated by the National Records of Scotland (NRS) in the same way as population projections.

NRS support for small area projections of population and households is reported at the Small Area Population Projections section of the NRS website. Guidance on preparing small area population projections with POPGROUP can also be obtained from the same web page.

The examples used in this document are taken from household projections for the multi-member wards of Fife, using POPGROUP version 3.1 and Derived Forecasts (DF) version 1, with Excel 2007. The software functions equally with Excel 2003.

The examples in this document are an improvement on earlier guidance[1]. The examples use:

1. The software Derived Forecasts, which is designed to replicate the different methods of household projection used in each country of the UK. DF is an improvement on HOUSEGROUP which was the basis of earlier guidance.

2. NRS 2008-based household projections, rather than the earlier 2006-based projections.

3. A census commissioned table for each data zone, which allows direct calculation of age-specific headship rates for each local area, rather than the approximate method recommended before.

The approach described here is also used by Edge Analytics Ltd when providing a service to produce small area projections in Scotland. A similar approach is used for small areas in England or Wales, adapted to the different data available for those countries.

'Forecast' and 'projection' are used interchangeably in this guidance.

[Footnote 1] Earlier guidance on small area projections in Scotland was published in 2010. Guidance Part 1 on population projections using POPGROUP remains up to date. Guidance Part 2 on household projections using HOUSEGROUP, is now superseded by this document using the Derived Forecast module of POPGROUP. Those continuing to use HOUSEGROUP will be able to take advantage of the data referred to in the Appendix, but will remain limited to 5 household types, and to fixed age groups that are not the same as those used by NRS.

Future developments and revisions

Experience of local authorities and health authorities will be shared to provide improvements or alternative practices, through the POPGROUP User Group for Scotland, hosted by NRS.

New data for small areas from the 2011 Census is expected early in 2013.

The next revision of Council Area household projections is expected after the 2011 Census.

Contents

1. Before starting

1.1. Pre-requisites

(a) POPGROUP and DF software, installed.

(b) The POPGROUP and DF reference manuals. This guidance assumes that the user becomes familiar with POPGROUP and DF and that the reference manual will be referred to for help with basic usage.

(c) A population forecast prepared in POPGROUP, based on recent local experience of fertility, mortality and migration, for the small areas within a single local authority Council Area. It may have been prepared as described in the Guidance for small area population projections referred to in the Introduction.

From NRS:

(d) Population and household projections for the Council Area, including 2001. They can also be obtained as a module which loads them into DF, from POPGROUP via the Local Government Association (information from popgroup@edgeanalytics.co.uk).

(e) 2001 Census data for Data Zones (Appendix).

From the user's own resources:

(f) A geographical conversion table ('lookup'), specifying how each Data Zone is wholly or proportionately allocated to each of the user's small areas.

1.2. Which small areas?

Guidance Part 1 (population projections) discussed the nature of small areas that can be forecast using POPGROUP software.

To extend the population projections to households, detailed estimates of household characteristics for the Council Area as a whole will be adjusted according to the less detailed information for each small area that is published in the 2001 Census. For this reason, the small areas will normally cover the whole of one local authority Council Area in Scotland, without overlaps. It is possible to use the same method to make population and household projections for small areas that cover more than one local authority or parts of one or more authority; this involves merging information from different areas which is not referred to here.

2.   The strategy for these small area projections

The household projections follow a standard approach, the same as is used by NRS for Council Areas in Scotland.

1. Forecast the population by age and sex (achieved as described separately in Guidance Part 1).

2. Forecast the population not in households (those in institutions including homes, and hostels), by age and sex (section 4.2).

3. Forecast the headship rate for each type of household: the proportion of an age group who head a particular type of household; for example the proportion of 20-24 year olds who are lone parents (section 4.3).

The software then calculates the projections:

4. Deduct the population not in households from the population, giving the household population.

5. Multiply the household population at each age by the headship rates for that age, giving the number of household heads for each type of household.

6. Add the number of household heads across ages, giving the total number of households of each type.

The user requires information for small areas, about the population not in households, and about headship rates (steps 2 and 3 above). In this strategy the information for small areas is estimated for the year 2001, by scaling Census data for small areas to the detailed estimates for the Council Area.

The population not in households is assumed a constant proportion in future years, as NRS assumes for Council Areas. A user may alter that assumption easily, by editing input (the DFPopAdjust file).

The headship rates are projected forward into the future in line with NRS assumptions for the Council Area. For example when a greater proportion of young people are expected to be in one-person households in Fife, this is assumed to be also the case for each small area within Fife.

A household projection is first made based on the recent demographic change ('migration-led' population projection). The population projection is then adjusted according to scenarios of planned development of housing. These may include a scenario of no development, as well as developments envisaged in plans devised locally. The results show in which areas and by how much the population is expected to be sensitive to housing plans, and make use of the ratio households/dwellings.

Household projections

Steps in strategy	Summary of outputs for each small area	
1. 2001 data allocated to each small area	Population not in households	Household types
2. Scaling to Council Area household projections	Detailed age-sex household population	Household headship rates
3. Projected number of households	Uses the migration-led projection to calculate the implied number of households	
4. Housing-led projection	Uses a housing development plan to adjust migration to fill the projected households	

3. DF Model Set-up

3.1 DF Model Set-up: small areas

Open, complete, run and save the DFsetup file, as in this example and the notes below.

(a) Set up screen

POPGROUP Derived Forecasts
Model Setup Information

File Header	Fife electoral wards	1
Model ID, to name folders	FifeWardsHH	1
Location of Folders	C:\forecast\2. DF\	1
Type of model to be set up	GROS 2008 Household	2

Next

Notes:

1. The file header, Model ID and location of folders are at the convenience of the user.

2. The type of model should be set to the latest NRS household option

(b) Group definition screen

```
POPGROUP Derived Forecasts
Group definition

Use Labels from a
POPGROUP Model_Setup    C:\forecast\popgroup_v3\MODEL_SETUP_FifeWards.xls      ┌1┐
file                                                                          └─┘

                                              [ Get Labels ]

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

                                              [   Back    ]
No. of Groups
    23                                        [   Next    ]

Labels for total of all Groups

'ALL' Group | Short label | Long label                                        ┌2┐
            | Fife        | Fife Council Area                                  └─┘

Labels for each Group
The order given will be used on the input and output files, and printed reports
No. | Short label | Long label                                               ┌2┐
 1  | BuckMeth    | Buckhaven Methil and Wemyss Villages                      └─┘
 2  | BurntKin    | Burntisland Kinghorn and Western Kirkcaldy
 3  | Cowdenb     | Cowdenbeath
 4  | Cupar       | Cupar
 5  | DunfCen     | Dunfermline Central
```

Notes:

1. The labels for areas can be taken from the POPGROUP file used to set up the population projections. Double-clicking this cell will bring a dialogue box to find the file. Once this file and its path have been entered, click the button below to 'Get labels'.

2. The labels have been filled automatically from the POPGROUP file named in item 1.

(c) Model selections screen

```
POPGROUP Derived Forecasts
Model Selections

Model Type                     Base Year  ┌1┐                                 ┌3┐
GROS 2008 Household              2008     └─┘   [ Back ]    [ Run Setup ]      └─┘

┌─ Age / Sex groups ──────────────────┐  ┌─ Derived Units ─────────────────────┐
│                        [Modify Age  │  │                        [ Modify     │  ┌2┐
│                        / Sex groups]│  │                         categories ]│  └─┘
│ Choose a set of Age / Sex groups    │  │ Choose type of Derived Unit rates   │
│ GROS 2008 Household    ▼  [ View ]  │  │ GROS Head of Household  ▼  [ View ]  │
│ Label for Age / Sex groups is…      │  │ Label for Derived Unit rates is…    │
│ GROS 2008 Household           ┌2┐   │  │ GROS Head of Household              │
│                               └─┘   │  │ Choose Derived Units                │
├─ Population Adjustment ─────────────┤  │ Households              ▼           │
│                                     │  │ Label for Derived Units is…         │
│ Make Population Adjustment . . . . .│  │ Households                          │
│   ⦿ Yes        ☐ No                 │  ├─ Validation ────────────────────────┤
│ Label for Population Adjustment     │  │ Value of each rate  ☐ 0 or +ve      │
│ Not in Households                   │  │   ⦿ From 0 - 1    ☐ No Limit         │
│                                     │  │ Sum across categories  ☐ Sum to 1   │
│ Adjustment using . . . . . ⦿ %      │  │   ⦿ 1 or Less    ☐ No Limit         │
│   ☐ Number      ☐ Mix               │  ├─ Calculations on Derived Units ─────┤
│ Adjustment method . . . . ☐ Add     │  │ ☐ Divide    ☐ Multiply   ⦿ None     │
│   ⦿ Subtract    ☐ Mix               │  │                                     │
├─ Sub-Populations ───────────────────┤  │                                     │
│                                     │  │                                     │
│ Use Sub-Populations . . . . . . . . │  │                                     │
│   ☐ Yes         ⦿ No                │  │                                     │
└─────────────────────────────────────┘  └─────────────────────────────────────┘
```

Notes:

1. Change the base year to 2001. Do not change any of the other selections, which are pre-set to NRS household projections.

2. You may wish to view the age-sex groups and household categories.

3. Click the 'Run Setup' button.

3.2 Check the results

Running DFSetup as above will create three folders as requested. One will have skeleton files, and the other two be empty, ready for input files and output files.

3.3 DF Model Set-up: Council Area

If you have the DF data module for NRS household projections, install and run the data module, choosing the Council Area in which the small areas are contained.

You will now have two models, one for your Council Area as a whole, filled with data, the other for small areas within the Council Area, not filled with data.

In the next sections you will be using this Council Area projection for 2008-2033, and also headship rates for 2001 which are provided in the DF data module's 'RawData' folder.

If you do not have the DF data module, you may get the same information from NRS: headship rates, communal establishment population and household projection.

4. Data preparation

4.1. Allocation of data to small areas

The Census data for communal establishments, heads of each household type and age, and dwellings and household spaces (see Appendix) must be allocated to the small areas identified in the Model Setup.

The allocation will usually be not of whole Data Zones but in proportion to the overlaps of each Data Zone with each local area, estimated through geographic information systems (GIS) or postcode or other type of directory. The creation of a Geographical Conversion Table (sometimes called 'lookup table', or 'recasting proportions') is usually undertaken in-house because the composition of the local areas is best known locally. It is not provided by NRS. The source data may be available to the user for Output Areas rather than Data Zones – in which case it should similarly be allocated to Council Area's small areas.

If the aim is to undertake forecasts for a number of different sets of small areas which do not nest within each other (wards, planning areas, library areas, etc,) then the allocation will be done from census areas to each set of small areas. There will be one projection model for each set of small areas.

4.2. Local population not in households

1. For each small area, calculate the proportion of people not in households in 2001, using the Census Table CAS001 (see Appendix). Separately for each age and sex, divide the number in Communal Establishments by total population (the sum of those in Communal Establishments and in households).

2. After calculating the proportions of residents in Communal Establishments for each of your local areas from the 2001 Census, consider updating them.

3. In preparation for their household projections, NRS prepared updated proportions of residents in Communal Establishments which were used in its most recent 2008-based projections. The update makes a significant difference in many Council Areas and in many age groups. For example there has been an expansion of students in higher education halls of residence in many areas, and a reduction in people in adult care residences and hospitals in some areas, which changes the proportion of residents in Communal Establishments.

4. You could apply an overall adjustment to each local area in your Council Area to bring the Census proportions in line with the NRS estimates for the 2008-based projections. This may be done for each small area by multiplying the Census 2001 proportion from step 1 by a factor, as follows:

    (Proportion in Communal Establishments in Council Area used in NRS projections) /(Proportion in Communal Establishments in Council Area in Census)

    This ratio can be calculated by the user from NRS data. It is also available from the POPGROUP website. Multiply each small area's proportion not in households from step 1, by the ratio for your Council Area.

5. However, it is very likely that the proportion in Communal Establishments has changed differently since 2001 in each of your local areas, as institutions of different types expand, close or open. You could consider information available to the Council, or a special study, to estimate the number and proportion in Communal Establishments at as recent a time as possible.

6. The changing number of residents in Communal Establishments adds uncertainty to the projections of households, as we cannot predict future changes for each local area. The acknowledgement of this uncertainty is probably more important

than being sure of the exact current proportion of residents in Communal Establishments in each area.

7. Enter these small area proportions of the population not in households into the sheets on a DFPopadjust skeleton. This skeleton was created in 3.1-3.2 above. Enter the proportions in the first column, which is labelled for year 2001.

8. Document the file, validate the file, check the messages and correct any errors, and save in your input folder as DFPopadjust1.xls.

4.3. The headship rates for small areas, using a training scenario

1. In summary, we run a 'training' forecast for each small area using the NRS Council Area rates for every small area (Paras 2-3). Comparison with the Census number of households gives an adjustment factor that reflects the circumstances of each small area (para 4-7).

Training forecast

2. Copy the NRS projection of the Council Area headship rates, into the 'default' sheet of the small area DFRates.xls skeleton input file. You will be copying data from 3.3 above into a file created in 3.1-3.2 above.

a. Copy into the default sheet of the small area DFRates skeleton file the headship rates for the columns 2008 to 2033 from the NRS file (direct from NRS, or the DFRates input file in the district data module of 3.3).

b. Copy into the default sheet of the small area DFRates file the headship rate for 2001 from the NRS data (direct from NRS, or the headship rates file in the Data Modules RawData folder). Note that the DFRates file does not have a category for 'Non-heads' so ignore these NRS rows. Note that the DFRates file does have an age category 0-15 and you should fill these with zeros.This age group is included so that DF can properly calculate average household size.

c. Fill in the columns for 2002-2007 in the default sheet of the small area DFRates file, by interpolating between 2001 and 2007. You can write a formula in the cells, or calculate on another sheet and copy back in.

d. Document, validate, check the messages and correct any errors, then save in your input folder as DFRatesTraining.xls.

3. Run DF, preparing a scenario as follows, with Scenario Identifier 'Training':

POPGROUPDerived Forecasts - Households
Information for this scenario

	Run Model	[7]

Scenario identifier	Training	
File Header	Training forecast for headship rates	
Other information (e.g. contact details)	Your own contact details	
Final year for this forecast	**2002**	[1]
	Double click to browse for directory or workbook names	
Default folder for the input workbooks	C:\forecast\2. DF\FifeWardsHH_inp	[2]
Folder for the output workbooks	C:\forecast\2. DF\FifeWardsHH_out	[2]

Input workbook names

Rates	DFRatesTraining	[3]
Population forecasts	C:\forecast\popgroup_v3\FifeWards_out\fore_Mig.xls	[4]
Population adjustments	DFPopadjust1	[5]
Constraints (optional)		

Output workbooks (named automatically from the scenario identifier)

Forecast Detail	DFForecastDetail_Training.xls
Forecast Total	DFForecastTotal_Training.xls
Population forecast	DFRiskPop_Training.xls
Rates used	DFRatesOut_Training.xls
Reporter and Charter	DFReporter_Training.xls

This scenario saved as: DFScenario_Training.xls

last run on: *23/03/2011 at 09:38:34*

Notes for this scenario, to be placed on the output files

Population not in households uses local information, but made consistent with GRO(S) total for Fife. Held constant as %.
Population projection is migration-led, using recent experience.
Headship rates are the same for all small areas, taken from the GRO(S) projection for Fife. [6]

Notes:

1. Forecast for one year to 2002, as only the results for the first year are needed.

2. Input directories as named when setting up the model (see above).

3. Headship rates for the district, prepared as in points 1. and 2. above.

4. Population forecasts indicate the full path and file name of the detailed output file (beginning 'fore_'): those that you have already produced, for example using Guidance Part 1.

5. Population not in households as prepared in 4.2 above.

6. Always document what you are doing.

7. Run the scenario. In the next step you will use one of the output files.

Adjusting the Council Area rates for 2001

4. For each small area, complete the following table. In order to make the most of the data, three of the categories of household type are subdivided by whether the household head is below age 60, because household formation will be different in some local areas. However, to avoid very small numbers, the two lone parent categories (1 adults with 1 child and 1 adult with 2+ children) have been amalgamated into a single category.

   The data sources for each column are (a) the Census data (see Appendix), (b) the output file "DFForecastDetail_Training.xls", or the analysis tool "DFReporter_Training.xls", both from para 3, and (c) compute the ratio of these two columns.

   In the table below, the example ward in Fife has headship rates which are higher than Fife's average, particularly so for younger 1-person households.

Buckhaven Methil and Wemyss Villages	(a) Households, from Census	(b) Households, from Training scenario	(c) Ratio Census / Training
Age under 60, 1 person - adult male	785	665	1.18
Age under 60, 1 person - adult female	673	514	1.31
Age under 60, 2 persons - both adults	1,391	1,288	1.08
Age 60+, 1 person - adult male	397	381	1.04
Age 60+, 1 person - adult female	1,048	1,058	0.99
Age 60+, 2 persons - both adults	1,328	1,315	1.01
2+ persons, 1 adult & 1+ dep child	481	506	0.95
3+ persons - all adults	612	688	0.89
3+ persons - 2+ adults, 1+ dep children	1,865	1,776	1.05
All households	**8,579**	**8,191**	**1.05**

5. Calculate the small area headship rates for each age and sex, by multiplying the default set of rates in DFRatesTraining.xls by the ratios in the last column of this table. For example, all the default rates at any age for 1 adult 1 child and 1 adult 1+ children (lone parent) households, should be multiplied by the ratio in the table for that household type (0.95 in the example above). And all the default rates at ages under 60 for 1-male households should be multiplied by the ratio in the table for that type (1.18 in the example above).

6. Enter these headship rates in the column for 2001 on the small area sheets of the file DFRatesTraining.xls, document and save as DFRates1.xls.

7. Validate, check the messages and correct any errors, and save again as DFRates1.xls.

4.4. The relationship between Households and Dwellings

The relationship between households and dwellings is computed as a ratio of the census counts for these two indicators from the 2001 Census (see Appendix). It will be used in later sections, with POPGROUP.

1. Enter this ratio households/dwellings for each small area in the first column of the POPGROUP skeleton input file (not DF) DFSupply.xls.

2. If desired the relationship can be changed according to expectations of changing rates of second homes, vacant housing or households sharing the same household space (see POPGROUP reference manual).

3. Document, validate, check the messages and correct any errors, and save in the POPGROUP input folder as DFSupply1.xls.

5. A household projection based on recent demographic experience

5.1. Prepare the scenario

Open the previous DF scenario file DFScenario_Training.xls, and edit it to use the small area headship rates that you prepared in 4.3, DFRates1.xls. Use a scenario identifier 'Mig', and project to 2033:

POPGROUP Derived Forecasts - Households
Information for this scenario

	Run Model
Scenario identifier	Mig
File Header	Training forecast for headship rates
Other information (e.g. contact details)	Your own contact details
Final year for this forecast	**2033**
	Double click to browse for directory or workbook names
Default folder for the input workbooks	C:\forecast\2. DF\FifeWardsHH_inp
Folder for the output workbooks	C:\forecast\2. DF\FifeWardsHH_out
Input workbook names	
Rates	DFRates1 [1]
Population forecasts	C:\forecast\popgroup_v3\FifeWards_out\fore_Mig.xls
Population adjustments	DFPopadjust1
Constraints (optional)	

Output workbooks (named automatically from the scenario identifier)

Forecast Detail	DFForecastDetail_Mig.xls
Forecast Total	DFForecastTotal_Mig.xls
Population forecast	DFRiskPop_Mig.xls
Rates used	DFRatesOut_Mig.xls
Reporter and Charter	DFReporter_Mig.xls

This scenario saved as: DFScenario_Mig.xls
last run on: *28/03/2011 at 12:01:41*

Notes for this scenario, to be placed on the output files

Population not in households uses local information, but made consistent with GRO(S) total for Fife. Held constant as %.
Population projection is migration-led, using recent experience.
Headship rates are for local areas from Census 2001, consistent with Fife total households of each type.

Notes:

1. Use the headship rates prepared to reflect local evidence from the 2001 Census.

5.2. Run the projection

When you have entered the above information, run the scenario by clicking the button: **RUN THE MODEL**

6. The impact on housing of continuing recent population experience ('migration-led' or 'trend based' forecasts)

This section repeats the population projection based on recent demographic experience made in section 5, but runs it from POPGROUP. It additionally computes the dwellings that would be demanded by that projection.

This section is re-running a previous population projection (migration-led) and in the background running DF, to provide the same household projection that was prepared in the previous section 5.

The only new information will be the number of dwellings implied by this population projection. The POPGROUP output file comp_mig.xls will contain the number of households and the number of dwellings expected in each small area.

6.1. Prepare the scenario

Open the POPGROUP input file 'scenario_mig.xls'. Edit it as follows and run it; it will be saved automatically as scenario_mig.xls in the input directory that was created when you ran the Model Setup.

(a) Sheet 'Run_Details':

You can leave this sheet unchanged, except to alter the documentation on this sheet to say that the housing impact is requested. The scenario ID can remain 'Mig', as it is the same population projection. The outputs will be the same, but contain housing information on the comp_mig.xls output file.

(b) Sheet 'Constraints_and_impacts':

In addition to the constraint of past population estimates, the household input files are also entered, and the relationship between households and dwellings, as below.

Population Estimates and Forecasts

Constraints and impacts on derived forecasts

Double click to browse for workbook names

Annual Constraints	cons1

CheckFiles

First Derived Forecast

Rates	C:\forecast\2. DF\FifeWardsHH_inp\DFRates1.xls
Population Adjustment	C:\forecast\2. DF\FifeWardsHH_inp\DFPopAdjust1.xls
Sub-Population	
Factors	
Supply	DFSupply1

Clicking the 'Check Files' button will check that the files you have specified exist in the locations you have specified, and will read the nature of the rates and adjustments from those files, writing them to the scenario file.

6.2. Run the projection

When you have entered all the above information, run the scenario by clicking the button on the 'Run_Details' sheet: **RUN THE MODEL**

The output files will be left open. At the foot of the comp_mig.xls file is the number of households and dwellings for each year of this projection.

7. The impact on population of housing plans (dwelling-led forecasts)

7.1. Prepare the constraints file

As in Section 6, this will be a POPGROUP forecast, running Derived Forecasts in the background. This time, however, the migration taken from the POPGROUP input files will be altered to meet a number of dwellings entered on the constraints file.

The constraints are often the number of extra dwellings expected in each year after the latest population estimate. These are the responsibility of the user, and often are given by planners or developers. An example constraints file with dwellings specified:

Population Estimates and Forecasts — **Fife Electoral Wards**
POPGROUP version 3.1 - DF compatible version
Constraints to be applied to the annual forecasts — **Buckhaven Methil and Wemyss Villages**
[Validate] [Options wizard]

Derived & Supply Unit Constraints — *Year beginning July 1st*

Options	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Provide change in total derived units													
Provide change in total supply units								□	□	□	□	□	□

Rules *Double click any option you wish to choose for a year and then fill in the relevant data below*

Data - year beginning July 1

Change in total no. of derived units													
Change in total no. of supply units								53	55	64	17	112	112

Population Constraints — *At June 30th*

Options	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Provide total population													
Provide population by sex & age	□	□	□	□	□	□	□						

Rules *Double click any option you wish to choose for a year and then fill in the relevant data below*

Data	Total													

5-year age/sex

Sex	Age													
male	0-4													
male	5-9													
male	10-14													

Save it under a new name, eg 'ConsDwellingsA' might refer to the dwellings in plan A.

Sometimes, planners wish to know what the population might be if no dwellings were constructed. The constraints file would be as follows:

Population Estimates and Forecasts — **Fife Electoral Wards**
POPGROUP version 3.1 - DF compatible version
Constraints to be applied to the annual forecasts — **Buckhaven Methil and Wemyss Villages**
[Validate] [Options wizard]

Derived & Supply Unit Constraints — *Year beginning July 1st*

Options	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Provide change in total derived units													
Provide change in total supply units								□	□	□	□	□	□

Rules *Double click any option you wish to choose for a year and then fill in the relevant data below*

Data - year beginning July 1

Change in total no. of derived units													
Change in total no. of supply units								0	0	0	0	0	0

Population Constraints — *At June 30th*

Options	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Provide total population													
Provide population by sex & age	□	□	□	□	□	□	□						

Rules *Double click any option you wish to choose for a year and then fill in the relevant data below*

Data	Total													

5-year age/sex

Sex	Age													
male	0-4													
male	5-9													
male	10-14													

7.2. Prepare the scenario

Prepare the scenario file as in Section 6 (migration-led) except that:

1. The Sheet 'Run_Details': enter migration weights under Housing, 50% on in-migration and 50% on out-migration.

2. The Sheet 'Run_Details': use an ID referring to the housing scenario, eg. 'DwellingsA'.

3. The Sheet 'Constraints_and_impacts' Use the name of the constraints file with housing constraints added ('ConsDwellingsA.xls' if named as above), and

4. The Sheet 'Run_Details' will be documented to this effect.

7.3. Run the population projection constrained to dwellings

When you have entered all the above information, run the scenario by clicking the button on the 'Run_Details' sheet: **RUN THE MODEL**

The output file comp_ID.xls (The ID from the scenario) will contain at its foot the Housing constraints. The population will not be the same as in the migration-led scenario, but will reflect the migration required to fill the housing specified.

The details of how POPGROUP alters migration are given in the POPGROUP manual.

The two population forecasts may be compared using 'comparison_summ.xls' in the POPGROUP skeleton folder.

7.4. Run the household projection constrained to dwellings

The output from the population projection will be sufficient for most purposes. On its 'comp' output file it has the projected number of dwellings (the constraint), and the equivalent number of households at the foot of each sheet.

Full household results from this projection may be obtained as follows. Run a household projection as in section 5 but which uses population forecast output from 7.3: eg the file 'fore_DwellingsA.xls'.

The two household forecasts may then be compared using the Utility 'DFcompare.xls'.

Appendix: 2001 Census data

The following data from the 2001 Census are used when preparing small area household projections.

Population not in households

'Table CAS001 Age by sex and whether living in household or communal establishment' is available from NRS Census Customer Services for each Census Output Area, but it will be most convenient to ask for the version already aggregated to Data Zones and the age groups used in NRS household projections as follows:. Note that the table is provided in text format with 117,095 rows, which will read directly into Excel 2007/2010 but will be truncated in Excel 2003. The same table is available from the POPGROUP website, where a version on two sheets in Excel 2003 is also provided.

The following table shows the content, for Scotland as a whole.

	Communal Establishment Residents Males	Communal Establishment Residents Females	Household Residents Males	Household Residents Females	ALL PEOPLE
Total	39,146	46,860	2,393,348	2,582,657	5,062,011
0 to 15	2,126	1,400	496,123	472,416	972,065
16 to 19	6,422	6,542	121,237	117,889	252,090
20 to 24	6,147	4,126	150,969	153,145	314,387
25 to 29	3,329	1,299	150,783	161,892	317,303
30 to 34	2,469	622	182,205	196,798	382,094
35 to 39	2,049	555	192,569	207,781	402,954
40 to 44	1,534	558	182,642	193,176	377,910
45 to 49	1,120	594	165,805	169,950	337,469
50 to 54	1,175	680	172,943	176,309	351,107
55 to 59	1,095	648	139,740	146,516	287,999
60 to 64	1,092	702	123,559	136,380	261,733
65 to 69	1,238	1,013	108,771	128,094	239,116
70 to 74	1,673	2,004	88,380	114,860	206,917
75 to 79	2,233	4,015	63,824	95,451	165,523
80 to 84	2,139	6,025	34,216	62,609	104,989
85 to 89	1,965	7,855	14,696	34,725	59,241
90+	1,340	8,222	4,886	14,666	29,114

Household types

NRS Census Customer Services have prepared (and can supply on request) Table 160, containing household composition for each Data Zone. It is used to anchor to local circumstances the NRS projection of household headship rates.

The following table shows the content of the data with the number of households for Scotland as a whole (excluding households with no adult residents).

Note that the two categories in the NRS household projections have been amalgamated into one (2+ person, 1 adult & 1+ dependent child) to avoid very small numbers in some Data Zones.

The table is sub-divided into age of head of household because the household formation of younger and older adults varies between local areas.

Household composition by age of head of household	Total	16-59	60+
All households with 1+ persons	2,192,127	1,477,083	715,044
1 person - adult male	305,299	209,736	95,563
1 person - adult female	415,454	162,328	253,126
2 persons - both adults	649,503	347,419	302,084
2+ persons, 1 adult & 1+ dep child	138,140	135,571	2,569
3+ persons - all adults	204,630	151,748	52,882
3+ persons - 2+ adults, 1+ dep children	479,101	470,281	8,820

Household/Dwellings ratio

Tables UV53 and UV55 are available for every Census Output Area.

POPGROUP allows the relationship between households and dwellings to be specified in DFSupply either as the ratio between households and dwellings, or in more detail as three rates of shared dwellings, vacancy, and second homes.

Either: Single conversion factor derived units / supply units (Households/dwellings)

    = UV53 cell 2 / UV55 cell 1

Or: Three separate rates, estimated by

    Dwellings vacant rate = UV53 cell 5 / UV55 cell 1

    Dwellings holiday/second homes rate = UV53 cell 4 / UV55 cell 1

    Households sharing rate = UV53 cell 3 / UV55 cell 2

These to be explored and altered, for example if the vacancy rate at the time of the census is thought to be in error or changing over time.

Total dwellings	UV55 cell 1
Unshared dwellings	UV55 cell 2
Shared dwellings	UV55 cell 3
Occupied household spaces	UV53 cell 2
Unoccupied household spaces	UV53 cell 3
Second home household spaces	UV53 cell 4
Vacant household spaces	UV53 cell 5