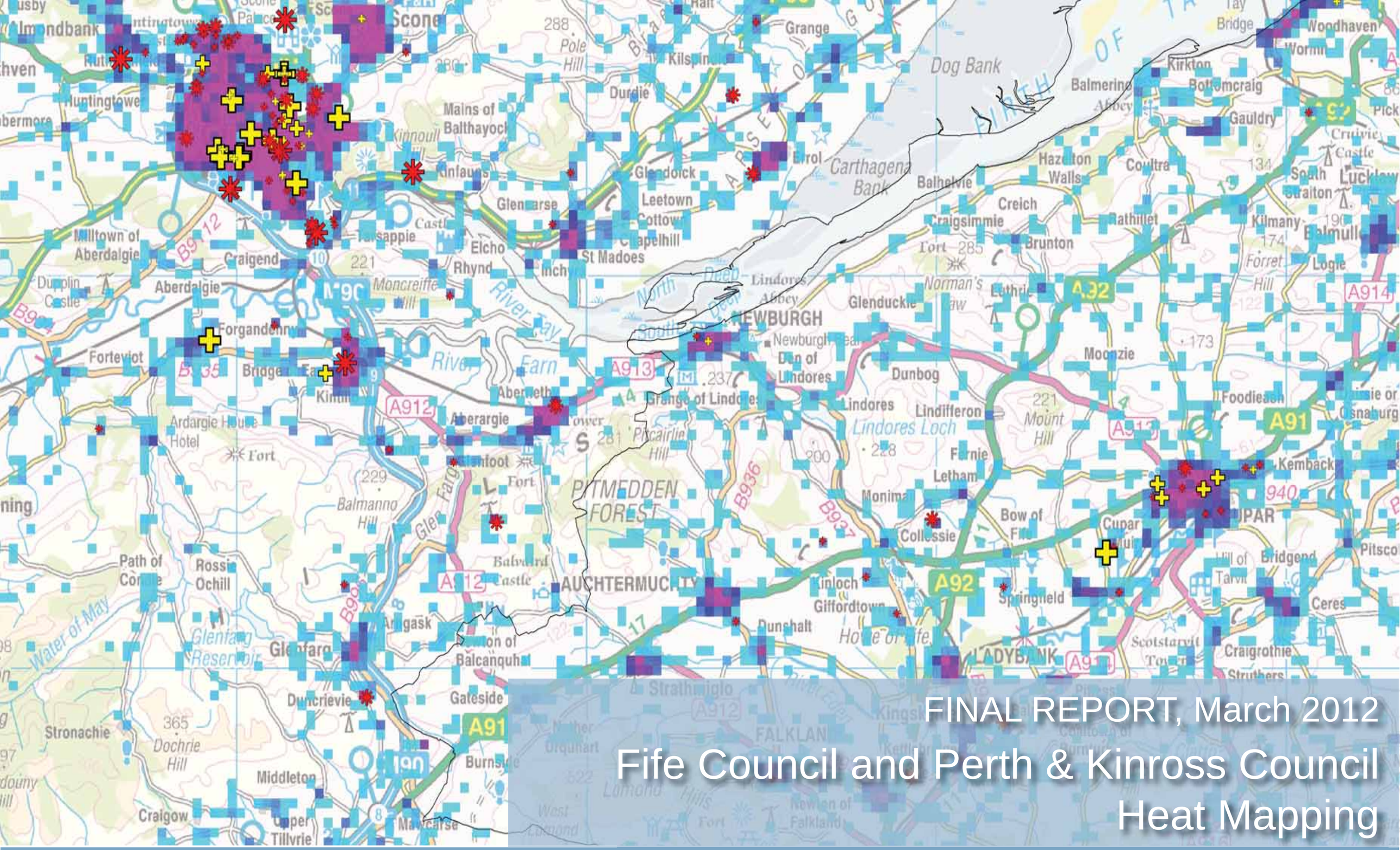



FINAL REPORT, March 2012

# Fife Council and Perth & Kinross Council Heat Mapping

AECOM

The Scottish Government

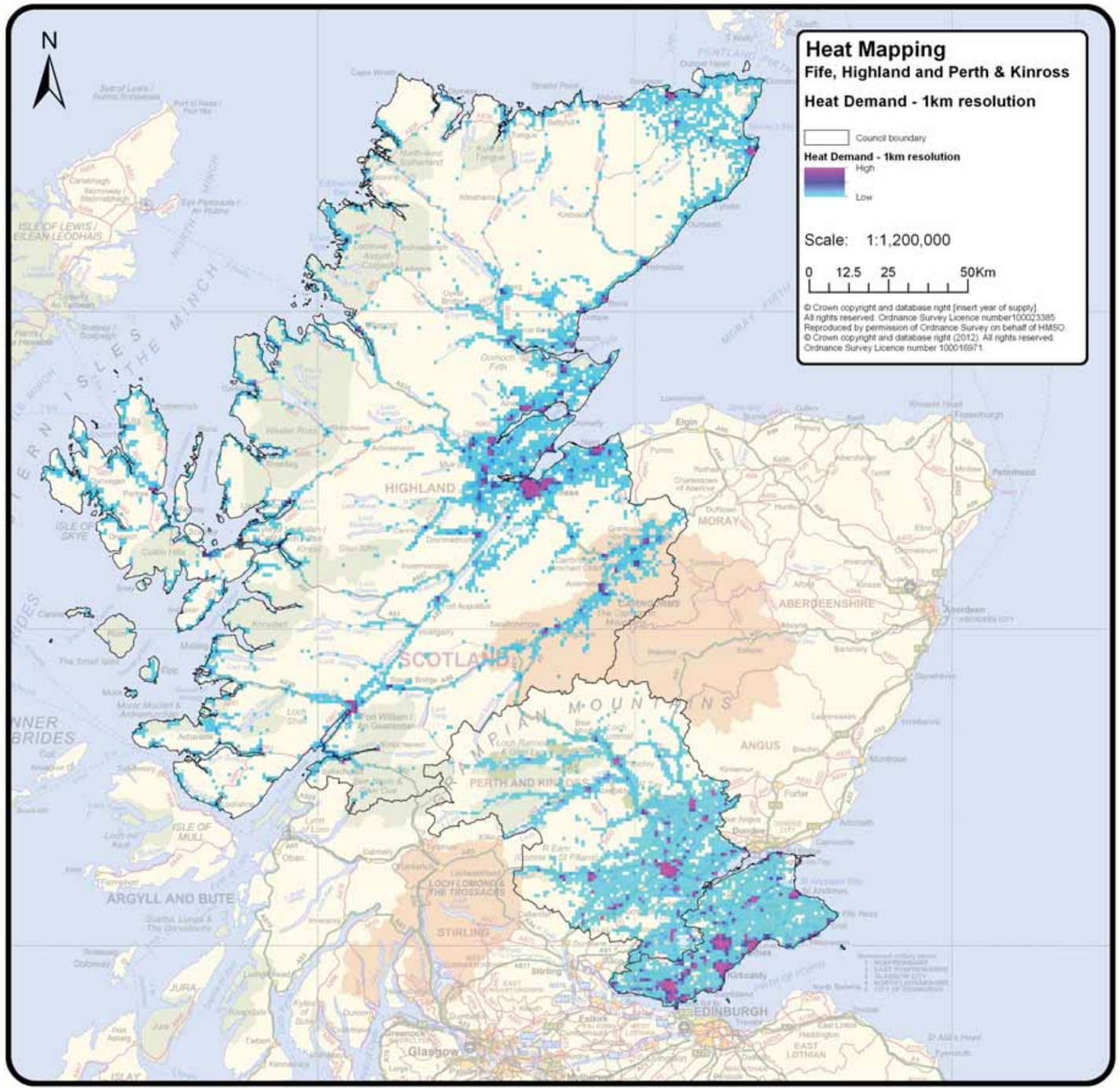
PERTH & KINROSS COUNCIL

Fife COUNCIL

## List of Acronyms used in the report

AD - Anaerobic Digestion
AECB - Association for Environment Conscious Building
ASHP - Air Source Heat Pump
BGS - British Geological Survey
BM - Benchmark
CAG - Corporate Address Gazetteer
CHP - Combined Heat and Power
CIBSE - Chartered Institution of Building Services Engineers
DE - Decentralised Energy
DECC - Department of Energy and Climate Change
DEFRA - Department for Environment, Food and Rural Affairs
DeMap - Decentralised Energy amd Energy Masterplaning Programme
DH - District Heating
DTI - Department for Trade and Industry
ECI - Environmental Change Institute
EUETS - European Union Emissions Trading Scheme
FC - Fife Council
FIT - Feed-in Tariff
FREDS - Forum for Renewable Energy Development Scotland
GHG - Greenhouse Gas
GIS - Geographic Information System
GROS - General Registers Office for Scotland
GSHP - Ground Source Heat Pump
IGZ - Intermediate Geography Zone
LDF - Local Development Framework
LDP - Local Development Plan
LFG - Landfill gas
LPG - Liquefied Petroleum Gas
LSOA - Lower Super Output Area
MCS - Microgeneration Certifictaion Scheme
MSOA - Middle Super Output Area
NAEI - National Atmospheric Emissions Inventory
NHS - National Health Service
PKC - Perth and Kinross Council
RHI - Renewable Heat Incentive
SEPA - Scottish Environment Protection Agency
SHCS - Scottish House Condition Survey
SNH - Scottish Natural Heritage
SPRI - Scottish Pollutant Release Inventory
UPRN - Unique Property Reference Number

Scottish Heat Demand - Highland, Perth & Kinross and Fife Councils



The Fife Council and Perth and Kinross Council Heat Maps are Geographic Information System (GIS) based spatial planning tools which bring together a range of relevant spatial information relating to renewable heat opportunities with a suite of complementary GIS tools. These tools allow interrogation and analyses of the Heat Map providing users with a range of potential outputs including maps, statistics and predictions of the impacts of future development.

The maps have been developed specifically to help deliver the Scottish Government target of 11% of all heat demand from renewable sources by 2020. Existing renewable heat provision is estimated to be 2.8% of the existing non-electrical heat demand. These Heat Maps will aid this process by providing a means to assess the impact of proposed development within these Council areas and helping to influence the planning decision making process.

The ability to allow users to test different development scenarios is a key highlight of the Heat Maps which distinguishes it from other Heat Maps that have been developed in the past. These Heat Maps have been developed following the successful design and implementation of a pilot methodology for Heat Mapping for Highland Council in 2011. Each map has been developed using the same methodology. A template (Appendix A3) was developed for the Highland Council Heat Map which outlines the key stages in preparing a Heat Map using this methodology. This template has been used in the preparation of these Heat Maps.

The Heat Maps are made up of two main elements:

- A range of GIS layers showing information relating to heat demand, potential heat supply, skills/ technology and opportunities and constraints

- A suite of GIS tools which allow the GIS layers to be analysed, in particular for the prediction of the impacts of different development scenarios

A key factor of the methodology which distinguishes it from previous methodologies is the level of spatial detail used in its creation. Heat demand values have been calculated at an individual property level, unlike other Heat Maps which calculate heat demand using a coarser geography. This means that these Heat Maps are a truly scaleable product which can be used at all scales from national to local, depending on the circumstances.

An additional output from this study is the identification of key opportunity areas within each Council based upon the information contained in the Heat Map. This was not part of the original Highland Heat Map.

Ten potential opportunity locations have been identified for each Council area. These opportunities cover a range of development types, including housing, employment and brownfield. Each of the 10 opportunities has been identified through a three stage process:

- Stage 1 - GIS Multi Criteria Analysis (All sites)
- Stage 2 - Additional information gathering and spatial analysis (Top 20 sites from stage 1 only)
- Stage 3 - Expert review (Top 20 sites from stage 1 only) process

This process has used the information contained in the Heat Map to provide a method to consistently analyse and compare the key attributes of potential sites across the study area. These initial results were then subjected to further spatial analysis and information gathering before a final review by renewable heat experts to finalise the final list of opportunities. This exercise has demonstrated the value of the Heat Map and a real world example of how it can be used to inform the decision making process.

This study is the first to have been commissioned since the completion of the Highland Heat Map. Lessons learned from the original Heat Mapping work have been implemented successfully during this study. In particular, the early involvement of the Steering Group in preparing data access agreements with the respective Assessor bodies prior to commissioning consultants was invaluable in ensuring the project was delivered on time. Without this early intervention, it is extremely unlikely that the project could have been delivered on time.

Other departures from the Highland Heat Map relate to a couple of additions to the GIS toolset and some minor improvements to the existing tools identified through feedback from stakeholders.

The key learning outcome of the project is the need to ensure data quality and integrity throughout the process. The methodology has been developed using data sources which are both consistent and have a national coverage. Good communication with data providers is essential to help both understanding of the input data and to secure longer term commitment to providing updated data for future Heat Map revisions. The quality of the Heat Map outputs can only be as good as the inputs, so it is therefore imperative that a full understanding of the strengths and limitations of all inputs is gained. In addition, it is also necessary to be confident that updates to input data will be available at regular intervals in the future.

Additional learning outcomes relate to the need for good consultation. It has been evident during this project that existing perceptions of what a Heat Map is can vary greatly between individuals, if indeed they have any existing awareness. It is therefore essential that for any future heat mapping exercises that stakeholder consultation remains a key part of the process.

The completion of the Heat Map should not be seen as the end of the process. It is in fact only the beginning and is where the value and benefits of the Heat Map will be realised. The Heat Map is in fact a dynamic tool which will evolve constantly over time to reflect the ever changing situation in the real world. This will require a level of ongoing maintenance to ensure that the map remains up to date and of value to its users. Update protocols and GIS tools have been developed to aid this process. It is also expected, and indeed encouraged that the Heat Map will evolve over time to take advantage of the best available information and functionality as it is identified.

Training users in how the Heat Map outputs can be applied is an additional area where ongoing effort will be required. This study has provided training for a number of individuals in both Councils and other stakeholder organisations to improve understanding of what the Heat Map is and how it can be used. Further ongoing training should be considered for a wider range of Council staff, drawing upon specific applications of the Heat Map within each Council. Consideration should also be given as to how new staff members are trained in the use of the Heat Map.

A wider aspiration of the Heat Map is to provide access to the outputs to a wider range of users, including the general public. A strategy for dissemination of the outputs should be developed by the host organisation to ensure that these are easy to understand and are provided in a format that users require. This should consider how best to train new users in understanding the Heat Map and its applications.

The next key steps for each Council to consider are:

- to develop a strategy for wider dissemination of the map and its outputs.
- to develop a strategy for future maintenance of the Heat Map and define roles and responsibilities.
- to provide feedback to Scottish Government and other organisations on the ongoing use and application of the Heat Map.

The Heat Maps provide a significant opportunity to influence the planning process, by providing a sound evidence base which can be used to identify and appraise renewable heat opportunities across Fife and Perth and Kinross.

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## 1.1 Introduction

AECOM were commissioned by Fife Council, Perth and Kinross Council and Scottish Government in December 2011 to prepare a heat map for both the Fife and
Perth and Kinross Council areas. Scottish Government kindly provided the necessary funding to make the project possible.

There were three key objectives that were identified which needed to be addressed in order to successfully achieve this aim. These were:

1) To produce a multi layered, GIS based, map which directs and supports opportunities to maximise the generation and use of renewable heat within all planned new developments (industrial, commercial and domestic) and refurbishment projects. This includes the creation and/or extension of district heating (DH) networks, the use of waste heat and low carbon heat/Combined Heat and Power (CHP) where this could lead to greater opportunities for renewable heat in the future.

2) To deliver a Geographic Information System (GIS) based system suitable for use and updating in either Perth & Kinross Council or Fife Council, and suitable for interrogation by the public, development industry professionals and local businesses. The resolution of the heat demand layer should be supplied at 1km, 500m, 250m and 50m resolution.

3) To produce a short training package on the system (to be owned by the steering group), to train both Councils staff on how to update and/or revise the layers, and provide back up support for a subsequent 6 month period.

## 1.2 Policy Context

The Climate Change (Scotland) Act 2009 puts Scotland on a path to reducing Greenhouse Gas (GHG) emissions by 80% below the 1990 baseline by the year 2050. Deep reductions are required long before 2050, however, with an interim target set at a 42% reduction as soon as 2020.

Most developed economies are almost entirely underpinned by fossil fuels to support all economic activity and – in fact – our way of life. Thus, meeting these targets will involve dramatic changes in all aspects of the economy – including power generation, transport and all areas of energy demand. Even if Carbon Capture and Storage is successfully developed as a low carbon power generating technology, there is still certain to be a significant shift away from fossil fuel use in general.

Scotland's Climate Change Delivery Plan (June 2009) highlights the scale of the challenge and identifies some of the steps that need to be taken. About 16% of Scotland's GHG emissions in 2006 were associated with the supply of heat which amounts to about 9.3 Megatonnes of $CO_2$ emissions (this does not include emissions from the European Union Emissions Trading Scheme (EUETS) traded sector – such as power generators and some heavy industry). By 2020, it is anticipated that the corresponding figure will need to fall to about 5.0 Mt of $CO_2e$. Thus decarbonisation of heat will be required to contribute more than its fair share to the achievement of the 2020 target, as some of the other sectors (e.g. transport) face problems which are more intractable over such a short time period.

This reduction will be achieved through a mixture of demand side interventions such as energy efficiency measures (e.g. building insulation and air-tightness) and switching to lower carbon heating sources. Some of the reductions will also be attributable to the increasing uptake of heat pumps, which will result in reductions in fossil fuel use outside the EUETS traded sector, but increases in emissions from the traded sector – i.e. power stations (there should, however, be significant net reduction in GHG emissions).

The Scottish Government has set a target to deliver at least 11% of all heat demand from renewable sources by 2020. The Energy Saving Trust has published (2011) Renewable Heat in Scotland – a report to the Scottish Government, which calculates the existing renewable heat provision to be 2.8% of the existing non-electrical heat demand. Therefore there is much to be done between now and 2020. Another update is due in 2012.

Recent developments include the introduction of the Renewable Heat Incentive (RHI), which opened to applicants in late 2011. This incentivises consumers (commercial only for the first phase, domestic to follow in phase two) to install renewable heating systems by providing revenue payments based on the number of kilowatt hours of metered renewable heat used. Support for biomass heating systems in particular appears to be strong, and should provide sufficient incentive to many consumers, especially in areas not served by the mains gas network. An announcement regarding the timing of phase two is expected imminently: phase two will bring individual domestic properties into the scheme and possibly some technologies excluded from phase one (such as air source heat pumps).

The topics of heat, energy and waste are linked. The Scottish Zero Waste Plan (ZWS) requires a marked move away from landfill, with just a small residual fraction being landfilled by 2025 (up to a maximum of 5%): this means that landfill gas will decline as a potential contributor to renewable heat and power. On the other hand, the plan does allow for significant volumes (up to 25%) to go to energy from waste plants (excluding AD), opening up the possibility of new district heating networks linked to these facilities. The Scottish Government will introduce regulatory measures to support the delivery of landfill bans, by ensuring energy from waste treatment is only used to recover value from resources that cannot offer greater environmental and economic benefits through reuse or recycling. These measures will supersede the current 25% cap which currently applies only to municipal waste, and are likely to result in similar amounts of resources being available for energy from waste treatment.

The ZWS plan identifies that the remaining 70% of municipal solid waste should be dealt with through a combination of recycling, composting and AD. Some of the 70% recycling and composting target can be met through the use of anaerobic digestion: the biogas produced by this can also be used to provide heat and power (among other options).

## 1.3 Opportunities

Most of the existing renewable heat used is derived from biomass, with Heat Pumps and – to a lesser extent – solar and waste treatment technologies providing the balance. Whilst biomass use is expected to increase significantly, it is recognised that there is increasing competition for the biomass resource – not least from power generators. Therefore the other technologies will be expected to play their part. Examples of contexts in which renewable heating might be used include:

- Heat pumps – particularly suitable for modern or refurbished buildings, and especially when there is a suitable area of ground for installation of a heat collector. These are powered by electricity, but the investment of one unit of electricity typically extracts around 1.5 units of renewable heat, resulting in efficiency of 250% or more (e.g. =(1.5 units of renewable heat + 1 unit of electrical heat)/1 unit of electricity. Total of 2.5 units of heat for every unit of electricity used).

- Solar thermal – typically for domestic hot water, but also can contribute to space heating. Suitable for most domestic buildings with a suitable area of roof, reasonably exposed to direct sunlight. Also suitable for commercial and industrial buildings with a domestic hot water demand (hotels, schools, etc.).

- Biomass facilities vary in scale from wood burning stoves to the 100MW+ power stations that are currently in the planning system around the UK and in some cases being built. There are, however, many instances of wood chip and wood pellet boilers being used in public and commercial buildings throughout Scotland at around the 100kW scale.

  There is also a network of small suppliers of woodchips and logs, and it is important that this network is nurtured and developed as the proximity principle is key to the sustainable growth of woodchip and log use. Wood pellet is much more energy dense than woodchip (energy / volume) and can feasibly be transported greater distances: accordingly there is merit in having centralised production of the pellet in larger plant offering significant economies of scale.

Figure 1.1 Biomass boiler

- District heating networks (perhaps using biomass as the heat source, or spare heat from an industrial facility) are easier to install in new developments than retrofit in existing developed areas – but, of course, new developments are built to higher thermal standards than in the past, so do not need so much heat.

- Significant energy levels are embodied in a range of waste materials, and this can be harvested in one of a number of ways (depending on how the waste is selected, sorted, and / or pre-treated). These are typically linked to electricity generation, but it has long been standard practice in parts of Europe to set such waste treatment plants up as Combined Heat and Power (CHP) with heat being supplied to the neighbourhood through district heating networks. CHP is favoured in the UK, also, by the Best Practicable Environmental Option assessment. Examples of technologies include the following:

Anaerobic digestion – which converts biodegradable organic wastes into a biogas (mainly methane), which can be used in a variety of ways including – potentially – injecting into the gas main (after purification), thus adding a renewable component to the mains gas supply. Good for segregated food wastes and organic slurries.

Advanced thermal treatments – including gasification and incineration with energy recovery – especially suitable for dry wastes, as energy is not then wasted on evaporating water.

Figure 1.2 Roseisle distillery (which has an anaerobic digestion facility)

An example of this type of technology is the waste to energy facility on Shetland. Shetland Heat Energy and Power Ltd has been serving district heating to both domestic and non domestic properties in Lerwick since 1998. Hot water is pumped around Lerwick through underground insulated pipes and enters properties through a heat exchanger, supplying their heating and hot water needs. The heat used in the scheme is generated at a Waste to Energy Incinerator located on the outskirts of Lerwick. The incinerator at the Energy Recovery Plant burns domestic and commercial waste from Shetland, Orkney and from the offshore oil industry, reducing the amount of waste going to landfill. Up to June 2009 there was a total of 1002 connections and 961 of these are receiving heat.

- Landfill gas (LFG) is currently captured in many landfill sites in the UK and utilised in gas engine generators. There is scope for alternatives involving renewable heat – including CHP or cleaning up the gas and injecting into the gas main.

  Additionally, at landfill sites where the LFG yield is reportedly too low for economic utilisation, it is currently flared (frequently with the addition of natural gas to keep the flare going): more sustainable alternatives involving the provision of heat may be possible, however. Over time, the opportunity for LFG utilisation will decrease as biodegradable waste is diverted from landfill, but it is likely that in general, some existing waste management sites will be preferred for future waste to energy facilities of other types.

Figure 1.3 Lochhead Combined Heat and Power Landfill gas plant

## 1.4 Barriers

There are, of course, many potential barriers to the uptake of these technologies, including:

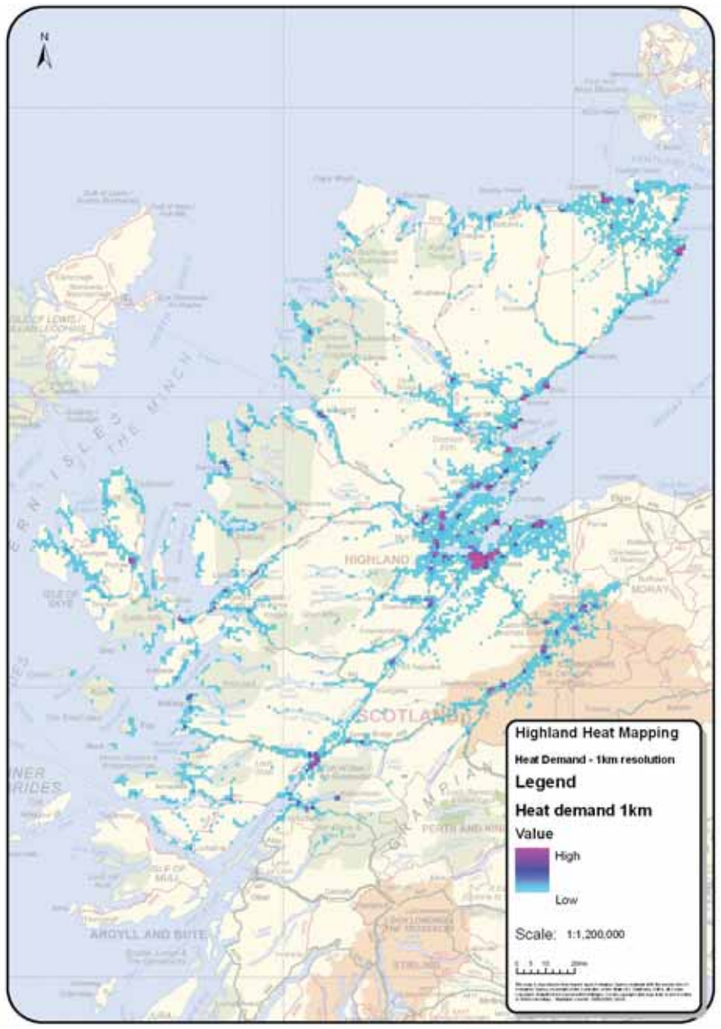
- planning barriers (particularly with reference to waste to energy);
- high density housing making comprehensive provision of solar thermal, heat pumps, and biomass boilers impossible in some existing developments;
- expense associated with retrofits – e.g. providing new district heat infrastructure in existing developments;
- competition for resources, such as alternative uses for timber and for some agricultural ‘wastes’ such as straw and chicken litter which can be productively used as fertiliser / soil improver as well as providing fuel for incinerators.

## 1.5 Prior Heat Mapping Initiatives

The requirement for this study arose from the successful development and implementation of a methodology for mapping renewable heat opportunities in the Highlands. This previous study commissioned by Highland Council, with funding from Scottish Government was intended to provide a more detailed level of mapping than had previously been attempted and to provide analytical functionality which could be used to help inform future planning of renewable heat opportunities. The outputs and final report from this study can be accessed from the following link.

http://www.highland.gov.uk/yourenvironment/planning/energyplanning/renewbleenergy/HighlandHeatMappingProject

Figure 1.4 Highland Heat Map




This study in turn arose from a previous study commissioned by the Forum for Renewable Energy Development in Scotland (FREDS) 2007. This study produced a heat map which was used in the FREDS report Scotland's Renewable Heat Strategy: Recommendations to Scottish Ministers which was published in 2008.

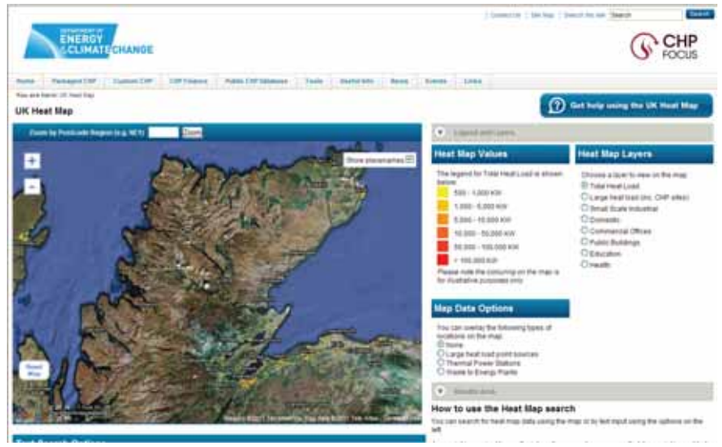
The map, produced by AEA Technology and presented to FREDS on 17 May 2007, contains a graphical view of a 1km grid of carbon dioxide emissions data adjusted to represent a proxy for heat use. The map was based upon information on CO2 emissions across the UK taken from the National Atmospheric Emissions Inventory (NAEI). This includes mapping of CO2 emissions at 1km resolution across the UK. This data set has been manipulated to map heat use and forms the basis of the heat map.

The heat map developed through that study provided a broad brush indication of heat demand and potential supply. It was noted however that "more detailed data would be required to develop an effective decision-making tool". Recommendations from this work identified that "there is merit, particularly at a local level, in developing heat maps to give a strategic overview of potential sites. However, there needs to be consistency in the approach adopted across all local authorities and the Scottish Government should provide the necessary guidance to achieve this."

Another example of heat mapping is the Industrial Heat Map, a piece of work carried out by the former Department for Trade and Industry (DTI) and Department for Environment, Food and Rural Affairs (DEFRA) to assist power station developers to explore opportunities to use CHP, including community heating, when developing proposals for new power stations.

This includes a series of map layers representing the heat demand across various sectors within the UK. Like the FREDS heat map, the resolution of the map output is 1km², but with additional more detailed point data source information.

Figure 1.5 Industrial Heat Map screenshot

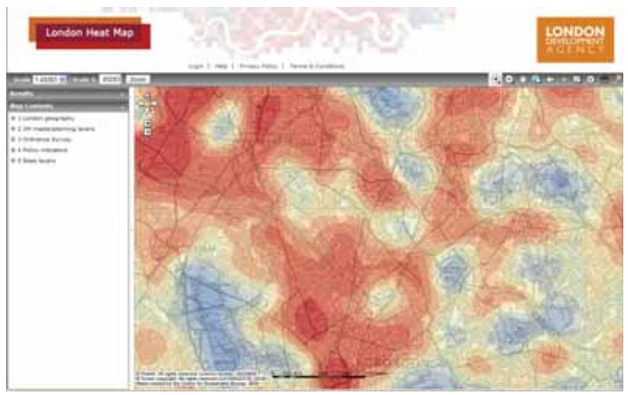



The London Heat Map has been developed by the Decentralised Energy and Energy Masterplanning (DeMap) Programme to assist both the public and private sector to identify Decentralised Energy (DE) opportunities in London. The London Heat Map is an interactive tool that allows users to identify opportunities for decentralised energy projects in London.

The London Heat Map provides spatial intelligence on factors relevant to the identification and development of DE opportunities: major energy consumers, fuel consumption and CO2 emissions, energy supply plants, community heating networks, heat density etc.

It is publicly accessible to anyone with an interest in DE. Local authorities can use the map as the starting point for developing detailed Energy Master Plans to inform DE policies in their Local Development Frameworks (LDF) and climate change strategies. Developers can use the map to help them meet London Plan DE policies (connection into an existing network or extending their own communal heating networks beyond their site boundaries).

Figure 1.6 London Heat Map screenshot



## 2.1 Management

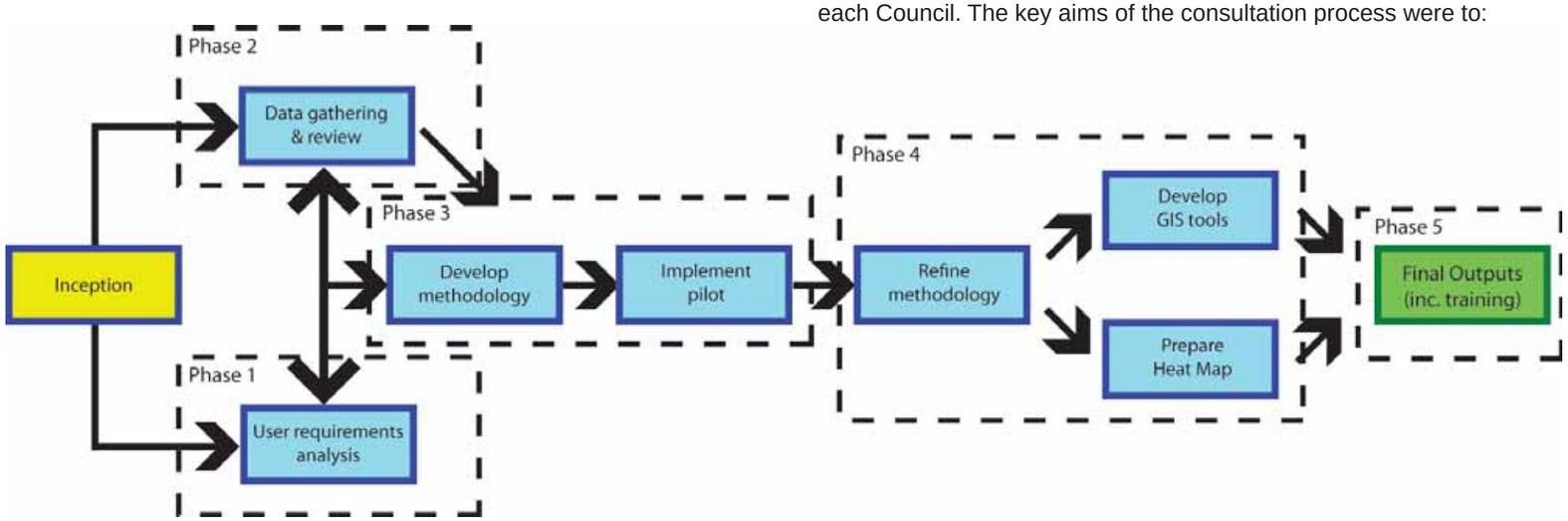
A steering group containing a number of key stakeholders was formed at the outset of the project. The role of its members was to provide direction through feedback at regular intervals and to act as ambassadors for the project within their respective organisations. Membership of the steering group included the following organisations:

- Scottish Government
- Fife Council – Sustainable Development
- Perth and Kinross Council – Planning
- Fife Council – GIS
- Perth and Kinross Council – GIS

## 2.2 Project Phases

The proposed methodology was presented to the project steering group at the inception meeting and was subsequently refined as a result. Figure 2.1 outlines the key phases of the project and the order in which they were tackled.

Figure 2.1 Project outline




### 2.2.1 Phase 1 – User Requirements

It was identified at an early stage that it would be essential to carry out a stakeholder consultation exercise in order to fully understand the hopes and aspirations of stakeholders in relation to the project outputs. Consultation was also required to provide an understanding of the existing knowledge and awareness of heat maps and their application in identifying renewable heat opportunities.

It was therefore important to identify at an early stage who the main users of the Heat Map outputs would be. Table 2.1 lists the main outputs from the study and identifies the main potential user groups for each one.

Table 2.1 Project outputs and potential users

| Output | User Group |
|---|---|
| Heat Map | Council staff<br>Scottish Government<br>Developers<br>General public |
| GIS Tools | Council staff |
| GIS Outputs (derived from GIS tools) | Council staff<br>Scottish Government<br>Developers |
| Training | Key stakeholders<br>Council GIS staff |

Identification of these key user groups was crucial in identifying the organisations that were to be invited to participate in the user requirements consultation process. A consultation workshop was run for each Council. The key aims of the consultation process were to:

- raise awareness of the project and heat mapping in general
- identify potential data sources
- identify any potential refinements required to the toolset

Appendix A1 provides a summary of both stakeholder consultation events.

### 2.2.2 Phase 2 – Data Gathering

Having ascertained what additional information was available and any refinements to the Heat Map toolset it was then possible to move to the next stage which was to gather the necessary data required for the Heat Map.

A common challenge in this type of project is the dispersed nature of the relevant data across different organisations and locations. The methodology has been designed to use national data sources where possible to ensure consistency of information across different Council areas in Scotland. The methodology does also allow for the use of more detailed local information where relevant. This can be particularly valuable in some cases as this information can improve the accuracy of the map significantly at a local level.

The stakeholder workshops identified a number of additional data sources within each Council area. These were assessed for their suitability prior to their inclusion in the Heat Maps.

Additional data identified for the Fife Council area includes various reports relating to existing and proposed schemes and data relating to fuel poverty in the area. For Perth & Kinross Council, additional sources that were identified included the Green Resorts business initiative (as a source for energy consumption data) and background information relating to woodfuel projects in the area.

Appendix A2 lists every data set, its source, and any comments about how each dataset was used in the production of the Heat Maps. It is important that any issues relating to data collection are understood to ensure that the same information can be gathered in the same format for future revisions of each Heat Map.

### 2.2.3 Phase 3 – Pilot Area Map Creation

The previous phases provided clear guidance on what additional information was available for each map and the refinements to the toolset that were required.

The original methodology was refined to take account of this information. and was then piloted on a small part of the study area for each Council. The reason for testing the methodology on a pilot area first is to raise awareness within the steering group of the typical outputs that will be generated from the study. This exercise also helps to highlight any local issues that may be encountered when preparing the map for the whole of each Council area.

The pilot areas that were chosen for the testing of the methodology were Kirkcaldy in Fife and Perth in the Perth and Kinross area. These areas were considered to provide a representative and substantial sample of the different property types we would expect to see across each of these Council areas.

The main lessons learned from this exercise were:

- Some gaps in the expected heat demand in some areas. This was due to a combination of factors with additional data expected in some cases (e.g. HMP, and NHS Tayside) and further investigation required in some areas (e.g. largely industrial/ commercial areas where more evidence was required to make an accurate calculation of heat demand)
- Incomplete records within the Assessors data - within the assessors data supplied by both Councils it was noted that not all records were fully populated. For example, at least one element of information was missing (i.e. age, type or area). This was an issue that was identified in the production of the Highland Heat Map, and the same solution of using weighted averages was implemented in each case. This approach is explained in more detail in Section 2.2.4.
- Public/ Commercial building classification - within the Kirkcaldy pilot area, it was noted that some buildings were incorrectly categorised. A review of council owned properties was carried out to help identify and address these issues.

**2.2.4 Phase 4 - Map Creation**

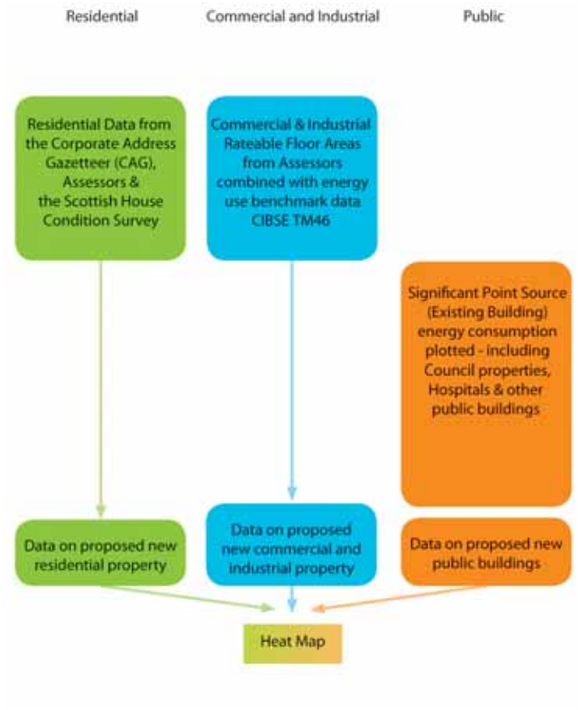
Each of the two Heat Maps was prepared using the methodology that was developed for the Highland Council Heat Map as discussed in Section 1.5.

In simple terms, this shows the spatial distribution of heat energy demand, potential heat supply, skills and technology providers and opportunities/ constraints in a given area. This information is useful for prioritising energy efficiency action, and considering the technical feasibility and financial viability of district heating options.

The methodology is based upon what is known as the bottom-up approach, which models heat demand at the individual property level. This approach is appropriate for Heat Mapping as it supplies the level of detail required (i.e. the outputs can be used at a variety of scales from local to national).

Figure 2.2 illustrates the methodology used in the preparation of the Heat Demand layer of the map.

Figure 2.2 Heat Demand methodology outline

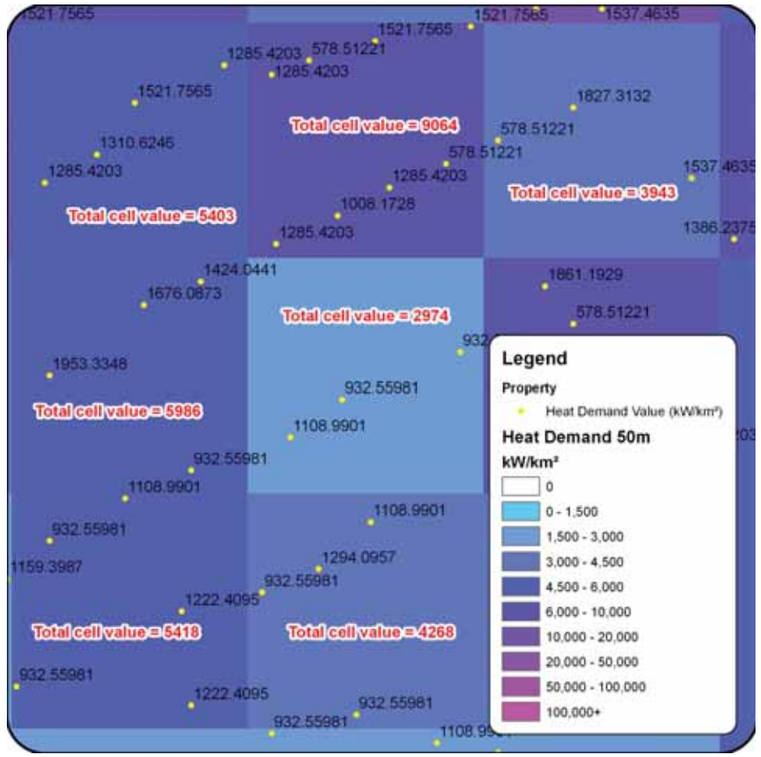



The Heat Map is made up of five different elements (or themes), heat demand, potential heat supply, opportunities/ constraints, skills and technology and context. Each layer needs to be prepared before it is collated into the final Heat Map product. The process required to prepare each of these elements is outlined in detail in the following paragraphs.

**2.2.4.1 Heat Demand**

This is the most complex layer to prepare as the input data has to be manipulated in order to provide a realistic estimate of the heat demand for every building. This layer is developed by allocating heat demand values to all point data sources (buildings) that may have a need for heat. The information assigned to each building is then aggregated to form a continuous surface providing heat demand values at a user specified scale. Figure 2.3 illustrates the concept. Each property (yellow dots) has a heat demand value assigned (black text labels). The sum of the heat demand for each property within each cell is calculated (red text) to give a continuous surface of heat demand values based upon the property level information.

Figure 2.3 Aggregation of point values to heat demand surface




In order to achieve this, it is necessary to use a data source which identifies all buildings in each of the Council areas. In each case, we used the Corporate Address Gazetteer for each Council.

**Corporate Address Gazetteer (CAG)**

In Scotland, each Council holds and manages a CAG. The CAG is a spatial dataset that provides the location of every address in the Council area with a range of relevant attribute information including address and Unique Property Reference Number (UPRN). Figure 2.4 illustrates the attributes included within the Fife CAG. Figure 2.5 highlights those attributes supplied with the Perth and Kinross Council CAG.

Figure 2.4 Supplied Fife Council CAG attributes

Figure 2.5 Supplied Perth and Kinross Council CAG attributes

The information provided in the CAG is not in itself useful for calculating heat demand, but it does accurately record the spatial location of each address. The key attribution included within the CAG which can be utilised to access information that could be used to model heat demand is the “UPRN” field. The Unique Property Record Number (UPRN) is a unique number given to every building within the CAG. Using this unique record it is possible to link the CAG to other data sources which also use the UPRN.

There are a range of additional data sources that have been used to calculate heat demand for properties in each Council area. These are:

Fife Council
- Fife Assessors valuation data
- Fife Council Properties Energy Bills
- NHS Fife Energy Bills
- CIBSE TM46: 2008 - Energy Benchmarks
- Scottish House Condition Survey
- Fife Private Sector House Condition Survey
- Various existing studies/ reports

Perth and Kinross Council
- Tayside Assessors valuation data
- Perth and Kinross Council Asset Management Energy Bills
- Tayside Fire and Rescue Service
- Tayside Police Service
- CIBSE TM46: 2008 - Energy Benchmarks
- Scottish House Condition Survey
- Perth and Kinross House Condition Survey
- Various existing studies/ reports

**Assessors Valuation Data**

Information relating to floor area, property age and property type are required in order to model heat demand for each building. The Scottish Assessors valuation data provides this type of information and through the local Assessor bodies, Fife and Tayside we were able to access this data.

Each Assessor is responsible for the valuation of both domestic and non domestic properties within one or more Council Areas. A valuation of non domestic properties is undertaken every five years and is referred to as the Revaluation. The Assessor must provide a Valuation Roll listing of these properties, which is available for public inspection. There are a total of 14 Assessors which cover all 32 Scottish local authorities. the Fife Assessor covers only Fife Council, whilst the Tayside Assessor covers Dundee City and Angus Councils, as well as Perth and Kinross Council.

The data held by the Assessors does contain some confidential information, so care needs to be taken to ensure that only useful and non sensitive attribution is used in the Heat Map production. Access to this information can also be difficult, as not all the Assessor organisations are currently able to easily share this information. Gaining access to this information required considerable preparation by the steering group prior to the project commencing to ensure that this information would be made available. This should be noted when considering creating any further Heat Maps, that agreement should be sought from the relevant Assessor bodies prior to commencement of the project.

Figure 2.6 Scottish Assessors Portal

Upon receipt of the Assessors data from each Council a review of the content quantified the extent of UPRN matches with the CAG, the


completeness of the attribute content and the supplied metadata to determine any limitations in the data.

For both Council areas, there was only a small percentage of records in the Assessors data that didn’t have a corresponding UPRN match in the CAG. Within the Fife Council data there were only 18% of records without a match. For the Perth and Kinross data this was only 1%. These were matched manually wherever possible. UPRN’s were also matched to energy consumption data where required. There was only one other significant issue relating to the Assessors data which should be noted:

- The attribution provided within the Assessors data for each Council is not complete. This means that for some properties, not all information has been included within each attribute.

Table 2.2 summarises the completeness of the attributes relating to house type, property age and floor area for Fife Council. Table 2.3 summarises the completeness of the attributes for Perth and Kinross Council.

Table 2.2 Completeness of assessor attribution for Fife Council

| Attribute | Number of records | % complete |
|---|---|---|
| Property type - Domestic | 169428 | 99.5 |
| Age of property - Domestic | 169428 | 99.5 |
| Floor area - Domestic | 169428 | 99.5 |
| Property type - Non domestic | 12827 | 100 |
| Floor area - Non- domestic | 9826 | 77 |

Table 2.3 Completeness of assessor attribution for Perth and Kinross Council

| Attribute | Number of records | % complete |
|---|---|---|
| Property type - Domestic | 72498 | 90 |
| Age of property - Domestic | 72498 | 95 |
| Floor area - Domestic | 72498 | 99 |
| Property type - Non domestic | 8511 | 88 |
| Floor area - Non- domestic | 8511 | 62 |

The section describing the construction of the heat demand layer explains how these issues have been addressed in making the heat demand calculations.

**Energy Consumption Billing**

Energy bills are an excellent source of information when attempting to understand the existing heat demand in an area. This is because they record the exact energy consumption for each property, rather than relying on modelling the likely energy consumption. Local authorities and other large public organisations often hold this type of information and are willing to use it for Heat Mapping. Both Fife Council and Perth and Kinross Council made this type of information available for this project. Buildings where energy consumption figures were available included swimming pools, police stations, Council offices and schools.

For each Council energy bills were supplied for five years. These were reviewed and a mean value was calculated for the three most recent years figures. The reason for this was to ensure that the climatic fluctuations of recent years were taken into account. The information that was provided for each Council property included consumption of

oil, gas and electricity. For each property there is a record for every account and for every bill associated with that account for 12 months. Very few properties have bills relating to all three energy types. In most instances properties would have bills relating to either one or two of the three energy types.

A number of other organisations also supplied information about their energy bills in addition to the Councils. These were:
- NHS Fife
- Tayside Police
- Tayside Fire and Rescue Service
- Scottish Prison Service
- Private businesses

A request has also been made to the Perthshire Green Resorts and other tourism providers. The timing of this request is such that any inputs have not been included in this project, but can be added at the next revision of the Heat Map.

This type of information is generally supplied in tabular form. There is a requirement to manipulate this information first before further use to ensure the data can be used in the Heat Demand layer. This includes:
- Editing any field headers to ensure only valid field names are used
- Checking that UPRN's match the CAG, where these do not match it may still be possible to match these manually
- Calculating a mean heat demand value based upon the three most recent full billing years (i.e. values for 2012 were not used as these did not give a complete year). Where gas or oil is used these have been assumed to relate to heat demand. Where only electricity is consumed, a calculation has been made that 70% of this relates to heat.

Once the data has been cleaned, the table can be joined to the CAG using the UPRN field using GIS. The resulting joined table can then be used to calculate the heat demand value for each property.

The process used for other organisations data is exactly the same, although it is more likely that these may not have an existing UPRN match.

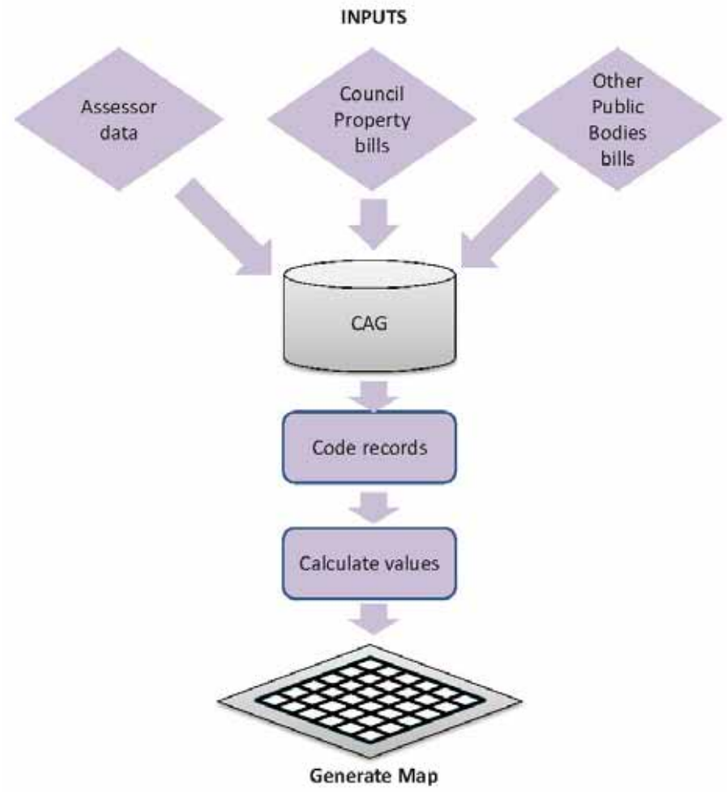
**CIBSE TM46: 2008 - Energy Benchmarks**
Energy benchmarks have been developed for the purpose of predicting energy usage for a range of public buildings. The benchmarks provide energy values for 29 different types of public building broken down into typical electricity and fossil-thermal use.

These benchmarks have been used to predict the energy demand for public and commercial buildings where there is no existing billing information available.

**Distilleries**
There are a number of distilleries within the study area, with 5 in Perth and Kinross and one in Fife. These properties have a significant heat demand and potential heat supply. In order to estimate the heat demand associated with each distillery, public domain information about production levels (megalitres per year) was sourced and a calculation was made relating to the potential waste heat that may be available.

**Construction of Heat Demand layer**
The previous sections have explained the data sources that are required to calculate heat demand. This section explains how these data sources are utilised and the energy demand calculations made.

Figure 2.7 outlines the heat demand calculation process from the inputs




required to the outputs that are generated.

Figure 2.7 Heat Demand calculations process diagram
The following processes have been carried out to calculate demand for different properties depending on the information that is available. Issues relating to each data source have already been discussed in the previous section.

- Step 1 – Add additional fields to the CAG
- Step 2 – Identify and code different scenarios (i.e. based upon the different attribution available)
- Step 3 – Make heat demand calculations

**Step 1- Add additional fields**
Additional fields that are added to the CAG are displayed in Table 2.4.

Table 2.4 Additional fields added to the CAG

| Name | Type | Purpose |
|---|---|---|
| CALC_CODE | Integer | Identify the calculation method used |
| HEATDEMAND | Float | Heat demand value in kWh |
| BM | Integer | The number of the CIBSE TM46 Benchmark (BM) to be used in calculating heat demand for commercial/ industrial buildings. |
| MM_Area | Float | MasterMap footprint area. Only used when no other floor area information is available. |
| HD_km2 | Float | Heat demand value in kW/km². |
| Confidence | Integer | Used to record the Confidence level value. |
| Comments | Text | Any relevant additional information about the property |

**Step 2 - Identify and Code different attribution scenarios**
The attribution available from the source data that has been used to calculate heat demand varies between datasets. For example, It has already been noted that not all attributes are populated for every record in the Assessors data. It has therefore been necessary to take a range of different approaches when calculating the heat demand value for each record depending on the information available. In order to audit how each record has been calculated, a code has been entered in the "CALC_CODE" field which explains which method has been used for the calculation. Table 2.5 lists each code and the calculation process that has been used.

Table 2.5 Heat demand calculation codes

| Code | Process |
|---|---|
| 0 | No heat demand anticipated. These records have been removed from the heat demand calculations. This includes non property related records (e.g. plots of land, trig points etc.) |
| 1 | Calculation is based upon actual energy consumption data as supplied by each Council and other public bodies. |
| 2 | Calculation for residential properties is based upon records with populated attributes for age, house type and floor area. |
| 3 | Calculation for industrial/ commercial properties is based upon records with populated attributes for property description and floor area. A benchmark is generated from the property description field, which is then used with the floor area to calculate a heat demand value. |
| 4 | Calculation for industrial/ commercial properties is based upon records with populated attributes for property description only. A benchmark is generated from the property description field. This is then used with the MasterMap building footprint area to calculate a heat demand value. |
| 5 | Calculation for residential properties is based upon records with populated attributes for house type and area, but no age. A weighted average based upon fully populated records is used in place of age. |
| 6 | Calculation for residential properties is based upon records with populated attributes for house type and age, but no area. A weighted average based upon fully populated records is used in place of area. |
| 7 | Calculation for residential properties is based upon records with populated attributes for age and area, but no house type. A weighted average based upon fully populated records is used in place of house type. |
| 8 | Calculation for residential properties is based upon records with populated attributes for house type only. Weighted averages based upon fully populated records are used for each house type. |
| 9 | Calculation for residential properties is based upon records classified as domestic in “Category” field. No other information is available. A weighted average is used to assign heat demand values to these records. |
| 10 | Calculation for public buildings based upon the property type. Each property type is assigned a benchmark and the heat demand value is calculated using the MasterMap building footprint area for each record. |
| 11 | Calculation for residential properties where no other attribution is known. A weighted average is used to assign a heat demand value to these records. |
| 12 | Calculation for residential properties is based upon records that are identified as flats/ rooms. A weighted average for flats has been used to assign a heat demand value to these records. |
| 13 | Calculation for industrial/ commercial properties that have been identified through various address queries. Each record is assigned a benchmark and a heat demand value is calculated using the MasterMap building footprint area. |
| 14 | Calculation for residential properties is based upon records identified as new houses. A weighted average has been applied for new properties. |
| 15 | These records have been identified as having an inquantifiable heat demand (e.g. caravan park) |
| 16 | These records have been identified as having a possible heat supply and/ or heat demand (e.g. waste water treatment works). |
| 17 | These records have been identified as distilleries. Heat demand calculations have been based upon production levels. |
| 19 | These industrial/ commercial properties records have been assigned a benchmark but a heat demand calculation is impossible as no area figure exists (e.g. no area figure in assessors data and the record does not intersect a MasterMap building footprint). |

**Step 3 - Make Heat Demand Calculations**
Once each record is coded it is a relatively straightforward task to assign the relevant heat values to each record.

The heat demand calculation process differs for the following types of property:

- Domestic properties
- Non-domestic properties

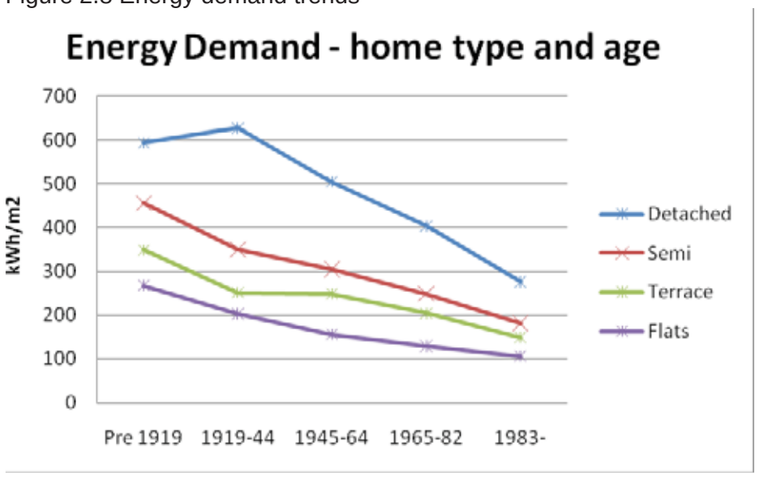
**Domestic Properties**
Heat demand values for domestic properties have been extracted from the Scottish House Condition Survey (SHCS) 2009. This provides heating values for five different time periods and four different residential property types. The data survey includes properties in both the Fife Council and Perth and Kinross Council areas. We have used the data for the whole of Scotland to identify a heat demand value for each of the 20 different categories (i.e. age and type). Table 2.6 lists the values that we have used in our calculations and Figure 2.8 illustrates the downward trend in energy demand over the last 100 years.

AECOM also reviewed local House Condition Surveys for both Council areas. A detailed review can be found in Appendix A4.

Table 2.6 Energy intensity values (kWh/m²/yr for space & water heating) for the 20 different dwelling categories.

| | Pre 1919 | 1919-44 | 1945-64 | 1965-82 | 1983-2010 |
|---|---|---|---|---|---|
| Detached | 594 | 627 | 505 | 404 | 276 |
| Semi | 456 | 350 | 305 | 249 | 181 |
| Terrace | 349 | 251 | 249 | 204 | 149 |
| Flats | 268 | 203 | 156 | 129 | 106 |

Figure 2.8 Energy demand trends




The Heat Map can also be used to predict the impact of development on future heat demand in an area. We have taken the basic philosophy that users can input their own values based on the timing and design of the development. Otherwise default values can be calculated for residential development using the following figures:

2011 – 2016: 65 kWh/m² per annum
2017 onwards:
Flats and Terraces – 39 kWh/m² per annum
Detached & Semi-detached – 46 kWh/ m² per annum

Calculations have been based upon the Zero Carbon Hub Task Group recommendations – to be fully implemented by 2017 (year when the Sullivan Report recommends “net zero carbon buildings” hit the ground in Scotland).

We have compared these with Passivhaus and AECB (Association for Environment Conscious Building) gold standard of 15 kWh/m², and AECB silver standard of 40 kWh/m². These figures do not include water heating. We have added 25 kWh/m² for hot water (based on 100 litres per day for 100m² house). Using this calculation the gold standard is equivalent to the zero carbon standard.

For the period 2011 - 2016 we have based the values on the AECB silver standard, which amounts to around 65 kWh/m² per annum (space and water heating) for all dwellings. From 2017onwards we have used the gold standard ("net zero carbon buildings") values listed above.

**Non-domestic properties**
Heat demand values for these properties have been calculated using the CIBSE TM46: 2008 energy benchmarks. Each property has been assigned to the relevant benchmark and calculated using floor areas derived from either the Assessors valuation data or Ordnance Survey MasterMap building footprints.

The approach for calculating values for new non-domestic properties is the application of a fixed percentage reduction of the CIBSE benchmark figures. This is the approach that has also been suggested by the AECB. The reductions that have been applied are:

- Silver standard - 70% reduction. 2011 - 2016.
- Gold standard - 95% reduction. 2017 onwards.

The AECB energy performance standards of silver, passivhaus and gold have been developed as clear and achievable targets designed to help guide all those involved in the delivery and use of energy efficient, low-carbon new-build properties.

**Confidence Levels**
An additional layer has been developed which can be used in conjunction with the heat demand layer to determine the confidence levels associated with every cell in the heat demand layer. The confidence levels have been calculated by assigning a confidence score to each property based upon the calculation method. For example, a property where the heat demand value was taken from actual energy consumption data would be assigned a score of 4 to signify a high level of confidence. In contrast, a property where little information was known other than type, a score of 1 would be assigned to signify low confidence. Table 2.7 lists the 4 confidence levels and the calculation methods that they include.

Table 2.7 Confidence level definitions

| Confidence Level | Calculations codes included (refer to table 2.7 for codes) in confidence level |
|---|---|
| 1 | 1 |
| 2 | 2, 3, 17 |
| 3 | 5, 6, 7, 8, 12, 14 |
| 4 | 4, 9, 10, 11, 13 |
| NULL | No value calculated |

**2.2.4.2 Potential Heat Supply**
Understanding heat demand is just one part of a Heat Map. The locations of potential heat supply sources are equally important if the Heat Map is to provide guidance on matching demand with supply. There were a number of sources identified within the specification and these have been sourced wherever possible. This includes where there are opportunities for low carbon heat including mains gas-fired CHP (as used for district heating in Aberdeen, alongside some biomass DH); and some types of waste to energy scheme (which would not be renewable if, for instance, burning plastics).

Details of the information included in the Heat Map relating to potential heat supply is included in Appendix A2.

**2.2.4.3 Skills and Technology**
Another important element to consider when assessing the potential for renewable heat within an area is whether there are existing skills and knowledge within the area which could be utilised in any new initiative. This includes skills relating to both low carbon and renewable heat. A lack of local skills or suppliers could be a significant handicap for the implementation of renewable heat technology in a particular location.

Appendix A2 provides a list of the information gathered relating to existing skills and knowledge within the study area.

**2.2.4.4 Opportunities/ Constraints**
It is important to understand and recognise the full range of potential opportunities and constraints that might impact upon the potential for renewable heat in an area. It is therefore sensible that these opportunities and constraints should also form part of the Heat Map.

The layers included were identified through the previous Highland Council Heat Mapping and also from feedback gained at the stakeholder workshops.

Appendix A2 lists the layers that have been included as part of this theme.

**Phase 4 - Tool Development, Testing and Implementation**
The purpose of providing added functionality is to extend the use and value of the Heat Map beyond a simple static map output. The stakeholder workshops explored with stakeholders the type of functionality that had already been developed for the Highland Heat Map and explored whether there were any revisions or additions to the toolset that could improve the functionality.

Some revisions/ additions to the toolset were identified and included in the map specification. Table 2.8 lists the existing range of functionality that has been delivered. Table 2.9 lists the revised/ additional functions.

Table 2.8 Existing Heat Map functionality

| Functionality | Description |
|---|---|
| ArcGIS Map document | The Heat Map is accessible through an ArcMap mxd. |
| Data grouping | Data layers are grouped into five themes of information (Heat Demand, Heat Supply, Skills/ Technology/ Opportunities/ Constraints, |
| Geographic bookmarks | The map includes bookmarks allowing easy navigation from one geographical location to another. |
| Legend Symbology | Clear and legible symbology has been supplied with the Heat Maps. |
| Layout Template | A standardised print template has been provided for preparation of printed outputs. |
| Data Update protocols | Protocols for updating data sources have been provided. |
| Scenario Development | This geoprocessing model helps users to understand the impact of new development on heat demand. |
| Proximity – Development Proposals | This model provides users with a summary of heat demand and potential supply within a specified distance. |
| Search – Areas of High/ Low Heat Demand | This model highlights the locations of significant clusters of heat demand. |
| Search – Skills/ Suppliers/ Knowledge | This model provides users with a summary of skills, suppliers and knowledge within a specified distance. |
| Postcode reporting | This model provides a summary of heat demand & potential heat supply within a distance of a postcode. |

Table 2.9 Revisions/ Additions to the functionality

| Functionality | Description |
|---|---|
| Usage Log | Each time one of the Heat Mapping Tools is executed a record of that process will be stored in a database table which resides in the general project geodatabase. |
| Monitoring/ Temporal | This tool allows a comparative analysis between different heat maps from different periods.<br><br>AECOM has provided a "baseline" heat map based on the initial datasets collated. This heat map is stored in a separate geodatabase as a reference. Each time a new scenario is developed or the Update Facility is executed this reference map can be compared against to determine any significant changes that have occurred.<br><br>A simple raster math process has been incorporated into the Scenario Development Tool which results in a differential raster which is created along with the new heat map. This differential raster will highlight where any change has occurred as a result of the new scenario. |
| Cross Boundary Analysis | The raw heat mapping data has been combined for both the Fife and Perth and Kinross Council areas. This helps to ensure that when either council execute a new scenario near the council boundary the effects of any overlapping property are also considered in the final output. |
| Modular Toolset | The Tools have been provided as two separate tool boxes, allowing a modular approach to be taken to deployment of the functionality. One tool box contains all functionality that requires access to the Spatial Analyst extension and the other contains all other tools (i.e. Postcode, Proximity and Search Skills). This will potentially allow those tools which do not require Spatial Analyst to be deployed more widely. |
| Spatial Analyst License - Check in/ out | This issue has been investigated and development of a solution is ongoing. The proposed use of a python script to achieve the check in/ out of the license does not resolve the issue as this script only works outside the ArcMap environment. AECOM intend to apply a revision to the toolset during the maintenance period to resolve this issue, potentially using .net. |
| Tool Presentation and compatibility | The tools have been delivered in a simple toolbar which integrates into the standard ArcMap 10 interface, much like that of the editor or layout toolbars which are available by default. The toolbar can be installed on any machine using the customisation menu and displays a series of button controls to run each of the relevant tools. The tools themselves are also provided in ModelBuilder format. |

The tools were developed using ArcGIS Modelbuilder and were designed to provide trained Council staff with a simple method for carrying out specific types of analysis which would be required on a regular basis.

These tools were tested by technical staff within each Council. The purpose of the testing was to identify any issues relating to the operation of the tools and also to understand whether the tools were meeting the needs of the end users. Feedback from the testing was provided to AECOM and the tools were subsequently refined.

Some of the key issues identified during initial testing have been listed below:

- setting of path names for the location to write the usage log
- setting of variables to the scratch workspace environment
- check in/ out of spatial analyst extension (see comment in table 2.9)

Both Councils will now test the tools for an extended period of time and a subsequent revision of the tools will take place during the maintenance period to ensure any outstanding issues are addressed.

**2.2.5 Phase 5 – Training**

At the outset of this project it was identified that there would be a requirement to provide potential heat map users with information about the contents of the map, its strengths and limitations and how it could be used.

Our approach to this was to run four separate training events aimed and focused on specific user groups. These were:

- Fife Council Stakeholder Seminar
- Fife Council Technical Training
- Perth & Kinross Council Stakeholder Seminar
- Perth & Kinross Council Technical Training

The Stakeholder Seminars were aimed at the key stakeholders relating to each Council with the focus on what the map includes, how it has been created and how it can be used in the decision making process.

The seminars included:

- Introduction – background to the project and the need for a Heat Map from both a National and Council perspective
- What is the Heat Map? – a first look at the Heat Map and what it includes
- Heat Map Methodology – an explanation of how the Heat Map has been constructed and its strengths and limitations
- Potential applications of the Heat Map – an exploration of how the Heat Map can be used.
- Discussion forum - this provided an opportunity for attendees to participate in an open discussion relating to all aspects of the Heat Map.

The technical training workshops were aimed at technical GIS staff who are responsible for using the GIS tools and maintaining and updating the Heat Maps . The training focused on the following key areas:

- Introduction - broad overview of the purpose and need for a Heat Map
- Data manipulation - detailed exercise exploring the Heat Map inputs and how these have been generated
- Heat Map tools - exercises based upon the use of the delivered Heat Map tools
- Data Update/ Maintenance - information about protocols for future Heat Map maintenance

The feedback gained from the events included the following comments and discussion points:

- Potential to build upon the Heat Map framework with other spatial renewable energy layers
- Some additional information was supplied relating to locations and type of existing schemes
- Greater length of time would be beneficial for the GIS training due to the amount of material to be covered.
- The data update training would perhaps be more effective delivered to a smaller group (e.g. the 1 or 2 people who will have responsibility for updating the map)

## 3.0 The Heat Map

The Heat Map is the sum of all the outputs described in Appendix A2 and not just heat demand. It is made up of over 20 different layers, relating to heat demand, potential heat supply, constraints/ opportunities and skills/ technology. These are accessible within a GIS for display, interrogation and more complex spatial analysis (Section 4 will explain the types of spatial analysis in more detail).

This section contains a series of map outputs showing the range of information available within the Heat Map at different scales of operation.

## 3.1 Heat Demand

Figure 3.2 illustrates the existing modelled heat demand across the study area. At this scale the heat demand values have been aggregated to a 1km resolution. This provides a quick visual impression of the key hot spots of heat demand across the each Council.

The map has been designed so that it can be used at a range of scales including national, regional and local. The use of point data in the methodology to assign heat demand values ensures that the heat demand values can be aggregated up to any resolution required by the user. This provides the user with considerable flexibility.

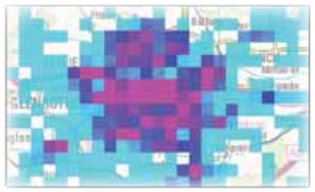
A series of different resolution heat demand layers have been included in the Heat Map to ensure that users can view the information at the appropriate level of detail in relation to the map scale. The heat demand layer has been supplied at 1km, 500m, 250m and 50m resolution.

Figure 3.1 Heat Demand resolution (Glenrothes)

50m resolution


250m resolution


500m resolution



1km resolution

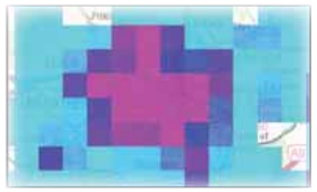
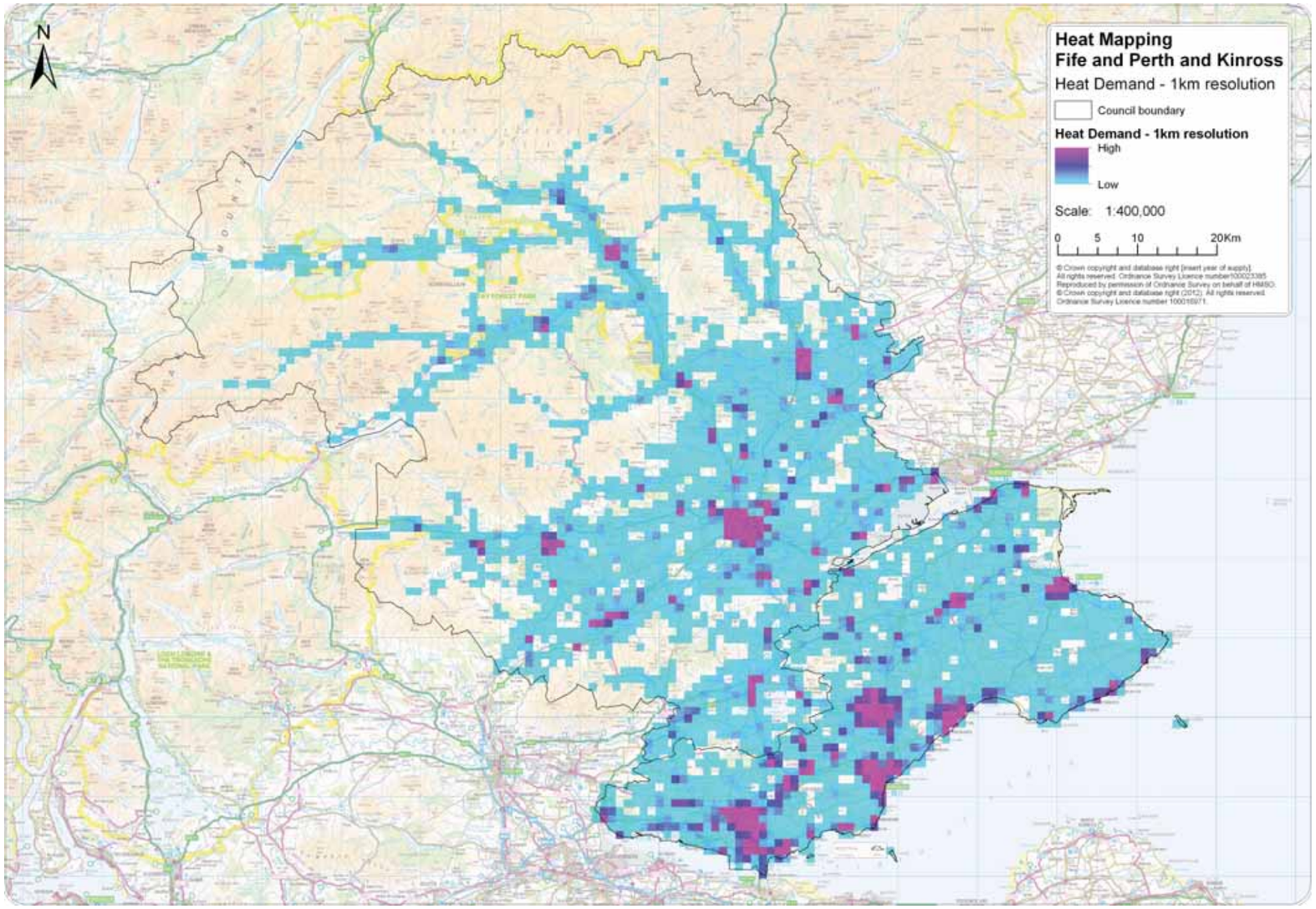


Figure 3.2 Study Area wide Heat Demand




Figures 3.3 - 3.13 illustrate a series of large scale map outputs for the Heat Demand layer for different locations within the study area. At these larger scales the level of detail available to the user is increased with not only a finer resolution of output available but a point data source indicating locations of major energy loads across the map.

Figures 3.14 and 3.15 illustrate the confidence levels associated with the heat demand calculations for Dunfermline and Perth respectively. This information is available for all locations and should be used by users to understand the robustness of the calculation method used.

The assignment of confidence levels is discussed in more detail in Section 2.2.4.1.

Figure 3.16 displays information from the remaining heat demand layer. This illustrates the percentage of households that are currently experiencing fuel poverty. This information is available at a census Output Area level. An Output Area is a spatial geography which on average covers an area containing approximately 50 households. This is very detailed and highlights the extremes of fuel poverty more clearly than is possible with a datazone.

Figure 3.3 Heat Demand - Cupar

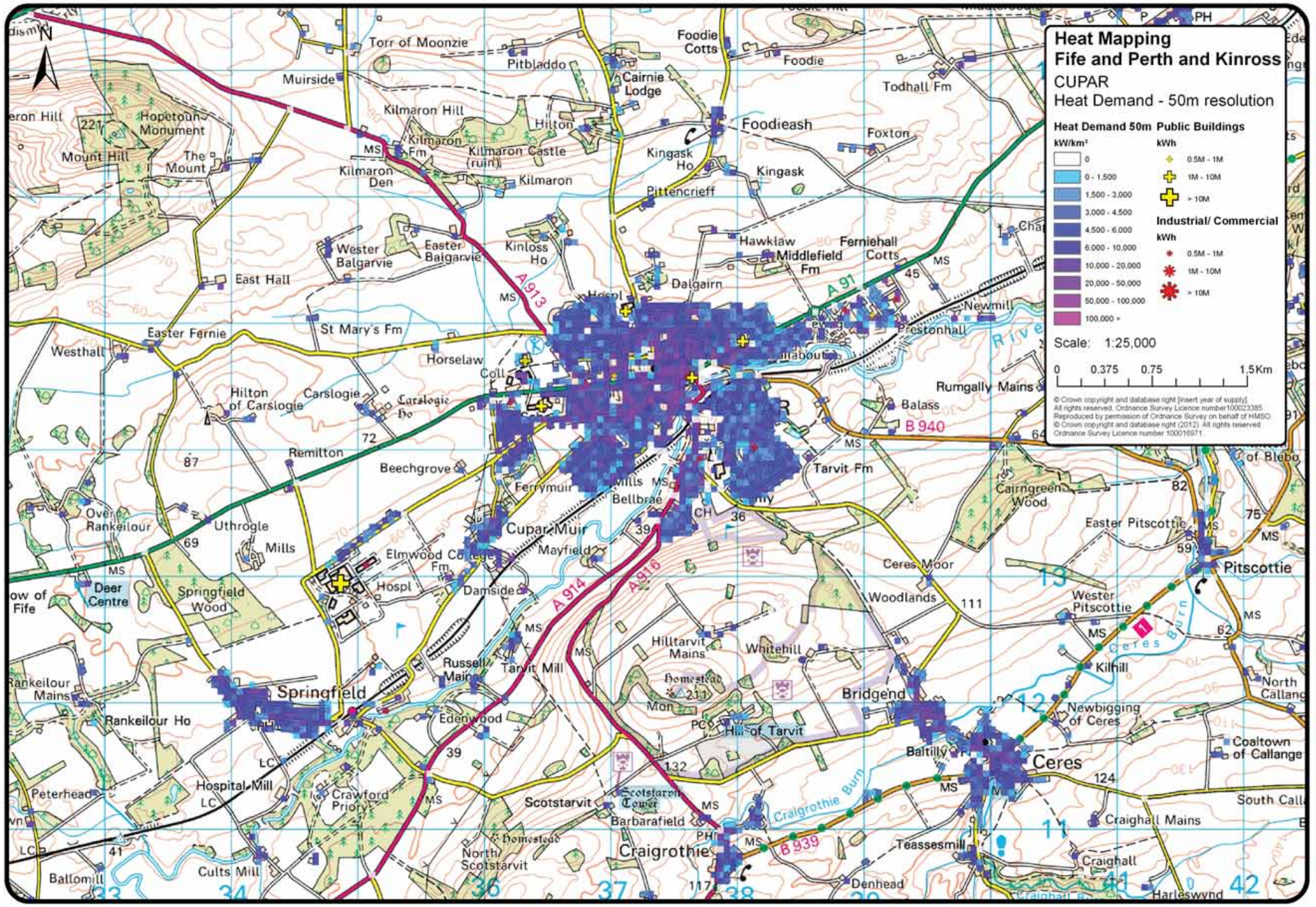


Figure 3.4 Heat Demand - Dunfermline

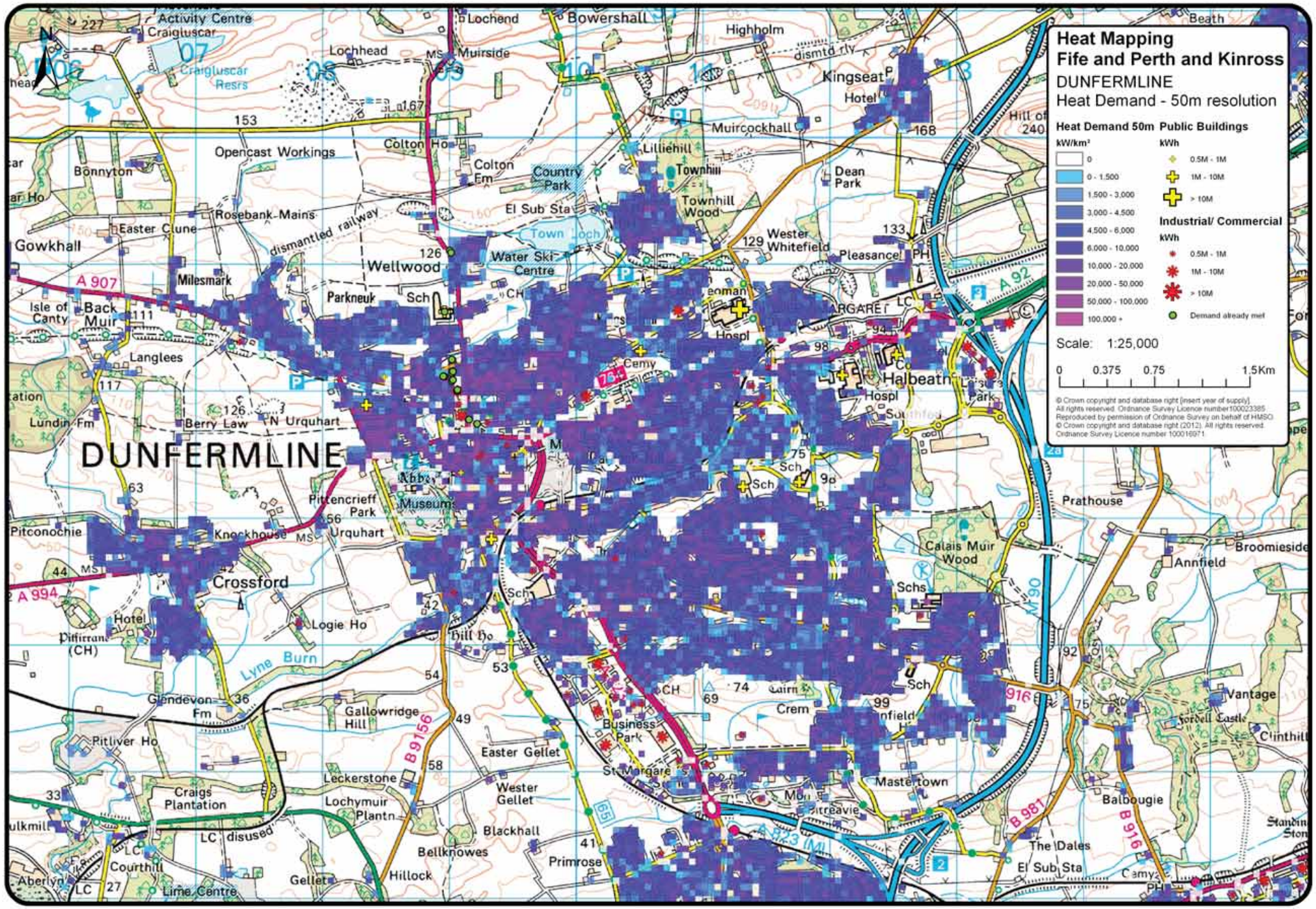


Figure 3.5 Heat Demand - Glenrothes

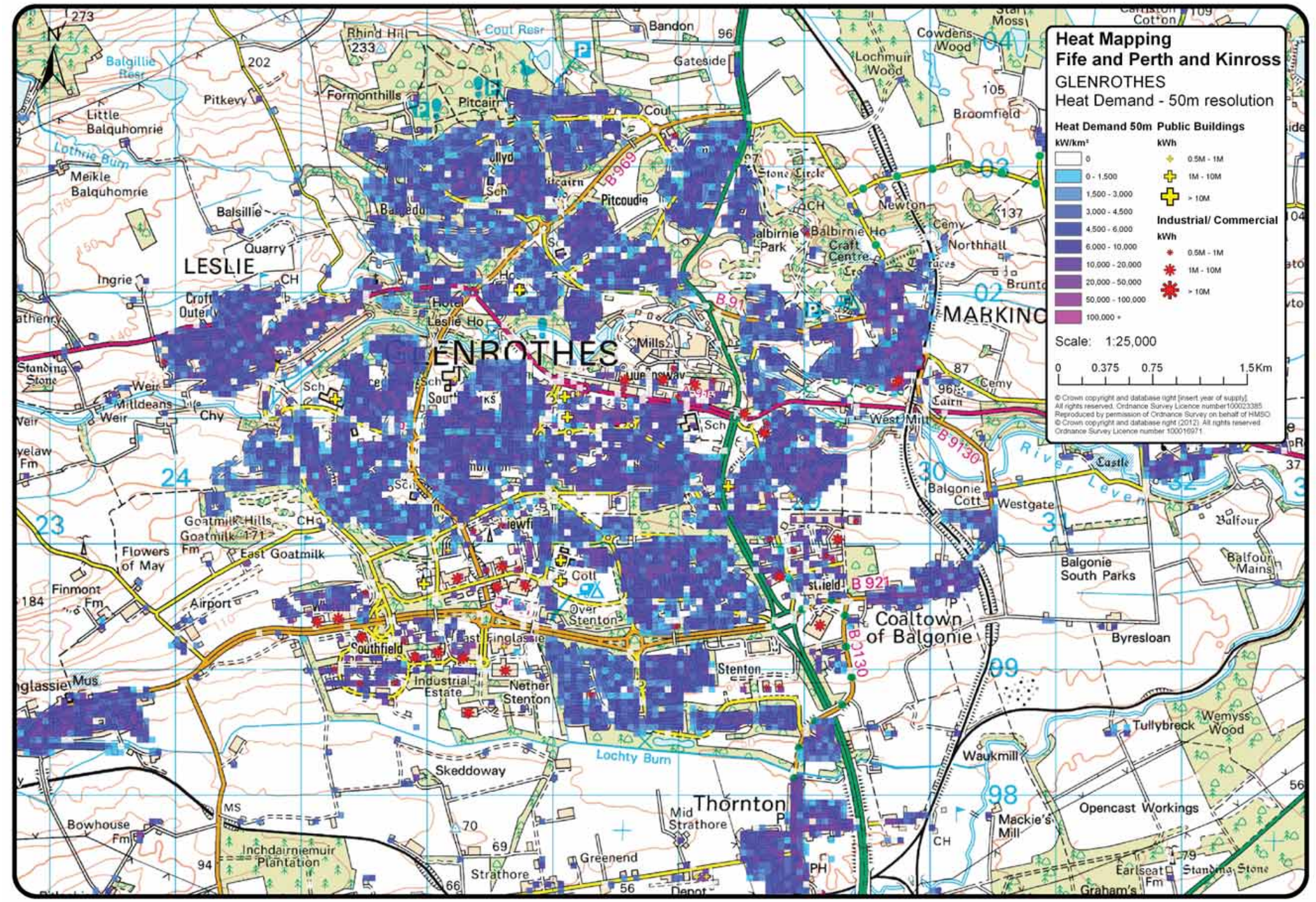


Figure 3.6 Heat Demand - Kirkcaldy

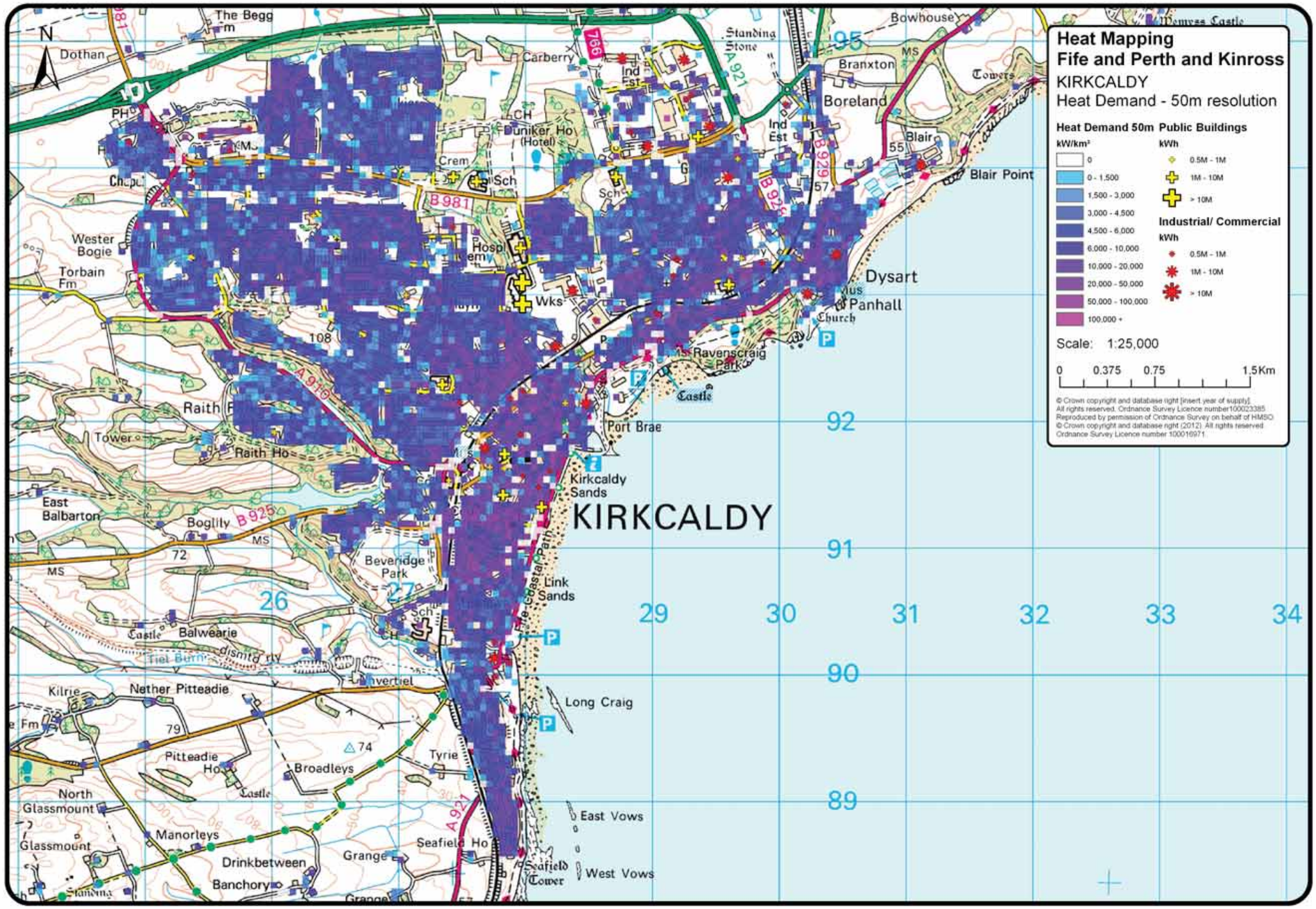


Figure 3.7 Heat Demand - Methil

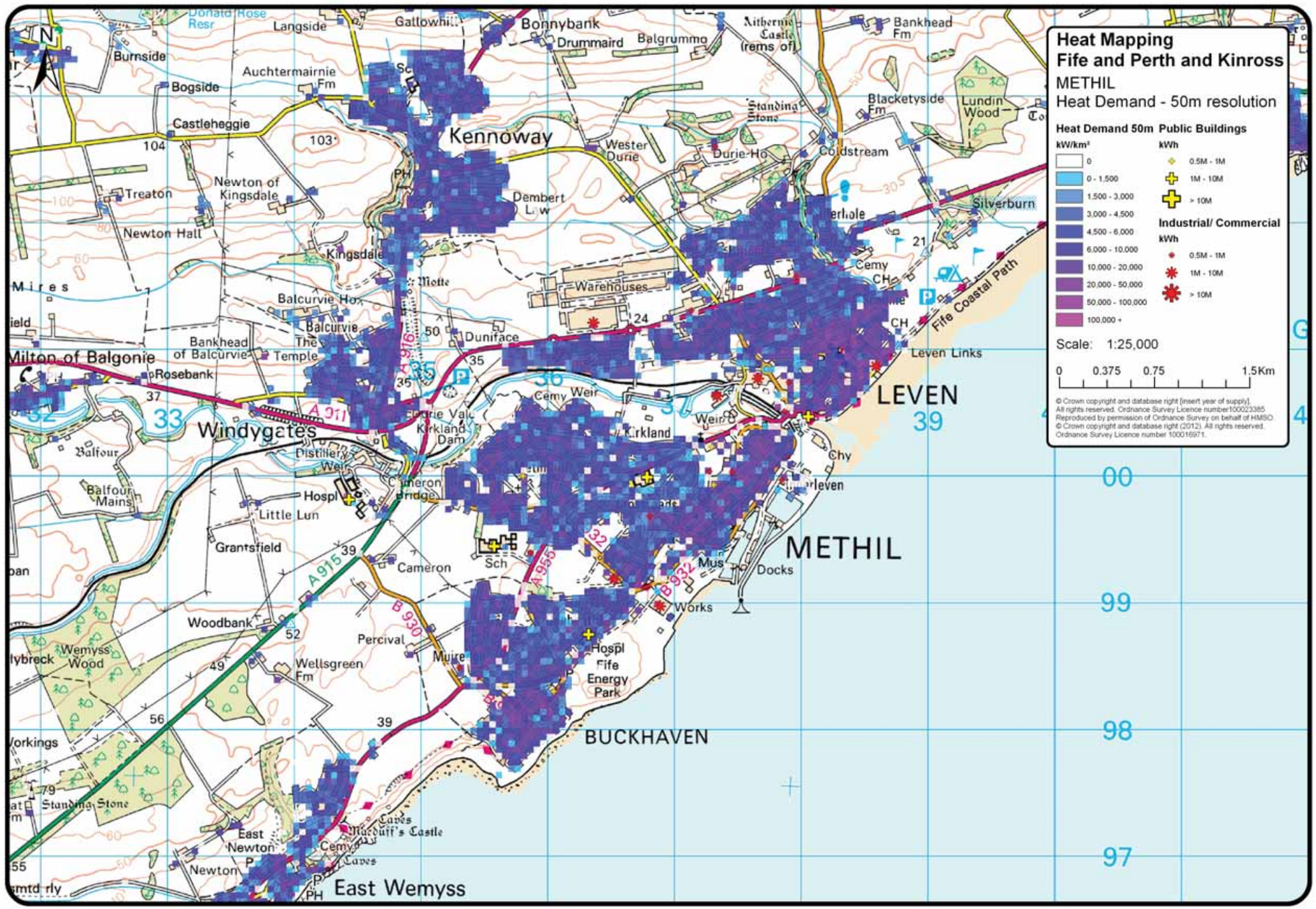


Figure 3.8 Heat Demand - St Andrews

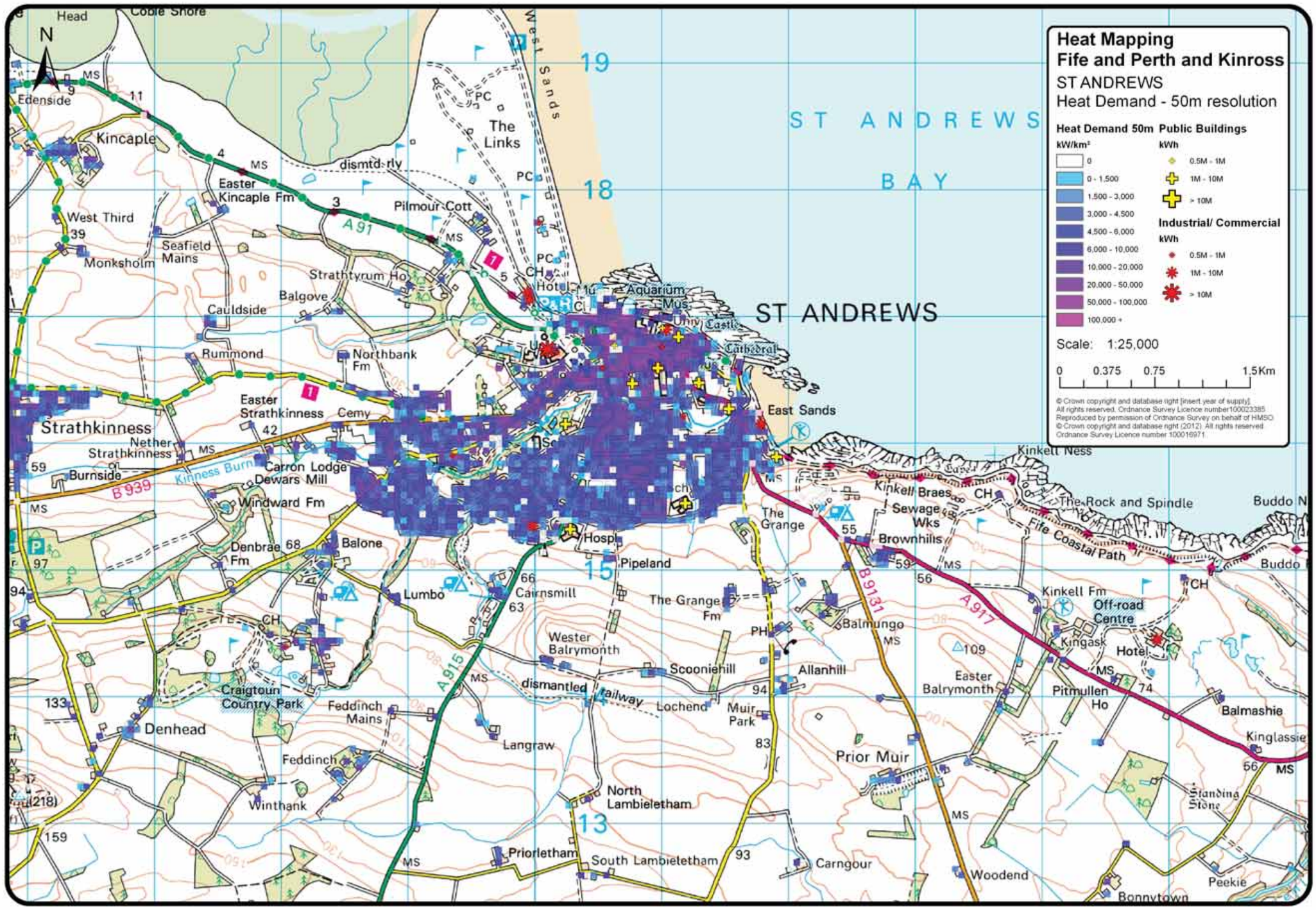
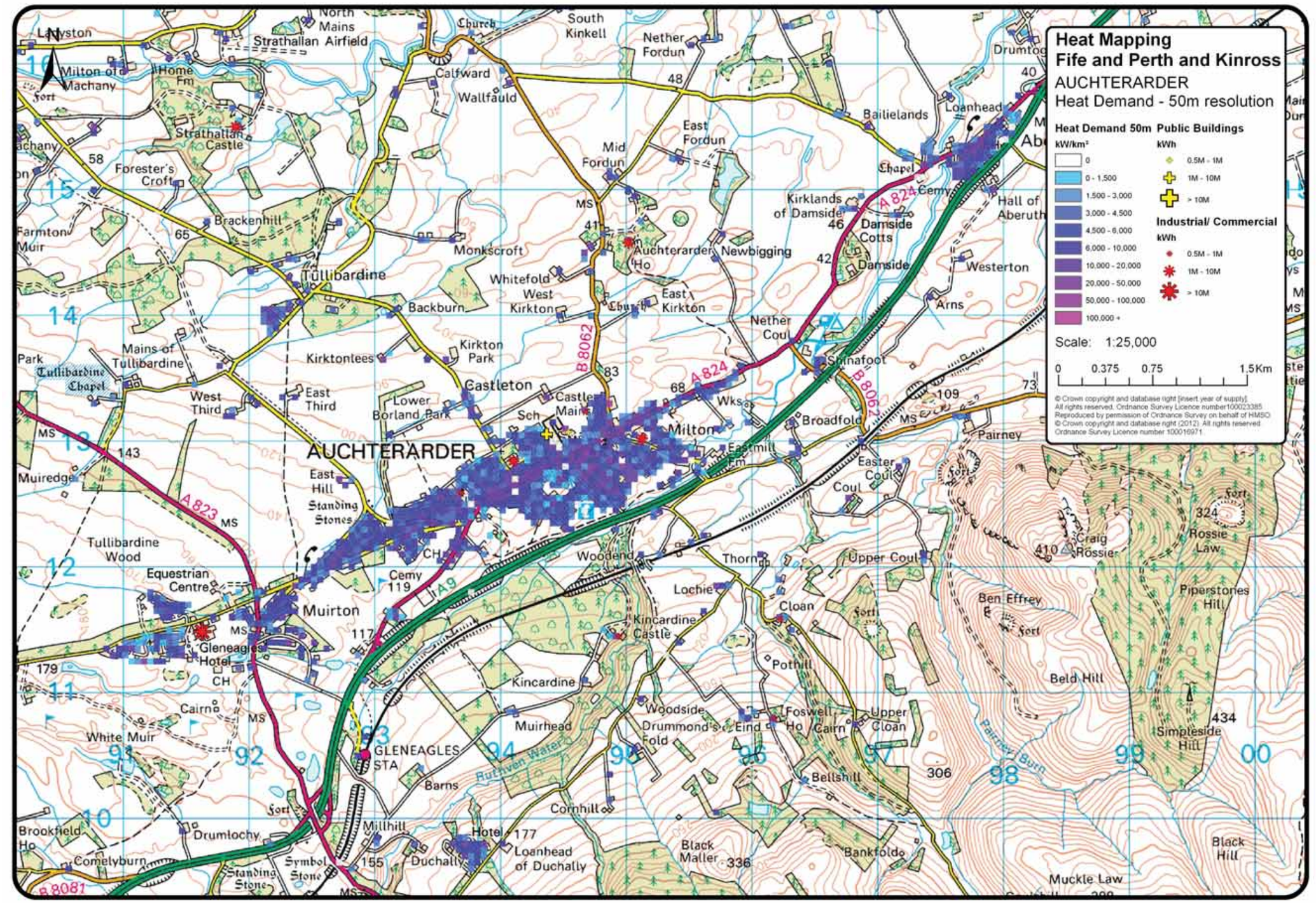


Figure 3.9 Heat Demand - Auchterarder




# Heat Mapping - Fife Council and Perth & Kinross Council

Figure 3.10 Heat Demand - Blairgowrie

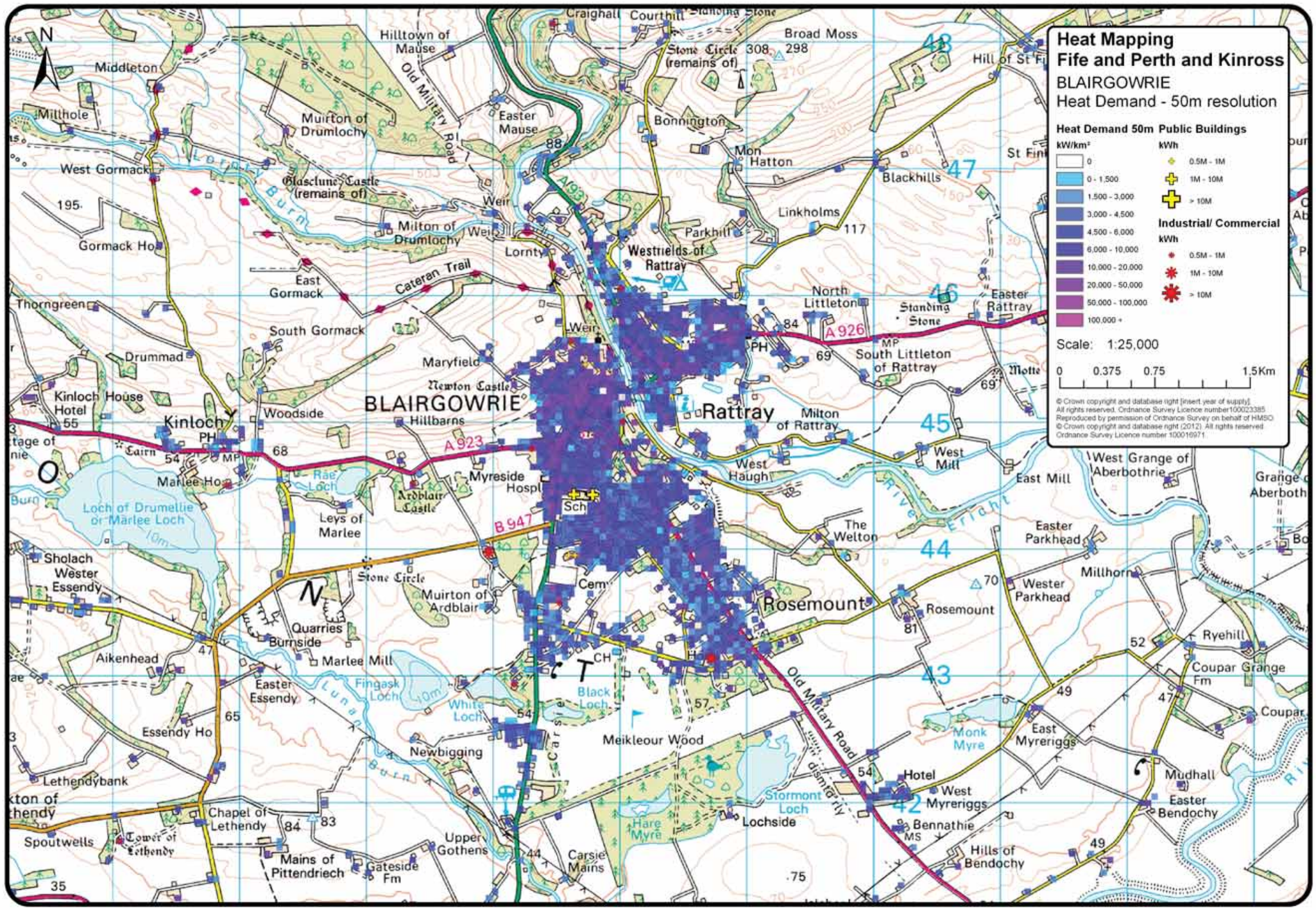


Figure 3.11 Heat Demand - Crieff

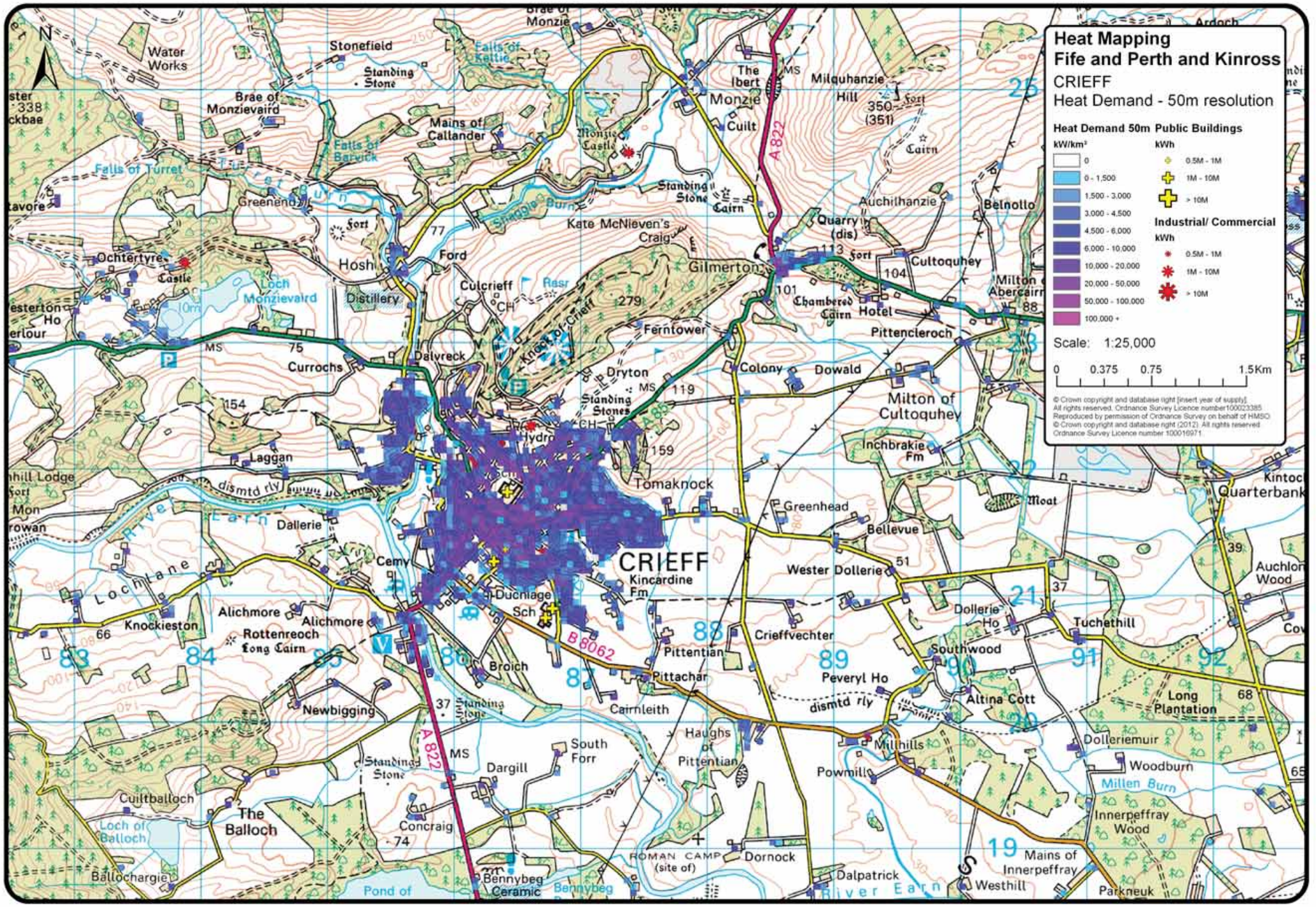


Figure 3.12 Heat Demand - Perth

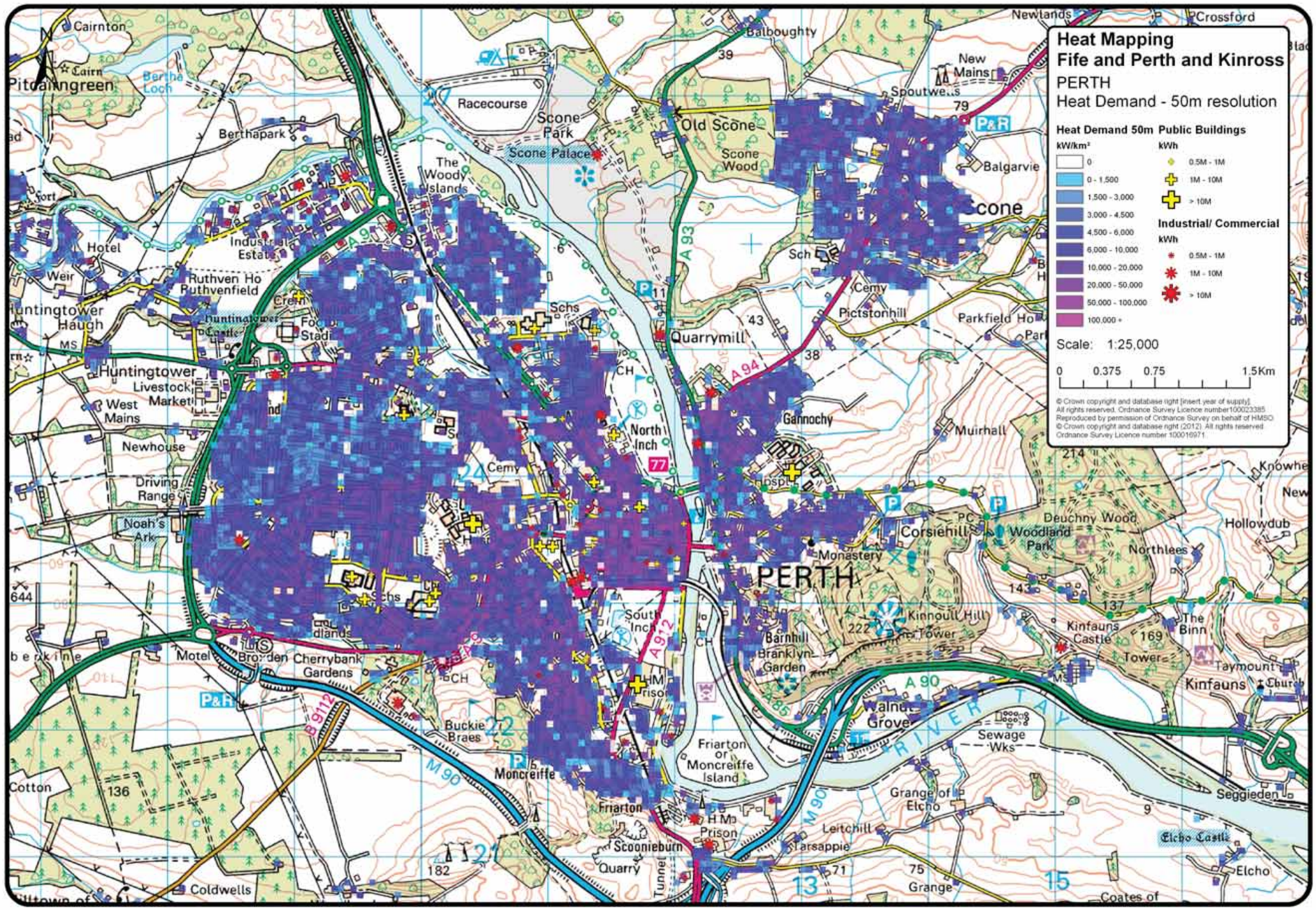


Figure 3.13 Heat Demand - Pitlochry

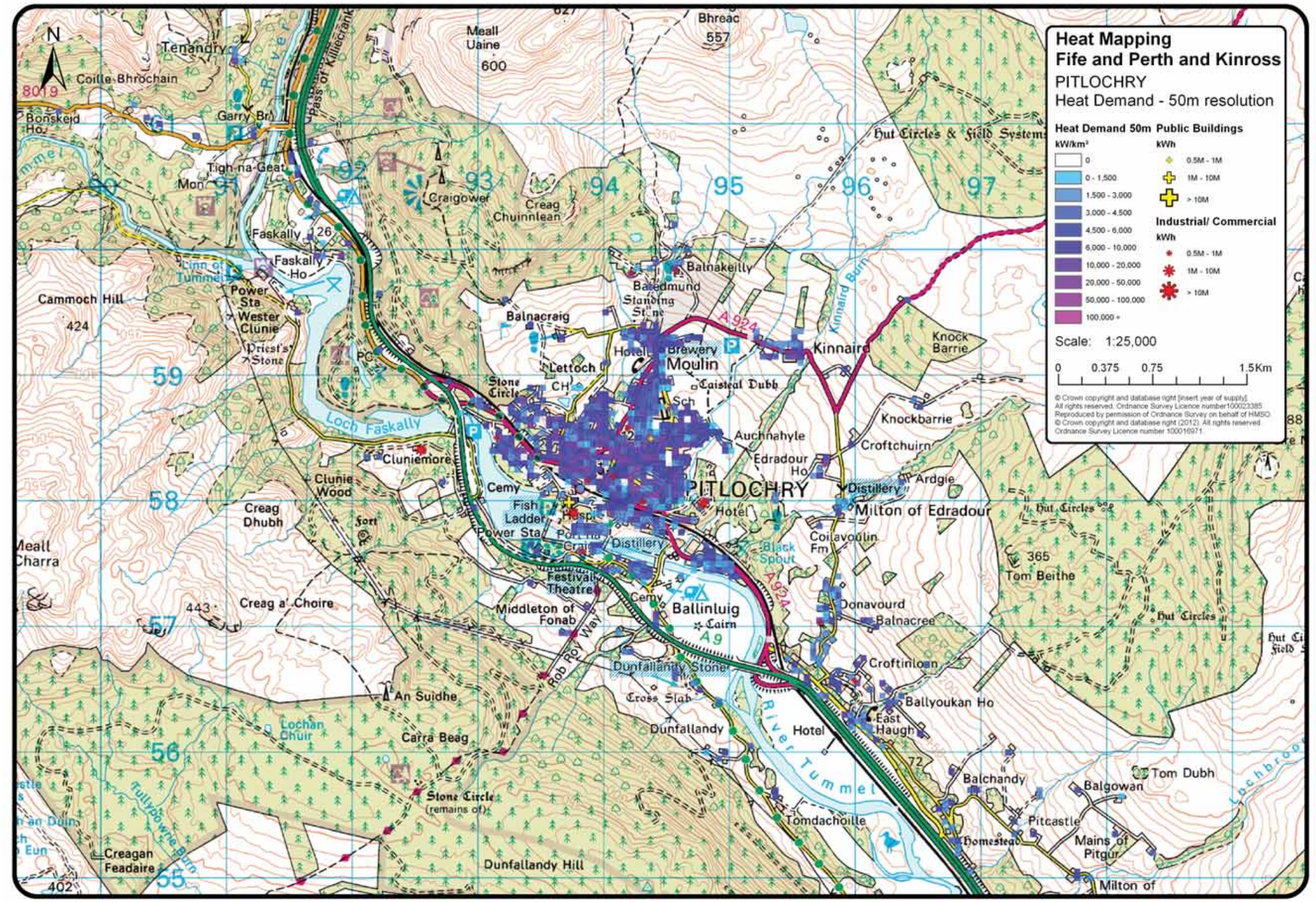


Figure 3.14 Heat Demand Confidence - Dunfermline

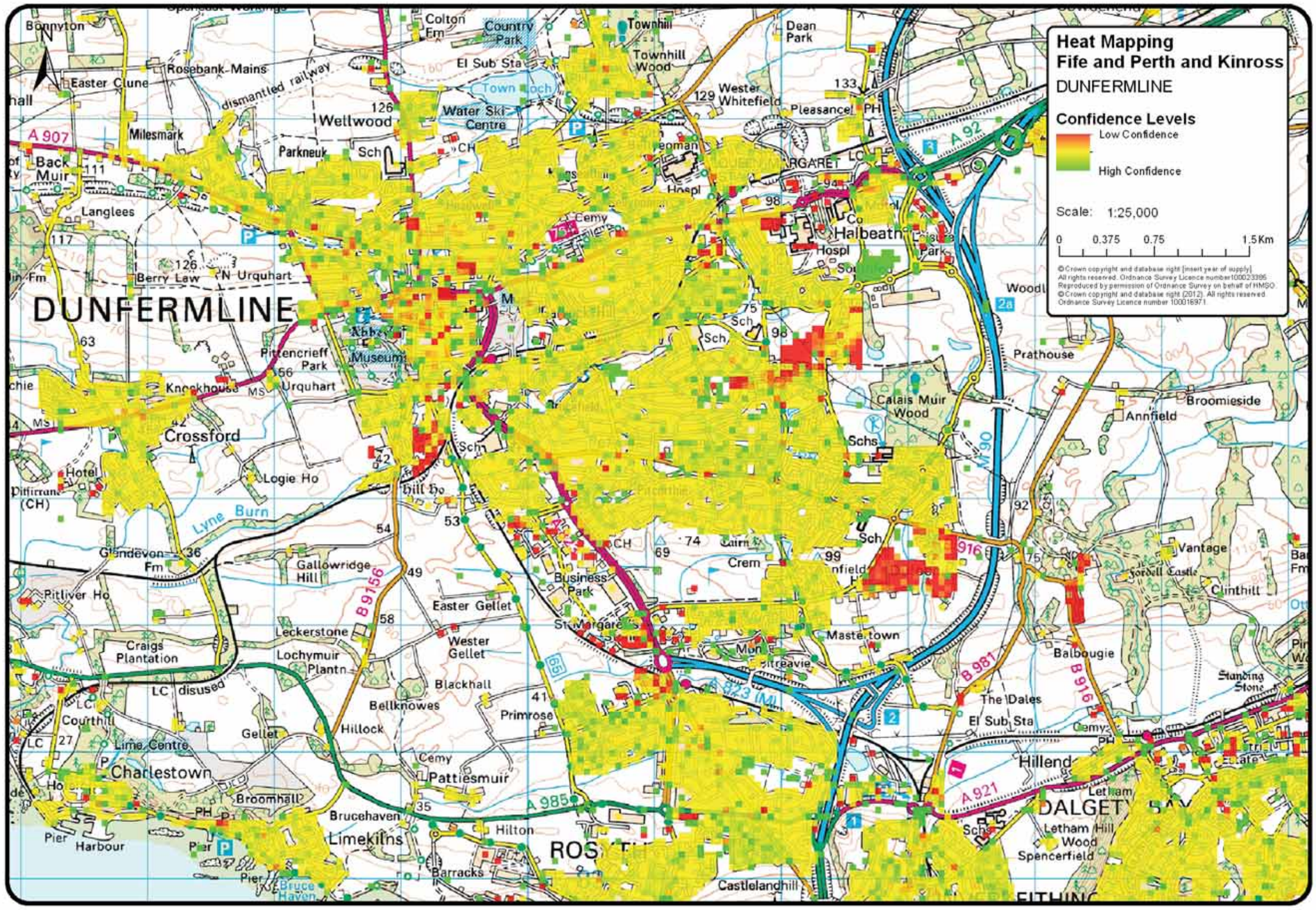
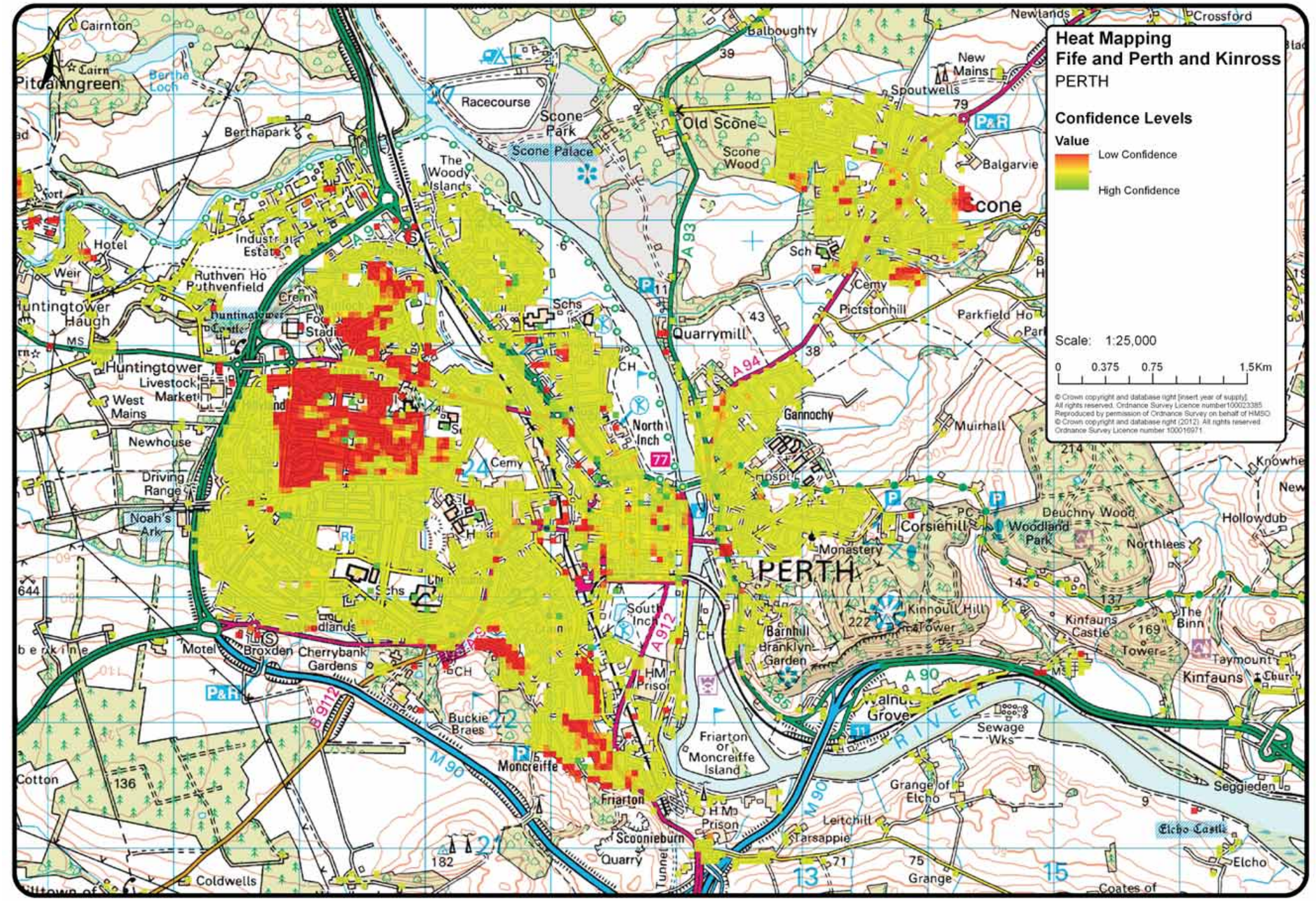
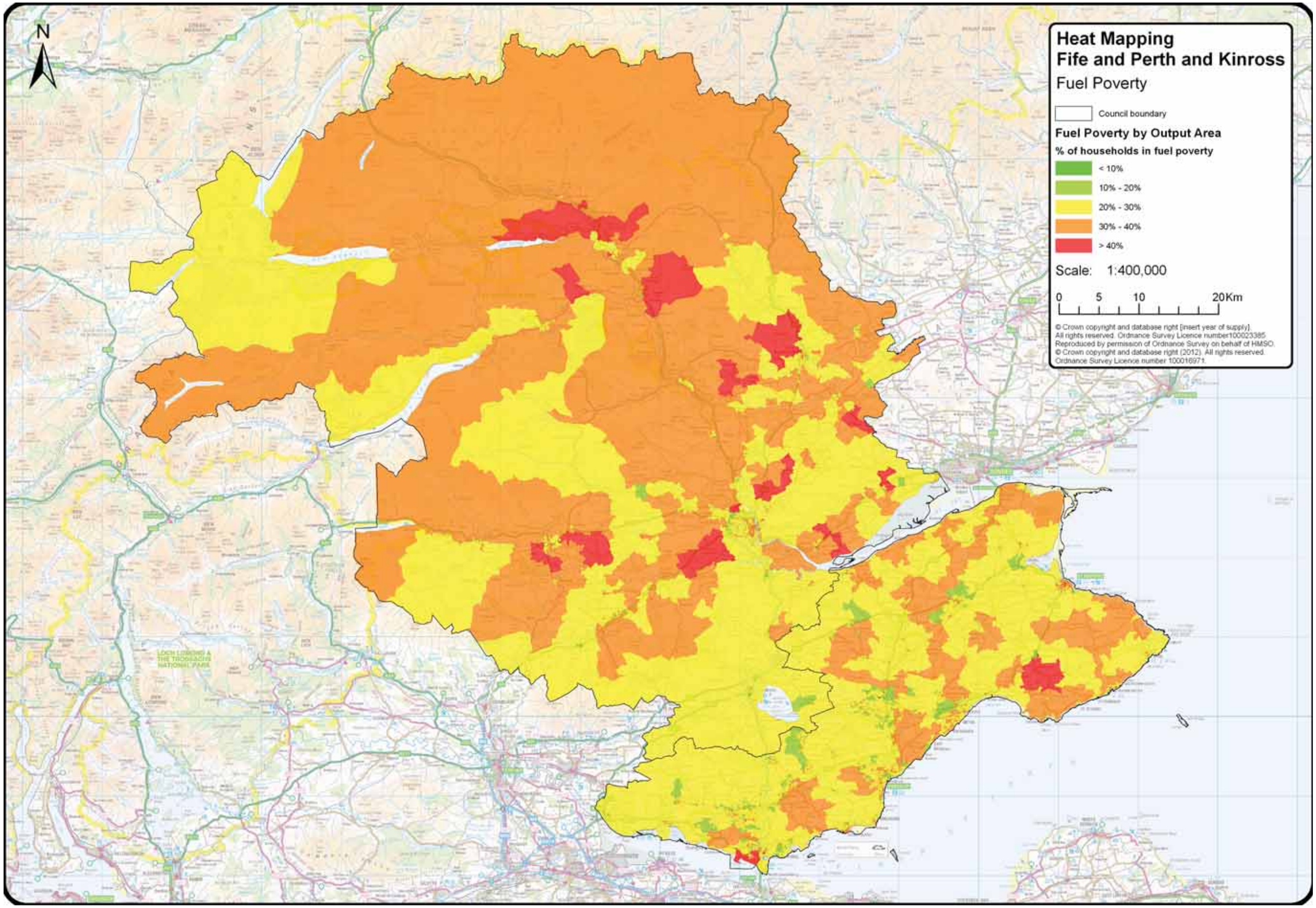


Figure 3.15 Heat Demand Confidence - Perth




# Heat Mapping - Fife Council and Perth & Kinross Council

Figure 3.16 Fuel Poverty



### 3.2 Potential Heat Supply

Figure 3.17 illustrates the layers of information that have been identified relating to potential heat supply. These are a combination of point, line and polygon data sources which have been included because of their potential as a source of heat. All information relating to the locations of potential heat supply can be displayed at any user specified scale. Figure 3.17 illustrates this information for the entire study area.

**Distilleries** have been included as potential heat sources as these can present an opportunity to access any surplus heat production. This type of heat source could be of interest when planning locations of potential district heating networks.

Locations of **existing fossil fuel suppliers** have been identified to provide an indication of where existing heat supply is sourced from. Supply has been broken down by the fossil fuel type (i.e. Oil, Coal).

Locations of **existing woodfuel suppliers** have been identified. Additional information relating to the products available from each location is also provided.

Locations of **existing industrial heat production** have been identified. These could theoretically offer potential for wider heat supply. Types of existing industrial heat production within the study area includes power stations, sewage plants and a paper mill.

The locations of **existing renewable schemes** including District Heating networks within the study are have been identified. Where it exists, additional information relating to the energy value for each scheme has also been included.

Locations of **existing methane emitters** have been identified. These could offer potential supply opportunities for potential energy from waste schemes. These could also provide opportunities for low carbon heat. Within the study area this includes Landfill sites, sewage plants and poultry farms. Additional information relating to these locations has been added where available.

Areas that are served by the **gas grid** have been identified. This is based upon access to the gas grid by datazone, showing all datazones that are wholly or partially served by the gas grid.

Locations of potential **minewater** have been identified with values for heat from discharges. The locations of other collieries have also been included along with the pumping sites and discharges.

Only suppliers located within the study area have been included on the map. There will be suppliers located outwith the study area who also supply these locations.

### 3.3 Skills/ Technology

Figure 3.18 illustrates the contents of the Skills/ Technology suppliers theme.

Locations of **technology suppliers** have been sourced from the Microgeneration Certification Scheme (MCS). This layer also includes information about the types of technology that each supplier deals in, including low carbon heat technologies.

**Educational establishments** offering renewable energy related courses have also been identified. The names of available courses has also been supplied for each establishment.

The information included in this theme is dynamic in nature and is likely to change rapidly over time. Consideration is being given by the Council to whether this theme could be linked into existing corporate databases which contain this type of information.

### 3.4 Opportunities and Constraints

The final theme relates to opportunities and constraints relating to a range of other criteria including ecological designations, flood risk, air quality management areas and local planning site allocations for future development.

Figure 3.19 illustrates the constraints included within this theme. These relate to flood risk, natural heritage designations and air quality management areas. Each of these constraints were considered during the opportunity assessment.

Figure 3.20 illustrates information relating to potential renewable heat opportunities. These have been sourced from the Local Plans for each Council and have been used as the starting point for the opportunity assessment. Each opportunity has been categorised according to type (i.e. Housing, Employment etc.).

Information has also been sought relating to the Forest and Woodland Strategies for each Council area but has not yet been included. National guidance from the Forestry Commission on developing FWS, “The Right Tree in the Right Place” recommends a spatial approach which identifies different types of woodland including energy forests with potential to contribute to woody biomass energy production. The draft Fife FWS is currently being reviewed, and once completed this information can be added to the Heat Map. An Indicative Forestry Strategy exists for Perth and Kinross. When this is updated in due course to a FWS this information should also be added.

Figure 3.17 Potential Heat Supply

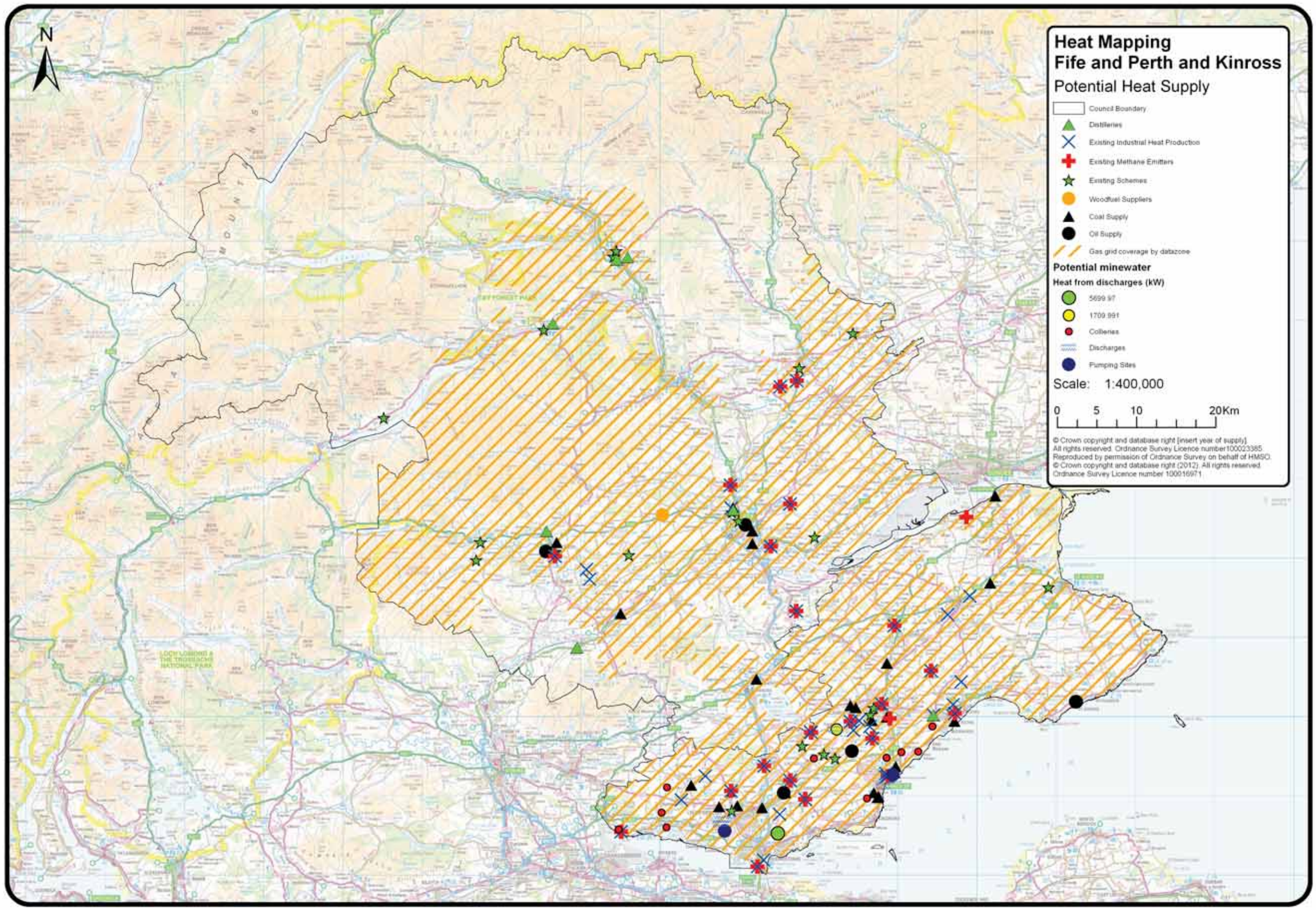


Figure 3.18 Skills and Technology Suppliers

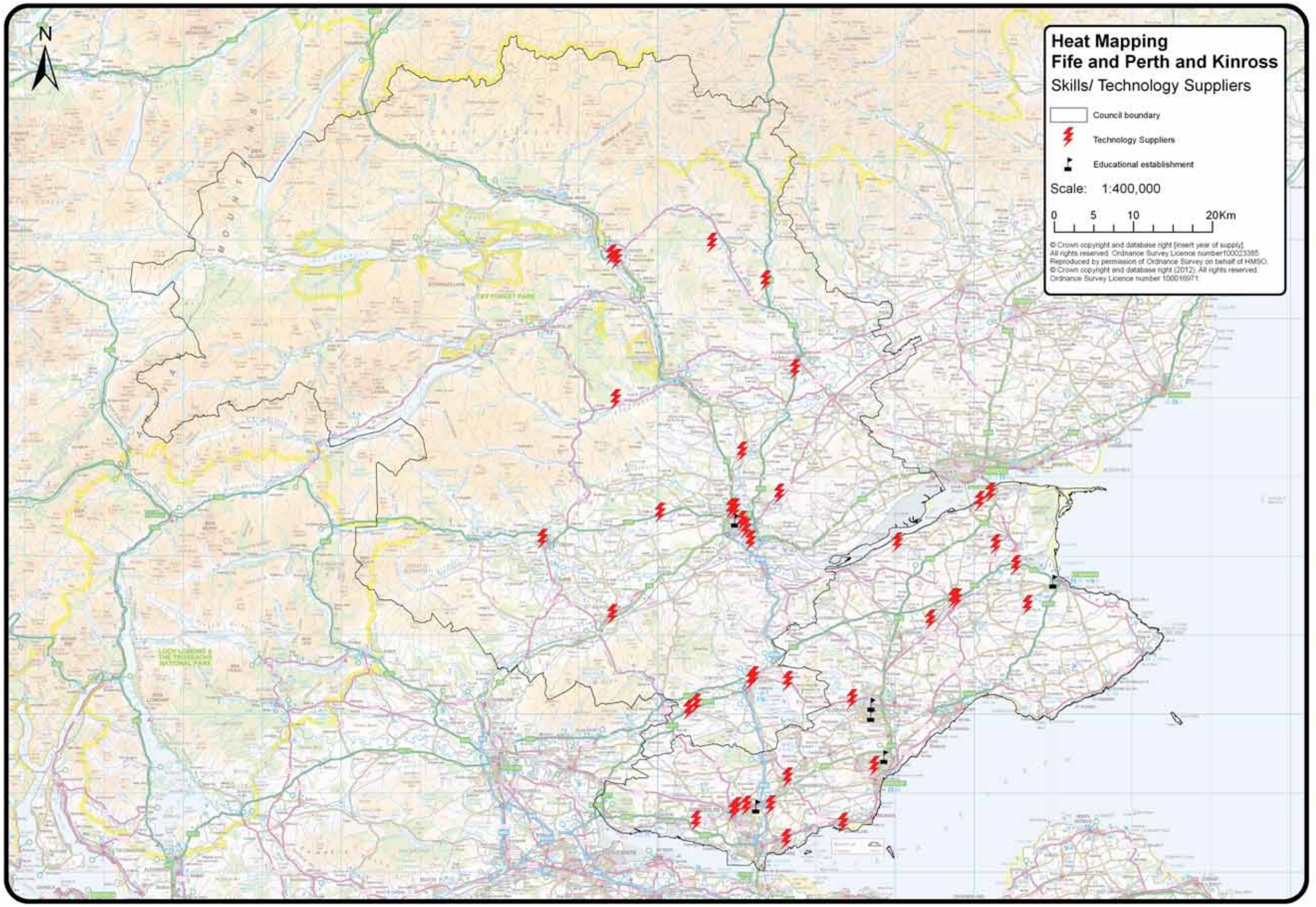


Figure 3.19 Constraints

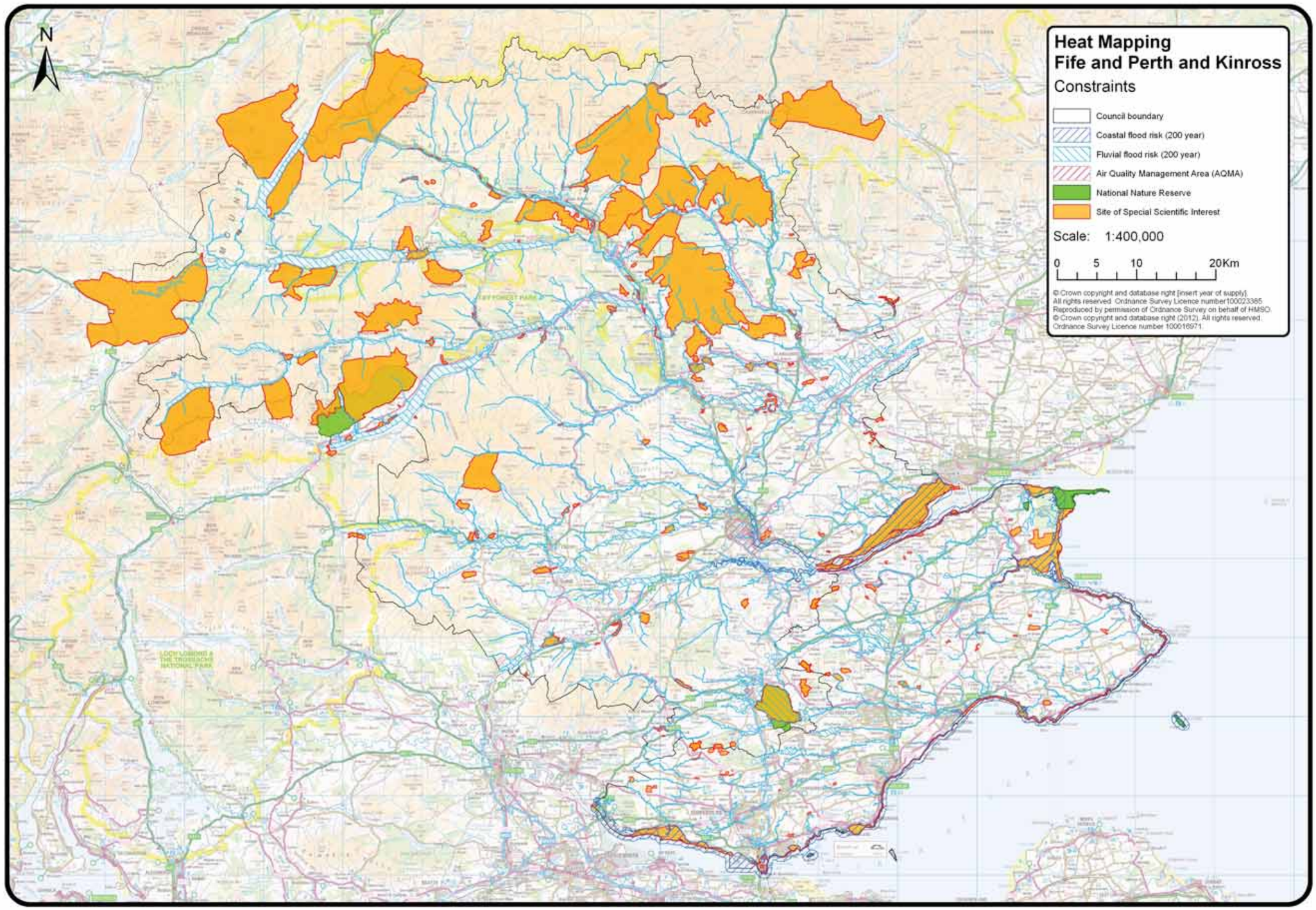
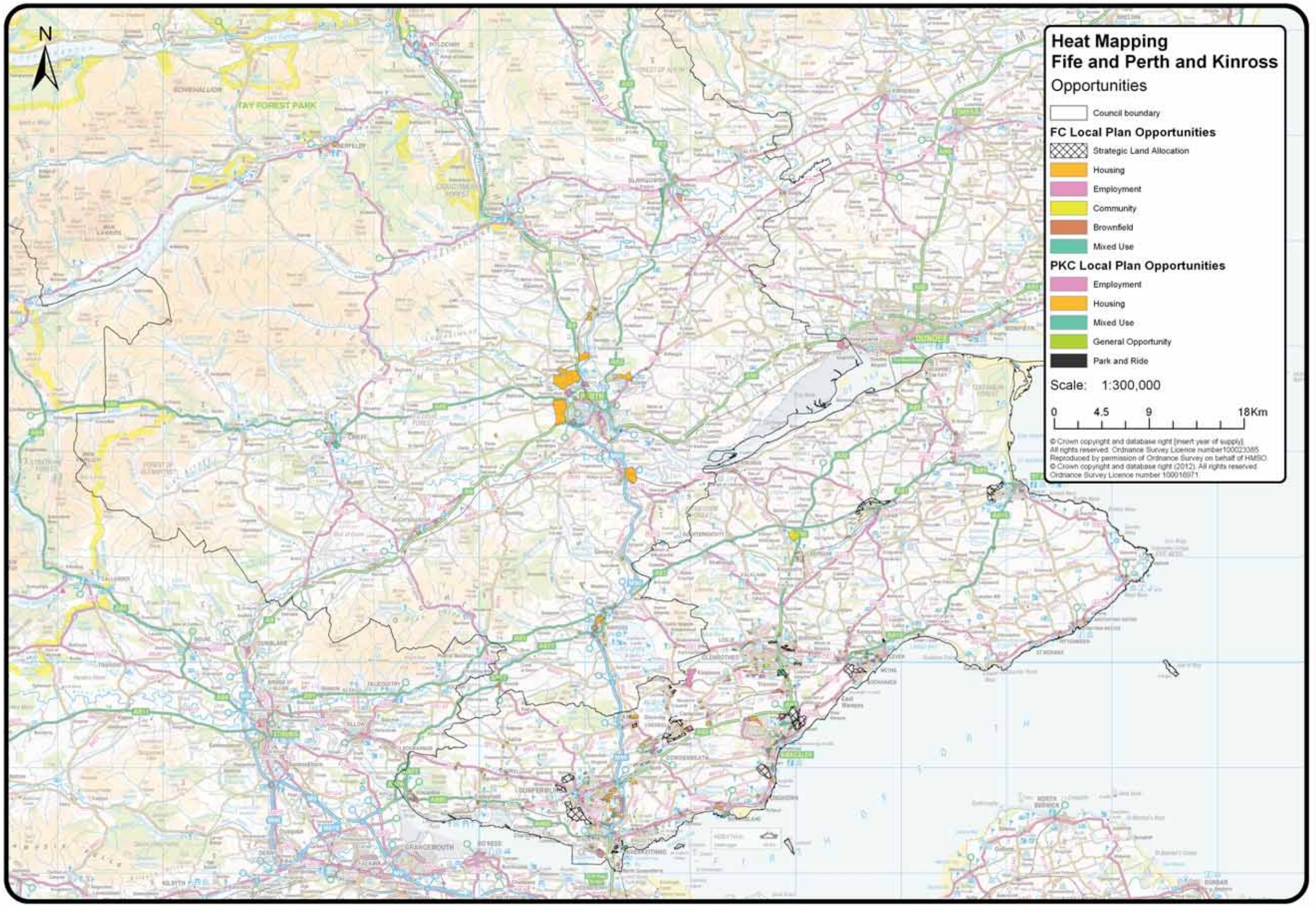


Figure 3.20 Local Development Plan Opportunities



## 4.0 GIS Tools

One of the key strengths of the Heat Map is that it has the potential to be much more than just a static map. It has been designed so that the information within the map can be easily interrogated and analysed to help inform the future planning of renewable heat opportunities. A range of additional functionality has been provided which extends the value of the Heat Map and makes it easier to use. This GIS functionality helps to address some of the key questions that people may wish to interrogate the map for. The toolset has been based upon feedback from stakeholder sessions in Highland, Fife and Perth and Kinross Council areas. For example , a planner or developer may wish to understand how a new development might affect the level of heat demand in a neighbourhood whilst also identifying the locations of any existing potential heat supply within a specified distance.

The design of the Heat Map in GIS means that users already have a wealth of potential analytical tools at their fingertips. At the most basic level, standard GIS functionality allows users to:

- View - zoom in/ out, pan, switch layers on/ off, alter symbology
- Interrogate - identify locations/ attribution associated with features
- Analyse - spatial relationships of features

Beyond this simple functionality the Heat Map includes a suite of customised tools which do not require extensive GIS expertise to use. The key rationale behind the development of the functionality was that it should address common questions that users are likely to ask of the map and present the tools in an easy to use format.

The original functionality that has been developed for the Highland Council Heat Map has been refined where appropriate. As a result of the stakeholder workshops run for this project some additional functionality has been designed to address feedback from these events.

The tools that have been developed are:

- Scenario Development Tool - REVISED
- Development Proposals – Proximity Summary
- Search Tool – Areas of Heat Demand
- Search Tool – Skills/ Suppliers/ Knowledge
- Postcode Reporting
- Geoprocessing Log - NEW

Each tool has been developed using ArcGIS ModelBuilder. ModelBuilder is an application within ArcGIS which can be used to create, edit, and manage models. Models are workflows that string together sequences of spatial analysis tools, feeding the output of one tool into another tool as input. Using ModelBuilder is an effective way of streamlining frequently carried out tasks in a consistent and efficient manner. ModelBuilder is a visual programming language for ArcGIS but is quite accessible to GIS specialists with knowledge and experience of ArcGIS.

The tools have been developed for use by trained GIS professionals and staff from both Councils have received training in the use of them.

Each tool is described in more detail in the following sections.

### 4.1 Scenario Development Tool

**Purpose**

To update the heat map with heat demand values for new or proposed developments (residential or industrial/ commercial) to allow the user to understand the impact that new development will make on heat demand in a particular location.

**Inputs**

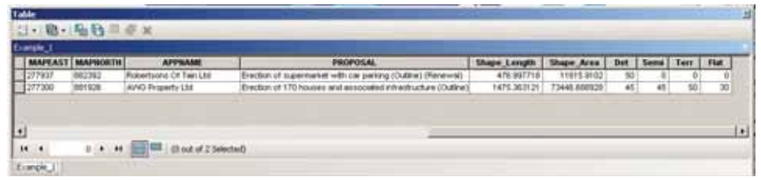
Users can input information about the new development in one of four ways. There has been a model developed for each of the four options:

1. Polygon – the user can provide an areal boundary of a new development
2. Point – the user can provide centroids of individual units within a new development
3. Heat Value (Polygon) – the user can enter the proposed heat values for the development (if available)
4. Heat Value (Point) - the user can enter the proposed heat values for each unit in a development (if available)

If proposed energy values for a new development are available these should be used wherever possible (i.e. options 3 or 4). In the event that this level of information is not available, then options 1 & 2 should be used. Users should also note that using point information (options 2 & 4) relating to unit level data will always provide more detailed results than using a polygon site boundary (i.e. options 1 & 3).

In order to accurately calculate potential energy values for new developments it is necessary to input some information about the development. For residential properties this relates to house types, and for commercial/ industrial this relates to the 29 CIBSE benchmarks that have been used in the heat demand calculations. A template feature class pre-populated with this attribute information has been provided. Figure 4.1 illustrates the required format for the input information for a residential development.

Figure 4.1 Input table for residential development




**Applications**

This tool has been designed to be used specifically for assessing the impact of planning applications or testing potential development plan allocations.

The level of detail that will be achieved from the outputs depends on the level of detail contained in the inputs.

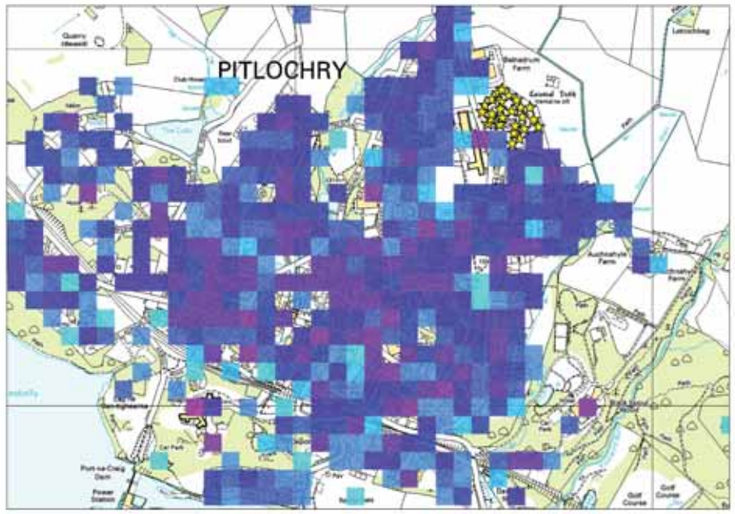
**Outputs**

Figure 4.2 illustrates a typical before and after scenario where two separate proposals are planned (one for retail and one for housing), indicated by the red line boundary. The spatial accuracy of the outputs will depend on the level of detail available regarding the development. This example shows a planning application boundary but does not include the detail of where the different property units will be located. In this instance it is only possible to make an assumption that the heat demand would be spread consistently across the whole site. Where more information exists, (e.g. in a masterplan) each development block could be modelled to give a more realistic impression of potential heat demand across the whole site. The tool also offers an option for the user to input more detailed information as points, if this is available. This will provide the user with a more detailed output which will reflect more closely the impact on heat demand of different types of development.

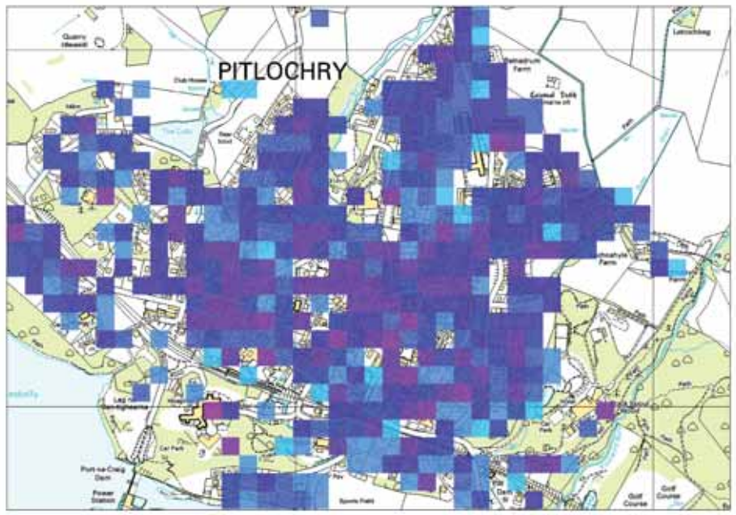
A Heat Map Differential is also output as a raster displaying the extent and value in which the heat map has increased as a result of the scenario. The location and name of the new heat map differential raster must be specified by the user in the tool dialog. The output heat map is rendered using a standard symbology.

Figure 4.2 Scenario Development - Before and After (Pitlochry)

Before




After




## 4.2 Development Proposals - Proximity Summary

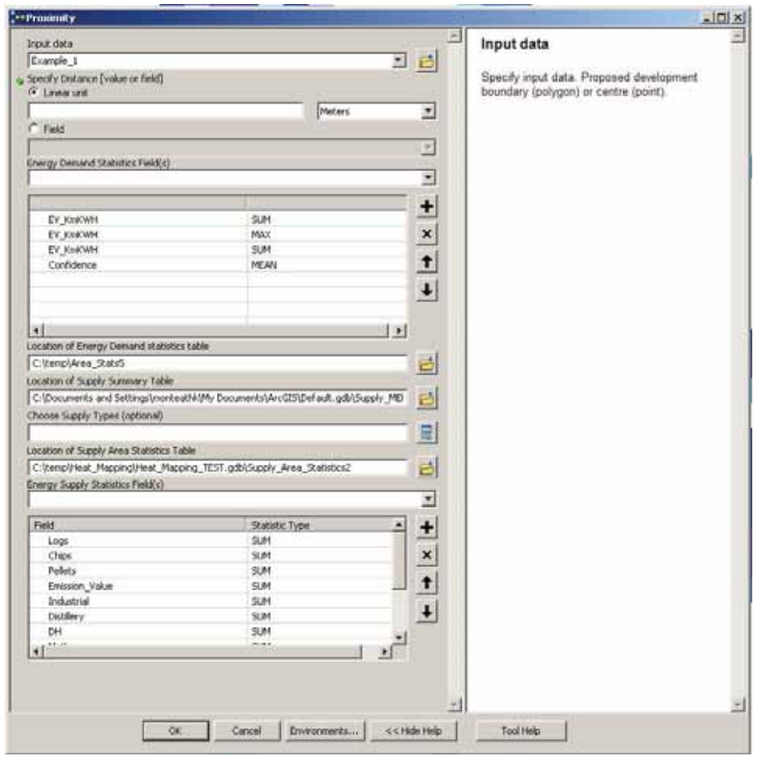
**Purpose**

To summarise the heat demand and potential heat supply within a user specified location. This can be from a specific point location or from the boundary of a development proposal.

**Inputs**

The tool requires the user to provide a location (either a point or a boundary dataset) and specify a search distance within which they would like statistics for, relating to heat demand and potential heat supply. The user also has the option of narrowing down the results by specifying the type of supply they are interested in. If this option is not chosen, the default will list all types of supply. Figure 4.3 illustrates the tool dialog box through which the user is prompted for their inputs.

Figure 4.3 Tool dialog box




**Applications**

This tool has been designed for assessing development proposals. This differs from the previous tool in that it provides the user with a summary of the existing heat demand and supply within a specified area of influence of the development. These statistics can be used to highlight where there are existing areas of high demand and potential supply that could be suitable for renewable heat.

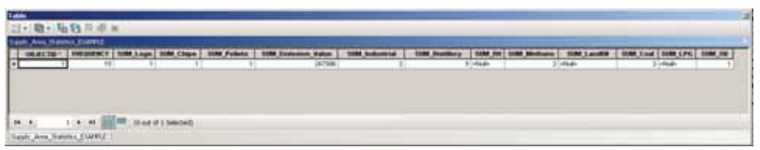
**Outputs**

Figure 4.4 illustrates the typical outputs produced from this tool. The outputs are in tabular form and consist of three tables. The information provided within the tables gives the user a summary of the overall heat demand and overall potential heat supply within the search area. It also provides the user with an additional breakdown of all potential heat supply sources within the area of search and the potential supply associated with these. Due to the format in which the outputs are provided these can be easily incorporated into other applications.

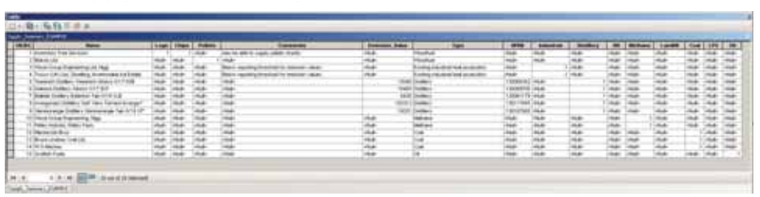
Figure 4.4 Tool outputs

Heat Demand Summary


Potential Heat Supply Summary



Heat Supply Sources Listing



## 4.3 Search - Areas of High/ Low Heat Demand

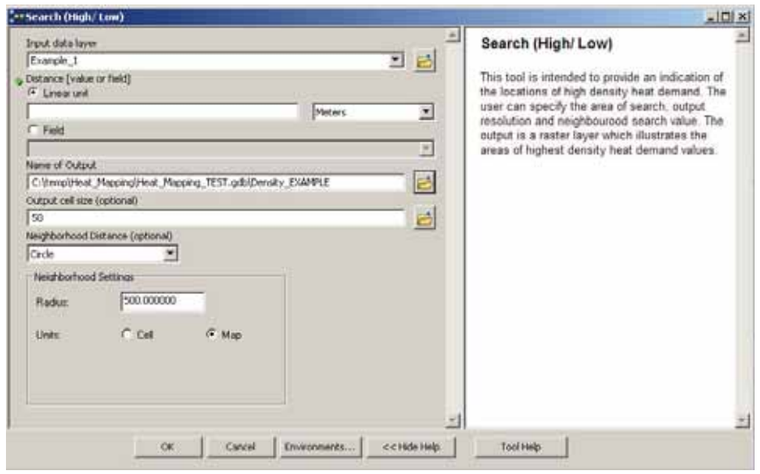
**Purpose**

To identify significant clusters of heat demand within a user specified location. This tool helps the user to visualise and highlight existing clusters of high heat demand for further investigation with regards to renewable heat opportunities. The outputs produced using this tool differ significantly from the Heat Map itself as heat demand is being calculated on a neighbourhood basis (i.e. each cell and its neighbouring cells) as opposed to each individual cell in isolation. The tool can also be used on previous scenario development tool outputs to predict whether new developments are likely to form part of significant clusters of heat demand where there may be opportunities to investigate renewable heat opportunities.

**Inputs**

The tool requires the user to provide a location (either a point or a boundary) and to specify a search distance which indicates how far from the input location the user is interested. The user is also required to provide a threshold distance to indicate the spatial influence of existing heat demand sources. This threshold signifies the neighbourhood in which the heat demand might exert an influence (e.g. the user may have a certain size/ scale of scheme in mind which would dictate the distance that existing heat demand may have an influence over). Figure 4.5 illustrates the tool dialog and the inputs required from the user.

Figure 4.5 Tool dialog

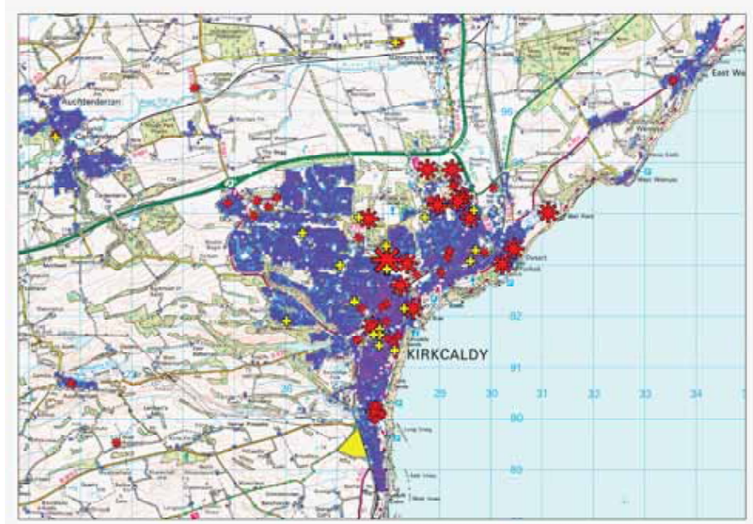



**Output**

The output from this tool is a density map created using the user specified parameters in the model. Figure 4.6 shows an example of the heat map and the output from this tool for the same area. This clearly illustrates why it is important to analyse heat demand across a neighbourhood as opposed to on a cell by cell basis.

Figure 4.6 Heat Demand compared to Heat Density (Kirkcaldy)

Heat Demand




Heat Density

## 4.4 Search - Skills/ Technology Suppliers

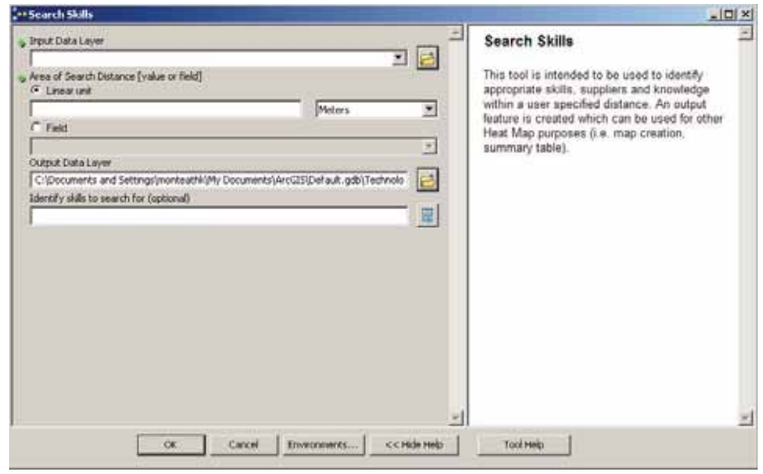
**Purpose**

To identify the existing skill base within a user specified distance of any location. An output data layer is produced which can be utilised in other Heat Map processes.

**Inputs**

The user is required to provide an input location (point, line or polygon) and an area of search radius. The user also has the option to specify which types of technology to search for. The default will search for all types. Technology types that can be searched for include Air Source Heat Pumps, Heat Pumps, Hydro, Micro CHP, Wind, Biomass, Solar/ Thermal, Ground Source Heat Pumps and Solar (Photovoltaic). Figure 4.7 is an illustration of the dialog box for this tool.

Figure 4.7 Tool dialog box




**Outputs**

The output is a data layer containing a selection of features extracted from the skills database using the user specified parameters. Figure 4.8 shows a typical example of the tabular results of this analysis.

Figure 4.8 Skills search output

## 4.5 Postcode Reporting

**Purpose**

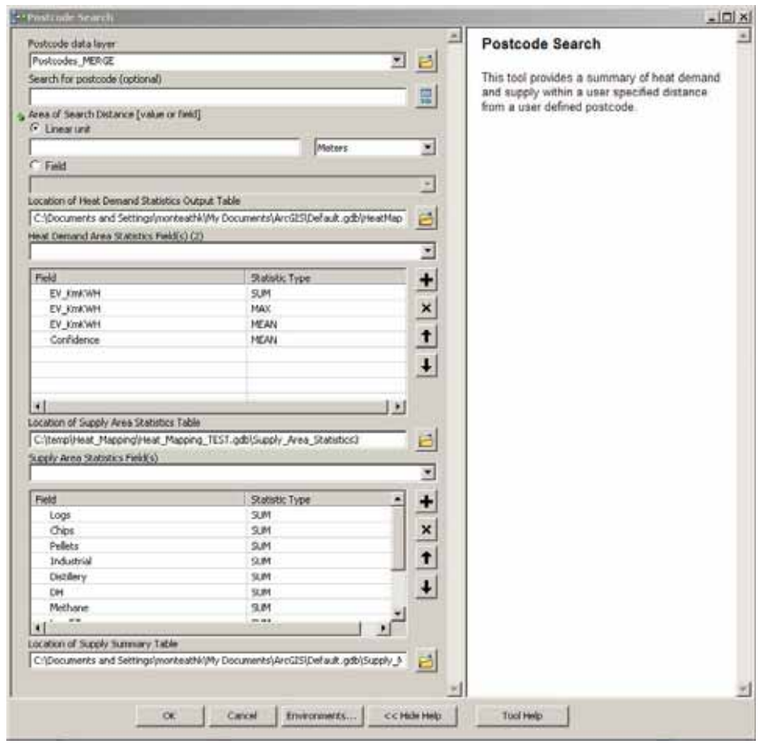
To allow users to search for potential heat supply and heat demand using postcode locations.

**Inputs**

The tool requires a minimum of two inputs from the user, a postcode and a search radius for the report. The user can also optionally specify the types of summary statistics that they require for both heat demand and potential heat supply. If these options are not taken then the default option will provide the user with some standard statistics. Figure 4.9 is an illustration of the dialog box for this tool.

Figure 4.9 Tool dialog box

**Outputs**




The outputs derived from this tool will take exactly the same form as those described in the Proximity tool (i.e. three output tables containing summary statistics for heat demand, potential heat supply and a summary of potential supply locations).

## 4.6 Geoprocessing Log

**Purpose**

All of the previously described tools contain two additional dialogue boxes which are designed to capture additional information directly from the user as well as automatically recording each time a tool is executed.

**Inputs**

Information requested from the user includes the following:

- User Name / Email – The user is required to provide some form of identification which is specific to the organisation. This information can be used to identify which members of an organisation are using the tools and how often each user is executing the associated process.

- Description – This provides the user with an opportunity to describe why they are using the tool. For example if the Scenario Development Tool is being run, the user could provide information on the development which has been selected as the input etc.

  In addition to the user inputs two other pieces of information are captured by the tool:

- Tool Executed – This information simply captures the tool run and stores it in the output table.

- Date Executed – The date and time in which the tool is run is captured based on the system clock

All information captured by this tool is stored in the Usage Log Table located in the General Model Data geodatabase.

## 5.0 Opportunity Assessment

The key purpose of the Heat Map is to be able to inform the decision making process for future planning of renewable heat schemes through analysis of a robust evidence base. The outputs should be quantifiable and be capable of comparison across different geographic areas.

This section illustrates how the Heat Map can be used to help identify potential opportunities for renewable heating. One of the objectives of the study was to use the Heat Map to identify potential opportunities within each Council area. We have identified 10 opportunities within each Council area. The method that has been used to identify these opportunities and the outputs are described in detail below.

## 5.1 Site Selection

The Local Development Plans for each Council were used to focus the search towards realistic locations for potential renewable heat development. Whilst other locations may have some merit, it was felt that the development locations identified in the Local Plans offered the best opportunities for the immediate future.

Local Development Plans for each area were reviewed and mainly new development proposals identified relating to the following policy areas:

- Brownfield
- Community
- Employment
- Housing
- Mixed Use
- Strategic Land Allocations

This provided a total of 502 sites for the Fife Council area and 137 for the Perth and Kinross Council area. Figure 3.20 highlights the locations of these opportunity areas.

## 5.2 Opportunity Assessment Method

A three stage process was developed which enabled the long list of sites for each Council to be narrowed down to the top ten most attractive potential locations.

- Stage 1 - GIS Multi Criteria Analysis (All sites)
- Stage 2 - Additional information gathering and spatial analysis (Top 20 sites from stage 1 only)
- Stage 3 - Expert review (Top 20 sites from stage 1 only)

It should be noted that for the purposes of this study the opportunity assessment is a high level strategic exercise designed to highlight potential locations where renewable heating could play a valuable role.

**It is anticipated that a detailed feasibility study would be required before any of these opportunities are progressed further.**

## 5.3 Stage 1 - GIS Multi Criteria Analysis

The first stage uses the information contained in the Heat Map to rank each site according to its potential as a location for renewable heating.

Each site has been scored based on five criteria:

- Heat Demand within 500m
- Distance to nearest potential supply (within a maximum of 2kms)
- Distance to nearest existing scheme (with potential for expansion and within 2kms)
- Fuel poverty rank
- Number of potential anchor loads (within 500m)

Each of these criteria were then ranked into ten classifications using Natural Breaks (Jenks). For each opportunity the five ranks were the weighted and added together. Finally, they were divided by five to give an opportunity score for each site. All opportunities were then ranked based on the opportunity score, with 1 being the most attractive opportunity.

The weighting used for the criteria was:

- Heat demand - 50%
- Proximity to supply - 20%
- Proximity to existing scheme - 10%
- Fuel poverty - 10%
- Potential anchor loads - 10%

The weighting was devised by AECOM through our experience of planning, designing and implementing renewable heat networks. This weighting could of course be adapted depending on the specific needs of the user. For example, if fuel poverty was considered to be the most important factor then the weighting could be revised accordingly.

The output from this analysis was a ranking for all sites, from the site with the greatest opportunity to the one with the least opportunity. The outputs are transparent and contain all the ranking information for each of the criteria, making it easy to quickly understand the reason for the ranking of a particular site.

The top twenty sites within each Council area were highlighted prior to moving onto stage 2. Figure 5.1 illustrates the overall output for the Fife Council area and Figure 5.2 shows the results for the Perth and Kinross Council area.

Figure 5.1 Fife Council Opportunity Assessment Ranking

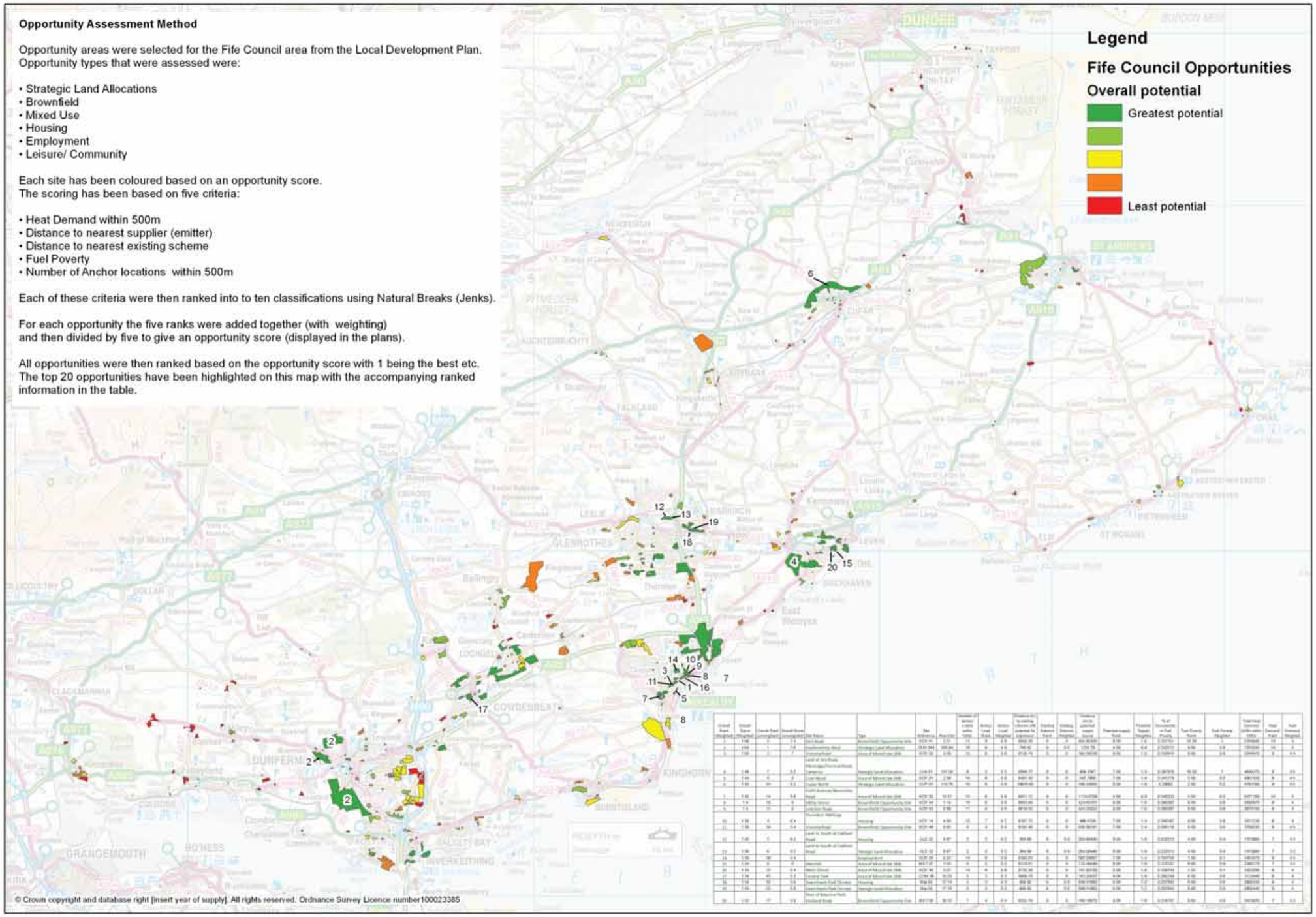
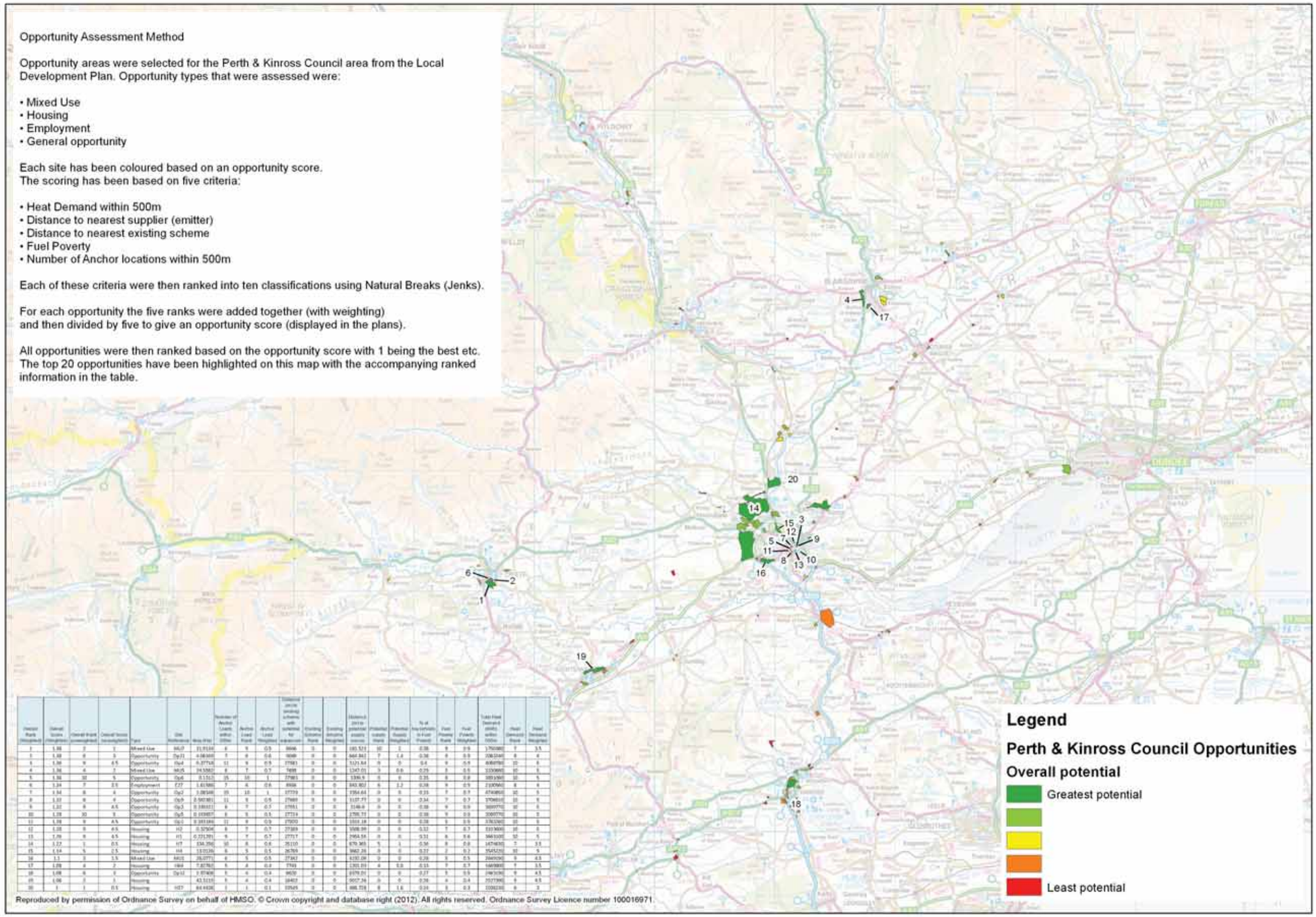


Figure 5.2 Perth and Kinross Council Opportunity Assessment Ranking



### 5.4 Stage 2 - Additional Information Gathering/ Spatial Analysis

In order to prepare each site prior to the expert review, some additional information was collated for each site. This information provides more detailed information about each site, it's surroundings and future development potential. The information that was collated as part of this stage was:

- Development Plan proposal details including information on proposed development and any information relating to potential energy provision
- Location map of site and immediate surroundings
- Listing of potential anchor loads and types within 500m of the site boundary
- Listing of all potential supply within 2km of the site boundary
- Identification of potential constraints within 500m of the site boundary including flood risk, air quality management areas, SSSI and National Nature Reserves

This information was compiled in a spreadsheet along with the ranking information from stage 1 prior to the stage 3 review. Appendix A5 contains the information compiled for each of the top twenty opportunities for each Council area.

### 5.5 Stage 3 Expert Review

The final stage uses the experience and knowledge of experts in the renewable heat network field to review and assess all the information collated for each site. From this review the final ten opportunities have been selected.

Figure 5.3 highlights the locations of the top ten opportunities identified for Fife Council. These have been banded into three broad categories of potential. For some of these opportunities we have included multiple sites where there is good potential for these to be considered together.

Table 5.1 provides further detail on each of the ten opportunities.

Table 5.1 Fife Council Top Ten Opportunities

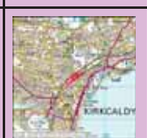
| Site Number | Site Name | Opportunity Rank | Map | Type | Notes |
|---|---|---|---|---|---|
| 1 | Glenrothes - Cadham Road | 12, 13 |  | Housing/ Strategic Land Allocation | Site is close to the Tullis Russell plant with 50MW biomass CHP plant in construction - ideal if tie in to this possible. Site also close to the hospital and of good size. |
| 2 | Dunfermline West | 2 |  | Strategic Land Allocation | Potentially 4 separate opportunities, which could also be linked. Sites are very large with mixed use planned. District Heating is already indicated in the Local Plan. |
| 3 | Buckhaven | 4 |  | Strategic Land Allocation | Site is a good size and between various decent loads which are close to the site boundary. The scale of the site means it is a good opportunity. It may be possible to link to Fife energy park. |
| 4 | Kirkcaldy Forth Avenue | 7 |  | Mixed Use | Good potential as some decent loads in the site area/adjacent. The site is fairly compact and will have potential for good demand density. |
| 5 | Kirkcaldy | 14 |  | Employment | The site is next to Victoria Hospital and close to the Forbo Nairn flooring factory so there are good potential local heat sources. It is also close to other opportunities which could be linked. |
| 6 | Kirkcaldy Cluster | 8, 9, 10, 16 |  | Brownfield/ Housing/ Mixed Use | The sites are close to Victoria Hospital and the Forbo Nairn flooring factory. There is a group of adjacent opportunities making a scheme more likely. Also possible to link to other nearby opportunities. |
| 7 | Cupar North | 6 |  | Strategic Land Allocation | The site is large and so would offer potential for including district heating and renewable heat. |
| 8 | Kirkcaldy - Victoria Road Cluster | 3, 11 |  | Mixed Use/ Brownfield | One site is small but dense development planned and the larger site partially surrounds this making a good combined opportunity. |
| 9 | Central Park Cowdenbeath | 17 |  | Mixed Use | Large enough site to justify district heating if considered from the outset, with leisure centre adjacent. |
| 10 | Markinch | 18, 19 |  | Housing/ Strategic Land Allocation | The site is a good size. Mixed use adjacent to the site including Council Properties and may offer opportunity for links. |

Figure 5.3 Fife Council Top Ten Opportunities

Figure 5.4 highlights the locations of the top ten opportunities identified for Perth and Kinross Council.

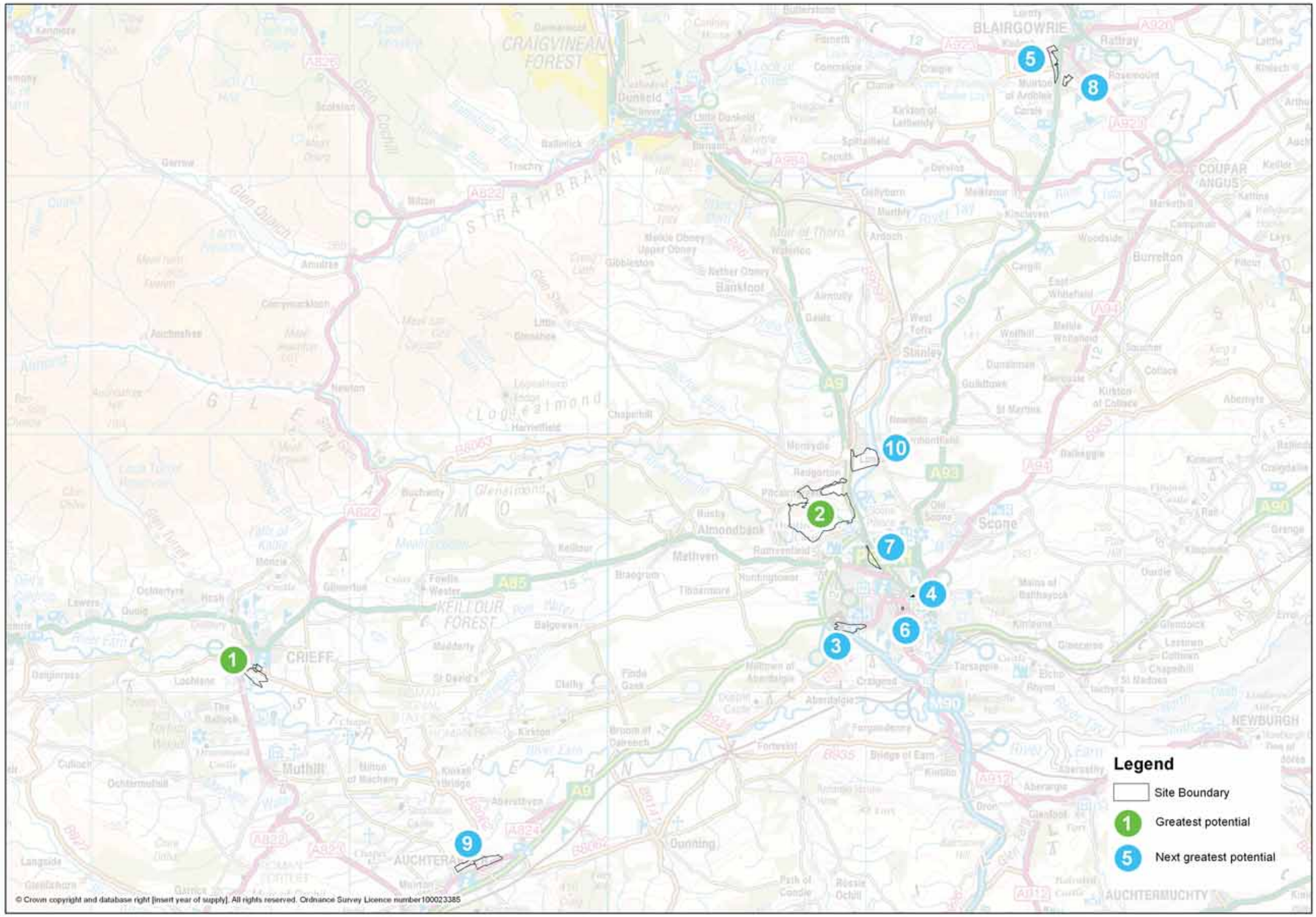
Table 5.2 provides further detail on each of these opportunities.

This approach has taken a strategic overview of the key elements that should be considered when identifying appropriate locations for renewable heat technology. The results from this analysis provides a focus for future potential initiatives. A detailed feasibility study is recommended prior to the progression of any site identified through this process.

Table 5.2 Perth and Kinross Council Top Ten Opportunities

| Site Number | Site Name | Opportunity Rank | Map | Type | Notes |
|---|---|---|---|---|---|
| 1 | Crieff Cluster | 1,2,6 |  | Mixed Use/ Employment/ General Opportunity | Cluster of adjacent opportunities with mixed use and community campus including swimming pool adjacent. |
| 2 | Bertha Park, Perth | 14 |  | Housing | The site is very large and the local plan already indicates District Heating. It is close to Inveralmond Industrial estate (river separates) which has a number of significant heat loads. |
| 3 | Broxden, Perth | 16 |  | Mixed Use | It is a large site. Local plan already indicates district heating and CHP. Possible link to Aviva site. |
| 4 | Mill Street, Perth | 3, 9 |  | General Opportunity | The area is between the Council offices (recently refurbished) and Theatre. Development would allow ideal opportunity to develop a scheme linking these loads with the opportunities that could use the site. |
| 5 | West Blairgowrie | 4 |  | Mixed Use | The site is large and has some adjacent loads that would be good to link to. The loads are mainly towards the north of the site so a smaller district heating scheme at this end could also be a possibility if not for the entire site. Possible link to site ranked 17. |
| 6 | Perth Bus Station area | 8 |  | General Opportunity | Site of bus station. There are mixed use surrounding buildings including a large hotel and tower blocks so good loads next to the site. A small scheme linked to adjoining large loads possible or expanded to link to the other nearby opportunities. Possible links to sites ranked 5 and 11. |
| 7 | Marshalling Yards, Perth | 15 |  | Housing | The site is between Perth Grammar School and Perth College so could link these. It is of a decent size. Possibility to link to Inveralmond industrial estate also. |
| 8 | Blairgowrie South | 17 |  | Housing | The surrounding area has the Community Campus including pool. It is also close enough to opportunity 4 to consider a link. |
| 9 | Auchterarder | 19 |  | Housing | The site is large and adjacent to some decent loads. District heating should be considered from the start. |
| 10 | Luncarty South | 20 |  | Housing | The site is close to Battleby Landfill. It is also close to large development opportunity 14. District heating is already indicated in the Local Plan. |

Figure 5.4 Perth and Kinross Council Top Ten Opportunities



## 6.0 Next Steps

Whilst the creation of a Heat Map for Fife and Perth and Kinross Council areas is a significant achievement, in many ways it is only the start. The Heat Map provides a detailed picture of heat demand, potential heat supply, skills and technology providers and potential opportunities and constraints related to renewable heat. The design of the map also provides users with a wealth of analytical options using the in-built functionality of GIS as well as providing access to a range of bespoke renewable heat related tools.

This does however merely provide a baseline, albeit one that provides the platform to direct and target future renewable heat opportunities in a coherent and consistent manner. In order to ensure that the maximum value is gained from the Heat Map it will be important to address some key issues which will be factors in the impact that the Heat Map will make:

- Provision of Heat Map outputs and services
- Future development and updating of the Heat Map
- Lessons learned from this study and recommendations for future mapping

## 6.1 Provision of Heat Map Outputs and Services

The Heat Map has been developed for use by both Council staff and other wider stakeholder groups including the general public. Online access to each Heat Map is available to everyone, allowing access to the data layers within each of the key Heat Map themes.

http://www.fifedirect.org.uk/heatmap

http://www.pkc.gov.uk/heatmap

This does not provide access to the additional GIS toolset.

Staff within each Council are able to access the Heat Map through their corporate intranet. This provides access to all data layers within each of the Heat Map themes. Within each Council, specialist GIS staff have access to the suite of Heat Map GIS tools. Due to software licensing issues, these are currently the only people with the ability to run the tools.

This is quite an important issue as a number of stakeholders have participated in the project and have willingly provided both their views and in some cases their data to the project. The project has considerably raised the profile of heat mapping in these areas and has created a sense of anticipation amongst potential users. It is therefore important that this opportunity is not lost and that stakeholders will be able to access outputs from the Heat Map in some form.

In the short-term, we would recommend that each Council develops a protocol for dealing with stakeholder requests for information relating to the Heat Map analysis and implementation of the tools. This will define:

- Main contact for requests
- Nature of requests that will be complied with
- Timescales for dealing with each request
- Who requests will be accepted from
- Outputs that will be provided

It will also be necessary for each Council to consider how and who this information will be communicated to. Like many organisations at present, Councils are experiencing increasing pressure upon their staff resources and this should be taken into account when considering how these services will be publicised.

## 6.2 Future Development and Updating of the Heat Map

It has already been stated that the Heat Map provides a detailed baseline of information relating to renewable heat opportunities. Unfortunately the baseline will only ever be as up to date as the information contained in it. It is therefore essential that the data that makes up the Heat Map is updated regularly. It has always been anticipated that the Heat Map will be dynamic and will evolve over time to reflect the changes taking place on the ground. Over time the Heat Map will be able to provide information on relevant trends and also the impacts that renewable heat installations have made to communities across both Councils.

This will not happen automatically, and therefore will require some effort. The required effort however, is expected to be far less than the effects of not updating the map regularly over a period of time.

The Heat Map has been constructed from a large number of data sources and organisations. The map has been designed to ensure a high degree of confidence for all key datasets, and that these would be updated by the data owners at regular intervals. It is important for the future maintenance of the Heat Map that each Council maintains a regular dialogue with each of the data providers. Agreement should be sought on such issues as:

- frequency of updates
- key contacts
- data limitations/ restrictions on use
- data format

A good relationship with data providers will help to ensure that updated information is received regularly, in the correct format and that the information is handled correctly. Providing data providers with information about the benefits of the Heat Map and how it contributes to the Council's objectives can help to improve engagement with providers. It is also important that data providers are given credit for the role their organisations have played.

The two key datasets used in the construction of each Heat Map were the CAG and the Assessors (Fife and Tayside) valuation data . The CAG is updated continuously and is available within each Council at any time. The Assessors valuation data is also updated regularly, but is more difficult to access as it is held by another organisation. In an ideal world the Heat Map would use the most up to date information from both data providers, in effect providing a new version of the map every day or even more frequently.

Given the need to request this data from the Assessor, it would not be feasible or indeed desirable to request the data so frequently. As a priority, each Council should continue dialogue with the respective Assessors to agree a suitable update frequency for this information. We recommend that each Council aims to update annually around the end of the financial year. A review of the frequency of updates should be carried out to determine whether this is the appropriate, and revised as required.

The Heat Map is only as good as the information that it is constructed from. We are aware of some weaknesses relating to some of the data sources and these have been discussed elsewhere. This has been captured for every record in the information relating to the confidence level of the heat demand calculation. Efforts should be made over time to work with data providers to iron out any issues relating to accuracy, completeness or consistency of data. This will help to steadily improve the quality of the map from good to excellent over the coming years.

## 6.3 Lessons learned and recommendations for the future

One of the key successes from this project has been the early and active involvement of the project steering group in securing agreement from each Assessor regarding use of their data prior to appointment of a consultant. This has saved a significant amount of time and has ensured that the proposed programme could be met.

This brings to three, the total of Heat Maps that have been completed using this methodology. At present each Heat Map is being disseminated separately by each individual Council. Users are required to visit three separate links to find the relevant information. We believe that it would be more efficient for Councils and effective for Heat Map users if the information was to be made available from a central online Heat Mapping portal. Delivery of the Heat Map through this type of approach would also allow wider access to the additional GIS tools and functionality for the wider stakeholder group.

As more Heat Mapping is carried out, this type of approach will become essential to ensure that the information is presented in a coherent and consistent fashion. It will also allow users to consider cross boundary issues and analyse the data at any scale from national to local. Provision of a central point of access should also help to raise the profile of renewable heat at a national level and help to raise awareness of the potential for this type of opportunity.

**Fife Heat Map User Requirements Workshop - Summary**

**16th January 2012**

**Rothes Halls, Glenrothes, KY7 5NX**

**Attendees:**

| | |
|---|---|
| Hugh Muschamp | Fife Council |
| Graham Esson | Perth and Kinross Council |
| Duncan Beaton | Fife Council |
| John Buchan | Carnegie College |
| Heather Honeyman | Fife Assessor |
| Walter Smith | Fife Assessor |
| Allan Conry | Fife Council |
| Barbara Whiting | Fife Council |
| Dave Thompson | Fife Council |
| Bill Dewar | Fife Council |
| David Robertson | Fife Council |
| Michael Westwater | Fife Council |
| Karen More | Fife Council |
| Lucinda McAllister | Fife Council |
| Mark Valentine | NHS Fife |
| Nick Clark | Ore Valley Housing Association |
| Robin Edgar | SESplan |
| Kenny Monteath | AECOM |
| Robert MacGregor | AECOM |
| Andrew Range | AECOM |

**General thoughts**

The event was well attended, particularly by Council staff. The event was less well attended by external representatives. There appeared to be good engagement from attendees and there also appeared to be some prior knowledge of heat mapping and its applications. Further clarification of the purpose of the Heat Map would have been useful (i.e. also specifying what the Heat Map does not do e.g. financial modelling).

A number of leads for potential information were identified and will be followed up. Details of all identified leads are included below. Some ideas were also generated regarding revisions/ additions to the existing functionality, some of these are unlikely to be appropriate at this time. Details are included below.

Overall, the workshop fulfilled its dual aims to raise awareness and understanding of the project whilst giving future users of the map an opportunity to provide feedback on its contents and functionality.

**Breakout Session 1 - What information should a heat map include?**

**What information would make the heat map relevant to your organisation?**

- Heat Demand levels for Housing Association stock – Housing Associations
- Identification of potential opportunities – Sustainability projects
- Allocation of sites in future LDP
- Existing DH schemes & opportunities for expansion – should provide information on location of properties included within the scheme
- Not necessarily any additional information but advantage lies in providing easy access to a consistent baseline of information relating to renewable heat.
- Consumption type – particularly industrial/ commercial (what element is process and what is surplus heat which can be used)
- Energy value of potential heat supplies

The methodology has already picked up most of the standard information that people would expect to see include in a Heat Map, but there were a few items identified where more robust information is available or a greater level of detail was identified as beneficial.

**What information does your organisation hold that could help in the development of a heat map?**

Data Sources include:

- Multi- year public building consumption records – Bill Dewar
- OPR Ratings – Bill Dewar
- Home Energy Conservation Act (HECA)
- Energy Performance Certificates – Bill Dewar
- Fuel Poverty – Energy Saving Trust/ Energy Action Scotland

Organisations to contact for further information include:

- Housing Association Alliance – a number of potential sources
- Carbon Trust
- Health Facilities Scotland – Mark Valentine
- Diageo – Have Fife Council got a contact?
- Green Business Fife – Barbara Whiting

Documents which may include some relevant information include:

- Potential for biomass fuel stocks – Fife Council
- Minewater DH feasibility
- Kirkcaldy DH feasibility study – Bill Dewar

A number of data sources have been identified and listed. These will be acquired where possible and reviewed for their potential contribution to the Fife Heat Map.

**Breakout Session 2 – How would you use a Heat Map?**

**What functionality would you require to make use of the heat map?**

Suggested refinements include:

- Inclusion of EPC data to base heat demand model to provide more accurate density mapping function outputs
- Ability for different departments to update Heat Map
- Tools should be EPC ready so that this information can be used as it becomes available

Potential additional functions include:

- Financial tool – to provide high level costs associated with a potential opportunity
- Benchmark tool – would be used to highlight properties which are above the Council recommended energy consumption BM
- Add a log function to all tools to help monitor the level of usage

**In what format would you require any outputs?**

Outputs that were identified as being potentially useful include:

- Access to the raw data so that heat demand for a particular location can be analysed in more detail, as well as more information about potential spare capacity
- Ability for external organisations to import development scenario outputs

**Additional Issues**

Maintenance of map – the map must be dynamic and capable of being updated in the future. The map will be designed with this very much in mind. The final report will make recommendations for the ongoing management and maintenance of the map and any associated functionality.

**Next Steps**

The next steps will be:

- AECOM will now follow up the data contacts/ leads and advise on the outcome of these investigations
- AECOM will review the functionality suite and submit any changes to the steering group for approval

**Perth and Kinross Heat Map User Requirements Workshop - Summary**

**19th January 2012**

**Pullar House, Perth**

Attendees:

| | |
|---|---|
| Graham Esson | PKC |
| Ewan Wallker | PKC |
| Anne Condliffe | PKC |
| Brenda Murray | PKC |
| Brian Roxburgh | SEPA |
| Brian Stanford | PKC |
| Ciara Gray | PKC |
| Gordon Dick | PKC |
| Gary Mair | Tayside Police |
| Gordon Reid | Dundee CC |
| Hilary Thomson | PKC |
| Ian Scott | Tayside Police |
| John Cruickshank | PKC |
| Mike Strachan | FCS |
| Pam Ewen | TAYplan |
| Peter Marshall | PKC |
| Robert Boyd | UHI Perth |
| Sandra Thomson | PKC |
| Steve Dunn | PKC |
| Steven MacDonald | PKC |
| Wayne Easson | Tayside JVB |
| William Black | PKC |
| Paul Grace | PKC |
| Hugh Muschamp | Fife Council |
| Duncan Beaton | Fife Council |
| Kenny Monteath | AECOM |
| Robert MacGregor | AECOM |

**General thoughts**

The event was well attended, particularly by both Council staff and external stakeholders. There appeared to be good engagement from all attendees and a desire in particular from external stakeholders to understand the benefits that heat mapping might have for their organisations. The spread of attendees between Council and external organisations allowed the breakout sessions to be more focused towards each of these two major user groups. Examples / case studies showing the opportunities the heat map can generate and how these are realised would be very helpful for stakeholders to understand the benefits.

A number of leads for potential information were identified and will be followed up. A summary spreadsheet will be circulated containing all leads from both Council workshops. Some ideas were also generated regarding revisions/ additions to the existing functionality, some of these are unlikely to be appropriate at this time. Details are included in the relevant section below.

Overall, the workshop fulfilled its dual aims to raise awareness and understanding of the project whilst giving future users of the map an opportunity to provide feedback on its contents and functionality.

**Breakout Session 1 - What information should a heat map include?**

**What information would make the heat map relevant to your organisation?**

- Use for grant funding justification - PKC Housing Dept
- Identification of locations of supply where there is potential to tap into – PKC Non domestic buildings Dept
- Identify potential for DH schemes – PKC Planning Dept
- Identify locations of major producers of waste heat & type of demand – PKC
- Access information on user types and show a breakdown on a map – PKC
- Identify demand that could take waste heat – SEPA
- Use for Strategic Development – TAYplan
- Identification of potential customers for biomass – Forestry Commission

The methodology has already picked up most of the standard information that people would expect to see include in a Heat Map, but there were a few items identified where more robust information is available or a greater level of detail was identified as beneficial.
What information does your organisation hold that could help in the development of a heat map?
Data Sources include:

- Proposed & Approved developments – PKC planning dept
- Additional demand & opportunities for heat – PKC
- Incinerator proposal – Gary Dimmock (PKC)
- Muirton Community Campus – Building Standards
- Inveralmond – Brian Stanford (PKC) & Scottish & Southern (get details from G Esson)
- Glenfarg
- Housing Stock database – John Cruickshank (PKC)
- Glen Lyon Woodfuel initiative – Hilary Thomson (PKC)
- Mental health facility (Murray hospital)
- EPC for Non-domestic properties >1000m²– Gordon Dick (PKC)
- Building Standards Register
- Sepa – Producers of (waste) heat

Organisations to contact for further information include:

- EST – HEED
- Scottish Prison Service
- Large private schools – EPC could be in non-dom database?
- Comrie & Alyth Climate Challenge Groups
- SEPA
- Forestry Commission

Documents which may include some relevant information include:

A number of data sources have been identified and listed. These will be acquired where possible and reviewed for their potential contribution to the PKC Heat Map.

**Breakout Session 2 – How would you use a Heat Map?**

**What functionality would you require to make use of the heat map?**

The users found this quite difficult to answer without prior experience of using the toolset. A few refinements/ additions were suggested. Suggested refinements include:

- Matching potential heat supply more closely with local demand
- Consider flagging up potential Air Quality impacts as an issue – likely to be of limited use as AQMA data already sits in Heat Map as a separate layer.
- Ability for tools to check in and out spatial analyst licence as and when necessary
- Consider redesigning toolbox so that tools which do not require spatial analyst could potentially have a wider audience (e.g. summary and search tools)
- Type(s) of buildings to be selectable
- Identification of good practice examples by pinpointing low con sumption for individual buildings for a certain type, ideally at a national level drawing in heat maps from other areas
- Ability to rank opportunities that the heat map identifies – with selectable criteria for the ranking process to allow options testing
- Identification of where mains gas is available
- Infrastructure included so any weaknesses can be identified e.g. poor roads preventing forestry resource being utilised
- Heat demand profile on day / week scale
- Tool to show number of renewable heat installations, e.g. number of biomass boilers

Potential additional functions include:

- Monitoring tool to record change of the key data layers at regular intervals – Could be a tool or a protocol

**In what format would you require any outputs?**

Outputs that were identified as being potentially useful include:

- The PKC view was that a range of formats will be necessary depending on the user/ purpose.
- It may make sense to set up a separate Heat Map in Location Centre for PKC staff
- Potential to share data with e.g. SEPA mapping
- Datazone exports

**Additional Issues**

PKC staff access to map - a fairly unscientific poll of PKC attendees identified that approximately 80% of staff currently use Location Centre to view spatial information. The launch of the data will therefore be critical to ensure that all staff understand how they can access the Heat Map.

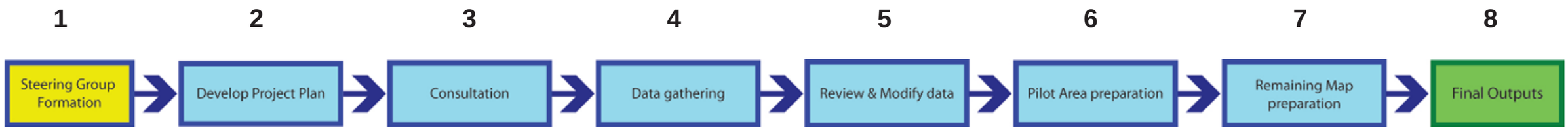
Electric heating – consumption data will include non-heat loads. These cases would use the benchmark approach.

**Next Steps**

The next steps will be:

- AECOM will now follow up the data contacts/ leads and advise on the outcome of these investigations
- AECOM will review the functionality suite and submit any changes to the steering group for approval

| Heat Demand Theme | | |
|---|---|---|
| Name | Source | Status |
| Energy consumption by datazone | DECC | Sourced - used for validation |
| Proposed new development | FC/ PKC | Sourced |
| Assessors valuation data | Tayside/ Fife Assessor | Sourced |
| Existing public building energy loads | FC/ PKC, NHS Fife, Tayside Police, Tayside Fire and Rescue Service, Perth & Kinross Green Resorts, Scottish Prison Service | Sourced - Green resorts data still being received, will be useful for any updates though. |
| Rural Fuel Poverty Indicator | Energy Action Scotland | Sourced - included in the heat demand theme |
| Distilleries, Manufacturers, Industrial premises and Retail building locations | Diageo, Scotchwhisky.net | Sourced - Locations mainly from Corporate Address Gazetteer (CAG) |
| Scottish House Condition Survey | Scottish Government | Sourced - used in heat demand calculations |
| Energy benchmarks | Chartered Institution of Building Services Engineers (CIBSE) | Sourced - CIBSE TM46: 2008 |
| Potential Heat Supply Theme | | |
| Waste production & existing landfill sites | Scottish Pollutant Release Inventory (SPRI) & local knowledge | Sourced |
| Existing industrial heat production | SPRI | Sourced |
| Woody biomass production capacity | usewoodfuel scotland | Sourced |
| Potential medium/ deep geothermal capacity | British Geological Survey (BGS) | Not included but opportunity to link into “Study into the potential for deep geo-thermal energy in Scotland”. This is due for completion March 2013. |
| Gas grid | Energy Action Scotland | Sourced - datazones with full or partial access to the gas grid. |
| Existing District Heating & CHP systems | Local knowledge | Sourced |
| Existing fossil fuel suppliers | Trade directories | Sourced |
| Minewater potential | Scottish National Minewater Potential Study (2004) | Sourced |
| Skills and Technology Theme | | |
| Locations of trades people/ services | Microgeneration Certification Scheme (MCS) | Sourced |
| Educational establishments offering related training | Web search/ contact with universities/ colleges | Sourced |
| Renewable technology suppliers | MCS | Sourced |
| Renewable technology facilities | MCS | Sourced |
| Opportunities and Constraints Theme | | |
| Designated sites | SNH | Sourced - SSSI and NNR’s. Additional designations could be added if required. |
| Existing Local Development Plan Opportunities | FC/ PKC | Sourced |
| Flood risk mapping | SEPA | Sourced - coastal and fluvial 200 year flood event locations. |
| Air Quality Management Areas (AQMA) | FC/ PKC | Sourced |
| Forest and Woodland Strategies (FWS) | Lothians and Fife Greenspace Network Partnership/ PKC | Sourced - FWS not currently available for either area yet. Fife FWS is in draft form and should be available soon. |
| Context | | |
| Base mapping | Ordnance Survey | Sourced - Miniscale, 1:250,000 and 1:50,000 mapping products. |




The workflow diagram at the top of this page identifies each of the key stages required in the production of a Heat Map. A more detailed explanantion of each stage is given in the text below. This template is intended as a step by step outline for local authorities to use when developing a Heat Map.

**Stage 1 - Steering Group Formation**
A steering group should be formed which will have responsibility for directing the project as well as raising awareness of the project and its outputs throughout the organisation.

The steering group should consist of at least the following members:
- Planning (Council)
- GIS (Council)
- Assessor data representative

In addition it would also be useful to have representation from the following departments:
- Housing and property (Council)
- Waste management (Council)

The steering group should meet at regular intervals throughout the project, coinciding with the production of the project deliverables.

**Stage 2 - Develop Project Plan**
It is the responsibility of the Steering Group to ensure that a Project Plan is developed which will describe how the Heat Map will be successfully delivered. At a minimum the Project Plan should contain the following elements:

- Proposed programme for all phases
- Details of the project team, roles and responsibilities
- Communication strategy
- Risk Log
- Quality review strategy

**Stage 3 - Consultation**
As Heat Mapping is a relatively unknown concept, it will be important to raise awareness of Heat Mapping and its potential applications both within your organisation and within other relevant local organisations. Key stakeholders should be engaged from the outset and should remain involved throughout the project lifecycle. The consultation approach should be detailed in the Communication Strategy which forms part of the Project Plan. In addition to raising awareness of the Heat Map and its potential application, the consultation should be used to garner information from stakeholders on potentially useful data sources.

**Stage 4 - Data Gathering**
On completion of the initial stakeholder consultation a list of proposed data sources should be drawn up which will be used to develop the Heat Map. All data sources should then be requested from the source organisations. Metadata should also be sought for all data received using the UK GEMINI metadata standard.

**Stage 5 - Review and Modify data**
On receipt, all data should be reviewed for completeness and accuracy. All metadata should also be reviewed and any restrictions relating to use should be observed. Clarification should be sought from the data provider where necessary.

The original data supply should then be copied and manipulated where necessary to prepare it for use in the Heat Map.

**Stage 6 - Pilot Area preparation**
It is always useful for a project of this nature where the outputs cover a large geographical area to test the methodology on a small pilot area. Whilst the methodology has already been tested during the Highland Heat Mapping project there is considerable value in continuing to prepare a pilot area for each Heat Mapping project. The reasons for this are twofold. Firstly, every geographic area will have its own nuances which will inevitably through up different types of issues that may not have been already addressed in other areas. The pilot map gives an opportunity for these to be addressed at an early stage in the project before it is too late. Secondly, and perhaps even more importantly the production of a pilot map provides the steering group with an early output of an area they are familiar with which they can interrogate. This helps to improve the understanding of the steering group of the strengths and limitations of the map and will aid them when raising awareness of the Heat Map within their organisation.

The pilot process consists of two stages:
- Map preparation
- Map Review and feedback

The map is prepared for a pilot area which should be agreed with the steering group in advance. This should be an area that members of the steering group are familiar with and it should be large enough to contain a range of different urban and rural characters typical of the overall study area.

On completion of the pilot area, the steering group should review the results and provide feedback to the project team. This could range from clarification on certain issues to identification of additional useful information or refinements to the methodology. Any refinements to the methodology must be agreed with the steering group.

**Stage 7 - Remaining Map preparation**
Once the pilot area has been reviewed and any issues resolved the Heat Map can be prepared for the remainder of the study area. This will incorporate any refinements identified during the previous phase.

**Stage 8 - Final Outputs**
All final outputs should be reviewed by the steering group, including all map data, any reports and any GIS tools if specified as part of the map.

Final outputs should also include any training which may be necessary for potential users of the Heat Map, including training materials. This should be identified as part of the Project Plan.

**House Condition Surveys Review**

**Annual Updates and Changes Since the Highland Heat Map**

**SHCS 2009 & 2010 Key Findings**
The Scottish Government SHCS website has 2009 and 2010 SHCS reports available for download. The Key Findings reports contain interesting data in terms of energy efficiency, with SAP, NHER, EPC and CO2 data for different categories of the housing stock. There are changes from the 2009 to 2010 data, showing a general improvement in the housing stock and thus decreasing energy intensity.

However, this data is very difficult to use as:

- NHER ratings include all domestic energy consumption
- SAP ratings are built around cost, so you can't go straight to kWh / m2 figures
- SAP2005 includes lighting, although SAP2001 is just space and water heating.
- EPCs are derived from SAP, CO2 ratings are presumably also derived from SAP.

For these reasons the actual datasets are used to calculate the energy intensities required for the heat maps.

**SHCS Physical and Derived Data**
To calculate the energy intensity (kWh / m2) used in the heat map, the physical and derived datasets were used. These are published in three year groupings, the most recent being 2007 – 2009. This was the dataset used for the Highland Heat Map to develop the energy intensity figures. The existing energy intensities will therefore be used for the heat maps

**Fife Council – Private Sector HOUSE CONDITION SURVEY 2009**

**Introduction**
The heat map uses 20 categories of dwelling energy intensity (kWh / m2) to account for domestic heat demand. The Fife Council Private Sector House Condition Survey contains data in terms of NHER and SAP ratings to cover energy efficiency. The SHCS Key Findings reports contain similar data and so these ratings are used for the comparison in this review.

While this information is of interest, as noted in the review of the 2009 / 2010 data, the SHCS physical and derived datasets were required to derive the energy intensities for the different categories of dwelling.

Access to the full Fife Council dataset would be required to produce kWh / m2 energy intensities if the Council data were to be used in the heat map.

**Comparison of data**
The Fife Council Survey covers Private Sector dwellings only. The SHCS data used in the existing heat maps is broken down into 20 categories based on age and type of the dwelling, without regard to tenure.

Use of the Fife Council Private Sector data in isolation without accompanying Council / RSL data would skew the results. Currently the different tenures are averaged over all properties in the heat map and this averaging would be lost by use of this dataset.

To illustrate this, table 1 shows the SHCS data across all tenure types and the Fife Council Private Sector data for various ages and types of dwellings.

| | FC- Private Sector 2009 | SHCS 2009 | FC- Private Sector 2009 | SHCS 2009 |
|---|---|---|---|---|
| | NHER | NHER | SAP | SAP |
| Age | | | | |
| Pre-1919 | 5.52 | 5.1 | 55 | 51.8 |
| 1919-1944 | 6.63 | 6.2 | 64 | 61.4 |
| 1945-1964 | 6.81 | 6.6 | 65 | 65.3 |
| 1965-1982 | | 6.5 | | 65.0 |
| Post 1982 | | 7.6 | | 74.4 |
| 1965-1974 | 6.73 | | 65 | |
| 1975-1989 | 7.02 | | 67 | |
| Post 1989 | 7.75 | | 75 | |
| Dwelling type | | | | |
| Detached house/bungalow | 6.85 | 5.3 | 65 | 54.1 |
| Semi-det. house/bungalow | 6.50 | 6.0 | 62 | 59.6 |
| Terraced house/bungalow | 6.88 | 6.8 | 66 | 67.6 |
| Four-in-block flat | 6.92 | | 68 | |
| Tenement flat | 7.09 | 7.2 | 72 | 70.7 |
| Other flat | 7.25 | 7.1 | 74 | 69.4 |
| Private Sector Total | 6.81 | 6.2 | 66 | 61.2 |

The data shows that the Fife Council data gives significantly better NHER and SAP ratings in some of the categories and has a higher average than the SHCS for the private sector.

The Private Sector report submitted does not give a full breakdown of either SAP or NHER ratings against age and property type. The categories used also have some differences, as shown in Table 2:

Table 2: Categories used

| Main House Type | | Date of Construction | |
|---|---|---|---|
| FC | SHCS | FC | SHCS |
| Detached house/bungalow | Detached | Pre-1919 | Pre-1919 |
| Semi-det. house/bungalow | Semi-detached | 1919-1944 | 1919-1944 |
| Terraced house/ bungalow | Terraced | 1945-1964 | 1945-1964 |
| Four-in-block flat | Not Used | 1965-1974 | 1965-1982 |
| Tenement flat | Tenements | 1975-1989 | Post 1982 |
| Other flat | Other flats | Post 1989 | |

**Use of Fife Council Private Sector House Condition Survey Data**
The differences highlighted in Tables 1 and 2 mean that the approach adopted has been to use the national SHCS data.

In order to use the Fife Council data public sector data for the same region would be required. The full dataset for both Private and Public sectors would be required to determine kWh/m2 energy intensities for each housing type, assuming the same kind of data is available as for the SHCS.

The current 20 categories of housing in the heat map would need to be revised for the different groups used by Fife Council. This would result in 24 categories, based on the increased number of age ranges. The Fife Council data is also broken down into different areas. Again energy intensities for these could be considered but this adds multiple categories of dwelling and makes the heat map increasing complex.

For the intended uses of the heat map these changes are not considered to be significant in terms of having a major impact on the results and would add a significant degree of complication to the process of updating the heat map in future. The heat map is therefore based on the SHCS dataset.

**Perth and Kinross Council - HOUSE CONDITION SURVEY 2009 - OVERVIEW REPORT - ALL TENURES**

**Introduction**
The heat map uses 20 categories of dwelling energy intensity (kWh / m2) to account for domestic heat demand. The Overview Report contains data in terms of NHER and SAP ratings to cover energy efficiency. The SHCS Key Findings reports contain similar data and so these ratings are used for the comparison in this review.

While this information is of interest, as noted in the review of the 2009 / 2010 data, the SHCS physical and derived datasets were required to derive the energy intensities for the different categories of dwelling. Access to the full Perth and Kinross Council dataset would be required to produce kWh / m2 energy intensities if the Council data were to be used in the heat map.

**Comparison of Data**
Section 5 of the Perth and Kinross Council Report contains information on NHER and SAP ratings. This is limited to an average rating against tenure type. From table 5 in section 5.2 of the report, table 11 of the Scottish House Condition Survey 2009 and table 16 of the Scottish House Condition Survey 2010:

Table 1: Average / Mean NHER ratings

| | Occupied | Private Rented | Council (LA / Other Public) | RSL (HA/ Co-op) | All Dwellings |
|---|---|---|---|---|---|
| PKC 2009 | 6.5 | 4.9 | 6.9 | 6.7 | 6.4 |
| SHCS 2009 | 6.2 | 6.1 | 7.0 | 7.5 | 6.5 |
| SHCS 2010 | 6.5 | 6.3 | 7.1 | 7.7 | 6.7 |

From table 5 in section 5.2 of the report, table 16 of the Scottish House Condition Survey 2009 and table 19 of the Scottish House Condition Survey 2010:

Table 2: Average / Mean SAP ratings

| | Occupied | Private Rented | Council (LA / Other Public) | RSL (HA/ Co-op) | All Dwellings |
|---|---|---|---|---|---|
| PKC 2009 | 57 | 45 | 64 | 62 | 57 |
| SHCS 2009 (SAP 2005) | 55.9 | 56.3 | 63.2 | 65.9 | 58.2 |
| SHCS 2010 (SAP 2005) | 60.4 | 59.5 | 64.8 | 67.5 | 61.9 |

The results indicate that Perth and Kinross has slightly poorer performing housing stock than the national average, under both NHER and SAP assessments, with the biggest difference in the private rented sector.

The Overview report submitted does not give a full breakdown of either SAP or NHER ratings against age and property type. The categories used also have some differences, as shown in Table 3:

Table 3: Categories used

| Main House Type | | Date of Construction | |
|---|---|---|---|
| PKC | SHCS | PKC | SHCS |
| Detached house/bungalow | Detached | Pre-1919 | Pre-1919 |
| Semi-det. house/bungalow | Semi-detached | 1919-1944 | 1919-1944 |
| Terraced house/ bungalow | Terraced | 1945-1964 | 1945-1964 |
| Four-in-block flat | Not Used | 1965-1974 | 1965-1982 |
| Tenement flat | Tenements | 1975-1989 | Post 1982 |
| Other flat | Other flats | Post 1989 | |

**Use of Perth and Kinross House Condition Survey Data**
In view of the differences shown in Table 3, the approach has been to maintain the national figures from the SHCS for Perth and Kinross Council. In particular the date ranges post 1965 are not compatible.

From tables 1 and 2 the all dwellings average for both the NHER and SAP figures show less than a 2% difference between the Perth and Kinross and SHCS data. This is an acceptable difference in context of the heat mapping exercise.

The larger differences in some of the tenure types mean there would be some change to the results from use of the Perth and Kinross Council data. The overview report also states the Perth and Kinross Council area is broken down into five areas: Greater Perth, Eastern Highland, Kinross and Strathearn. Analysis could also be further broken down to reflect these areas.

Changes to allow use of the Perth and Kinross Council Data
The full dataset for the survey would be required to determine kWh/m2 energy intensities for each housing type, assuming the same kind of data is available as for the SHCS.

The current 20 categories of housing in the heat map would need to be revised for the different groups used by Perth and Kinross. This would result in 24 categories, based on the increased number of age ranges. Including the different geographical areas would result in over 100 categories.

For the intended uses of the heat map these changes are not considered to be significant in terms of having a major impact on the results and would add a significant degree of complication to the process of updating the heat map in future. The heat map is therefore based on the SHCS dataset.

| Overall Rank (Weighted) | Overall Score (Weighted) | Overall Rank (unweighted) | Overall Score (unweighted) | Site Name | Type | Site Reference | Area (Ha) | Number of Anchor Loads within 500m | Anchor Load Rank | Anchor Load Weighted | Distance (m) to existing scheme with potential for expansion | Existing Scheme Rank | Existing Scheme Weighted | Distance (m) to potential supply source | Potential supply Rank | Potential Supply Weighted | % of households in Fuel Poverty | Fuel Poverty Rank | Fuel Poverty Weighted | Total Heat Demand (kWh) within 500m | Heat Demand Rank | Heat Demand Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.68 | 2 | 7.4 | Den Road | Brownfield Opportunity Site | KDY 41 | 2.51 | 14 | 8 | 0.8 | 8904.58 | 0 | 0 | 403.86426 | 8.00 | 1.6 | 0.357151 | 10.00 | 1 | 5794840 | 10 | 5 |
| 2 | 1.64 | 1 | 7.6 | Dunfermline West | Strategic Land Allocation | DUN 084 | 300.84 | 19 | 9 | 0.9 | 740.42 | 6 | 0.6 | 1250.79 | 4.00 | 0.8 | 0.322612 | 9.00 | 0.9 | 7253040 | 10 | 5 |
| 3 | 1.56 | 3 | 7 | Victoria Road | Area of Mixed Use (B4) | KDY 05 | 4.28 | 15 | 8 | 0.8 | 9126.74 | 0 | 0 | 382.09238 | 8.00 | 1.6 | 0.330816 | 9.00 | 0.9 | 5240970 | 9 | 4.5 |
| 4 | 1.48 | 7 | 6.2 | Land at Sea Road, Muiredge/Percival Road, Cameron | Stategic Land Allocation | LVA 01 | 107.50 | 9 | 5 | 0.5 | 6906.37 | 0 | 0 | 469.4397 | 7.00 | 1.4 | 0.387978 | 10.00 | 1 | 4836370 | 9 | 4.5 |
| 5 | 1.44 | 8 | 6 | Coal Wynd | Area of Mixed Use (B4) | KDY 01 | 2.58 | 16 | 8 | 0.8 | 9491.50 | 0 | 0 | 547.7806 | 7.00 | 1.4 | 0.241279 | 5.00 | 0.5 | 4061550 | 9 | 4.5 |
| 6 | 1.42 | 51 | 5.2 | Cupar North | Strategic Land Allocation | CUP 01 | 110.76 | 10 | 6 | 0.6 | 14679.65 | 0 | 0 | 166.54605 | 9.00 | 1.8 | 0.20062 | 2.00 | 0.2 | 4763180 | 9 | 4.5 |
| 7 | 1.42 | 14 | 5.8 | Forth Avenue/Bennochy Road | Area of Mixed Use (B4) | KDY 02 | 13.51 | 15 | 8 | 0.8 | 9651.13 | 0 | 0 | 1134.6708 | 4.00 | 0.8 | 0.248333 | 5.00 | 0.5 | 6471160 | 10 | 5 |
| 8 | 1.4 | 10 | 6 | Millie Street | Brownfield Opportunity Site | KDY 44 | 1.14 | 10 | 6 | 0.6 | 8693.06 | 0 | 0 | 424.60161 | 8.00 | 1.6 | 0.286387 | 8.00 | 0.8 | 2656970 | 8 | 4 |
| 9 | 1.4 | 11 | 6 | Junction Road | Brownfield Opportunity Site | KDY 43 | 0.98 | 11 | 6 | 0.6 | 8618.55 | 0 | 0 | 443.35033 | 8.00 | 1.6 | 0.286387 | 8.00 | 0.8 | 2875740 | 8 | 4 |
| 10 | 1.38 | 4 | 6.4 | Dunnikier Maltings | Housing | KDY 14 | 4.00 | 12 | 7 | 0.7 | 8397.72 | 0 | 0 | 488.9339 | 7.00 | 1.4 | 0.286387 | 8.00 | 0.8 | 3231230 | 8 | 4 |
| 11 | 1.38 | 34 | 5.4 | Victoria Road | Brownfield Opportunity Site | KDY 48 | 0.92 | 6 | 4 | 0.4 | 9183.46 | 0 | 0 | 626.99341 | 7.00 | 1.4 | 0.266118 | 6.00 | 0.6 | 3706030 | 9 | 4.5 |
| 12 | 1.36 | 5 | 6.2 | Land to South of Cadham Road | Housing | GLE 32 | 9.87 | 2 | 2 | 0.2 | 264.68 | 9 | 0.9 | 264.68446 | 9.00 | 1.8 | 0.232513 | 4.00 | 0.4 | 1373980 | 7 | 3.5 |
| 13 | 1.36 | 6 | 6.2 | Land to South of Cadham Road | Stategic Land Allocation | GLE 32 | 9.87 | 2 | 2 | 0.2 | 264.68 | 9 | 0.9 | 264.68446 | 9.00 | 1.8 | 0.232513 | 4.00 | 0.4 | 1373980 | 7 | 3.5 |
| 14 | 1.36 | 38 | 5.4 | | Employment | KDY 28 | 6.22 | 14 | 8 | 0.8 | 8382.63 | 0 | 0 | 582.29667 | 7.00 | 1.4 | 0.164756 | 1.00 | 0.1 | 5453470 | 9 | 4.5 |
| 15 | 1.34 | 9 | 6 | Aberhill | Area of Mixed Use (B4) | MET 07 | 7.03 | 9 | 5 | 0.5 | 9318.61 | 0 | 0 | 135.48049 | 9.00 | 1.8 | 0.316707 | 9.00 | 0.9 | 2366170 | 7 | 3.5 |
| 16 | 1.34 | 31 | 5.4 | Nairn Street | Area of Mixed Use (B4) | KDY 40 | 5.07 | 14 | 8 | 0.8 | 8730.58 | 0 | 0 | 181.80726 | 9.00 | 1.8 | 0.108754 | 1.00 | 0.1 | 3424290 | 8 | 4 |
| 17 | 1.34 | 43 | 5.2 | Central Park | Area of Mixed Use (B4) | COW 06 | 10.25 | 5 | 3 | 0.3 | 4809.70 | 0 | 0 | 183.30037 | 9.00 | 1.8 | 0.266744 | 6.00 | 0.6 | 3133440 | 8 | 4 |
| 18 | 1.34 | 22 | 5.8 | Sweetbank Park Terrace | Housing | Mar-02 | 17.74 | 5 | 3 | 0.3 | 848.42 | 6 | 0.6 | 848.41893 | 6.00 | 1.2 | 0.257843 | 6.00 | 0.6 | 2802440 | 8 | 4 |
| 19 | 1.34 | 23 | 5.8 | Sweetbank Park Terrace | Stategic Land Allocation | Mar-02 | 17.74 | 5 | 3 | 0.3 | 848.42 | 6 | 0.6 | 848.41893 | 6.00 | 1.2 | 0.257843 | 6.00 | 0.6 | 2802440 | 8 | 4 |
| 20 | 1.32 | 17 | 5.8 | Rear of Bayview Park, Kirkland Road | Brownfield Opportunity Site | MET 09 | 30.33 | 7 | 4 | 0.4 | 9253.19 | 0 | 0 | 166.19972 | 9.00 | 1.8 | 0.316707 | 9.00 | 0.9 | 2433820 | 7 | 3.5 |

| Overall Rank (Weighted) | Site Name | Type | Site Reference | Map | Area (Ha) | ANCHOR LOADS: Anchor Loads within 800m | POTENTIAL SUPPLIERS: Potential Suppliers within 2 km (Certified) | Potential Suppliers within 2 km (CHO) | Potential Suppliers within 2 km (Methane) | CONSTRAINTS: Flood - Coastal | Flood - Fluvial | w2km | SSSI | Well | LOCAL PLAN: Plan Class/Type | Estimated capacity 2009 - 2059 (Total Capacity) | Lead agency | Status/developer requirements (additional to requirements set by Development Plan policies, and other information | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Elm Road | Brownfield Opportunity Site | KDY 01 |  | 2.5191 | Mill Road, Maggies Centre, Dunnikier Works, Victoria Hospital, Kirkcaldy Fire Station, Nairns Works, Snooker Club, Adam Smith College | None | Scottish Water_Kirkcaldy STW | Scottish Water_Kirkcaldy STW | Yes | Yes | No | No | No | | | Fife Council / Fife Constabulary/ Scottish Court Service | This site is identified as a development opportunity. This means this land has the potential to be redeveloped. The preferred uses for this site are:<br>• Justice centre; and<br>• General employment.<br>This site is not suitable for retail use as adequate capacity exists in Kirkcaldy Town centre for expansion of convenience and comparison goods provision.<br>No residential development will be supported unless it is proven that no residential amenity issues will be created. | Site is close to new hospital with plans for access underdeveloped land possible; local area low density with railway to south of site so limited scope; potential to link to a number of the other opportunities |
| 2 | Dunfermline West | Strategic Land Allocation | DUN 084 |  | 300.835 | General Busine ss Park, Industrial Units, Queen Anne High School, McLean Primary School, Beeches Nursing Home, John Douglas Home | None | Lochmead Landfill, Fife Council | Lochmead Landfill, Fife Council | No | Yes | No | No | No | Strategic Land Allocation<br><br>See Development Framework | 2,200<br><br>(4,200) | Private Sector | It is anticipated that more than one Masterplan will be produced reflecting the nature requirements and phasing of the sites. In summary these requirements include:<br>• 4200 houses phased over the period to 2026 (2009 – 2019: 1,812 Houses)<br>• 60 ha of business land.<br>• Capacity for further housing and employment growth post 2026.<br>• 3 new primary schools and a new secondary school.<br>• Strategic and local road improvements.<br>• Public transport facilities and services.<br>• Local shops and services, including health care.<br>• Public art.<br>• Open space and landscape improvements.<br>The layout of all new development will follow urban design principles. Existing routes, principal points of interest, views and landscapes feature will influence the layout. New housing should incorporate:<br>• Energy efficient features and on-site zero or low carbon equipment.<br>• Strong building lines and active frontages along pedestrian and vehicle routes.<br>• New and existing gateways, arterial routes and strategic views.<br>• Public Art.<br>In addition the Dunfermline SLA will seek to a range of housing needs and provide a wide choice in tenures, house types and sizes of property. This includes: | Very large development sites; potential to do something at each site without necessarily linking them – possibly 4 separate opportunities |
| 3 | Victoria Road | Area of Mixed Use (B4) | KDY 06 |  | 4.2837 | Adam Smith College, Adam Smith Theatre, Kirkcaldy Police Station, Kirkcaldy Fire Station, Nairns Works, Snooker club, Forth Park Hospital, Gowrie House Home | None | Scottish Water_Kirkcaldy STW | Scottish Water_Kirkcaldy STW | Yes | Yes | No | Yes | No | | | | This area represents an opportunity to utilise brownfield and other development sites to promote new residential and employment investment in support of broader area regeneration. | Close to opportunity 1, although separated by a railway; low density area; surroundings not of great benefit to a DH scheme |
| 4 | Land at Ava Road, Methilhill/Pennyhill Road, Leven | Strategic Land Allocation | LVA 01 |  | 107.003 | Cameronbridge Distillery, Buckhaven High School, Randolph Wemyss Memorial Hospital, Methilhill Primary School, Cameron Hospital, Methilhaven Home, Donaldson Tanker Engineering Ltd | Cameronbridge Distillery | Cameronbridge Distillery, Levenmouth STW | Levenmouth STW | Yes | Yes | No | Yes | No | Other Transportation Proposal | | Fife Council | An augmented road network for Levenmouth is identified on the Proposals Map, linking economic regeneration areas and sites. It shall be developed in a phased manner during the period of the Local Plan, and its route will be safeguarded from prejudicial development. The line of the road through the Levenmouth SLA is indicative only - the final route will be determined through the masterplanning process. The Levenmouth Link Road will be part funded through planning agreements as identified in section 3. | Site is a decent size and between various decent loads which are close to the site boundary; surrounding housing low density; scale of site means good opportunity possible to link to Fife energy park |
| 5 | Coal Wynd | Area of Mixed Use (B4) | KDY 03 |  | 7.50396 | Adam Smith College, Kirkcaldy Swimming Pool, Kirkcaldy Indoor Market, Adam Smith Theatre, Kirkcaldy Police Station, Gowrie House Home, Kirkcaldy Fort Station, Snooker Club | None | Scottish Water_Kirkcaldy STW | Scottish Water_Kirkcaldy STW | Yes | Yes | No | Yes | No | | | | The colocation of compatible uses will be supported within this area. | Small area in town centre; low density surroundings; potential will depend on what is built |
| 6 | Cupar North | Strategic Land Allocation | CUP 01 |  | 110.763 | Cupar Sports Centre, Bell Baxter High School, Bell Baxter Junior High, Cupar Health Centre, Cupar Swimming Club, Rosbank Care Home, Various Industrial Units | None | St Andrews Cheesdon International Ltd., AB Agri Ltd (Animal Feed) | None | No | Yes | Yes | No | No | | | Private | This site represents the Cupar North Strategic Land Allocation.<br>Total site capacity is 1,400 houses, of which 752 should be developed beyond the Local Plan period, creating a high quality western gateway to town.<br>See the Cupar North Development Framework diagram and text (above) for details of proposed land uses.<br>Masterplanning (to include phasing) and consultation arrangements to be approved by Fife Council.<br>All housing and commercial development within the Strategic Land Allocation area requires to contribute on an equitable basis to the essential community infrastructure, including transportation and employment land.<br>Burial and construct relief road within early phases of house-building, including junctions at A91.<br>Safeguarding land as greenspace for future infrastructure including future road corridor at Gillaskeuky Wood.<br>Implement advance planting and landscaping.<br>Design statement to be produced for each neighbourhood and submitted to Fife Council for approval.<br>Retail park to be restricted to bulky goods (max 5,500 sq.m.). Includes leisure and commercial (hotel) development.<br>Provision of employment land (Class 4).<br>New primary school.<br>Contribution to secondary education.<br>Care home(s).<br>Possible location of community recycling centre. | Large site on potential to include DH etc |
| 7 | Hunt Avenue/Burnside Road | Area of Mixed Use (B4) | KDY 02 |  | 13.507 | Adam Smith College, Kirkcaldy Indoor Market, Adam Smith Theatre, Kirkcaldy Police Station, Gowrie House Home, Snooker Club, Forth Park Hospital, Fife College of Health | None | Scottish Water_Kirkcaldy STW | Scottish Water_Kirkcaldy STW | Yes | Yes | No | No | No | | | | The preferred uses for this site are:<br>•Higher Education; and<br>•Employment uses – Class 4,5 & 6. | Good potential as some decent loads in the site area/adjacent, site is fairly compact; potential for good demand density |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | Melville Street | Brownfield Opportunity Site | KDY 44 |  | 1.112884 | Victoria Works, Nairns Works, Bingo Club | None | Scottish Water, Kirkcaldy STW | Scottish Water, Kirkcaldy STW | Yes | Yes | No | Yes | No | Brownfield | 28 | Private Sector | This site is identified as a development opportunity. This means this land has the potential to be redeveloped. The preferred uses for this site are:<br>• Residential, and/or<br>• General Employment.<br>This is a prominent site along key transport corridors through Kirkcaldy. The design of any development on this site must be of high quality and follow the Urban Design principles set out in the Creating A Better Fife: Fife Urban Design Guide and the Fife Masterplans Handbook.<br>Any residential capacity is dependent on the mix of end uses.<br>Access onto St. Clair Street must be via an upgraded junction. | Close to hospital, less factory and other opportunities |
| 9 | Junction Road | Brownfield Opportunity Site | KDY 43 |  | 0.982805 | Mill Plant, Victoria Works, Nairns Works, Bingo Club | None | Scottish Water, Kirkcaldy STW | Scottish Water, Kirkcaldy STW | Yes | Yes | No | Yes | No | Brownfield | 60 | Private Sector | This site is identified as a development opportunity. This means this land has the potential to be redeveloped. The preferred uses for this site are:<br>• Residential, and/or<br>• General Employment.<br>This is a prominent site along key transport corridors through Kirkcaldy. The design of any development on this site must be of high quality and follow the Urban Design principles set out in the Creating A Better Fife: Fife Urban Design Guide and the Fife Masterplans Handbook.<br>A higher density residential development is appropriate on this site given its location close to the centre of Kirkcaldy and the density of surrounding new residential developments.<br>Any residential capacity is dependent on the mix of end uses.<br>Access to site must be taken from Junction Road. | Close to hospital, less factory and other opportunities |
| 10 | Dunnikier Maltings | Housing | KDY 14 |  | 3.99503 | Mill Plant, Victoria Works, Nairns Works, Bingo Club | None | Scottish Water, Kirkcaldy STW | Scottish Water, Kirkcaldy STW | No | Yes | No | No | No | Housing | 108 | Private Sector | This site has planning permission. | Close to other opportunities, water based options |
| 11 | Victoria Road | Brownfield Opportunity Site | KDY 46 |  | 0.924296 | Dunnikier Works, Gowrie House Home, Kirkcaldy Fire Station, Snooker Club, Adam Smith College campus | None | Scottish Water, Kirkcaldy STW | Scottish Water, Kirkcaldy STW | Yes | Yes | No | Yes | No | Brownfield | 40 | Private Sector | This site is identified as a development opportunity. This means this land has the potential to be redeveloped. The preferred uses for this site are:<br>• Residential, and/or<br>• General Employment.<br>This is a prominent site along key transport corridors through Kirkcaldy. The design of any development on this site must be of a high quality and follow the Urban Design principles set out in the Creating A Better Fife: Fife Urban Design Guide and the Fife Masterplans Handbook.<br>A higher density residential development is appropriate on this site given its location close to the centre of Kirkcaldy. Any residential capacity is dependent on the mix of end uses.<br>Access to site must be taken from Victoria Road. A Traffic Assessment is required due to the proximity of the site to a major traffic corridor and the nearby signalised junction. | Small site but dense development planned, surrounding low density |
| 12 | Land to South of Cartmet Road | Housing | GLE 32 |  | 9.8719 | ASDA Supermarket, Bingo Club | None | Tullis Russell Papermakers | Tullis Russell Papermakers | No | Yes | No | No | No | SLA/Housing | 200 | Private Sector | This site is identified as a Local Plan allocation.<br>This site forms part of the Glenrothes East/Markinch SLA.<br>This site should be accessed from the A92 Markinch roundabout via an upgraded Tullis Russell access.<br>A development contribution towards school provision is required for this site. | Tullis Russell building new biomass plant, ideal large load to tie into if possible, close to hospital, decent size |
| 13 | Land to South of Cartmet Road | Strategic Land Allocation | GLE 32 |  | 9.8719 | ASDA Supermarket, Bingo Club | None | Tullis Russell Papermakers | Tullis Russell Papermakers | No | Yes | No | No | No | SLA/Housing | 200 | Private Sector | This site is identified as a Local Plan allocation.<br>This site forms part of the Glenrothes East/Markinch SLA.<br>This site should be accessed from the A92 Markinch roundabout via an upgraded Tullis Russell access.<br>A development contribution towards school provision is required for this site. | this is the same opportunity as the previous one |
| 14 | | Employment | KDY 26 |  | 6.22426 | Mill Plant, Whytemans Brae Hospital, Maggies Centre, Dunnikier Works, Victoria Hospital, Nairns Works | None | Scottish Water, Kirkcaldy STW | Scottish Water, Kirkcaldy STW | No | Yes | No | No | No | Housing | 20 | Private Sector | This site has planning permission. | Next to Victoria Hospital, next to opportunity 1, close to floating factory, no good local heat sources, close to other opportunities which could be linked |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | Aberhill | Area of Mixed Use (MU) | MET 07 |  | 7.03206 | Aberhill Depot, Kirkland High School, Flaukier-Barbour, Indoor Bowling Club, Aberhill primary School, Elmpark Sawmill, Dubbieside Bakery, , Abbotsford Nursing Home, Sainsburys Supermarket | None | Leven south STW | Levenmouth STW | Yes | Yes | No | No | No | Levenmouth SLA | 1150 | Private sector | This site is identified as a Local Plan allocation.<br>The area of search includes some existing housing, employment and brownfield sites which are in addition to the Fife Structure Plan allocation.<br>The SLA allocation goes beyond the Local Plan period and extends to 2026.<br>Development requirements are outlined in the Levenmouth Development Framework text above. | Next to opportunity 20, mixed use; limited extent and low density surroundings |
| 16 | Nairn Street | Area of Mixed Use (MU) | KD7 40 |  | 5.07169 | 4M Plant, Dunnikier Works, Kirkcaldy Fire Station, Nairns Works, Bingo Club, Adam Smith College campus | None | Scottish Water, Kirkcaldy STW | Scottish Water, Kirkcaldy STW | Yes | Yes | No | Yes | No | Area of Mixed Use | | Private Sector | This site is identified as a Local Plan allocation.<br>The co-location of compatible uses will be supported within this area. The area west of Cadenhy Road uses will be restricted to car sales and Class 4 uses.<br>The hatched areas are extensions to the existing designated AMU. | Close to other opportunities; wider linked options; mixed use intended; adjacent to fire factory |
| 17 | Central Park | Area of Mixed Use (MU) | CONV 08 |  | 10.2636 | St Brides RC Primary, Cowdenbeath Leisure Centre | None | Fife NGL Plant | Fife NGL Plant | No | Yes | No | No | No | General Employment | | Private Sector | This site is identified as a Local Plan allocation | Low density housing / mixed use surrounding area, leisure centre adjacent, large enough site to justify CHI if designed in, |
| 18 | Beaverbank Park Terrace | Housing | Mar 02 |  | 17.7372 | Preston House, Lomond House, Woodside Court Nursing Home, Industrial Units - Hag Business Park | None | Tullis Russell Papermakers | Tullis Russell Papermakers | No | Yes | No | No | No | SLA/Housing | 30 | Private Sector | This site is identified as a Local Plan allocation.<br>This site forms part of the Glenrothes East/Markinch SLA.<br>A development contribution towards school provision is required for this site. | Site is a good size; industrial uses uncertain - Fife Council offices & data centre possibly |
| 19 | Beaverbank Park Terrace | Strategic Land Allocation | Mar 02 |  | 17.7372 | Preston House, Lomond House, Woodside Court Nursing Home, Industrial Units - Hag Business Park | None | Tullis Russell Papermakers | Tullis Russell Papermakers | No | Yes | No | No | No | SLA/Housing | 30 | Private Sector | This site is identified as a Local Plan allocation.<br>This site forms part of the Glenrothes East/Markinch SLA.<br>A development contribution towards school provision is required for this site. | same as previous |
| 20 | Rear of Bayview Park... Kirkland Road | Brownfield Opportunity Site | MET 09 |  | 30.33 | Aberhill Primary School, Kier Hardie Street Depot, Aberhill Depot, Kirkland High School, Indoor Bowling Club, Elmpark Sawmill, Abbotsford Nursing Home | None | Levenmouth STW | Levenmouth STW | Yes | Yes | No | No | No | Brownfield | ≈100 * although this could be increased to approx. 190 units – see adjacent text | Private sector | This site is identified as a development opportunity. This means this land has the potential to be redeveloped.<br>Due to existing road and junction capacity issues any residential development on this site which is accessed off Methil Brae must not exceed 100 units. If proposal MET10 is implemented the capacity of this site could be reviewed. Alternatively, Methil Brae from Methilhaven Road to the proposed development site and Kirkland Walk from Methilhaven Road to Methil Brae, may be able to be upgraded by a developer to Residential Core Road standards as set out in Fife Council's Transportation Development Guidelines. This would allow a re-assessment of housing provision based on Methil Brae north of Kirkland Walk being considered as a Housing Road. In accordance with the advice given in the Transportation Development Guidelines, a maximum of 200 residential units would then be permissible off this stretch of Methil Brae. Allowing for the existing properties in this area, a maximum of approximately 190 new units would be acceptable.<br>The design of any development on this site must be of high quality and follow the Urban Design principles set out in the Creating A Better Fife' Fife Urban Design Guide and the Fife Masterplans Handbook. Any development on this site must provide a formal landscaped walkway along the River Leven frontage that links the areas of protected open space to the west and east of this site. | as per site 15 |

| Overall Rank (Weighted) | Overall Score (Weighted) | Overall Rank (unweighted) | Overall Score (unweighted) | Type | Site Reference | Area (Ha) | Number of Anchor Loads within 500m | Anchor Load Rank | Anchor Load Weighted | Distance (m) to existing scheme with potential for expansion | Existing Scheme Rank | Existing Scheme Weighted | Distance (m) to potential supply source | Potential supply Rank | Potential Supply Weighted | % of households in Fuel Poverty | Fuel Poverty Rank | Fuel Poverty Weighted | Total Heat Demand (kWh) within 500m | Heat Demand Rank | Heat Demand Weighted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.38 | 2 | 1 | Mixed Use | MU7 | 31.9134 | 6 | 5 | 0.5 | 8646 | 0 | 0 | 181.523 | 10 | 2 | 0.38 | 9 | 0.9 | 1750380 | 7 | 3.5 |
| 2 | 1.38 | 6 | 3 | Opportunity | Op21 | 4.06349 | 7 | 6 | 0.6 | 9049 | 0 | 0 | 664.842 | 7 | 1.4 | 0.38 | 9 | 0.9 | 2083240 | 8 | 4 |
| 3 | 1.36 | 9 | 4.5 | Opportunity | Op4 | 0.37718 | 11 | 9 | 0.9 | 27581 | 0 | 0 | 3121.64 | 0 | 0 | 0.4 | 9 | 0.9 | 4088780 | 10 | 5 |
| 4 | 1.36 | 4 | 2 | Mixed Use | MU5 | 24.5582 | 8 | 7 | 0.7 | 7699 | 0 | 0 | 1247.01 | 3 | 0.6 | 0.29 | 5 | 0.5 | 3330680 | 10 | 5 |
| 5 | 1.36 | 10 | 5 | Opportunity | Op6 | 0.1312 | 15 | 10 | 1 | 27983 | 0 | 0 | 3399.9 | 0 | 0 | 0.35 | 8 | 0.8 | 3891080 | 10 | 5 |
| 6 | 1.34 | 7 | 3.5 | Employment | E27 | 1.61586 | 7 | 6 | 0.6 | 8936 | 0 | 0 | 843.802 | 6 | 1.2 | 0.38 | 9 | 0.9 | 2100560 | 8 | 4 |
| 7 | 1.34 | 8 | 4 | Opportunity | Op2 | 1.08348 | 15 | 10 | 1 | 27729 | 0 | 0 | 3354.64 | 0 | 0 | 0.33 | 7 | 0.7 | 4740850 | 10 | 5 |
| 8 | 1.32 | 8 | 4 | Opportunity | Op9 | 0.592381 | 11 | 9 | 0.9 | 27685 | 0 | 0 | 3137.77 | 0 | 0 | 0.34 | 7 | 0.7 | 3706810 | 10 | 5 |
| 9 | 1.32 | 9 | 4.5 | Opportunity | Op3 | 0.239321 | 8 | 7 | 0.7 | 27551 | 0 | 0 | 3148.6 | 0 | 0 | 0.38 | 9 | 0.9 | 3699770 | 10 | 5 |
| 10 | 1.28 | 10 | 5 | Opportunity | Op5 | 0.143857 | 6 | 5 | 0.5 | 27714 | 0 | 0 | 2795.72 | 0 | 0 | 0.38 | 9 | 0.9 | 3099770 | 10 | 5 |
| 11 | 1.28 | 9 | 4.5 | Opportunity | Op1 | 0.343184 | 11 | 9 | 0.9 | 27870 | 0 | 0 | 3314.18 | 0 | 0 | 0.28 | 5 | 0.5 | 3763260 | 10 | 5 |
| 12 | 1.28 | 9 | 4.5 | Housing | H2 | 0.32504 | 8 | 7 | 0.7 | 27389 | 0 | 0 | 3508.99 | 0 | 0 | 0.32 | 7 | 0.7 | 3323600 | 10 | 5 |
| 13 | 1.26 | 9 | 4.5 | Housing | H1 | 0.221291 | 9 | 7 | 0.7 | 27717 | 0 | 0 | 2954.55 | 0 | 0 | 0.31 | 6 | 0.6 | 3663100 | 10 | 5 |
| 14 | 1.22 | 1 | 0.5 | Housing | H7 | 334.256 | 10 | 8 | 0.8 | 25110 | 0 | 0 | 879.365 | 5 | 1 | 0.36 | 8 | 0.8 | 1674630 | 7 | 3.5 |
| 15 | 1.14 | 5 | 2.5 | Housing | H4 | 13.0126 | 6 | 5 | 0.5 | 26769 | 0 | 0 | 3662.26 | 0 | 0 | 0.22 | 2 | 0.2 | 3545220 | 10 | 5 |
| 16 | 1.1 | 3 | 1.5 | Mixed Use | MU1 | 28.0771 | 6 | 5 | 0.5 | 27342 | 0 | 0 | 4192.09 | 0 | 0 | 0.28 | 5 | 0.5 | 2649190 | 9 | 4.5 |
| 17 | 1.08 | 4 | 2 | Housing | H64 | 7.82782 | 5 | 4 | 0.4 | 7743 | 0 | 0 | 1201.03 | 4 | 0.8 | 0.33 | 7 | 0.7 | 1669800 | 7 | 3.5 |
| 18 | 1.08 | 6 | 3 | Opportunity | Op12 | 2.97408 | 5 | 4 | 0.4 | 8620 | 0 | 0 | 8379.01 | 0 | 0 | 0.27 | 5 | 0.5 | 2463190 | 9 | 4.5 |
| 19 | 1.06 | 2 | 1 | Housing |  | 43.3115 | 5 | 4 | 0.4 | 18402 | 0 | 0 | 5017.26 | 0 | 0 | 0.26 | 4 | 0.4 | 2527390 | 9 | 4.5 |
| 20 | 1 | 1 | 0.5 | Housing | H27 | 64.4436 | 1 | 1 | 0.1 | 23549 | 0 | 0 | 486.728 | 8 | 1.6 | 0.24 | 3 | 0.3 | 1038230 | 6 | 3 |

| | | | | | | ANCHOR LOADS | POTENTIAL SUPPLIERS | | | CONSTRAINTS | | | | | LOCAL PLAN | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Overall Rank (Weighted) | Site Name | Type | Site Reference | Map | Area (Ha) | Anchor Loads within 500m | Potential Suppliers within 2 km (Distillery) | Potential Suppliers within 2 km (CO2) | Potential Suppliers within 2 km (Methane) | Flood - Costal | Flood - Fluvial | AQMA | SSSI | NNR | Description | Timescale | Funding in place Y/N | Lead agency | Progress | Notes |
| 1 | Broich Road Crieff | Mixed Use | MU7 |  | 31.9134 | Crieff Hospital; Crieff Primary School; Strathearn Community Campus | None | PKC North Forr Landfill | PKC North Forr Landfill | No | Yes | No | No | No | **Site Actions**<br>-Masterplan (MU7)<br>-Transport Assessment (MU7)<br>-Archaeological investigation (MU7) | TBC | N | Developer/Landowner; Perth & Kinross Council; Transport Scotland | | Community Campus has a swimming pool and leisure facilities also; landfill not particularly big; hospital also small; mixed use designation |
| 2 | Broich Road Crieff | Opportunity | Op21 |  | 4.06349 | Ancaster Blesma Home; Crieff Hospital; Crieff Primary School; Strathearn Community Campus | None | PKC North Forr Landfill | PKC North Forr Landfill | No | Yes | No | No | No | **Site Actions**<br>-Masterplan (MU7)<br>-Transport Assessment (MU7)<br>-Archaeological investigation (MU7) | TBC | N | Developer/Landowner; Perth & Kinross Council; Transport Scotland | | As above - should be combined with opportunity 1 even if phased development |
| 3 | Mill Street (South), Perth | Opportunity | Op4 |  | 0.37718 | Bannatyne Fitness; City Mills Hotel; Matalan; Salutation Hotel; St Johnstoun Nursing Home; WM Morrison; AK Bell Library; Council Offices; Greyfriars House; Pullar House (Council buildings); Tayside Police | None | None | None | Yes | Yes | Yes | No | No | **Site Actions**<br>- Development Proposal | TBC | N | Developer/Landowner; Perth & Kinross Council | | North side of the street has the Council offices (recently refurbed), theatre and extensive pedestrian areas / car parks so possibly easier dig; Perth city centre is busy so digging up streets in centre may not be popular |
| 4 | Western Blairgowrie | Mixed Use | MU5 |  | 24.5582 | Blairgowrie Community Campus; Blairgowrie High School; Blairgowrie Recreation Centre; A Proctor Group Industrial Estate; Muirton House Nursing Home; Rosemount Care Home | None | Carsie Broiler Farm | Carsie Broiler Farm | No | No | No | Yes | No | **Site Actions**<br>-Masterplan<br>-Transport Assessment<br>-Wastewater Network Investigations<br>- Archaeological Investigation<br>-Increase education provision | 2015 | N | Developer/Landowner; Perth & Kinross Council; Transport Scotland; SEPA; Scottish Water | | Most of anchor loads at north end of site; industrial site manufacturers building cladding, insulation and acoustic products; existing housing is low density detached of varied age; density of development not known |
| 5 | Waverley Hotel, County Place, Perth | Opportunity | Op6 |  | 0.1312 | A K Bell Library; Caledonian Road Primary School; Perth Leisure Pool; Pullar House; Tayside Police; Bannatyne Fitness; City Mills Hotel; Dewars Ice Rink; Matalan, Perth Railway Station, St Catherines Retail Park; Station Hotel; WM Morrison | None | None | None | Yes | Yes | Yes | No | No | **Site Actions**<br>- Development Proposal | TBC | N | Developer/Landowner; Perth & Kinross Council | | Very small site; another very small site close by - possibly suited to building level measure but not DH; surrounding buildings moderate demand |
| 6 | Broich Road Crieff | Employment | E27 |  | 1.61586 | Crieff Hospital; Crieff Primary School; Strathearn Community Campus; Ancaster Blesma Home | None | PKC North Forr Landfill | PKC North Forr Landfill | No | Yes | No | No | No | **Site Actions**<br>-Masterplan (MU7)<br>-Transport Assessment (MU7)<br>-Archaeological investigation (MU7) | TBC | N | Developer/Landowner; Perth & Kinross Council; Transport Scotland | | Should link to sites 1&2, possibly as phased development |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | Thimbleroe Car Park, Perth | Opportunity | Op2 |  | 1.08348 | A K Bell Library; Caledonian Road Primary School; Perth Leisure Pool; Pullar House; Tayside Police; Bannatyne Fitness; City Mills Hotel; Dewars Ice Rink; Matalan; St Catherines Retail Park; Station Hotel; WM Morrison; St Johnstouns Nursing Home | None | None | None | Yes | Yes | Yes | No | No | **Site Actions** - Development Proposal | TBC | N | Developer/Landowner; Perth & Kinross Council | | Site is currently land used for car parks; fairly central and likely to be reasonably dense development; could potentially expand to link to opportunity 3 above, but this would be through existing buildings and busy streets |
| 8 | Bus Station, Leonard Street, Perth | Opportunity | Op8 |  | 0.592381 | A K Bell Library; Caledonian Road Primary School; Greyfriars House; Perth Leisure Pool; City Mills Hotel; Dewars Ice Rink; Matalan; Perth Railway Station; Station Hotel; WM Morrison | None | None | None | Yes | Yes | Yes | No | No | **Site Actions** - Development Proposal | TBC | N | Developer/Landowner; Perth & Kinross Council; Tactran | Feasibility Study to be prepared | Site of bus station; mixed use surrounding buildings including large hotel and tower blocks so good loads next to site; small scheme linked to adjoining large loads possible - AQMA though |
| 9 | Horsecross, Perth | Opportunity | Op3 |  | 0.239321 | Council building; Greyfriars House; Pullar House; Tayside Police; City Mills Hotel; Matalan; Salutation Hotel; St Johnstouns Nursing Home | None | None | None | Yes | Yes | Yes | No | No | **Site Actions** - Development Proposal | TBC | N | Developer/Landowner; Perth & Kinross Council | Currently marketed by Perth & Kinross Council | Should link to site 3 as across the street from it. Between theatre and refurbed council offices |
| 10 | Canal Street (former Beatties Toystore), Perth | Opportunity | Op5 |  | 0.148837 | Council building; Greyfriars House; Pullar House; Isle of Skye Hotel; Matalan; Salutation Hotel | None | None | None | Yes | Yes | Yes | No | No | **Site Actions** - Development Proposal | TBC | N | Developer/Landowner; Perth & Kinross Council | | Small site (one building); none of other opportunities particularly close |
| 11 | Caledonian Road School, Perth | Opportunity | Op1 |  | 0.343184 | A K Bell Library; Caledonian Road Primary School; Perth Leisure Pool; City Mills Hotel; Dewars Ice Rink; Matalan; Perth Railway Station; St Catherines Retail Park; Station Hotel; WM Morrison | None | None | None | Yes | Yes | Yes | No | No | **Site Actions** - Development Proposal | TBC | N | Developer/Landowner; Perth & Kinross Council | | Between opportunities 5 and 8, so could be linked potentially; main anchor load is the primary school which appears to be the site so may be up for closure? Mix of loads and potential pipe runs away from main roads |
| 12 | St John's School, Stormont Street, Perth | Housing | H2 |  | 0.32504 | Bell Sports Centre; Pullar House; Tayside Police; Balhousie North Inch Care Home; Bannatyne Fitness; City Mills Hotel; St Catherines Retail Park; St Johnstouns Nursing Home | None | None | None | Yes | Yes | Yes | No | No | **Site Actions** - Development Proposal | TBC | N | Developer/Landowner; Perth & Kinross Council | | Surrounding buildings mix used and lower density; not close to any other opportunities or major roads; if housing development demand likely to be low |
| 13 | Scott Street/Charles Street, Perth | Housing | H1 |  | 0.221291 | A K Bell Library; Caledonian Road Primary School; Council building; Greyfriars House; Pullar House; City Mills Hotel; Matalan; Salutation Hotel; Station Hotel | None | None | None | Yes | Yes | Yes | No | No | **Site Actions** - Development Proposal | TBC | N | Developer/Landowner; Perth & Kinross Council | | High demand surrounding site - mixed use including council office, Matalan; not close to other opportunities |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | Bertha Park, Perth | Housing | H7 |  | 334.256 | A B P Ltd; Beer Scotland; Fishers; Huntingtower House Hotel; Johnsons Apparelmaster; Kardtal Ltd; Spirax Binding; Tayside Contracts Depot; Williams Lea Document Services Building | Inveralmond Brewery | Battleby Landfill Site | Battleby Landfill Site | Yes | Yes | Yes | Yes | No | **Site Actions**<br>- Masterplan<br>- Flood Risk Assessment<br>- Connection with CTUR/A9 prior to commencement of development<br>- New primary school and new secondary school<br>- District Heating and Investigation into Combined Heat and Power (CHP) | 2015 | N | Developer/Landowner; Perth & Kinross Council Transport Scotland; Tactran; SEPA | Identified as an SDA in TAYplan Proposed Plan | Very large site; across the river from multiple decent roads in the industrial estate; AQMA and SSSI so development may be restricted; housing only so tie in to industrial estate beneficial; low density housing likely; large area so good possibility to do something; plan already talking of DH |
| 15 | Marshalling Yards, Tulloch, Perth | Housing | H4 |  | 13.0126 | Perth Grammar School; Hydrostatic Extrusions Ltd; Perth Distribution Office; Queens Barracks; Inveralmond House | Inveralmond Brewery | None | None | No | Yes | Yes | No | No | **Site Actions**<br>- Masterplan<br>- Flood Risk Assessment<br>- Archaeological Investigation<br>- Improvement/replacement of White Bridge<br>- Contaminated land assessment & remediation<br>- Increase primary school capacity | 2013 | N | Developer/Landowner; Perth & Kinross Council Transport Scotland; SEPA | | Surroundings low density and mixed use; between Perth grammar shool and Perth College so could link these; pipe run to Inveralmond Industrial estate could be mostly away from existing roads etc so limited disruption |
| 16 | Bridgen, Perth | Mixed Use | MU1 |  | 28.0771 | Fairview School; Perth Academy; Perth High School; Leisure Centre; Avisa HQ | None | None | None | No | Yes | Yes | No | No | **Site Actions**<br>- Masterplan<br>- Flood Risk Assessment<br>- New Primary School<br>- District Heating and investigation into Combined Heat and Power (CHP) | 2013 | Not required | Developer/Landowner; Perth & Kinross Council SEPA | Identified as an SDA in TAYplan Proposed Plan | Large site; nearby shools are large but a little removed; surrounding area mainly low density housing so not suitable to connect; likely to be site only scheme with possible link to Avisa |
| 17 | Blairgowrie South | Housing | H64 |  | 7.82782 | Blairgowrie Community Campus; Blairgowrie Recreation Centre; Rosemount Care Home | None | Carsie Broiler Farm | Carsie Broiler Farm | No | No | No | No | No | **Site Actions**<br>- Development proposal<br>- FRA<br>- Wastewater Network Investigation<br>- Archaeological Investigation | 2015 | N | Developer/Landowner; Perth & Kinross Council; Transport Scotland; SEPA; Scottish Water | | Surrounding area has community campus including pool; otherwise low density housing; close enough to opportunity 4 for tie in; could work if DH included from start |
| 18 | Former High School, Kinross | Opportunity | Op12 |  | 2.97408 | Kinross Primary School; Green Hotel; Rachel House Childrens Hospice; Windlestrae Hotel | None | None | None | No | Yes | No | No | No | **Site Actions**<br>- Development proposal | TBC | N | Developer/Landowner; Perth & Kinross Council | | Surroundings low density; no major roads adjacent to site; size limited |
| 19 | | Housing | |  | 43.31 | Parkdale Care Home; Community School of Auchterarder; Balhousie Care Home; Castle Brae; Colleam House | None | None | None | No | Yes | No | No | No | | | | | | Surroundings low density; some decent roads next to site; large area so can include DH |
| 20 | Luncarty South | Housing | H27 |  | 64.44 | Balhousie Luncarty Care Home | None | Battleby Landfill Site | Battleby Landfill Site | Yes | Yes | No | No | No | Site Actions<br>- Masterplan<br>- FRA<br>- Transport Assessment<br>- New junction to A9 & CTUR to be approved to allow access and site layout to be designed<br>- District Heating and Investigation into Combined Heat and Power (CHP) | 2013 | Not required | Developer/Landowner; Perth & Kinross Council; Transport Scotland; Tactran; SEPA | | Close to Battleby Landfill; close to large development opportunity 14; DH already in plan; housing only |