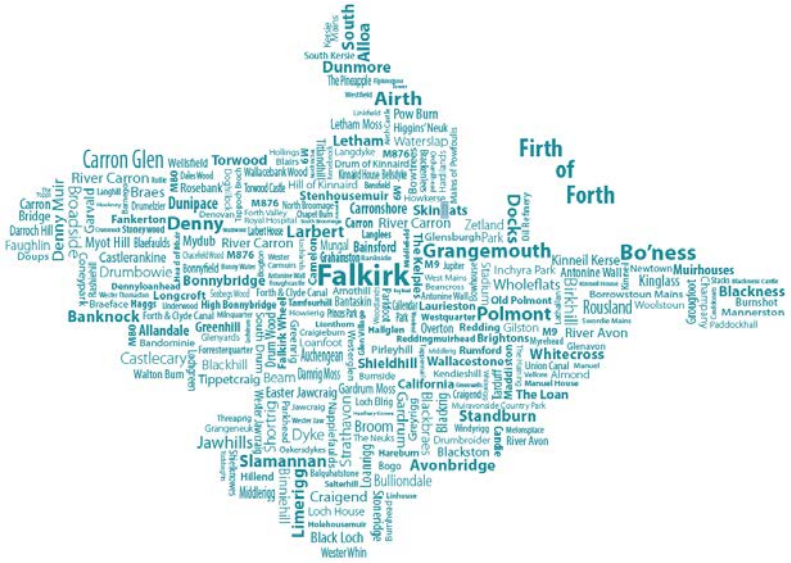
Renewable and Low Carbon Energy

Supplementary Guidance SG14

February 2022



Falkirk Council

Supplementary Guidance

A suite of 14 supplementary guidance notes (SG's) is currently being produced by the Council in conjunction with LDP2. The number of SGs is reducing from seventeen to fourteen, as three of the adopted SGs are being consolidated to provide a more comprehensive and integrated approach to guidance. The SGs seek to provide more detailed guidance on how particular local development plan policies should be applied in practice.

These SGs form a statutory supplement to LDP2, and are intended to expand upon planning policies and proposals contained in the proposed plan.

A full list of the supplementary guidance in this series is found below.

- SG01 Development in the Countryside
- SG02 Neighbourhood Design
- SG03 Residential Extension and Alterations
- SG04 Shopfronts
- SG05 Green Infrastructure and New Development
- SG06 Affordable Housing
- SG07 Biodiversity and Development
- SG08 Local Nature Conservation and Geodiversity Sites
- SG09 Landscape Character Assessment and Landscape Designations
- SG10 Trees and Development
- SG11 Frontiers of the Roman Empire (Antonine Wall) World Heritage Sites
- SG12 Listed Buildings and Unlisted Properties in Conservations Areas
- SG13 Developer Contributions
- SG14 Renewable and Low Carbon Energy

Renewable and Low Carbon Energy

1. Introduction

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3. Development Management Guidance for Renewable and Low Carbon Energy

4. Energy and New Development

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1. Introduction

Background

1.1 **What is renewable and low carbon energy?:** Renewable energy is generated from natural resources such as the sun, wind, and water, using technology which ensures that the energy stores are naturally replenished. Low carbon energy is generated from processes which generate substantially less carbon than traditional energy generation from non-renewable sources such as fossil fuels. National policy aims to encourage the transition to a low carbon economy, and recognises that the decarbonisation of energy delivery will be a staged process, as the development industry and local and national governments adapt to increasingly ambitious targets. Renewable and low carbon energy can address the needs of communities and businesses and can provide economic benefits as well as the reduction of fuel poverty, whilst protecting Falkirk's unique environment, and meeting the diverse needs of communities.

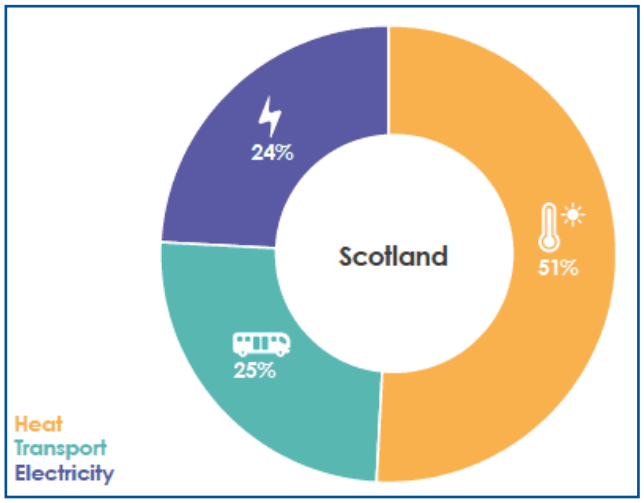
1.2 Figure 1 shows that heating makes up half of Scotland's energy consumption and transport and electricity make up approximately a quarter each. More than half (51%) of the energy we consume in our homes and businesses is used for heating, the majority of which is supplied by natural gas. An estimated 79% of homes used natural gas as their primary heating fuel in 2016.

Transport accounts for 25% of total energy demand. The majority of this is for road transport.

In recent years biofuel has been introduced into road fuel, and currently accounts for 3.1% of total fuels. Electricity accounts for just under a quarter of total energy demand, with 77% of electricity generation in 2015 coming from zero or low carbon sources, and 27% from wind energy alone. The installed capacity of renewables in Scotland reached 9.5 GW in June 2017.

The Scottish Government Energy Strategy advocates a 'whole-system view'. This means that we should be considering all sectors including domestic and non-domestic (i.e. industrial and commercial) sectors. Three-fifths of energy is accounted for by the industrial and commercial sectors and two-fifths consumed domestically.

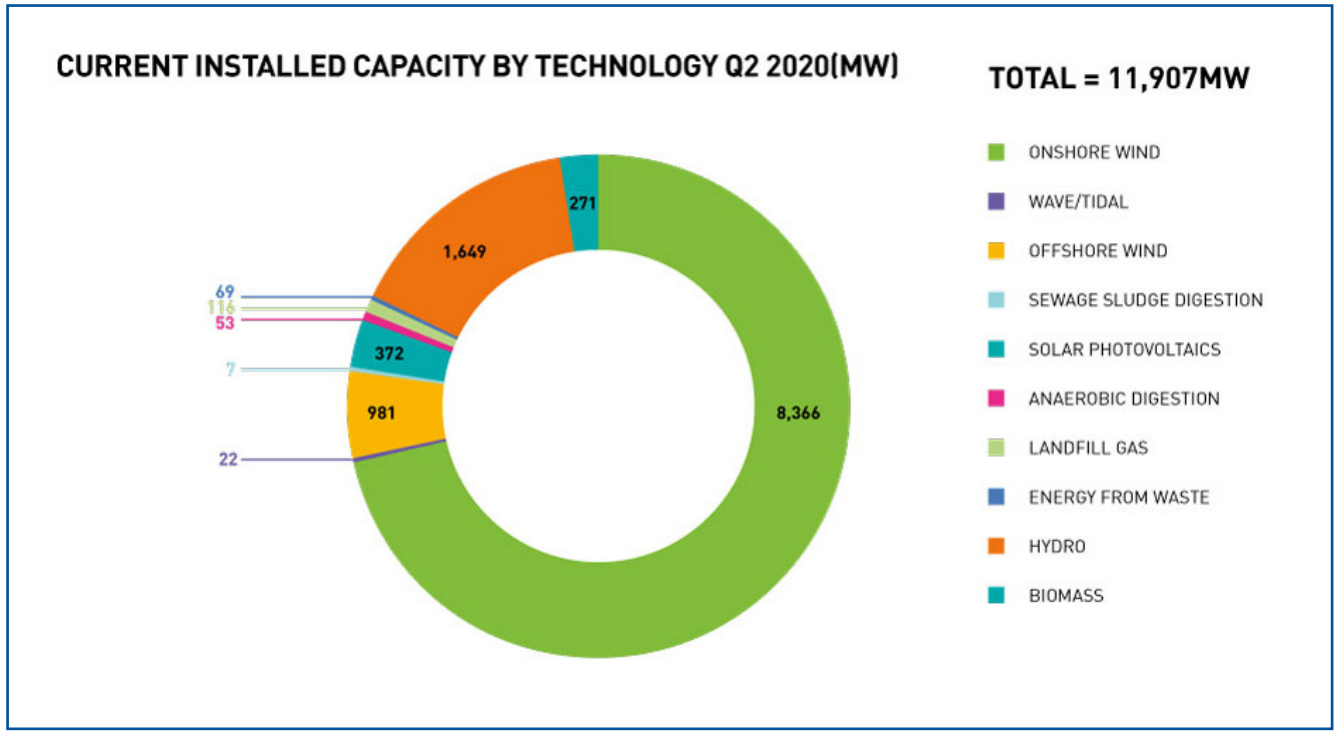
Figure 1



1.3 Figure 2 shows Scotland's installed renewable energy capacity. Renewable electricity generation capacity in Scotland has more than trebled in the last ten years; as of mid-2020, there was 11.9 GW of installed capacity across the country, an increase from 7.7GW at the end of 2015. This is broken down by sector below:

1.4 In terms of the Scottish economy the renewables sector accounted for 17,700 FTE jobs in 2017, with turnover from renewable energy activity in 2017 being £5,544 million. The renewable heat sector has seen the biggest growth in terms of turnover, to £1.7 billion in 2017 from £0.5 billion in 2016; this was due largely to increased activity in businesses within the production of electricity industry (*Source: ONS 'Low carbon and renewable energy economy, UK 2017*).

Figure 2: Scotland's Installed Energy Capacity



Purpose of Guidance

1.5 LDP2, adopted in August 2020, contains a number of policies in relation to renewable and low carbon energy. This Supplementary Guidance (SG) expands on these policies. It consolidates information previously contained within three separate guidance documents relating to Wind Energy Developments, Renewable Energy, and Low and Zero Carbon Development. It is intended that the document will provide a toolkit for developers, communities and individuals seeking to develop a range of renewable and low carbon technologies. These include biomass, CHP, solar/PV, ground, air and water source heat, deep geothermal and hydro, as well as the potential for district heating within the Falkirk Council area. The guidance is aimed at:

a) Commercial developers or community organisations exploring the feasibility for low carbon and renewable energy proposals and/or decentralised heat. This could be a standalone proposal such as a wind farm or hydro scheme, or it could be a proposal to be delivered alongside another development such as a district heating scheme.

b) Developers or individuals seeking to fulfil the planning requirements for inclusion of low and zero carbon technologies in new development of any scale. The guidance together with the Checklist in Appendix 2 sets out the level of information required so that the terms of the policy can be met.

1.6 **Section 2** of the guidance provides an overview of the technologies available, considerers locational constraints and opportunities within the area, and signposts to other sources of information on feasibility and technical scope. **Section 3** of the guidance sets out Development Management criteria for assessing proposals against the range of constraints which apply to developments. **Section 4** provides guidance for fulfilling the requirements of Policy IR13 for integrating Low and Zero Carbon Generating Technologies (LZCGT) within new development.

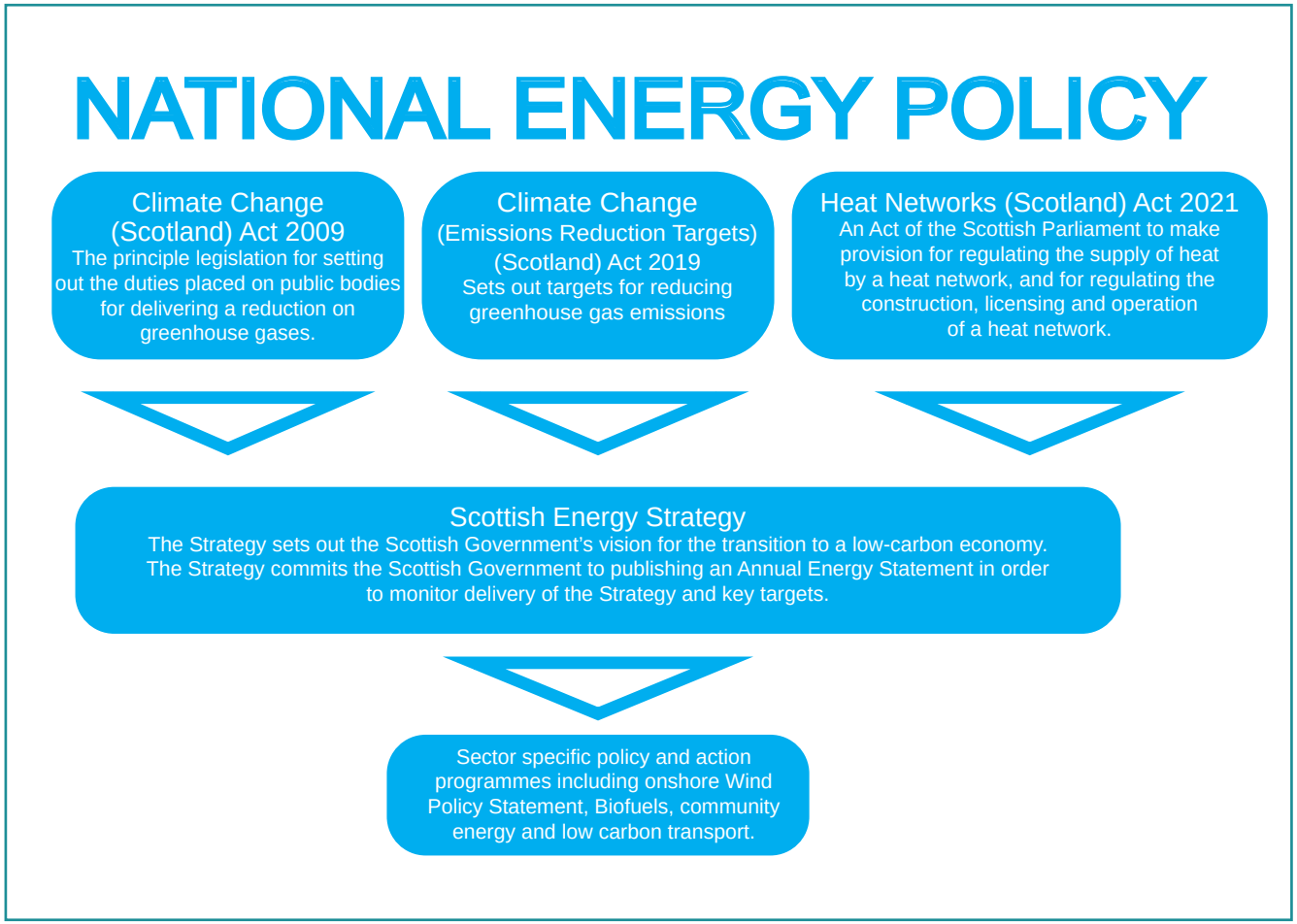
National Energy Policy and Guidance

1.7 There have been substantial legislative changes over the last 10 years brought in by the Scottish Government to drive progress towards a low carbon transition. Figure 3 shows the relationship between Scotland's energy legislation, national policy and key targets. The Scottish Government seeks to promote and explore the potential of Scotland's renewable energy resource and its ability to meet our local and national heat, transport and electricity needs, while also contributing to meeting our ambitious energy targets. Scotland's long-term climate change targets will require the near-complete decarbonisation of our energy system by 2045, with renewable energy meeting a significant share of our energy needs. Whilst the subsidy regime is managed by the UK through the Department for Energy and Climate Change, the Scottish Government has committed to a range of funding mechanisms and opportunities for investment in the decarbonised energy sector, in order to meet ambitious targets set by the Scottish Government over the next 20 years. More information on the latest Scottish Government investment in renewable and low carbon energy, including the Energy Investment Fund can be found here: https://www.gov.scot/policies/renewable-and-low-carbon-energy/

1.8 The **Climate Change (Scotland) Act 2009** committed Scotland to a 42% reduction in greenhouse gases by 2020 and 80% reduction by 2050. The Act requires Local Authorities to act sustainably, contribute to carbon emissions reduction targets and to climate change adaptation. Recently this target has been further strengthened to committing Scotland to have net zero emissions by 2045.

1.9 The **Scottish Government's Energy Strategy** sets out the long-term targets and roadmap for Scotland's energy until 2030. Key targets include 50% of the energy for Scotland's heat, transport and electricity consumption to be supplied by renewable sources by 2030, with the aim to decarbonise Scotland's energy system by 2050.

Figure 3: Scotland's Energy - National, Legislation, Policy and Targets.



1.10 The terms of the **Climate Change (Scotland) Act** informed the content of **National Planning Framework 3 (NPF3)** and **Scottish Planning Policy 2014 (SPP)**. The shared vision of NPF3 and SPP includes a growing, low carbon economy where we live in sustainable, well-designed places.

NATIONAL PLANNING FRAMEWORK

- Seeks to encourage greater use of all renewable technologies and recognised the progress to date with offshore and onshore wind;
- Seeks to encourage the recovery of waste heat and supports the development of heat networks, particularly in national developments such as Grangemouth Investment Zone. Seeks to secure greater community ownership of renewable energy developments;
- The emerging NPF4 is likely to include further spatial strategy work to set out the location and delivery of energy infrastructure. Integrated Regional Spatial Strategies could help to deliver this.

SCOTTISH PLANNING POLICY (SPP)

- Seeks to ensure an area's full potential for electricity and heat from renewable sources is achieved in line with national climate change targets, giving due regard to relevant environmental, community and cumulative impact considerations;
- Support new build developments, infrastructure or retrofit projects which deliver energy efficiency and the recovery of waste heat;
- Set out the factors to be taken into account in considering proposals for energy developments. These are reflected in Falkirk LDP2 policy and the Development Management Criteria in Section 3;
- Support the development of heat networks and use heat mapping to identify the potential for co-locating developments with a high heat demand, with sources of supply and ensure that Development Plans include policies in their provision.

1.11 The Renewable Heat Targets and Action report, published in 2019 monitors progress around renewable heat delivery. It indicates that in order to achieve the target of 50% of the energy for Scotland's heat, transport and electricity consumption to be supplied from renewable sources by 2030, retrofitting of micro-renewables and the development of district heating networks will be required. The action plan highlights the role that the planning system will play in terms of strategic policy and its regulatory role.

1.12 The Climate Change Plan 2018-2032 has been updated in December 2020 to include new ambitious targets to end our contribution to climate change by 2045. The Scottish Government have committed to reduce emissions by 75% by 2030 (compared with 1990) and to net zero by 2045.

1.13 The Draft Heat in Buildings Strategy - Achieving Net Zero Emissions in Scotland's Buildings sets out actions and proposals for transforming our buildings and the systems that supply their heat, ensuring all buildings reach zero emissions by 2045. The Draft Strategy also highlights the role which Hydrogen is likely to play in the longer term, which is reflected through the Hydrogen Policy Statement and Assessment, while focussing on technologies which are ready to deploy.

Local Energy Policy and Guidance

1.14 **Falkirk Council's Carbon Management Plan (CMP)** lays out how carbon emissions can be cut across all of the Council's estate and activities and identifies a commitment to investigate the potential for renewable energy projects linked to Council functions. The CMP also sets out various potential funding sources, including potential income from renewables projects, which can provide low cost loans and finance for energy efficiency and renewable energy projects. The Plan can be found here:
https://www.falkirk.gov.uk/services/environment/environmental-policy/climate-change/

1.15 The **Local Housing Strategy 2017-2022** seeks to ensure that there is an adequate supply of good quality housing and increase the range of affordable housing options on the Council area. The LHS also makes a commitment to explore potential for renewable energy including decentralised energy provision within areas of fuel poverty and communities which are not served by the gas network.

1.16 In August 2019, Falkirk Council declared a Climate Emergency and agreed to "push towards increasing our efforts to reduce our carbon emissions to net zero by 2030." The Council is driving forward with the Climate Change agenda through adaptation and mitigation. The Council has previously undertaken work on its Local Climate Impact Profile (LCLIP) which is a study of the impact of severe weather events on an area that looks at how services and lives are affected by any disruption.

1.17 Falkirk Council is in the early stages of producing a Council-wide Local Heat and Energy Efficiency Strategy (LHEES), having taken part in the Scottish Government initial pilot scheme. This will provide a framework for taking an area-based approach to heat and energy efficiency planning and delivery

Development Plan Policy

1.18 In terms of the strategic objectives which underpin the Vision of the Falkirk Local Development Plan 2 (LDP2), the plan seeks to support a low carbon, circular economy and build resilience to climate change. This will be achieved by:

- Embedding renewable energy and heat within new development;
- Ensuring a range of sustainable transport choices;
- Sustainable waste management; and
- Investment in flood mitigation resilience.

1.19 LDP2 is supportive of renewable and low carbon energy proposals subject to relevant policy criteria. It seeks to ensure that major developments assess potential for decentralised energy generation and district heating systems. LDP2 also seeks to ensure that new developments provide a specified reduction in carbon emissions through Low and Zero Carbon Generating Technologies (LZCGT). The relevant policies are as follows:

Policy IR12 sets out criteria for assessment of all proposals for energy development, as well as requiring proposals for onshore wind to be assessed against the Spatial Framework, shown in Map 3.7 of the LDP2 Spatial Strategy. These criteria are further expanded on in Section 3: Development Management Guidance.

Policy IR13 seeks to ensure that all new buildings incorporate on-site low and zero carbon-generating technologies (LZCGT) to meet a proportion of the overall energy requirements, and well as requiring development to minimise energy requirements. This policy is intended to meet the requirements of Section 72 of the Climate Change (Scotland) Act 2009. Section 4: Energy and New Development in the SG sets out the background and provides information on the level of assessment required.

Policy IR14 requires developers to assess the potential for decentralised energy generation in major new developments. Section 4: Energy and New Development in the SG sets out the background and provides information on the level of assessment required.

IR12 Energy Generation Development

1. Energy infrastructure developments will be assessed in relation to the following factors:
   - Net economic impacts, including local and community socio - economic benefits;
   - The scale of contribution to renewable energy generation targets and the effect on greenhouse gas emissions;
   - Landscape and visual impacts, having regard to Policy PE18;
   - Impacts on forestry, having regard to Policy PE20;
   - Ecological impacts; having regard to Policy PE19;
   - Impact on green belt objectives, having regard to Policy PE15;
   - Impact on carbon rich and rare soils, having regard to Policy PE25;
   - Impact on the water environment, having regard to Policy PE22;
   - The extent to which waste would be minimised during construction and operation, having regard to Policy IR18;
   - Impacts on the historic environment; having regard to Policies PE05-PE12;
   - Impacts on aviation and digital infrastructure;
   - Impacts on communities, whether settlements or individual residential properties, including issues of noise, shadow flicker and air quality;
   - Cumulative impacts in relation to the above factors, arising from the combined effect of the proposal with other existing or approved energy developments; and
   - Tourism and recreation impacts, including for public access and for long distance walking, cycling and scenic routes.

   Detailed guidance on the above factors as they apply to different energy technologies is set out in Supplementary Guidance SG14 Renewable and Low Carbon Energy.
2. Proposals for onshore wind energy proposals of 50m to tip and above will additionally be assessed in relation to the Spatial Framework set out in Map 3.7 of the Spatial Strategy, as follows:
   - Within areas of significant protection (Group 2), wind farms may be appropriate in some circumstances. Further consideration will be required to demonstrate that any significant effect on the qualities of these areas can be substantially overcome by siting, design or other mitigation; and
   - Within areas with potential for wind farm development (Group 3), wind farms are likely to be acceptable, subject to detailed consideration against the criteria set out in sub section (1).

IR13 Low and Zero Carbon Development

1. All new buildings should incorporate on-site low and zero carbon-generating technologies (LZCGT) to meet a proportion of the overall energy requirements. Applicants must demonstrate that 12% of the overall reduction in CO2 emissions as required by Building Standards has been achieved via on-site LZCGT. This proportion will be increased as part of subsequent reviews of the LDP. All proposals must be accompanied by an Energy Statement which demonstrates compliance with this policy. Should proposals not include LZCGT, the Energy Statement must set out the technical or practical constraints which limit the application of LZCGT. Further guidance is contained in Supplementary Guidance SG14 Renewable and Low Carbon Energy. Exclusions from the requirements of this policy are:
   - Proposals for change of use or conversion of buildings;
   - Alterations and extensions to buildings;
   - Stand-alone buildings that are ancillary and have an area less than 50 square metres;
   - Buildings which will not be heated or cooled other than by heating provided solely for the purpose of frost protection;
   - Temporary buildings with consent for 2 years or less; and
   - Where implementation of the requirement would have an adverse impact on the historic environment as detailed in the Energy Statement or accompanying Design Statement.
2. The design and layout of development should, as far as possible, seek to minimise energy requirements through the other sustainability aspects of the current Sections 6 and 7 of the current Building Standards Technical Handbook.

IR14 Heat Networks

1. Decentralised energy generation with heat recovery, and district heating systems, will be encouraged in major new developments, subject to the satisfactory location and design of associated plant. Energy Statements for major developments should include an assessment of the viability for such schemes. Scotland's Heat Map and applicable local Council strategies should inform this assessment.
2. Where the provision of a local energy centre or district heating system is not feasible, developers should futureproof their sites where possible for connection to future heat networks. The installation of pipework to the curtilage of development and safeguarding of piperuns within developments to allow future connection will be required unless the submitted Energy Statement, informed by Scotland's Heat Map and local Council strategies, demonstrates that there are financial or technical barriers to installation.

SG14 'Renewable and Low-Carbon Energy', sets out guidance on heat networks and the matters Energy Statements are expected to address.

Scope of Guidance

2.1 This section will set out the following:

- Description of each technology; and
- Locational guidance on opportunities and constraints within the area including any locations where there is installed or previously consented capacity or where known capacity has been identified through previous studies.

Wind

Description of Technology

2.2 Wind energy developments can range from domestic, freestanding or mounted turbines, through to commercial single turbines, and large scale wind farms. Height is measured to blade tip. Wind energy development will usually require include concrete foundations, transformers, access tracks, crane pads, construction compounds and cabling.

Locational Guidance

2.3 At the time of writing, Falkirk has an installed capacity of 40.3MW, with an annual output of around 106.02 GW(h). This is made up of a number of schemes including a 13 turbine scheme at Burnhead, a 4 turbine scheme at Todhill, and a number of single turbines, primarily on agricultural land. Between 2010-2015, a significant number of wind energy proposals were approved, although many unimplemented consents have now lapsed. There does remain some landscape capacity for wind energy development, although viability will largely depend on emerging technology, grid connection and storage and future subsidy and funding regimes.

Spatial Framework for Wind Energy

2.4 The Spatial Framework applies to all wind turbines of 50m to tip and above. Scottish Planning Policy clearly sets out the methodology for producing the Spatial Framework and requires it to identify areas falling into the following groups, on the basis of pre-defined constraints, as follows:

Group	Group Description	Scottish Planning Policy Critera	Falkirk Council Receptors
Group 1	Areas where wind farms will not be acceptable. There are no Group 1 areas in the Falkirk Council area.	National Parks and National Scenic Areas	No Group 1 areas within the Falkirk Council area.
Group 2	Areas of significant protection where wind farms may be appropriate in some circumstances. Further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation.	National and International Designations	• World Heritage Sites (Antonine Wall World Heritage site: see Map 6 in Appendix 1. • Natura 2000 and Ramsar sites. See LDP2 Proposals Map. • Sites of Special Scientific Interest National Nature Reserves*; See LDP2 Proposals Map. • Sites identified in the Inventory of Gardens and Designed Landscapes. See Historic Environment Scotland website for further details. • Sites identified in the Inventory of Battlefield Sites. See LDP2 Proposals Map.
		Other nationally important mapped environmental interests	• Areas of wild land as shown on the 2014 NatureScot map (indicates that there are no areas of this type in the Falkirk Council area) • Carbon rich soils, deep peat and priority peatland habitat.
		Community separation for consideration of visual impact (See Map 10 in Appendix 1)	• An area not exceeding 2km around cities, towns and villages within the Local Development Plan with an identified settlement envelope or edge. The extent of the area will be determined by the planning authority based on landform and other features which restrict views out from the settlement. See Section 2.1.7-8 for further explanation of how these areas were defined.
Group 3	Areas with potential for wind farm development where wind farms are likely to be acceptable, subject to detailed consideration against identified policy criteria.		Proposals in the Group 3 areas shown in Map 1 in Appendix 1 will be assessed against detailed policy criteria set out in LDP2 and addressed in Section 3 Development Management Guidance of this SG.

2.5 Map 1 in Appendix 1 shows the Spatial Framework as it applies to the Council area. The areas in orange are classified as Group 2 (Areas of Significant Protection) while the residual white areas are Group 3 (Areas with Potential for Wind Farm Development). It illustrates the limitations on large scale wind farm developments, given the area's largely urbanised character.

Community Separation Zones

2.6 Scottish Planning Policy advises that planning authorities may identify community separation zones for consideration of visual impacts on settlements. These are defined as: 'an area not exceeding 2km around cities, towns and villages identified on the local development plan with an identified settlement envelope or edge. The extent of the area will be determined by the planning authority based on landform and other features which restrict views out from the settlement'. These community separation zones will be regarded as an area of significant protection.

2.7 Falkirk Council has assessed each settlement edge for the purposes of the Spatial Framework. This is in terms of outward views, and potential visual impact arising from larger turbines. An appropriate separation distance has been identified, ranging from 1-2 km from the settlement edge. A number of settlement edges have emerged as being highly sensitive in visual terms, while the surrounding topography and vegetation cover close to others is able to provide screening of views. Applications for proposals of above 50m to tip within the community separation zones shown on Map 10 in Appendix 1 will be required to specifically address the potential for visual impact from the settlement edge, and within the settlement, through the Landscape and Visual Impact Assessment process.

Landscape and Visual Impact

2.8 Although the Falkirk Council area has no landscapes of national significance, it boasts a variety of landscape types which are important locally, and have varying degrees of sensitivity to wind turbines. These include three formally designated Local Landscape Areas. Guidance on the capacity of the various Landscape Character Areas to accept wind energy development in contained in Appendix 3. This guidance is based on a Landscape Capacity Study (LCS), undertaken in 2012, which reviewed the Landscape Character Assessments covering the area, identified 16 Landscape Character Areas (LCAs), and assessed the sensitivity of each to a range of turbine typologies.

Ecology

2.9 There are numerous ecological sensitivities across the Falkirk Council area, including a network of internationally, nationally and locally designated sites, habitats and species identified as being of important in the Local Biodiversity Action Plan, and legally protected species. In addition, for the Firth of Forth and Slamannan Plateau Special Protection Areas (SPAs), attention is drawn to the areas of supporting habitat, outwith the boundaries of the designations, which are used by birds for feeding or loafing. For the Slamannan Plateau SPA, the Bean Geese fields provide an indication of supporting habitat and are considered as an Area of Significant Protection for the purposes of the Spatial Framework. These, and potential supporting habitat for the Firth of Forth SPA, are shown in Map 2 in Appendix 1. Detailed guidance on a range of ecological constraints for each technology is contained in Section 3.

Community Impacts

2.10 There is the potential for impacts on communities across an area which is home to a number of urban settlements, as well as a significant rural community. These include visual impact, noise and shadow flicker. Map 10 in Appendix 1 shows the community separation distances identified for the purposes of the Spatial Framework. These may also be relevant for proposals of less than 50m to tip which do not fall within the Spatial Framework assessment. These separation distances provide a good indication of the potential for community impacts, although these could obviously occur beyond these boundaries.

Historic Environment

2.11 The Falkirk Council Area contains a number of international, national and local historic environment designations. Further details are highlighted in Section 3.

2.12 Wind energy can impact on the historic environment in terms of both direct impacts, and impacts on setting. Most of these impacts will be assessed on a case by case basis. The historic environment asset most likely to be affected by wind energy development is the Antonine Wall World Heritage Site (WHS), by virtue of its linear nature, and because the landscape setting of the WHS is critical to its understanding and interpretation. Assessment of this impact is likely to draw on landscape and visual assessment as well as Heritage Impact Assessment.

2.13 Map 6 in Appendix 1 shows a number of key heritage assets including the World Heritage Site and demonstrates the key areas where landscape and visual impact could be a determining issue as a result of visual sensitivities. There are numerous historic environment receptors across the Council area. Details of online mapping showing their location can be found in Section 3.

Peat and Carbon Rich Soils

2.14 The Council area includes area of carbon rich soils and prime agricultural land. These are shown on Map 8 in Appendix 1. The presence of carbon-rich soil or prime agricultural land will be assessed on a case by case basis. The potential impacts are set out in Section 3. Interactive mapping on peat and carbon-rich soil can also be found at Scotland's Soils: https://map.environment.gov.scot/Soil_maps/?layer=10

Other Relevant Areas of Constraint

2.15 The whole of the Council area falls within either Glasgow or Edinburgh airport consultation zones, and a central swathe falls within both Edinburgh and Glasgow zones. This is shown in Map 9 in Appendix 1. There is also a safeguarding area for Edinburgh Airport between Grangemouth and Bo'ness. There are also issues around Cumbernauld airport. Due to the scale of wind energy development, the scope for wind turbines within the Edinburgh Airport safeguarding zone is likely to be limited. The Edinburgh/Glasgow consultation zones will continue to cover the whole Council area and airport operators will be consulted as part of the planning application process.

Further Information

Scottish Government online planning advice can be found here:
https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/

Case Study: Burnhead Windfarm

Developer: EDF Renewables

Output: 26MW (equates to the energy needs of 15,000 homes)

Contribution to national targets: The wind farm would make 0.24% contribution towards Scotland's target of 11GW installed capacity by 2030.

Site location: The proposed development is located at Burnhead Farm (ruin) approximately 2.4 km (1.5 miles) south east of Limerigg. The site location is largely pasture farmland and commercial forestry. There are areas of moorland near to the site including Blawhorn Moss which is designated as a Special Area of Conservation (SAC) and is a National Nature Reserve, situated immediately south of the application boundary.

Project description: The Application was for a 13 turbine wind farm submitted to Falkirk Council in December 2010.

Planning Policy: In terms of Falkirk Council's Spatial framework, the site lies largely within an area with potential for wind energy (Group 3). The landscape is also capable of accommodating the 13 turbines and site lies entirely within Landscape Character Unit 3i Slamannan Plateau. This Landscape Character Unit is typical of larger scale, gently-undulating landform where larger typologies and groupings of turbines can potentially be accommodated, provided that visual, ecological and community impacts are avoided through the site selection and micro-siting process. The site also falls largely outwith the community separation distances identified in the Spatial Framework. The site at Burnhead was one of the only areas in Falkirk capable of accommodating a wind energy development of this scale.

Key constraints: Burnhead Windfarm is adjacent to Blawhorn Moss NNR and NatureScot (formerly SNH) advised that proposal was likely to have a significant effect on the qualifying interests of the site Special Area of Conservation (SAC) which were raised bog. These issues were addressed through an Appropriate Assessment and detailed assessment through Environmental Impact Assessment. There was significant frontloading of information during the EIA scoping process so that these issues could be resolved.

Environmental Enhancement: Through the application process and legal agreement, the project contributed funds into the NNR which would contributed towards improvement including enlarging and improving the car park, upgrading the access track, repairing the boardwalk and a contribution to feasibility work on the path network around Blawhorn and Blackridge.

Community Benefit: The community benefit fund benefits the community council areas of Avonbridge and Standburn, and Limerigg and Slamannan in Falkirk, and Blackridge in West Lothian. The fund is administered by Foundation Scotland. The total annual value is £130,000 (index linked) for the lifetime of the wind farm, of which 20% is ring-fenced for the Education and Training Fund which helps to fund training opportunities in association with local education provided such as Forth Valley College. The annual value per MW of output is £5000, in line with Scottish Government best practice guidance "*Community benefits from onshore renewable energy developments.*" : https://www.gov.scot/publications/scottish-government-good-practice-principles-community-benefits-onshore-renewable-energy-developments/pages/2/

Hydro

Description of Technology

2.16 There are several main types of hydro power generation:

- Diversion (run-of-river): where a proportion of water is diverted via a weir or lades into a penstock (pipe) to a turbine (which generates electricity) before returning the water to the river downstream. These schemes can often operate on a low head basis (run-of-river scheme that operates with a head of 20 meters or less). These are the main type of hydro scheme found locally. These are also the typical application found in micro-hydro schemes;
- Impoundment: where a dam or series of dams hold water back in flooded valley systems, creating a hydraulic head from which electricity is generated. These would often operate on a 'medium or high head' basis which would have a head height of greater that 25m, and can exceed 300m;
- Pumped storage - which uses similar principles to large scale impoundment but where a second reservoir is also used to pump water back into the first reservoir during off-peak hours. This provides a larger volume of water that can be used to generate electricity during periods of peak electricity usage.

Locational Guidance

2.17 There is one operational 500kw hydro scheme at Carrongrove. Scottish Water are also undertaking a programme of micro-hydro development across their network, with a site at Denny with an installed capacity of 100kw from two turbines.

2.18 A previous study in 2003 identified potential for hydro in the following areas:

- A 13km stretch of River Carron (Hydro scheme at Carrongrove is already implemented);
- 5km stretch of River Avon (excluding Muiravonside Country Park)

2.19 There remains some scope for run-of-river schemes across the Council area, and these will be assessed on a case-by-case basis, subject to relevant policies in LDP2, Development Management Guidance set out in Section 3, and other relevant assessments.

Further Information

2.20 Useful information around the procedures, costings and sources of finance for commercial scale schemes can be found at Renewable Energy Hub: https://www.renewableenergyhub.co.uk/main/hydroelectricity-information/

The Centre for Alternative Technology provides information on costings and feasibility for micro-hydro schemes: https://www.cat.org.uk/info-resources/free-information-service/energy/micro-hydro/

Case Study: Carrongrove Hydro

Developer: TLS Hydro

Output: 500kw (potential to power up to 500 houses)

Site location: On the River Carron, Fankerton, upstream from Denny.

Project description: The project comprised a small run-of-river hydro scheme on the River Carron in Denny developed in conjunction with a new housing development on the former Carrongrove paper mill site. The site was previously occupied the Carrongrove paper mill, which closed in 2005. Mactaggart and Mickel were the lead developer of the Carrongrove site, and TLD Hydro were brought in to construct and manage the hydro site.

Environmental Enhancement: The project is an example of a biodiversity net gain from an energy development in that a fish ladder was also created to allow local salmon to migrate up the river to spawn. The new fish ladder will enable up to 30 km of main river and tributaries to be spawning ground for salmon and sea trout.

Heat Pumps and Deep Geothermal

Description of Technology

2.21 The Scottish Government online renewables guidance advises that deep geothermal relates to geothermal sources below 100m in depth. There is a considerable deep geothermal heat resource which can be derived from a number of sources:

- Abandoned mine workings (low temperature);
- Hot sedimentary aquifers (low and possibly relatively high temperature);
- Hot dry rocks / petrothermal sources (relatively high temperature).

2.22 Works can involve recovering hot waters from mines (circa 50-1000m depth, <40 degrees C), or from water enclosed within permeable rocks known as hot sedimentary aquifers (HSAs). Water or steam can be retrieved and then used to either power turbines to generate electricity or heat property.

2.23 **Hot Dry Rock Geothermal** is where water (from elsewhere) is injected into fractured hot dry rocks, allowed to heat-up, and then taken out of another borehole. The steam or hot water produced can run turbines to generate electricity or heat properties.

2.24 **Ground source heat pumps** utilise heat from the ground which is absorbed at low temperatures into a fluid inside a loop of pipe (a ground loop) buried underground within trenches. The fluid then passes through a compressor that raises it to a higher temperature, which can then heat water for the heating and hot water circuits of the building. The cooled ground-loop fluid passes back into the ground where it absorbs further energy from the ground in a continuous process as long as heating is required.

2.25 **Water source heat pumps (WSHPs)** operate by taking the latent heat from water courses and boosting the temperature using electrically driven pumps. The resultant hot water can be fed into local heat networks or single buildings, providing a low-carbon source of renewable heat to local areas. WSHPs can also be used for cooling.

2.26 The water used can be from a range of sources, including rivers, canals, lakes, mines, the sea and groundwater aquifers (although the latter tends to be referred to as a ground source heat pump, the technology is basically the same). Heat pumps can be “closed loop” or “open loop”. In an open loop system, water is abstracted from the water source and passed through a heat pump before being discharged back into the water source. In a closed loop system pipes or heat exchange panels are placed in the water and a water/antifreeze mixture is passed through the pipes/panels absorbing energy from the water

2.27 **Hot Dry Rock Geothermal** is where water (from elsewhere) is injected into fractured hot dry rocks, allowed to heat-up, and then taken out of another borehole. The steam or hot water produced can run turbines to generate electricity or heat properties.

2.28 **Air source heat pumps** extract heat from the outside air in the same way that a fridge extracts heat from its inside. It can get heat from the air even when the temperature is as low as -15° C. Air source pumps can also be used for cooling. These are more commonly used in a domestic or industrial setting as they can be easily retrofitted to an existing building.

Locational Guidance

2.29 There is a potential deep geothermal resource across the Council area, particularly in areas where there are abandoned coal mine workings. There have been no commercial/large-scale geothermal proposals to date, although there has been some initial feasibility work on projects where the resource is known to exist, such as at Kinneil Kerse.

2.30 The Scottish Government are keen to encourage geothermal energy generation, particularly in locations which are off-grid. There may be locations in rural settlements in the Council area which would be suitable such as areas close to former mine workings. There are a number of rural areas which are subject to fuel poverty and the Council would be keen to support new development which could address this issue.

2.31 On a domestic/small-scale level, ground/water/air source heat pumps are continuing to be utilised. In the case of a ground source heat pump in a domestic setting, around twice the surface area of the dwelling is needed in external space, which will need to be excavated to fit the pipework. A borehole system takes up less curtilage. An air source pump system is much more compact and more suited to urban areas. A water source heat pump may also be applicable close to a water source.

Further Information

2.32 SEPA's requirements for activities related to geothermal energy (January 2017):
http://www.sepa.org.uk/media/219751/sepa-s-requirements-for-activities-related-to-geothermal-energy.pdf

Scottish Government Renewable and Low Carbon Energy Regulatory Guidance (Deep Geothermal) and the 2013 study assesses the potential across Scotland.
https://www.gov.scot/policies/renewable-and-low-carbon-energy/geothermal-energy/

Case Study: The Coach House, Falkirk

Developer/Architect: ThatStudio, Falkirk.

Site location: Falkirk Town Centre.

Project description: The Coach House represents a conversion and extension of an existing stable building, within the grounds of an existing dwelling. As well as being an exemplar of design, the dwellinghouse was able to incorporate a deep-bore ground source heat pump into the build. PV panels were planned to be integrated into the eastern pitch of the main roof and these will be fitted if required in the future. 100% of the heat and hot water needs of the property are generated from the ground source heat pump. The property is able to be independent of the gas grid, with any supplementary ambient heat provided by a wood burner in the main living space.

Solar and Photovoltaics

Description of Technology

2.33 Photovoltaic/solar panels convert sunlight to electricity via a solar inverter. Solar thermal energy generation uses the light from the sun to create heat, which can be used directly or to power a generator to make electricity. Solar and PV developments take a number of forms including:

- Mounted on a roof or structure (often in a domestic or industrial setting) or integrated within a roof fabric;
- Large-scale solar arrays, either on previously developed land or on agricultural, undeveloped land. These are installed in rows, with a metal frame mounting anchored to the ground. They may have the ability to rotate according to the position of the sun.

Case Study: Dalderse Waste Water Treatment Works, Falkirk

Developer: Scottish Water Horizons

Capacity: 250kw, generating 0.2GWHr of energy on an annual basis – equivalent to powering 55 homes for a year.

Site location: Dalderse WWTW is located to the north of Falkirk, adjacent to the River Carron.

Project description: The project comprises an array of ground mounted solar panels were installed within the curtilage of the existing waste water treatment work.

Planning Policy: Policy IR12 is broadly supportive of renewable energy proposals subject to assessment against specified environmental policy criteria. Although the site is within the green belt, it is within the envelope of the existing treatment works, is visually fairly self-contained, and does not compromise green belt objectives.

Locational Guidance

2.34 There is significant scope for solar/PV development across the Council area, within a number of settings. There has been significant uptake of domestic/small scale technology, and a several schemes installed within public facilities including Falkirk Sheriff Court and within Scottish Water land holdings. Housebuilders are also applying PV technologies across a range of house types in order to meet the requirements of LDP2 policy. Solar/PV is an eligible LZCGT which can be used to meet the requirements of LDP Policy IR13 as part of new development.

2.35 There has been some interest in terms of large-scale arrays, mainly within agricultural settings. Many ground mounted solar panels are able to maintain livestock grazing alongside solar array operations. However, many schemes may now be unviable as a result of changes to the subsidy regime.

2.36 Larger solar arrays should preferably be located on previously-developed land rather than greenfield sites. Greenfield sites may be attractive to developers in terms of ease of installation and choice of sites. However, development of greenfield sites will only be permitted where visual intrusion, impact on landscape quality, and impact on biodiversity is acceptable, and where loss of prime agricultural land/carbon rich soils is avoided. Additionally, within green belts, there should be no adverse impact on the function of the green belt (see LDP2 policy PE15 for Green Belt objectives). Large arrays close to and visible from communities are likely to be problematic. The Maps shown in Appendix 1 will be helpful in terms of spatially identifying areas of constraint. excavated to fit the pipework. A borehole system takes up less curtilage. An air source pump system is much more compact and more suited to urban areas. A water source heat pump may also be applicable close to a water source.

Biomass

Description of Technology

2.37 Biomass involves the production of heat and/or electricity from organic matter including wood and wood-waste, biogas, bioethanol and straw. This can be used to provide heat, or to run CHP (Combined Heat and Power) plants. The choice of fuel will be down to a range of site specific factors and project goals, such as:

- Fuel availability and cost;
- Fuel carbon content;
- Plant size and type;
- Fuel delivery and storage facilities required; and
- Plant maintenance requirements and cost.

2.38 Biomass can be applied to larger-scale industrial settings, as well as individual small-scale or domestic application.

Locational Guidance

2.39 Biomass proposals can potentially be located within or outside of urban areas and the location should be closely matched with key areas of heat demand shown on Scotland's Heat Map or specifically identified users of heat. Biomass schemes are generally located close to a source of biomass. At a smaller-scale, biomass and CHP can be an efficient way to heat a single unit, or a number of units as part of a district heating scheme.

2.40 In terms of large scale commercial development, planning consent was granted in 2012 under Section 36 of the Electricity Act 1989 for a Biomass Plant at Forth Ports in Grangemouth, and renewed again in 2020. This would provide 100MW of electricity and around 200MW of heat. While the consent has lapsed, Forth Ports remain involved with the project, although timescales are currently unclear.

2.41 The Bioenergy: Update Report produced in March 2020 sets out the Scottish Government's intentions for delivering a strategic framework for bioenergy, and how progress will be made over the next 18-24 months. A new air quality strategy to replace Cleaner Air for Scotland - The Road to a Healthier Future, also sets out the Scottish Government's air quality policy framework for the next five years and a series of actions to deliver further air quality improvements. The Scottish Government are also keen to encourage heat only and woody biomass CHP in locations which are off-grid. There may be locations in rural localities within the Council area which would be suitable. There are a number of rural areas where fuel poverty is an issue and the Council would be keen to support new development which could potentially reduce fuel poverty.

2.42 There are likely to be limited opportunities for further large-scale industrial biomass proposals given complexities around community and environmental impacts, all of which require detailed environmental assessment. Biomass continues to be exploited at an individual domestic/business level and there is scope for biomass to be explored for district heating purposes, where other technologies are unviable, or for communities not on the gas network.

Energy from Waste

Description of Technology

2.43 **Energy from waste** sources broadly utilise solid waste to generate energy and/or heat. Waste can be incinerated, generating power and heat, or otherwise converted to fuels through a range of other thermal or non-thermal processes such as gasification, pyrolysis, anaerobic digestion or fermentation. Landfill gas can also be recovered. With incineration, the heat and power generated can be fed back to the grid, or used in systems such as CHP or direct use within a heat network.

2.44 Energy from waste can be partially classified as renewable energy, as it contributes to the Renewables Obligation. It does, however, divert waste from landfill for use in the generation of heat or electricity, and as such is included in the range of low-carbon technologies covered by this SG. A full assessment of the carbon emissions from the development as well as carbon savings from any proposal will be required as part of any proposal.

Locational Guidance

2.45 Energy from waste operations are essentially waste management facilities and, as such, need to comply with LDP2 Policy IR16, with preferred locations in or adjacent to existing waste management facilities or on land identified for employment or industrial uses. The policy sets out a range of other considerations. Impacts on sensitive receptors such as residential areas will require rigorous assessment.

2.46 In terms of consented energy from waste capacity, an application has been approved at Avondale for an energy from waste plant, adjacent to the existing landfill. Another EfW project, due for completion in 2021, is the Earls Gate Energy Centre, as described in the case study.

2.47 In terms of energy from landfill gas, there are two landfill sites in the council area, both of which operate landfill gas utilisation. Avondale landfill currently operates a system with a capacity of around 10,000kw, while a smaller operation at West Carron landfill operates with a capacity of around 480kw (source: https://www.r-e-a.net/resources/landfill-gas-sites-map/. With the transition away from landfill and the aims of the Zero Waste Plan, landfill gas will have a limited lifespan.

Case Study: Earls Gate Park, Grangemouth (due for operation in 2021)

Developer: Consortium of Brockwell Energy, Green Investment Group (GIG) and Covanta Energy.

Output: The turbine has been designed to generate up to 21.6 MWe of electricity and up to 33.3 MWth of heat.

Site location: The site occupies an area of 12.3ha to the south and west of the CalaChem site, approximately 1.4km to the west of Grangemouth. The site is on previously developed land associated with the petrochemical complex. To the north, the site is bound by the existing CalaChem facility, with the A904 Earls Road located further beyond.

Project description: This is a new energy recovery facility at Earls Gate Park, Grangemouth. This replaces an existing gas-fired facility and will provide heat and power for adjacent industries and export surplus electricity to the National Grid. The energy centre is expected to process approximately 216,000 tonnes of waste, or 20% of total household waste landfilled in Scotland, and to annually produce 79 GWh of green electricity and 81 GWh of heat in the form of steam. The waste treatment/ energy recovery plant has been designed as a combined heat and power plant and will have capacity to provide heat and power to CalaChem and other industrial users on Earls Gate Park and to supply power to the National Grid.

Planning Policy: The site lies within an area identified as a Core Business Area within the LDP2 Proposals Map. Policy IR17 Waste Management Facilities applies to such proposals and advises that "co-location with other heat users should be sought and sites should be designed to enable links to be made to potential heat and/or power users and the Thermal Treatment of Waste Guidelines (SEPA) apply" As one of the end users will be the wider CalaChem site the proposals meets this aspect of the policy.

Key constraints: Whilst the site is within an established industrial area, the site is 1.4km west of Grangemouth, an established community and a sensitive receptor. Grangemouth is also the subject of an Air Quality Management Area. The application was subject to Environmental Impact Assessment which set out detailed information regarding noise, vibration, landscape and visual impact, ecology, air quality and traffic impacts. SEPA manage the air quality and pollution control under the Pollution Prevention and Control (Scotland) Regulations 2012, and the application sets out the monitoring procedures in place for the lifetime of the development.

Copyright: Earlsgate Energy Centre

Energy Recovery

Description of Technology

2.48 Energy recovery utilises the surplus heat from industrial processes. Whilst the energy may be derived from fossil fuels, utilisation of waste heat is considered a low carbon source of heat. Waste heat can be:

- Reused on site;
- Used by other industry users;
- Used as part of a CHP process; or
- Used as part of a heat network.

2.49 Heat recovery typically uses some sort of heat exchanger and can be utilise waste heat from:

- Waste Heat from Industrial Flue Gasses (such as an industrial boiler);
- Waste Heat from Effluent Streams (such as from food and drink or textile manufacturing); or
- Waste heat from Cooling or refrigeration processes.

2.50 More information on heat recovery can be found at: https://www.districtheatingscotland.com/wp-content/uploads/2017/10/Module-1-Heat-Recovery.pdf

Locational Guidance

2.51 There is significant potential for reutilisation of waste heat in the Council area. Grangemouth is the largest industrial site in Scotland, with sources of heat demand and production of waste heat from the refinery, chemicals plant, and other industrial and commercial buildings.

2.52 In neighbouring Stirling Council Area, waste heat is harnessed from waste water from Scottish Water's treatment works in Forthside. This is processed through an on-site energy centre and then distributed along Stirling Council's District Heat Network. More details can be found as a case study below.

2.53 There are clearly significant opportunities across Scotland, and within the Council area, for the processing of waste and co-location or energy production opportunities. Section 3 Development Management Guidance sets out the criteria which proposals are expected to meet.

2.54 The Grangemouth Energy project undertook viability and technical assessments to identify options involving district heat networks in the area. Whilst this project has stalled, opportunities are still being pursued in conjunction with Falkirk and Grangemouth Investment Zone Growth Deal.

Case Study: Stirling Energy Centre

Developer: Stirling Council and Scottish Water Horizons

Project description: Stirling Council and Scottish Water Horizons formed a partnership to commission a heat from waste-water technology alongside a combined heat and power (CHP) engine to provide low carbon energy to a district heat network in the Forthside area of Stirling. within a wider master-planned mixed use development, a key component of the Stirling/Clackmannanshire City Region deal. The project was partially funded by partially funded by the Scottish Government's Low Carbon Infrastructure Transition Programme (LCITP). Ramboll provided technical advice throughout the project.

End users include the offices of Zero Waste Scotland, St Modan's High School, the Water Industry Commission for Scotland, The Peak Leisure Centre and Forthside Conference Centre. The project is expected to save around 381 tonnes of carbon per year. Stirling Council will own and operate the heat network, while Scottish Water Horizons will own and operate the energy centre.

The system converts sewage into usable energy to power a district heat network using biogas generated by the existing anaerobic digestion plant to fire a combined heat & power (CHP) unit, with electrical output used to power a 'SHARC' sewage heat recovery system. The heat produced from the CHP and the heat recovery units will then be used to supply a district heating network. The large sewer heat pump will be the largest installation in the UK, and the first to supply multiple customers via a district heating network.

Energy Storage

Description of Technology

2.55 As the energy systems transition to become more decentralised and flexible, smart technologies like storage will play a greater role. The Scottish Government Energy Strategy identifies energy storage was identified as one of the key factors that would underpin the vision of a stable, managed energy transition to a largely decarbonised energy system. National Grid capacity and transmission is a key factor in terms of Scotland's ability to become a net exporter of energy, and an adequate network of energy storage provision is key to meeting this aim.

2.56 There are several types of energy storage:

Thermal Storage: linked to large heat installations such as commercial CHP or Biomass plants; and

Battery Storage: allows for off grid storage at small and large scales, derived from a battery system.

Hydrogen Production and Storage: allows for conversion of energy into hydrogen either to be reconverted back into electricity, used in fuel cells, hydrogen boilers or used to power vehicles.

Pumped Storage Hydroelectric: associated with commercial hydro schemes to balance grid export and demand.

Locational Guidance

2.57 Energy storage can be co-located with the energy generation installation. Energy storage proposals are likely to be assessed on a case-by-case basis, with applications expected to avoid environmentally sensitive areas, or areas where achieving a connection with either the National Grid, or the source of energy generation would be difficult. Where an energy storage solution is proposed in association with a development, details must be provided regarding how the energy will ultimately be utilised in off-grid areas, projects or schemes, or how the energy will be used to regulate grid capacity and connection. Early engagement with SEPA should be sought for proposals involving hydrogen production and/or storage.

2.58 OFGEM advise that it is possible that co-locating storage may impact the eligibility of an accredited Renewables Obligation generating station or Feed-in-tariff installation to receive continued support under the schemes, or may alter the amount of support received. Generators should consider carefully the requirements of the scheme to ensure their proposed configuration does not adversely affect their ability to receive support under the schemes.

Combined Heat and Power (CHP) and Decentralised Energy Networks

Description of Technology

2.59 The term 'decentralised energy network' also includes district heat networks, as well as a private power network for delivering electricity. This refers to a network system for distributing heat from a central location to meet requirements for heating and hot water in residential and commercial developments. Heat is normally generated in an energy centre and distributed through a pipe network to which heat customers are connected. An energy centre can be run either from renewable or non-renewable sources of energy such as natural gas or LPG. For new district heating schemes, a switch to renewable sources of fuel can take place in the future, as long as the specifications of the energy centre are appropriate. There are various development models for delivering and operating district heating. Examples include:

- Systems to serve new housing or mixed use development - initially owned by developer and may be transferred to 3rd party;
- Systems to serve public buildings such as a hospital - can be client owned or transferred to 3rd party;
- Social housing development schemes - owned and managed by local authority or housing association; and
- Energy from waste schemes - initially owned by local authority but can be transferred to a 3rd party.

2.60 District Heat Networks can also be run from combined heat and power (CHP). CHP systems are designed so that much of the heat produced as a consequence of generating electricity can be recycled for local space and water heating or for residential use or industrial processes. CHP is not necessarily a renewable technology as CHP can utilise a number of fuels but natural gas is the most commonly used fuel for CHP. As such, it falls within the category of low carbon technology for the purposes of LDP2 policy, unless run from renewable source. Fuel oils are another possible non-renewable alternative. CHP can run on biomass, biogas (such as from an anaerobic digestion process) and waste.

2.61 The main component of a district heating system consists of the primary pipe network below ground level. The primary pipe network transports heat in the form of hot water or steam to the door of each consumer, the hot water or steam passes through a heat exchanger, which is then passed onto heating systems within buildings and consumed as space heating and/or hot water. The lifetime of the pipe network should be around 40 to 50 years.

2.62 Around 20% of properties in the Falkirk Council area are not connected to the gas network (source; UK Government, Department for Business, Energy and Industrial Strategy). The majority of these are within rural communities.

2.63 In terms of ongoing work on heat within the Council area, the Grangemouth Energy Project previously undertook feasibility work around heat networks associated with industries and public sector buildings in Grangemouth, although the project has not progressed. Falkirk Council is in the Early stages of producing a Council-wide Local Heat and Energy Efficiency Strategy (LHEES), having taken part in the Scottish Government initial pilot scheme. Falkirk's LHEES will provide a framework for taking an area-based approach to heat and energy efficiency planning and delivery. LHEES will be in place in all Local Authority areas by the end of 2023. The emerging Scottish Government Heat in Buildings Strategy provides the framework for LHEES moving forward. Energy Statements will also be required to reflect the LHEES when identifying potential opportunities for district heat or other renewable and low-carbon technologies.

Locational Guidance

Development Viability

2.64 The principle of "linear heat density" can be used to help identify potential areas for district heating. The linear density of a heat network is the total heat demand, divided by the total length of pipe. The resultant figure serves as a useful marker for financial viability because the high capital costs of heat network infrastructure must be offset by sufficient heat sales through the network over a reasonable period of time. As such, a higher linear heat density generally indicates improved financial viability. Based on successful schemes in the UK and Scandinavia, a benchmark of 4MWh/m/year can be used to indicate potentially successful schemes. More details can be found at https://www.districtheatingscotland.com/

2.65 The initial viability of an indicative scheme can be worked out once the energy needs of the development are known. However, abnormal costs associated with the development, and the development of a heat network will undoubtedly influence whether a heat network is viable, so it is important for an energy statement to provide further details.

Technical barriers may include:

- Presence of existing below ground infrastructure or the presence of wayleaves or pipelines;
- Challenging topography and ground conditions, or restricted developable area of site;
- Lack of proximity to potential anchor loads.

Financial barriers may include:

- High levels of abnormal costs associated with the site due to other constraints or requirements. This may include remediation of previous uses of the site, or a high level of up front infrastructure required for delivery;
- Restriction on the availability of funding or finance due to the development model or type of development.

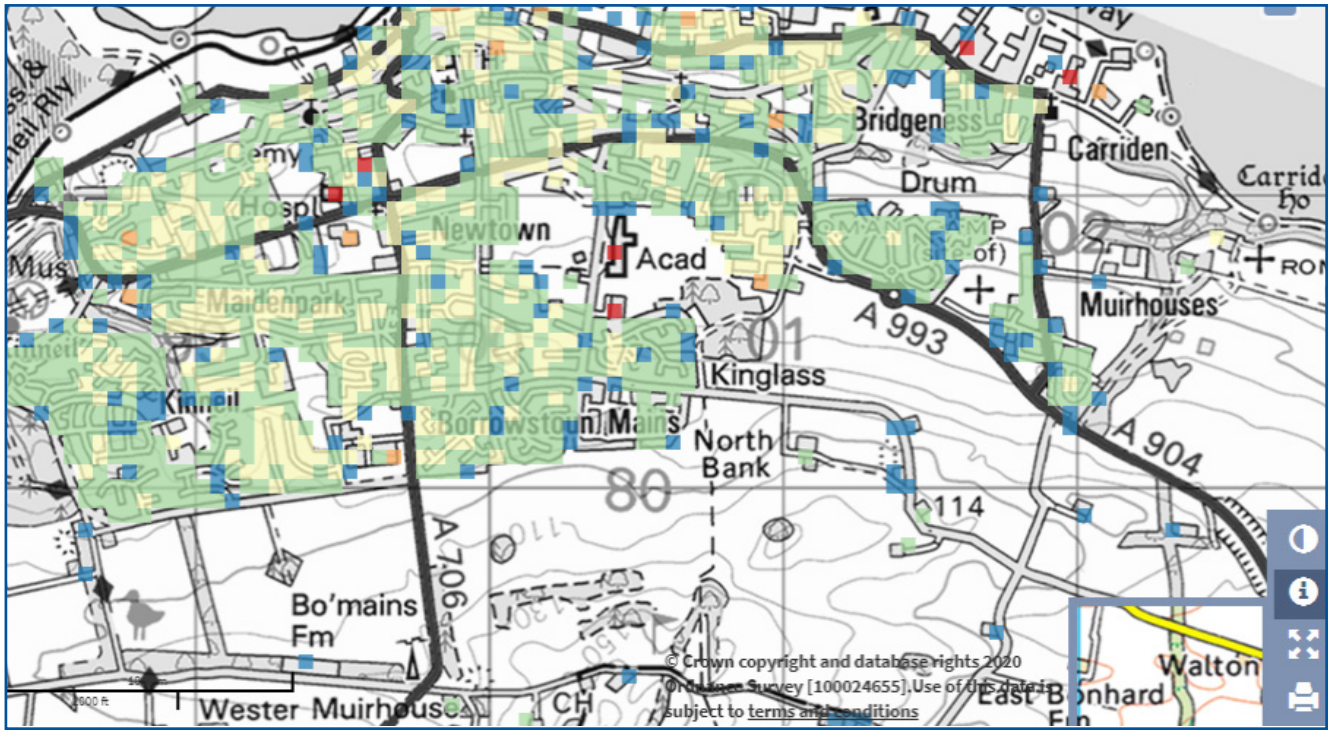
2.66 In order to maximise the potential opportunities, district heating should be considered as part of the early stages of a proposal, and within the initial scoping of a masterplan for larger sites. Where sites are unable to accommodate an energy centre or connect in to other potential sources of heat, developers should wherever possible 'future-proof' the site in terms of installing district heating infrastructure that could link into future networks. The average cost per metre for district heat pipe infrastructure is £982. This is based on information from the UK Government DECC (2015). Full details of this costing methodology can be found here.

Locational Guidance

Scotland's Heat Map

2.67 Scotland's Heat Map was developed by the Scottish Government as a tool to visualise opportunities for district heating. Heat maps can assist in spatial planning and co-locating areas of high heat demand and need with heat supply opportunities. Heat maps can show links between Local Development Plan proposals, and can assist with regeneration strategies and masterplanning for major sites. Scotland's heat map will be useful for developers when assessing the feasibility of a heat network as part of a new development. It allows the user to assess local heat demand, and identify any sources of energy. It can also identify anchor points as explained below. The data held within Scotland's Heat Map is periodically reviewed by the Scottish government, and can form a useful baseline for developing heat networks in the future.

Figure 3: Example of Heat Map Data. ©Scottish Government



2.68 **High Heat Demand:** This tends to be associated with urban areas where denser building layouts are more commonplace and where there are buildings with constant high heat demand (anchor heat loads), such as swimming pools, hospitals and industrial buildings. However, high heat demand is not exclusive to these areas and there might also be areas within rural communities with high heat demand by virtue of existing business uses, or heat demand within a rural settlement. Heat maps can also identify areas of high need such as fuel-poor areas or off gas grid communities, where there may be a policy objective to deliver more efficient, secure and sustainable heat. These are identified on the map above.

Heat Supply Opportunities: These are active renewable energy operations identified on the map. The Heat Map also identified areas of geothermal potential including abandoned mine workings, mine entries, hot wet rocks, and hot dry rocks.

Existing District Heat Networks: The Heat Map shows existing heat networks which are currently operational.

Case Study: Callendar Park Flats, Falkirk Council

Developer: Falkirk Council

Output: Increase from 3 to 6MW once further 3 blocks are installed.

Project Cost: £2.5 Million. £1.5 million from Falkirk Council with the remainder CEP and EEC grant funding.

Project description: The Council currently operates a 1.12MW gas powered Combined Heat and Power system along with a 2MW gas fired boiler in Callendar Park, Falkirk to provide thermal energy to 6 blocks of 84 flats each within the Callendar Park Estate and Callendar House (a non-domestic building). This is currently being extended to serve 3 further blocks. In addition, it is also proposed that there will be a private wire serving three schools (two primary and one secondary) as well as Council offices within Callendar Business Park. The properties were located within the bottom 15% of SIMD (Scottish Indices of Multiple Deprivation) and as such the scheme is intended to alleviate fuel poverty, in housing which is predominantly occupied by older people. The properties now no longer fall within the bottom 15% of SIMD data.

Planning Policy: Policies are broadly supportive of new renewable and low carbon energy development.

Key Constraints: The Antonine Wall World Heritage Site is located immediately adjacent to the flats. The proposed pipework required to be carefully assessed in order to ensure that impacts on sub-ground archaeology. Installation of future private wire systems will require detailed environmental scoping to ensure that impacts are avoided.

Carbon Capture Utililisation and Storage

Description of Technology

2.69 Carbon Capture, Utilisation and Storage (CCUS) is a system of capturing waste carbon dioxide generated by large scale energy intensive process processes, such as power generation, transporting it to a storage site by ship or pipeline, and depositing it where it will not enter the atmosphere, such as in an underground geological formation. Such formations include depleted oil and gas reservoirs or saline aquifers. Carbon Capture proposals in Scotland are proposing to store the carbon beneath the North Sea, transported via pipeline.

2.70 The Scottish Government recognises the potential role for thermal generation with carbon capture to form part of Scotland's decarbonisation strategy. Scotland's industrial clusters and largest sources of carbon dioxide in North East and Central Scotland are linked by a network of pipelines to depleted and well-mapped oil and gas fields in the North Sea. These depleted gas fields and aquifers offer vast carbon dioxide storage potential, providing Scotland with a competitive advantage in CCUS.

Locational Guidance

2.71 The National Planning Framework 3 (NPF3) identifies Grangemouth as a location for thermal energy generation with carbon capture and storage. This potential is identified diagrammatically in LDP2, and there are substantial sites available within the industrial complex and port which offer an area of search for future projects. The proximity of the port and industrial area to the local community, and to nationally and internationally important ecological designations, means that detailed environmental assessment will be required, assessed through the relevant regulatory processes.

Hydrogen Production

Description of Technology

2.72 Hydrogen is a clean fuel that, when consumed in a fuel cell, produces only water. Hydrogen can be produced from natural gas, nuclear power, biomass, and renewable power like solar and wind. In broad terms there are three types of hydrogen production:
Grey Hydrogen - is produced from the reforming of natural gas. This process produces both hydrogen and carbon dioxide.
Blue (or low-carbon) Hydrogen - is produced in the same way as grey hydrogen but the process is aligned with CCS systems which capture most of the CO2 produced, preventing it from entering the atmosphere and storing it safely in deep geological formations.
Green Hydrogen- is produced from the electrolysis of water, a process which splits water into its constituent parts of hydrogen and oxygen. When renewably sourced electricity is used this process is completely green.

2.73 At present, hydrogen is an evolving technology. The Scottish Government have published a Position Statement Scottish Government Hydrogen Policy Statement - gov.scot (www.gov.scot) setting out significant investment into development. This reflects the UK government approach.

Locational Guidance

2.74 The Scottish Government Position Statement highlights that the Grangemouth cluster already produces and consumes large quantities of hydrogen, positioning the region as a potential future hub of low carbon hydrogen supply and demand. There is substantial capacity for the industries in this area to capitalise on their location, skills and expertise, pooling their collective demand for low-carbon energy or working together to advance the early development of low-carbon infrastructure at scale. This is likely to link in with the area's Carbon Capture potential, and the capture of industrial emissions.

How to use the Development Management Guidance

3.1 This section is designed to give an overview of the development management criteria which will be considered when assessing proposals for all types of renewable and low carbon energy. It will help developers identify potential constraints for schemes, and assist in the compiling supporting information required for assessment.

Who will be Consulted on Energy Developments?

3.2 As part of the application process, the Council is required to undertake consultation with key agencies and other relevant organisations. Consultees may include (but are not limited to):

- Communities (eg community councils, local action and interest groups);
- Falkirk Council Services (including Roads and Transport Planning);
- Civil Aviation Authority;
- Individual airport operators;
- Ministry of Defence;
- NatureScot (formerly Scottish Natural Heritage);
- Historic Environment Scotland;
- Scottish Environment Protection Agency;
- Health and Safety Executive;
- Transport Scotland;
- Forestry and Land Scotland and Scottish Forestry;
- Network Rail;
- Electricity transmission/distribution network operator;
- OFCOM.

Prior to submission of any application, it can help to engage with stakeholders early in the process. This is particularly important for proposals which may result in positive and potentially negative impacts on communities. Early engagement allows communities to have their say and to influence the evolution of the proposal.

Who Determines Proposals?

3.3 Proposals with a capacity of 50MW and above are determined by the Scottish Government. Proposals under 50MW output are determined by Falkirk Council. There are also a number of parallel regulatory processes, one or more of which may apply to proposals. These could include:

- **Listed Building consent if a building is listed, or where the setting of a building is affected. Conservation area consent if the development is in a conservation area.**
  Determined by Falkirk Council, in consultation with Historic Environment Scotland where appropriate.
- **Trees subject to Tree Preservation Order:**
  Falkirk Council will need to issue consent to fell or prune trees, or where development may impact the root systems of protected trees. For further guidance please see SG10 Trees and Development.
- **Building Warrant**
  Some proposals including free standing structures and alterations to a building or structure will require a building warrant. These are determined by Falkirk Council. More information on the Council's Building Standards service can be found here: https://www.falkirk.gov.uk/services/planning-building/building-standards-online.aspx
- **Legally Protected Species Licensing**
  These are determined by NatureScot. A license may be required from NatureScot for development with a potential impact on protected species, for example European Protected Species (EPS) such as otters and bats.
  Further guidance is available at NatureScot.
- **Water Environment Licensing**
  Any activity that impacts on the water environment (such as Hydro development, or boreholes for geothermal energy) must accord with regulations and seek approval through SEPA to proceed under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)
- **Pollution Prevention**
  SEPA is responsible for the regulation of emissions to air, water and land under the Pollution Prevention and Control (Scotland) Regulations 2012. This could be necessary for disturbance of peat, or for emissions associated with biomass or energy from waste.
- **Waste Licensing**
  SEPA is responsible for monitoring and compliance with waste regulation.
  Proposals which produce or utilise waste, including biomass, AD and Energy from Waste, may require a permit from SEPA under the Waste Management Licensing (Scotland) Regulations 2011.

Environmental Impact Assessment (EIA)

3.4 Environmental Impact Assessment (EIA) is a means of drawing together, in a systematic way, an assessment of the likely significant environmental effects arising from a proposed development.

3.5 All developments falling within a description in Schedule 1 to the 2017 EIA Regulations require EIA. These would include, for example a large-scale windfarm or a commercial biomass development.

3.6 Developments of a type listed in Schedule 2 to the 2017 EIA Regulations will require EIA if they are likely to have a significant effect on the environment, due to factors such as their size, nature or location. Proposals which would fall into Schedule 2 include wind developments of more than 2 turbines or if the height exceeds 15 metres, or development such as a solar array. The proposal is then assessed according to the criteria set out in the EIA checklist as to whether or not the proposal is considered likely to have a significant effect on the environment.

General Energy Guidance

3.7 The following guidance is applicable to all renewable and low carbon energy development:

Scottish Government

3.8 Topic-specific planning advice for energy developments: https://www.gov.scot/collections/planning-advice-notes-pans/

SEPA

3.9 SEPA Guidance on all renewable energy development including relevant regulatory processes and topic-specific guidance on renewable energy: https://www.sepa.org.uk/environment/energy/renewable/

SEPA Guidance on all non-renewable low carbon energy development and resource recovery. This includes relevant regulatory processes and topic-specific guidance on renewable energy: https://www.sepa.org.uk/environment/energy/low-carbon-non-renewable-generation-and-resource-recovery/

NatureScot

3.10 NatureScot have produced a range of development guidance for energy developments including landscape and visual assessment, and guidance on repowering: https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/planning-and-development-renewable-energy

Guidance on Key Policy Criteria

3.11 The following tables provide guidance on each of the each of the factors which Policy IR12 states will be used to assess proposals for energy generation development. The tables identify the nature of the potential impact, relevant planning policy and highlight any specific considerations in relation to specific technologies, as well as identifying specific relevant guidance.

NET ECONOMIC IMPACTS AND THE SCALE OF CONTRIBUTION TO RENEWABLE ENERGY TARGETS

3.12

Nature of impact	Scale of potential impacts from applicable proposals
Policy IR12 requires applicants to demonstrate the scale of contribution to renewable energy generation targets and the effect on greenhouse gas emissions. This should be quantified as part of the supporting information. Energy development can have a positive impact on the local economy through job creation and using local supply chains, mainly at the construction stage. Renewable and low carbon energy can also provide local economic benefit through innovative heat and energy delivery, and alleviating fuel poverty, community or shared ownership, or local employment agreements Falkirk has a well-established tourism economy, and impacts on tourism and recreation are set out in Section 3.13.	**Wind** Dependant on scale/location of development. Wind energy can have significant landscape visual impacts, which in turn can impact on important cultural heritage receptors. This could result in economic impacts which would require to be assessed. **Hydro** Dependant on scale/location of development. **Heat Pumps (air, ground and water source)** Dependant on scale/location of development. **Deep Geothermal** Dependant on scale/location of development. There is a potentially significant positive impact on off gas grid rural communities from schemes in terms of addressing fuel poverty. **Solar and Photovoltaics** Dependant on scale/location of development. **Biomass** Dependant on scale/location of development. As with deep geothermal, there could be a positive impact on off-grid rural communities in addressing fuel poverty. **Energy from Waste** Dependant on scale/location of development. **Energy Recovery** Dependant on scale/location of development. **Energy Storage** Dependant on scale/location of development. **Combined Heat and Power and Decentralised Energy Networks** Dependant on scale/location of development. As with other technologies, heat networks assist in alleviating fuel poverty.

Development Plan Policy	Supporting Information Required	Sources of Further Guidance
IR12 Energy Generation Development IR13 Low and Zero Carbon Development	Applicants should demonstrate how their proposal would contribute to targets and emissions reduction by providing the following information: • Electrical or Heat Generation capacity; • Expected annual generation; • Approximate number of homes that could be powered or heated; • Fuel used and source; and • Carbon savings. For larger proposals, economic impact assessment should be provided, of a level appropriate to the scale of development. This should quantify the economic benefits, and potential impacts of proposals including number of FTE jobs created, impact on local supply chains, and the positive benefit to local communities. Landscape and Visual Impact Assessments should take into consideration potential visual impacts tourism receptors, and this should be incorporated into a wider assessment on economic impact of any proposal.	Draft advice on Net Economic Benefit and Planning (Scottish Government, 2016) https://www.gov.scot/publications/draft-advice-on-net-economic-benefit-and-planning/

IMPACTS ON TOURISM AND RECREATION

3.13

Nature of impact	Scale of potential impacts from applicable proposals
Policy IR12 requires applicants to assess impacts on tourism and recreation, within the Council area and in neighbouring local authorities. This includes public access and for long distance walking, cycling and scenic routes. Falkirk has a well-established tourism economy, with regional and nationally important attractions including the Falkirk Wheel, Helix Park, Callendar House and Park and a portfolio of landmark heritage assets. Falkirk also benefits from significant recreational assets including 300 miles of paths, including core paths and rights of way for walking and cycling, as well as part of the John Muir Trail, a national long-distance trail. Different types of energy development can affect users experience of tourism and recreational assets. For example, wind energy development can alter the perception of wildness in a landscape, and hydro development can affect watercourses used for fishing or other recreational pursuits. For larger projects in sensitive locations, impacts on tourism should be quantified as part of the overall assessment of a proposal. Landscape and Visual Impact Assessments should take into consideration potential visual impacts on these receptors, and this should be incorporated into a wider assessment on economic impact of any proposal.	**Wind** Dependant on scale/location of development. Wind energy can have significant landscape visual impacts, which in turn can impact on important cultural heritage receptors. This could result in economic impacts which would require to be assessed. **Hydro** Dependant on scale/location of development Specific impacts on watercourses or water bodies used for fishing should be identified as the environmental scoping stage. **Heat Pumps (air, ground and water source)** Dependant on scale/location of development. **Deep Geothermal** Dependant on scale/location of development. There is unlikely to be significant visual impact from infrastructure. **Solar and Photovoltaics** Dependant on scale/location of development. **Biomass** Dependant on scale/location of development. A flue/stack could be visible from sensitive receptors. **Energy from Waste** Dependant on scale/location of development. A flue/stack could be visible from sensitive receptors. **Energy Recovery** Dependant on scale/location of development. **Energy Storage** Dependant on scale/location of development. **Combined Heat and Power and Decentralised Energy Networks** Dependant on scale/location of development. A flue/stack could be visible from sensitive receptors.

Development Plan Policy	Supporting Information Required	Sources of Further Guidance
IR12 Energy Generation Development IR13 Low and Zero Carbon Development	For larger proposals, economic impact assessment should be provided, of a level appropriate to the scale of development. This should quantify the economic benefits, and potential impacts of proposals including number of FTE jobs created, impact on local supply chains, and the positive benefit to local communities. Landscape and Visual Impact Assessments should take into consideration potential visual impacts tourism receptors, and this should be incorporated into a wider assessment on economic impact of any proposal.	Draft advice on Net Economic Benefit and Planning (Scottish Government, 2016) https://www.gov.scot/publications/draft-advice-on-net-economic-benefit-and-planning/

LANDSCAPE AND VISUAL IMPACTS (INCLUDING GREEN BELT)

3.14

Nature of impact	Scale of potential impacts from applicable proposals
Landscape impacts are changes in the fabric, character, and quality of the landscape as a result of a development. This can include effects upon the overall patterns of elements that give rise to landscape character and regional and local distinctiveness such as designated landscapes and landscapes of conservation or historic importance. **Visual impacts** relate solely to changes in available views of the landscape, and the effect of those changes on people. This includes the overall impact on visual amenity, be it degradation or enhancement. In the context of wind energy, cumulative effects are expressed as follows: • 'In combination' (two or more windfarms seen by the observer from the same viewpoint in the same field of view); • Successive (two or more wind farms seen by the same observer from the same viewpoint but only by turning to look in a different direction); and • Sequential (two or more wind farms seen by an observer whilst travelling along a route, when no more than one may usually be seen at the same time). Repeated views of wind farms can give travellers along a route the impression that they are travelling through a 'wind farm landscape'. Green belt is designated around settlements to manage urban growth, to protect the landscape setting and identity of settlements, and to protect and give access to open space within and around towns and cities. Proposals will require to be assessed against these objectives. Green belt is shown on the LDP2 Proposals Maps for each settlement area.	**Wind** Potentially major landscape and visual impacts, depending on scale and location. Reference should be made to Falkirk Council's **Landscape Capacity Guidance for Wind Energy Developments**, which is set out in Appendix 3 to understand the capacity of local landscapes to accommodate turbines. There is the also potential for wind energy development to conflict with green belt objectives. **Hydro** Minor to major visual impact depending on scale and type of development. Most schemes in Falkirk are likely to be of small scale with limited impact from infrastructure. **Heat Pumps (air, ground and water source)** Minor-moderate impacts from above-ground infrastructure, although these are largely minor additions to buildings. **Deep Geothermal** This would be dependent on the scale or scheme. There is a greater likelihood of impact where there is a significant size of built development and apparatus such as a drill rig and energy centre, or where there are multiple schemes in close proximity to each other, or to settlements. **Solar and Photovoltaics** Potentially major landscape and visual impacts for solar arrays, as well as issues with glint and glare. Larger solar arrays may not be compatible with green belt objectives. **Biomass** Minor impacts from domestic/small scale. Significant impacts from commercial developments arising from stack height. **Energy from Waste** Potentially significant impacts from the industrial scale and nature of developments with particular issues arising in relation stack heights. **Energy Recovery** There could be visual impact from new buildings, waste-handling areas and chimney stacks. LVIA may be required for developments depending on the height of the building and stacks. **Energy Storage** Hydrogen tends to be stored in steel cylinders or bottles and fuel cells tend to be contained within boxed housing. Developments tend to be industrial in appearance and developers should submit details of landscaping to mitigate visual impacts. **Combined Heat and Power and Decentralised Energy Networks** There could be visual impact from new buildings and chimney stacks. Impacts arising from heat networks will depend on whether it is a network proposed as part of a new development or whether it is a retrofit scheme, which could result in a range of environmental impacts. LVIA may be required for developments depending on the height of the building and stacks.

Development Plan Policy	Supporting Information Required	Sources of Further Guidance
IR12 Energy Generation Development PE18 Landscape PE15 Green Belt Supplementary Guidance SG09 'Landscape Character Assessment and Landscape Designations'	Landscape and Visual Impact Assessment will be required for most non-domestic energy development proposals. Requirement for LVIA will be assessed on case-by case-basis. Cumulative landscape and visual impact with other proposed and consented developments should be assessed if appropriate. This will almost always be required for non-domestic wind energy proposals.	Draft advice on Net Economic Benefit and Planning (Scottish Government, 2016) https://www.gov.scot/publications/draft-advice-on-net-economic-benefit-and-planning/

TREES, WOODLAND AND FORESTRY

3.15

Nature of impact	Scale of potential impacts from applicable proposals
Forestry and woodland is a key resource for the area in terms of its landscape, biodiversity, recreational and carbon sequestration functions. Second Nature - A Biodiversity Action Plan highlights the fact that within the Falkirk area there are over 1100 hectares of broad-leaved woodland. Over 800 hectares of this is semi-natural, in other words the sort of woodland that naturally occurs within Scotland. Much of this semi-natural woodland is over 150 years old, some considerably more. Ancient and long-established woodlands are particularly valuable as mature, relatively undisturbed habitats and can support a diverse range of characteristic plants, animals and micro-habitats. Consequently, Policy PE20 of the LDP2 seeks to protect ancient, long-established and semi natural woodland as a habitat resource of irreplaceable value. In terms of the removal of general woodland associated with energy development, the principles of the Scottish Governments Policy on 'Control of Woodland Removal' will be followed where woodland is affected. New or existing forestry works will require input from Scottish Forestry and/Forestry and Land Scotland. In addition, a number of Tree Preservation Orders (TPOs) are in force across the Council area. These are likely to be close to settlements, so may not impact upon all types of energy proposal. These are shown on the LDP2 Proposals Maps.	**Wind** Potential felling and disturbance of root systems from siting of turbines, cabling and ancillary infrastructure. **Hydro** Infrastructure associated with hydro development can result in loss of, or damage to riparian trees and woodland. **Heat Pumps (air, ground and water source)** Dependent on scale and location of proposal. **Deep Geothermal** Dependent on scale and location of proposal. **Solar and Photovoltaics** Dependent on scale and location of proposal. **Biomass** Sustainable sourcing of biomass fuel is the critical issue. This will include minimising fuel transport requirements, using waste wood or planting and managing crops or woodland for fuel and biodiversity. OFGEM sets out sustainability criteria for Biomass proposals (see additional guidance). **Energy from Waste** Dependent on scale and location of proposal. **Energy Recovery** Dependent on scale and location of proposal. **Energy Storage** Dependent on scale and location of proposal. **Combined Heat and Power and Decentralised Energy Networks** Dependent on scale and location of proposal.

Development Plan Policy	Supporting Information Required	Sources of Further Guidance
PE20 Trees, Woodland and Hedgerows PE21 Promotion of Forestry and Woodland SG10 Trees and Development	Loss of trees and woodland should be quantified at the early stages of a proposal, and compensatory planting should be included in any scheme. Additional landscaping (for example to screen buildings and infrastructure) may also be required as part of habitat enhancement or mitigation of visual impact. Tree surveys are required for all developments where there are trees on site, along with additional surveys where identified through an initial Phase 1 habitat survey such as for ancient woodland. Proposals should demonstrate how construction of installations and tracks will avoid the loss of forestry, woodland and trees. Proposals should also seek to ensure habitat enhancement and additional planting where appropriate. This should be guided by green network opportunities identified in LDP2, and the Council's Forestry and Woodland Strategy (see additional guidance). Guidance on tree survey requirements can be found in SG10 Trees and Development.	Supplementary Guidance SG05 Biodiversity and Development Supplementary Guidance SG08 Local Nature Conservation and Geodiversity Sites Falkirk Council Forestry and Woodland Strategy The following documents produced by SEPA relating to peat are available at https://www.sepa.org.uk/environment/energy/renewable/ OFGEM Sustainability Criteria for Biomass: https://www.ofgem.gov.uk/environmental-programmes/ro/applicants/biomass-sustainability Local Energy Scotland (CARES) Toolkit - https://www.localenergy.scot/resources/cares-toolkit/ Forestry Scotland: Management of Ancient Wood Pasture: https://forestry.gov.scot/publications/standards-regulations-and-incentives/forestry-grant-scheme/forest-plan-resources/41-management-of-ancient-wood-pasture Forestry Scotland: Guidance on Woodfuel and Bio-Energy: https://forestry.gov.scot/forests-environment/climate-change/woodfuel-and-bio-energy Forestry Scotland: Control of Woodland Removal: https://forestry.gov.scot/support-regulations/control-of-woodland-removal

ECOLOGY

3.16

Nature of impact	Scale of potential impacts from applicable proposals
Energy developments can impact on ecological interests in a variety of ways. They can result in loss or degradation of habitat through the construction of energy infrastructure such as wind turbines and their associated infrastructure and access tracks. Pollution can result from construction activities. International and national sites are shown on Map 2 in Appendix 1, as well as on the LDP2 proposals maps. International sites are unlikely to be able to accommodate any development within the boundary without significant adverse impacts. Within supporting habitat, further assessment may be required to establish impacts on the integrity of sites. Areas in the immediate vicinity of, or with some ecological connection to the sites, may provide supporting habitat which is important for the qualifying species. In particular, for the Firth of Forth and Slamannan Plateau SPAs, areas of supporting habitat are used by birds for feeding or loafing. For the Slamannan Plateau SPA, the Bean Geese fields provide an indication of supporting habitat. These are shown in Map 3 in Appendix 1. A variety of habitats and species outwith designated sites may be important, notably priority species identified in Second Nature - A Falkirk Biodiversity Action Plan. However, this is a localised and complex constraint which is not amenable to simple mapping. Impacts will have to be assessed on a site-by-site basis.	**Wind** Potentially significant impacts on international, national and locally designated sites and legally protected species, depending on scale and location. Disturbance of wildlife can occur from construction or operation of turbines. Bird strike is also a risk during the operational phase. Wind energy development can have potentially significant impacts on Groundwater Dependent Terrestrial Ecosystems through construction, pollution or any activities or engineering operations which may disrupt groundwater flow. **Hydro** Proposals can result in direct impacts on ecology, as well as a loss of habitat, or habitat connectivity. This is dependent on the scale and location of the proposal. This could result of obstruction of riparian corridors, or through ancillary development required for the operation of the hydro scheme. Hydro schemes also have the potential to obstruct fish passage and migration, which may require mitigation such as a fish ladder. Hydro schemes can also result in impacts on legally protected species including bats, badgers and Great Crested Newts. This could be as a result of changes to the watercourse, or disturbance or displacement of supporting habitat as a result of construction or ancillary infrastructure. Hydro development can have potentially significant impacts on Groundwater Dependent Terrestrial Ecosystems through construction, pollution or any activities or engineering operations which may disrupt groundwater flow. **Heat Pumps (air, ground and water source)** Likely to be low-moderate, depending on location and extent of ground disturbance. **Deep Geothermal** Proposals can result in direct impacts on ecology, as well as a loss of habitat, or habitat connectivity. There is the potential for impacts on local, national and internationally designated sites. There may also be ecological impacts relating to the water environment. Smaller-scale development, particularly closed loop heat pump systems have less potential for significant impacts, although this is dependent on type and scale of development, and location. **Solar and Photovoltaics** Potential impacts arising from loss and disturbance of habitat. **Biomass** Minor impacts from domestic/small scale. Significant impacts from commercial developments from stack height. **Energy from Waste** Potentially significant impacts from commercial developments. **Energy Recovery** Dependent on type and scale of development, and location. **Energy Storage** Dependent on type and scale of development, and location. **Combined Heat and Power and Decentralised Energy Networks** Dependent on type and scale of development, and location. For new district heat networks of part of a development site, the design will specifically address ecological requirements in the context of the wider site. Retrofitting of network infrastructure will also have potential impacts in relation to ecological disturbance and damage, depending on the site location.

Development Plan Policy	Supporting Information Required	Sources of Further Guidance
PE19 Biodiversity and Geodiversity PE20 Trees, Woodland and Hedgerows SG06 Trees and Development SG07 Biodiversity and Development SG08 Local Nature Conservation & Geodiversity Supplementary Guidance	For most non-domestic energy developments, some level of ecological assessment will be required. This may include an initial desk-based Phase 1 habitat survey, extended to include survey on specific habitat, legally protected species surveys, and specific species licenses, which are managed by NatureScot. Information on the information required for different types of development can be found in SG07 Biodiversity and New Development. This also contains information on appropriate timing of habitat and species surveys, as well as ecological mitigation or enhancement. There is a specific development checklist for wind energy, which may also be applicable to other types of renewable and low carbon energy development. For International sites, proposals which are considered may result in a significant likely effect on the integrity of the site, the Habitats Regulations must be applied, and an Appropriate Assessment under the Conservation (Natural Habitats, &c.) Regulations 1994 must be carried out to determine Likely Significant Effect and possible Adverse Effect on Site Integrity. Applications subject to EIA will include specific chapters on ecology and the water environment along with suitable mitigation within the Environmental Statement.	Second Nature – a Biodiversity Action Plan for the Falkirk Council Area: https://www.falkirk.gov.uk/services/environment/environmental-management/biodiversity.aspx SEPA: CAR Licensing – A practical guide (October 2019): https://www.sepa.org.uk/media/34761/car_a_practical_guide.pdf NatureScot Habitat Regulations Guidance and Toolkit: : https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra/habitats-regulations-appraisal-hra-help-and NatureScot: 'Habitat Regulations Appraisal on the Firth of Forth' A guide for developers and regulators to meet the requirements of the Habitats Regulations on the Forth when first considering proposals. NatureScot: .'Assessing Connectivity with Special Protection Areas (SPAs)' (June 2016) which sets out further guidance to assess whether there is connectivity in terms of dispersal and foraging distances between the proposal and the qualifying interests of the site. Scottish Bean Geese Action group (responsible for monitoring and protecting Taiga Bean geese in Scotland). : Contact details available on request

SOILS

3.17

Nature of impact	Scale of potential impacts from applicable proposals
Wind energy developments on deep peat can have significant impacts on the environment including; • Habitat loss due to changes to hydrology caused by installing turbines; • The loss of sensitive species and habitats, some of which are protected; • Species or form qualifying interests to nationally designated sites; • The release of carbon, which significantly reduces the carbon saving; • Benefits of wind energy development. Parts of the Falkirk area contain areas of deep peat, and areas of intermediate peat bog. Map 8 shows the broad locations of carbon-rich soils, which are identified as an Area of Significant Protection (Group 2) for the purposes of the Spatial Framework for Wind energy. Prime quality agricultural land occupies about 17% of the Council area. This is defined as land falling within Classes 1, 2, and 3.1 in the Macaulay Institute 'Land Capability for Agriculture' classification. There are also a number of other rare soils which are found in the Falkirk area and are not mapped spatially. Impacts on these soils should be assessed on a case-by case-basis. SG08 Local Nature Conservation and Geodiversity Sites highlights locally-designated sites which contain rare soil types, as well as peat.	**Wind** Most typologies of turbine development within deep-peat areas will have some impact on the environment. This can be through release of carbon, disturbance of habitat and generation of quantities of waste peat. **Hydro** As with wind energy, infrastructure associated with hydro development can result in disturbance or loss of areas of peat. **Heat Pumps (air, ground and water source)** Unlikely to be significant impacts given likely location of infrastructure. **Deep Geothermal** Potential impacts from disturbance of peat, and changes to the water table. **Solar and Photovoltaics** This would be dependent on the level of ground disturbance associated with the proposal. In some instances, trenches and cable runs may cause more disturbance than the panels. Prime agricultural land can also be lost as a result of solar development. However, given the semi-temporary duration of solar array development, this land could be reinstated. Solar arrays tend to lend themselves to land which can accommodate grazing on-site. **Biomass** Dependent on scale and location of proposal. **Energy from Waste** Dependent on scale and location of proposal. **Energy Recovery** Dependent on scale and location of proposal. **Energy Storage** Dependent on scale and location of proposal. **Combined Heat and Power and Decentralised Energy Networks** Dependent on scale and location. Pipe runs should avoid environmentally sensitive locations.

Development Plan Policy	Supporting Information Required	Sources of Further Guidance
PE25 Soils and Agricultural Land	Where proposals affect an area of deep peat, or would result in interconnectivity with an area of deep peat, a Peat Management Plan that includes mitigation measures should be submitted with the planning application. The plan should include a peat depth survey and demonstrate that unnecessary disturbance, degradation and erosion would be avoided. The plan should set out suitable mitigation, and compensatory measures such as peatland restoration. There is a preference for any excavated peat to be re-used as peat, as reuse in peatland restoration or land improvement rather than being disposed of to landfill. For proposals involving the loss of prime agricultural land, justification for the choice of site should be set out.	Supplementary Guidance SG05 Biodiversity and Development Supplementary Guidance SG08 Local Nature Conservation and Geodiversity Sites Falkirk Council Forestry and Woodland Strategy SEPA Guidance on Soils: https://www.sepa.org.uk/environment/land/soil/ Scotland's Soils: https://soils.environment.gov.scot/ The following documents produced by SEPA relating to peat are available at https://www.sepa.org.uk/environment/energy/renewable/ SEPA's waste position statement for developments on peat (2010) SEPA's development on peatland guidance - waste (2010) Developments on peatland: Site surveys and best practice Floating roads on peat (2010) Guidance on the assessment of peat volumes, reuse of excavated peat and minimisation of waste Scottish Government Peat survey guidance https://www.gov.scot/publications/peatland-survey-guidance/ Local Energy Scotland (CARES) Toolkit - https://www.localenergy.scot/resources/cares-toolkit/

WATER ENVIRONMENT

3.18

Nature of impact	Scale of potential impacts from applicable proposals
Energy developments can have a significant impact on water quality and the ecological status of the water environment, particularly during the construction phase. Impacts on can include wetland degradation and habitat loss or disturbance, and pollution of water courses. There can be impacts on the quality and ecological status of groundwater, including drinking water and a potential increase in flood risk, including through loss of wetland/ bogs. Wetlands can be internationally and nationally important because of their ecological value and their key role in the water environment. Key functions include: • Reducing risk of flooding by attenuation; • Protecting surface and ground water from diffuse pollution; • Reducing climate change by storing carbon in organic soils; and • Supporting a range of wetland dependent habitats. **Watercourses, Surface water and Groundwater** Falkirk Council, as well as SEPA, have a duty to ensure that wind energy proposals and their associated development do not have an adverse impact on the ecological status and quality of watercourses, surface water and groundwater, including drinking water resources. Scottish Planning Policy sets out a 'flood risk framework', which provides a basis for planning decision making relating to flood risk. It divides flood risk into three categories - little or no risk, low to medium risk, and medium to high risk and outlines an appropriate planning response for each. For areas at risk of flooding, infrastructure development will normally be considered appropriate. For areas with a flood risk greater than 1:200, infrastructure such as wind turbines and their associated infrastructure may be appropriate subject to further flood risk assessment. The main issue as regards flooding is in relation to increasing the risk of flooding elsewhere, and removing or damaging natural compensatory storage mechanisms such as bogs. Damage to turbines and ancillary infrastructure are likely to be mitigated by appropriate construction techniques.	**Wind** Wind energy development can result in significant impacts. Examples of impacts could include: • Direct construction impacts (including pollution) through engineering works; • Culverting of water courses; • Hydrological/drainage impacts. **Hydro** Hydro schemes can potentially have a significant impact on water quality and the ecological status of the water environment, including during the construction phase. Particular areas which should be addressed are: • Changes in ecological status as a result of impoundment and changes in water flow; • Water Quality; • Changes to quantity and flow of water; • Sediment transport; • Impacts on migratory fish. • Pollution from construction; • Flooding and surface water drainage issues. **Heat Pumps (air, ground and water source)** Likely to be low-moderate, depending on location and extent of ground disturbance. **Deep Geothermal** Deep geothermal can have potentially significant effects on the water environment. All types of geothermal energy will involve access to ground water, and potentially sources of hot water deep underground. Used water may also be discharged to surface of ground water. These issue will be covered in depth as part of an abstraction licence, environmental permit, and potentially as part of EIA. **Solar and Photovoltaics** Likely to be low-moderate, depending on location and extent of ground disturbance. Adequate control of surface water and run-off will be required. **Biomass** Dependent on scale and location of proposal. **Energy from Waste** Dependent on scale and location of proposal. Reconfiguration and restoration of existing landfill sites may result in the water environment being affected. **Energy Recovery** Dependent on scale and location of proposal. **Energy Storage** Dependent on scale and location of proposal. **Combined Heat and Power and Decentralised Energy Networks** Dependent on scale and location of proposal.

Development Plan Policy	Supporting Information Required	Sources of Further Guidance
PE22 The Water Environment	Impacts on the water environment are included in the development checklist, set out in appendix 1 of SG05 Biodiversity and Development. Hydro proposals are likely to require a CAR license in line with the Water Framework directive and The Water Environment (Controlled Activities) (Scotland) Regulations 2011. Permits may also be required for other energy proposals for any water discharged to ground or surface water. Information submitted as part of a planning application is likely to include: • Water abstraction and circulation within the energy recovery system; • Information on the current water quality and any proposed abstraction or discharge; • Hydrology and drainage including abstractions, impoundments and watercourse engineering including crossings including details of surface water drainage; • A flood risk assessment (where appropriate); • A pollution prevention plan as part of the Construction Environmental Management Plan addressing SEPA Pollution Prevention Guidelines. Specific requirements relating to the provision of SUDS, and wastewater drainage should be discussed with SEPA, Scottish Water, and the Council as part of pre-application discussions.	Supplementary Guidance SG05 Biodiversity and Development SEPA Online Renewables Guidance: https://www.sepa.org.uk/environment/energy/renewable/ SEPA Land Use Planning Note 41: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions-and-groundwater-dependent-terrestrial-ecosystems.pdf SEPA: CAR Licensing – A practical guide (October 2019): https://www.sepa.org.uk/media/34761/car_a_practical_guide.pdf Local Energy Scotland (CARES) Toolkit - https://www.localenergy.scot/resources/cares-toolkit/ Falkirk Council has produced a guide on Flood Risk and Surface Water Drainage (June 2020). This contains links to the relevant flood risk legislation and guidance. https://www.falkirk.gov.uk/services/planning-building/development-management/docs/flood-risk/Planning%20application%20advice%20on%20flood%20risk%20and%20surface%20water%20drainage.pdf?v=202006030943

HISTORIC ENVIRONMENT

3.19

Nature of impact	Scale of potential impacts from applicable proposals
Energy development can affect the historic environment through direct impacts such as archaeological disturbance, and indirect impacts in terms of effects on the visual and landscape setting of historic sites. Development such as wind turbines can result in visual dominance by virtue of their vertical scale. Intervisibility between historic sites is also a key issue as certain archaeological or historic landscape features were intended to be seen from other historic sites, and wider vantage points. Cross-border impacts relating to cultural heritage views, vistas and intervisibility are also a crucial issue. The direct physical impacts of energy development can have a significant effect on sites of archaeological significance. For example, the concrete foundations of a 1MW to 2MW turbine can be up to 16m diameter and 3-4m in depth. There will be further direct impacts from anemometer masts, sub-stations, ancillary buildings, access roads/tracks, cabling and connection to the grid, and construction works.	**Wind** Wind energy may have significant impacts both on setting and direct physical impacts, as discussed. Cumulative impact will be a particular consideration. **Hydro** The impacts arising from hydro development on the historic environment are likely to either be direct impacts such as archaeological disturbance, or visual impacts, such as the impact on the setting of a sensitive receptor. Setting can also be affected by sensory factors such as noise, dust or vibration. **Heat Pumps (air, ground and water source)** The impacts arising from heat pumps and deep geothermal on the historic environment are likely to either be direct impacts such as archaeological disturbance, or visual impacts from development associated with the technology which could impact on the setting of a sensitive receptor. Setting can also be affected by sensory factors such as noise, dust or vibration. This will be dependent on the scale, nature and location of the proposal. **Deep Geothermal** Proposals can result in direct impacts on ecology, as well as a loss of habitat, or habitat connectivity. There is the potential for impacts on local, national and internationally designated sites. There may also be ecological impacts relating to the water environment. Smaller-scale development, particularly closed loop heat pump systems have less potential for significant impacts, although this is dependent on type and scale of development, and location. **Solar and Photovoltaics** The impacts arising from solar development on the historic environment are likely to either be direct impacts such as archaeological disturbance, or visual impacts, such as the impact on the setting of a sensitive receptor such as a battlefield or a listed building. Setting can also be affected by sensory factors such as noise, dust or vibration. **Biomass** The impacts arising from biomass development on the historic environment are likely to either be direct impacts such as archaeological disturbance, or visual impacts from built development such as stacks and buildings, including impact on the setting of a sensitive receptor. Setting can also be affected by sensory factors such as noise, dust or vibration which may affect the enjoyment of a sensitive site. **Energy from Waste** Dependent on scale and location of proposal. **Energy Recovery** Dependent on scale and location of proposal. **Energy Storage** Dependent on scale and location of proposal. **Combined Heat and Power and Decentralised Energy Networks** The impacts arising from CHP or heat network development on the historic environment are likely to be mainly direct impact such as archaeological disturbance, although there may be visual impacts from built development. Noise, dust or vibration may also affect the enjoyment of a sensitive site.

Development Plan Policy	Supporting Information Required	Sources of Further Guidance
D07 Antonine Wall D08 Sites of Archaeological Interest Policy D09 Listed Buildings Policy D10 Conservation Areas Policy D11 Areas of Townscape Value Policy D12 Historic Gardens and Designed Landscapes Policy D13 Battlefield Sites SG11 Frontiers of the Roman Empire (Antonine Wall) World Heritage Site SG12 Listed Buildings and Unlisted Properties in Conservation Areas	For proposals which may have direct impacts upon, or which may affect the setting of sensitive receptors, a specific Historic Environment study should be submitted with the application. The scope of this should be agreed with Historic Environment Scotland and the Council. It may be appropriate to draw on viewpoints and receptors identified in a Landscape and Visual Impact Assessment.	Frontiers of the Roman Empire (Antonine Wall) World Heritage Site SPG: https://www.falkirk.gov.uk/services/planning-building/planning-policy/supplementary-guidance/other-planning-guidance.aspx Historic Environment Scotland online mapping portal (incl GIS datasets): https://portal.historicenvironment.scot/ Historic Environment Scotland - suite of guidance on managing change in the historic environment: https://www.historicenvironment.scot/advice-and-support/planning-and-guidance/legislation-and-guidance/managing-change-in-the-historic-environment-guidance-notes/

AVIATION AND DIGITAL INFRASTRUCTURE

3.20

Nature of impact	Scale of potential impacts from applicable proposals
Aviation Impacts on aviation are primarily associated with wind energy, although solar arrays can cause glint and glare which can impact upon aircraft navigation. Any tall structure such as a flue or stack could potential require further assessment. The whole of the Council area falls within either of the airport consultation zones, and a central swathe falls within both Edinburgh and Glasgow zones. There is also a safeguarding area for Edinburgh Airport between Grangemouth and Bo'ness. Map 9 in Annex 1 provides further details. The Civil Aviation Authority's policy on wind turbine development and related guidance to the UK civil aviation community is set out in the policy document CAP 764. The CAA no longer deals with individual pre-planning consultations and has produced a guidance document which sets out what is expected of developers. The link can be found below. **Digital Infrastructure** Under the Wireless Telegraphy Act 2006, Ofcom is also responsible for protecting the spectrum from interference or abuse, which may be either deliberately or unintentionally caused. Ofcom will advise of the operators that prospective developers should contact. Fixed telecommunications link transmitters in the Falkirk Council area include: • Doups • Myot Hill • Banknock • Falkirk • Grangemouth (multiple points) • Bo'ness Outside the Falkirk area are transmitters which could be affected include: • Black Hill • Kirk O' Shotts • Cairnpapple • Earls Hill • Knock Hill This constraint has not been mapped, spatially. Issues can normally be resolved between the developer and the relevant operators, and new technology and mitigation methods are constantly emerging. Developers should liaise with OFCOM and any authorities or bodies likely to have an interest as part of the planning process, in particular, the local emergency services. The Met Office seeks to protects its operational radio interests by engaging in the formal planning consultation process. Tall structures such as wind turbines can adversely affect the operation of meteorological weather radar. The western part of the council area falls within the consultation zone for Holehead, which is shown on their website at the link below.	**Wind** Wind turbines produce electro-magnetic radiation which can interfere with broadcast communications and signals. Potential problems as a result of turbines can arise from signal blocking or signal reflection between transmitters and receivers. **Hydro** Unlikely to be impacts. **Heat Pumps (air, ground and water source)** Unlikely to be significant impacts given likely location of infrastructure. **Deep Geothermal** Unlikely to be impacts. **Solar and Photovoltaics** There is the potential for large-scale solar arrays to cause glint and glare which could have implications for aircraft navigation. **Biomass** Dependent on scale and location. **Energy from Waste** Stack height may be limited in within safeguarding areas. Anaerobic digestion can attract birds, which could be a potential aviation hazard in areas close to airport operators. **Energy Recovery** Unlikely to be impacts. **Energy Storage** Unlikely to be impacts. **Combined Heat and Power and Decentralised Energy Networks** Dependent on scale and location.

Development Plan Policy	Supporting Information Required	Sources of Further Guidance
IR11 Digital Infrastructure IR12 Energy Generation Development	For relevant proposals, Applicants should engage with National Air Traffic Services (NATS), the Civil Aviation Authority and airport operators to identify any potential impacts. Information for operators and consultees will vary but is likely to include: • Development parameters - Turbine numbers, site layout and turbine dimensions; • Proximity and line of sight to navigational aids, Secondary Surveillance Radar and Voice communication sites; and • Proximity and line of sight to Primary Surveillance Radar.	NATs Pre-planning assessment: http://www.nats.co.uk/nats-services/issues/wind-farms/pre-planning-assessment-service/ DECC Aviation Safeguarding Maps: https://restats.decc.gov.uk/cms/aviation-safe-guarding-maps/ Civil Aviation Authority Planning and Consultation Requirements: https://pub-licapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&-mode=detail&id=4468 Civil Aviation Authority CAP 764 Policy and Guidelines on wind turbines: https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&-mode=detail&id=5609 OFCOM Tall structures and their impact on broadcast and other wireless services: https://www.ofcom.org.uk/__data/assets/pdf_file/0026/63494/tall_structures.pdf CAP 764: Policy and Guidelines on Wind Turbines: https://publicapps.caa.co.uk/ Met Office Safeguarding Maps: https://www.metoffice.gov.uk/services/business-in-dustry/energy/safeguarding

IMPACT ON COMMUNITIES (INCLUDING NOISE AND SHADOW FLICKER)

3.21

Nature of impact	Scale of potential impacts from applicable proposals
Shadow Flicker Wind turbines can cause specific issues with shadow flicker. Shadow flicker is an effect that can occur when the shadow of a blade passes over a small opening (such as window), briefly reducing the intensity of light within the room, and causing a flickering to be perceived. Shadow flicker effects can only occur inside buildings where the blade casts a shadow across an entire window opening. **Noise** Energy development can cause issues with noise. This could either be from operation of the scheme itself or during the construction stage. This would depend on distance of the proposal from residential properties and communities. As well as protecting settlements and communities from adverse visual impact associated with wind energy development, the settlement buffer zones will also provide a degree of separation to reduce impacts from noise and shadow flicker. In terms of the implications of single/small clusters of turbines, it is industry best practice to ensure that a minimum separation distance of at least 10 x rotor diameter from a dwelling house, work place or community facility to a turbine is achieved in order to avoid shadow flicker, and also to mitigate noise impacts. The exact separation distance required will be partly dependent on prevailing climatic conditions, topography and tree cover. For a commercial-scale turbine, this could be around 500m+ from an individual dwellinghouse. For all proposals, the developer will be required to demonstrate that impacts, in particular noise, are acceptable. This constraint has not been mapped, spatially. Issues can normally be resolved between the developer and the relevant operators, and new technology and mitigation methods are constantly emerging. Developers should liaise with OFCOM and any authorities or bodies likely to have an interest as part of the planning process, in particular, the local emergency services. **Community Benefit** The Scottish Government produced Good Practice Principles for Community Benefits from Onshore Renewable Energy Developments to set out a benchmark for delivering community benefit. This document was drawn from engagement with the industry and sets out how developers are expected to deliver community benefit. Whilst this is intended primarily for onshore wind, the principles of good practice could be applied to other technologies. Community benefits associated with renewable energy are delivered entirely outwith the planning system. Developers are however, expected to engage with local communities to explore options in which community benefit can be delivered as part of wind energy developments. Scottish Government recommends a community benefit package for onshore wind developments with a value to the equivalent of at least £5,000 per installed megawatt per annum, index-linked for the operational lifetime of the project. Other onshore technologies should aspire to this level. Additionally, Scottish Government would like to see opportunities for increased levels of community investment explored.	**Wind** Noise and shadow flicker are further effects of wind farm development which can impact on communities. There are also potential effects such as disruption and dispersion of industrial plumes in industrial locations such as Grangemouth which are emerging issues, with very little background data and information available at present. **Hydro** • Visual Impact: likely to be relatively localised, but sites may be visible from paths and roads. • Noise: This could either be from the scheme itself or during the construction stage. This would depend on distance from residential properties and communities. • Safety Issues: The site including individual components of the hydro scheme should be considered in terms of public safety, particularly during the construction stage. **Heat Pumps (air, ground and water source)** Unlikely to be significant impacts given likely location of infrastructure. **Deep Geothermal** Potential impacts from noise or vibration, depending on location. **Solar and Photovoltaics** Depending in the siting and design of solar development, there could be potential issues with glint and glare, as well as public safety. **Biomass** Impacts on communities are likely to relate to: • Air quality and pollution; • Potential noise; • Transport and impacts relating to delivery of biomass stock. Commercial biomass developments tend to be located within the urban area so it is important that impacts on communities are carefully considered as part of an EIA. **Energy from Waste** Visual impact may arise from stacks and other development. As with biomass, impacts on communities are likely to relate to: • Air quality and pollution; • Potential noise; • Transport and impacts relating to delivery and processing of waste. **Energy Recovery** Dependent on scale and location of development. **Energy Storage** Dependent on scale and location of development. Security, lighting and public access restrictions should be detailed. **Combined Heat and Power and Decentralised Energy Networks** Impacts from CHP and heat networks will be dependent on scale and location of proposal. Installation of heat network infrastructure may cause noise and disruption to communities.

Development Plan Policy	Supporting Information Required	Sources of Further Guidance
IR12 Energy Generation Development	Safety Issues: Details should be provided as part of the application in relation to security on site, both temporary and permanent, as well as the location of signage and scale and type of fencing. Noise Impact Assessment Shadow Flicker Assessment (for turbines) Glint and glare assessment (for solar schemes)	Planning Advice Note 1/2011 Planning and Noise: https://www.gov.scot/publications/planning-advice-note-1-2011-planning-noise/ Good practice principles for community benefits from onshore renewable energy developments: https://www.gov.scot/publications/scottish-government-good-practice-principles-community-benefits-onshore-renewable-energy-developments/

DECOMMISIONING/RESTORATION and REPOWERING

3.22

Nature of impact	Scale of potential impacts from applicable proposals
Decommissioning Different types of renewable and low carbon energy will have varying lifespans. Wind turbines will have a lifespan or around 25 years, whereas a CHP plan lifespan may be anything from 10-30 years depending on the specification. To ensure that energy developments are decommissioned in line with current best practice and regulatory processes, a decommissioning plan will be drawn up at application stage, with payment of a restoration bond to ensure decommissioning is undertaken. Process is likely to be as follows: • Submission of draft restoration plans at application stage; • Finalisation of restoration plans within 6-12 months prior to expiry of permission; • Conditions used to secure approval of final restoration; • Conditions used to secure monitoring and reporting; and • Financial guarantee (bond) released only on satisfactory completion of restoration. **Repowering** Repowering a wind farm site involves the removal of wind turbines and their replacement with new turbines on the same site, normally increasing overall generating capacity and output as well as reducing the total number of turbines. With many schemes developed from 2002 onwards, technology has rapidly evolved with greater capacity as well as increased distribution will increase demand for repowering existing sites.	**Wind** One of the main environmental impacts arising from turbine removal is the removal of bases. In many cases the turbine bases are left in situ to avoid disturbance. This is particularly important for turbines located on carbon-rich soils or where habitats have become established over time. Restoration of a peatland can take from 5 to 30 years depending on the initial condition (Source: NatureScot). Raising the water table to, or near to, the surface is critical to successful restoration. In terms of repowering, sites are being repowered with fewer turbines, but a larger height to tip. In terms of landscape and visual impact this will require careful assessment through an LVIA. **Hydro** • Visual Impact: likely to be relatively localised, but sites may be visible from paths and roads. • Noise: This could either be from the scheme itself or during the construction stage. This would depend on distance from residential properties and communities. • Safety Issues: The site including individual components of the hydro scheme should be considered in terms of public safety, particularly during the construction stage. **Heat Pumps (air, ground and water source)** Depending on scale, location in relation to sensitive receptors. **Deep Geothermal** Depending on scale, location in relation to sensitive receptors. **Solar and Photovoltaics** Depending on scale, location in relation to sensitive receptors. Unlikely to be significant due to limited ground disturbance. **Biomass** Depending on scale, location in relation to sensitive receptors. Likely to be similar to decommissioning any industrial process or plant. **Energy from Waste** Depending on scale, location in relation to sensitive receptors. Likely to be similar to decommissioning any industrial process or plant. **Energy Recovery** Depending on scale, location in relation to sensitive receptors. **Energy Storage** Depending on scale, location in relation to sensitive receptors. **Combined Heat and Power and Decentralised Energy Networks** Depending on scale, location in relation to sensitive receptors. Heat network pipework should remain in situ, subject to future maintenance. Heat network capacity should be of the correct specification so as to future proof for future capacity requirements.

Development Plan Policy	Supporting Information Required	Sources of Further Guidance
Policy IR12 Energy Generation Development	Careful scoping of LVIA required given the changes in turbine size and/or re-siting within the site; Assessment of existing grid connections and infrastructure. Reassessment of impact on aviation and radar. Review of existing noise conditions and obligations; and Use of environmental and ecological information compiled for the original project application, construction and from post-construction monitoring as relevant base-line data for the new application.	Scottish Renewables Repowering Position Statement: https://www.scottishrenewables.com/assets/000/000/146/070317_Repowering_SR_Position_Paper_original.pdf?1553086864

LDP2 Policy Requirements

4.1 Policy IR13 of the Falkirk Local Development Plan is intended to meet the requirements of Section 3F of the Town and Country Planning Act by requiring low and zero-carbon generating technologies to be installed on new buildings in order to deliver a percentage of the carbon dioxide emissions reduction required by Building Standards. The policy is designed to ensure that the percentage reduction to be achieved through low and zero-carbon generating technology correlates with the most up-to-date building standards sustainability labelling at the time. Eligible technologies include:

- Wind;
- Solar/Photovoltaics;
- Hydro;
- Biomass;
- Deep Geothermal;
- Heat Pumps (air, water, ground);
- Combined Heat and Power (CHP) (run from renewable or low-carbon sources);
- Energy from waste sources.

4.2 Policy IR13 applies to all new domestic and non-domestic buildings. All new buildings should incorporate on-site low and zero carbon generating technologies (LZCGT) to meet a proportion of the overall energy requirements. Applicants must demonstrate that 12% of the overall reduction in CO^2 emissions as required by Building Standards has been achieved via on-site LZCGT. This proportion will be increased as part of subsequent reviews of the LDP. All proposals must be accompanied by an Energy Statement (a template can be found at Appendix 4) which demonstrates compliance with this policy. Should proposals not include LZCGT, the Energy Statement must set out the technical or practical constraints which limit the application of LZCGT.

Exceptions to the policy are;

- **Alterations and extensions including house extensions, and extensions to business/ industrial premises**.
  This should be an extension to an existing building, and used as an extension of the established use, or for uses ancillary to the primary building use such as storage of goods or ancillary workers facilities.
- **Stand-alone buildings which are ancillary and which have an area of less than 50m².**
  Including garden storage shed/buildings, or an industrial storage building.
- **Buildings which will not be heated or cooled other than by heating provided solely for the purpose of frost protection.**
  Including domestic garages or a stand-alone building used for agricultural purposes.
- **Temporary buildings with consent for 2 years or less.**
  Including modular buildings and temporary construction accommodation.
- **Where implementation of the requirement would have an adverse impact on the historic environment.**
  Such as where development which would impact upon the fabric or setting of designated site such as a listed building, scheduled monument or world Heritage Site.

4.3 The merits of each technology will very much depend on the characteristics, constraints and energy requirements of the development. For example, the space heating needs of a residential development will be different to an industrial development, and not every site will be able to accommodate technologies which require substantial land or infrastructure. Section 2 Locational Guidance and Section 3 Development Management Criteria set out broad constraints and considerations as they apply to each technology.

4.4 Generally, the most common technology being incorporated into domestic and non-domestic new development is solar/PV. This technology has now been incorporated into many standard house types, and does not require additional land or substantial infrastructure. Air source heat pumps are also increasingly used. For larger developments or non-domestic development with substantial energy needs, it may be that a mix of technologies could be utilised, and provision of CHP or heat recovery systems will be viable.

4.5 LDP2 which reflects national policy seeks to encourage renewable fuels as a first principle. For example, development proposals which incorporate CHP should ideally be run from renewable fuels. Building Standards sustainability labelling (Section 7) only identifies CHP fired by low-emission fuel sources as an eligible LZCGT. In order to meet the terms of LDP Policy IR13, developers should demonstrate that proposed CHP will be run from low-emission fuel sources. Whilst not strictly in accordance with LDP policy IR13, or Section 3F of the Climate Change (Scotland) Act 2009, CHP run from non-renewable sources (eg natural gas) will be considered on a case-by-case basis where it is demonstrated that renewable fuels are unviable or impractical (i.e. on a constrained site), and where there is a significant reduction in the projected carbon emissions from the development as a result of CHP.

Relationship between Building Standards and the Planning System

4.6 The Sullivan Report, published in 2007, made recommendations to the Scottish Government as to the most effective way to improve the energy performance of houses and buildings in Scotland, and thereby reduce carbon dioxide emissions. One of the most significant recommendations was to aim to achieve net zero-carbon buildings (in relation to emissions for space and water heating, lighting and ventilation) by 2016, if practical. There followed a series of stages reduction in carbon emissions from the 2007 standards, and Section 6 of the current technical handbook sets out the various aspects for compliance. Section 7: Sustainability labelling is intended, in part, to assist local authorities with meeting their Development Plan Policy obligations under Section 72 of the Climate Change (Scotland) Act 2009 by identifying the use of LZCGT, and setting out the specified reduction in carbon emissions which new development should achieve, over and above building standards. The latest Technical Handbooks can be found here: https://www.gov.scot/policies/building-standards/monitoring-improving-building-regulations/

Sustainability label	Description
Bronze Active	This is the baseline level where the dwelling meets the functional standards set out in sections 1 - 6 of the Handbook, but in addition the dwelling includes the use of an eligible low and zero carbon generating technology (LZCGT) in respect of meeting standard 6.1 within section 6 Energy.
Silver	A dwelling at this first optional upper level should meet all the standards in sections 1 - 6 that apply to the building for the bronze level and, in addition, the dwelling should comply with the silver level in each of the eight aspects below. These are: Aspect 1: Carbon dioxide emissions Aspect 2: Energy for space heating Aspect 3: Energy for water heating Aspect 4: Water use efficiency Aspect 5: Optimising performance Aspect 6: Flexibility and adaptability Aspect 7: Well-being and security Aspect 8: Material use and waste
Silver Active	This is the same as the silver level but, in addition, the dwelling includes the use of a low and zero carbon generating technology (LZCGT) in respect of meeting at least one of the aspects: Silver 1, Silver 2 or Silver 3.
Gold	A dwelling at this second optional upper level should meet all the standards in Sections 1 - 6 that apply to the building for the bronze level and in addition the dwelling should comply with the gold level in each of the eight aspects above.

Energy Statement Requirements

4.7 LDP2 Policy IR13 states that *"All proposals must be accompanied by an Energy Statement which demonstrates compliance with this policy. Should proposals not include LZCGT, the Energy Statement must set out the technical or practical constraints which limit the application of LZCGT."* Appendix 4 provides a template to be completed for each eligible development, and provides guidance on timing of submission of information.

4.8 Understanding the energy demands of new development is crucial to understanding how to achieve the best energy mix for the site in terms of low and zero carbon generating technologies, heat networks and where connection to the gas grid is necessary how to future proof the development for connection into heat networks in the future.

4.9 The UK Government published a research paper in 2017 showing the varying degrees of annual energy consumption per m² for different types of new build property. As of 2017, the average new build property had an energy demand of 122 kWh/m². 102 kWh/m². of this is electricity, and 12 kWh/m² is gas. There is some variance on this figure, with flats using around a combined 120 kWh/m² and bungalows using 143kWh/m². This means that for an average 3 bedroom, semi-detached property of around 100m², this would generate an **annual energy demand of 12,200 kWh.**

4.10 On average, properties not using gas use less energy overall than properties using gas (88 kW/m² and 125 kWh/m² respectively in 2017). This in part is due to properties not using gas being more likely to use other fuels (e.g.: solid-fuel burners) which are not captured in the data. At end use gas is less efficient for heating than electricity, as the efficiency losses for electric heating come at the point of generation rather than in the home.

Electric Vehicle Charging Provision

4.11 LDP2 policy IR009 states that new car parking provided as part of significant new commercial or community uses should incorporate electric vehicle charging points. Scottish Government guidance "Switched On Scotland - Action Plan" provides further detail on the Scottish Government's targets and roadmap to widespread adoption. The Scottish Government aims to phase out diesel and petrol cars by 2032.

4.12 The use of electric vehicles is one measure for reducing emissions locally and therefore the provision of necessary infrastructure which promote the use of such vehicles is essential. There are now over 10,000 ultra- low emission vehicles registered in Scotland. This is mainly due to vehicle manufacturers offering a range of plug-in vehicles, several incentive support measures offered by the UK Government and increasing public awareness of the impact of road transport emissions on the environment.

4.13 The technology for charging and vehicles is rapidly evolving, and developers should seek out best practice guidance. The Institute for Engineering and Technology provides up to date guidance: https://electrical.theiet.org/guidance-codes-of-practice/publications-by-category/electric-vehicles/

4.14 Developers are expected to future-proof new developments by providing charging facilities within curtilage of new domestic properties, and within the parking areas for business and community developments. A distinction is made between "passive" and "active" EV provision.

Active - A socket connected to the electrical supply system that vehicle owners can plug their vehicle into.

Passive - The network of cables and power supply necessary so that at a future date a socket can be added easily. This future-proofs a development for the growing demand for EV infrastructure.

4.15 A growing number of planning authorities have specified fixed rates of provision for passive and active PV. All domestic properties will have passive provision, as a charging point can easily be fitted on demand to a domestic supply. Many housebuilders are now choosing to install charge points into new properties as standard.

4.16 There are relatively few technical barriers to installation as part of new development, alongside provision of all other infrastructure. Where retrofitting is required, either as a standalone project or as part of redevelopment, barriers such as sub-ground archaeology or environmental constraints, or existing infrastructure or service wayleaves may exist and would be assessed on a case-by-case basis.

4.17 Policy IR09 requires new car parking provided as part of significant new commercial or community uses to incorporate electric vehicle charging points. Whilst not specifically identified in the scope of policy IR09, new residential should cover EV provision in the submitted Transport Assessment (where required) and the Energy Statement. It is assumed that detached, semi-detached and terraced dwellings with private parking spaces will be able to offer 100% passive provision. Developments with shared parking areas will be required to meet a level of provision, unless site constraints mean that provision is not possible. Developments should aim to meet the minimum requirements. Transport Assessments for new developments may also identify an enhanced requirement for additional EV infrastructure, in which case this should be provided. The following table sets out the minimum requirements for both passive and active provision in new development:

	Minimum Passive Provision	Minimum Active Provision
Residential		
Detached, semi-detached and terraced properties or flatted dwellings with private parking provision	100%	
Dwellings with shared parking provision	20% *	
Non-Domestic		
Retail and commercial leisure (over 500m²)	10% *	2% *
Office and business (with dedicated private parking)	20% *	2% *
Community and institutional uses (e.g. school or education uses, health facility)	20% * (equal split between visitor parking and staff parking)	2% * (equal split between visitor parking and staff parking)

* The calculated requirement should be rounded up to one whole space.

Case Study: Falkirk Stadium Low Carbon Vehicle Hub

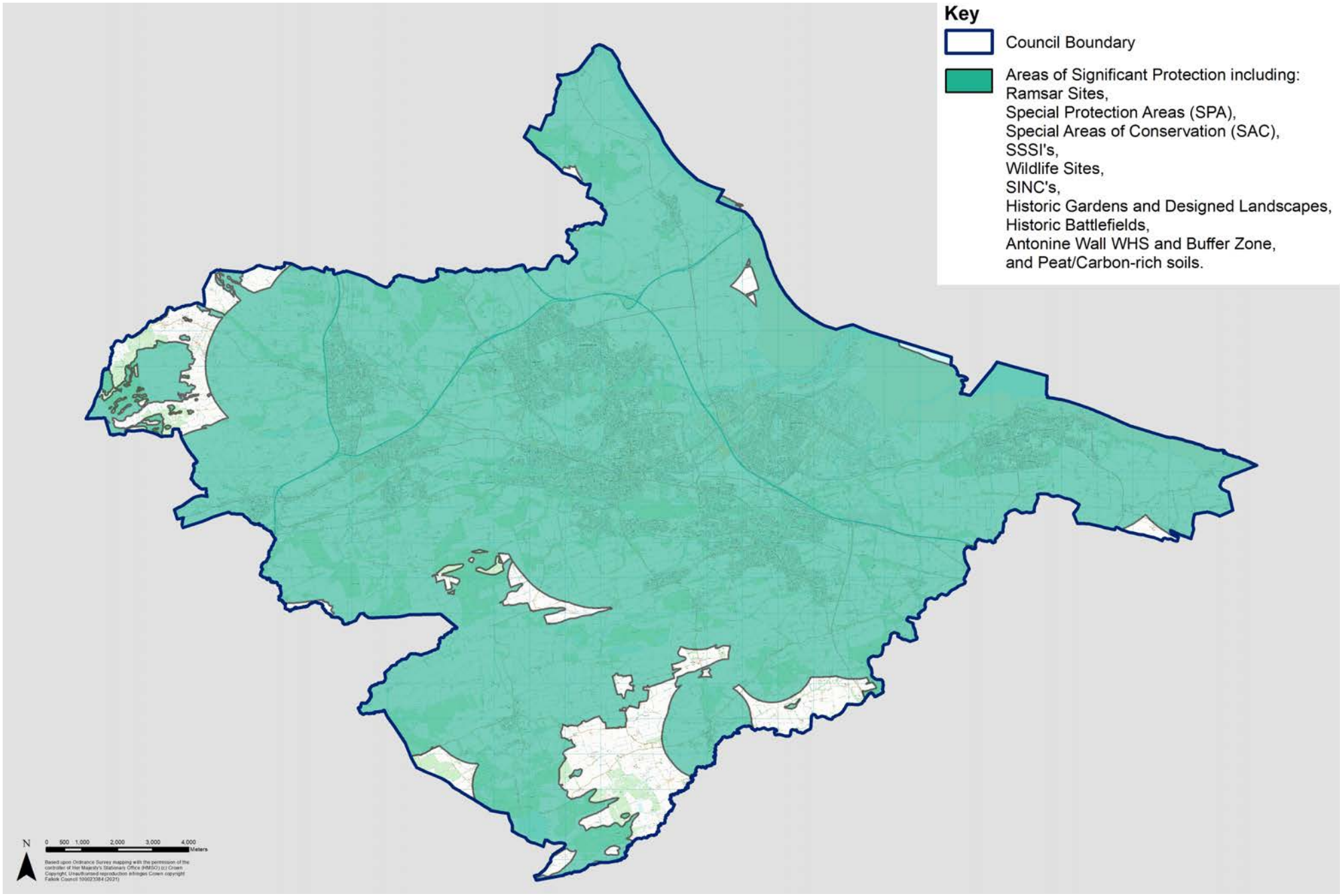
Developer: Falkirk Council

Output: 350/400kw.

Project description: The largest electric vehicle (EV) charging station in Scotland was developed at the Falkirk Stadium.
The £1.4m has capacity for 26 electric vehicles, and scope further connections across the 156 bays. The new EV station will generate over 30% of the required electricity to power the facility from its own solar canopy made up by 1272 panels covering an area of over 2,000sqm, saving 75 tonnes of carbon per year. It also brings the number of EV charging bays in the Falkirk and Grangemouth area to 68, an increase of almost 70%. Funding for the project came through Falkirk Council, the Scottish Government and the European Regional Development Fund through Transport Scotland's Low Carbon Travel and Transport Challenge Fund.

Planning Policy: Policies are broadly supportive of new renewable and low carbon energy development.

Key Constraints: **Policy IR09 Parking** requires significant new commercial or community uses to incorporate electric vehicle charging points. This was a part of the existing stadium complex, but the principles can be replicated on new developments with significant parking requirements.


Key
Council Boundary
Areas of Significant Protection including:
Ramsar Sites,
Special Protection Areas (SPA),
Special Areas of Conservation (SAC),
SSSI's,
Wildlife Sites,
SINC's,
Historic Gardens and Designed Landscapes,
Historic Battlefields,
Antonine Wall WHS and Buffer Zone,
and Peat/Carbon-rich soils.
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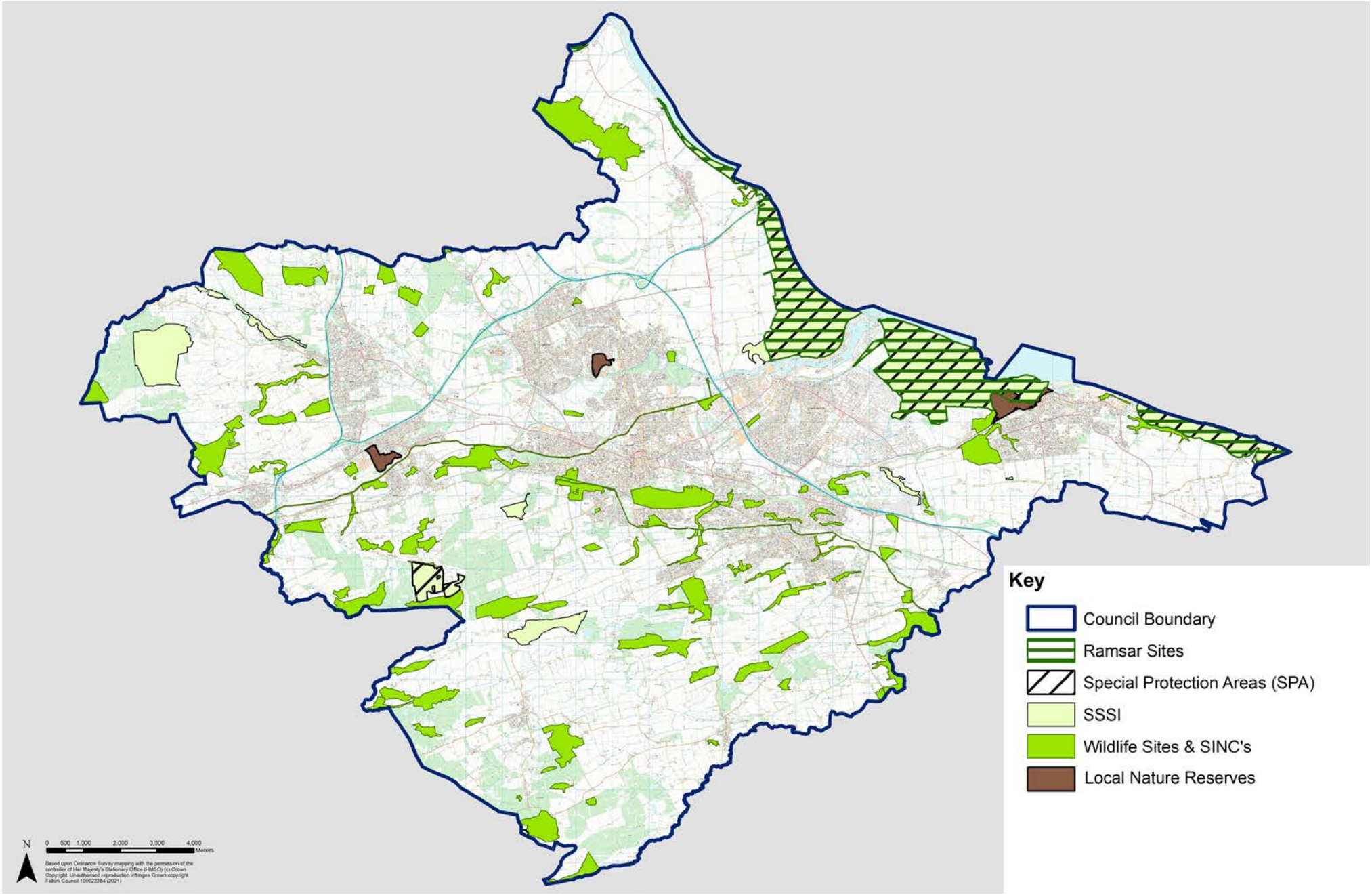
Meters


Key
Council Boundary
Ramsar Sites
Special Protection Areas (SPA)
SSSI
Wildlife Sites & SINC's
Local Nature Reserves
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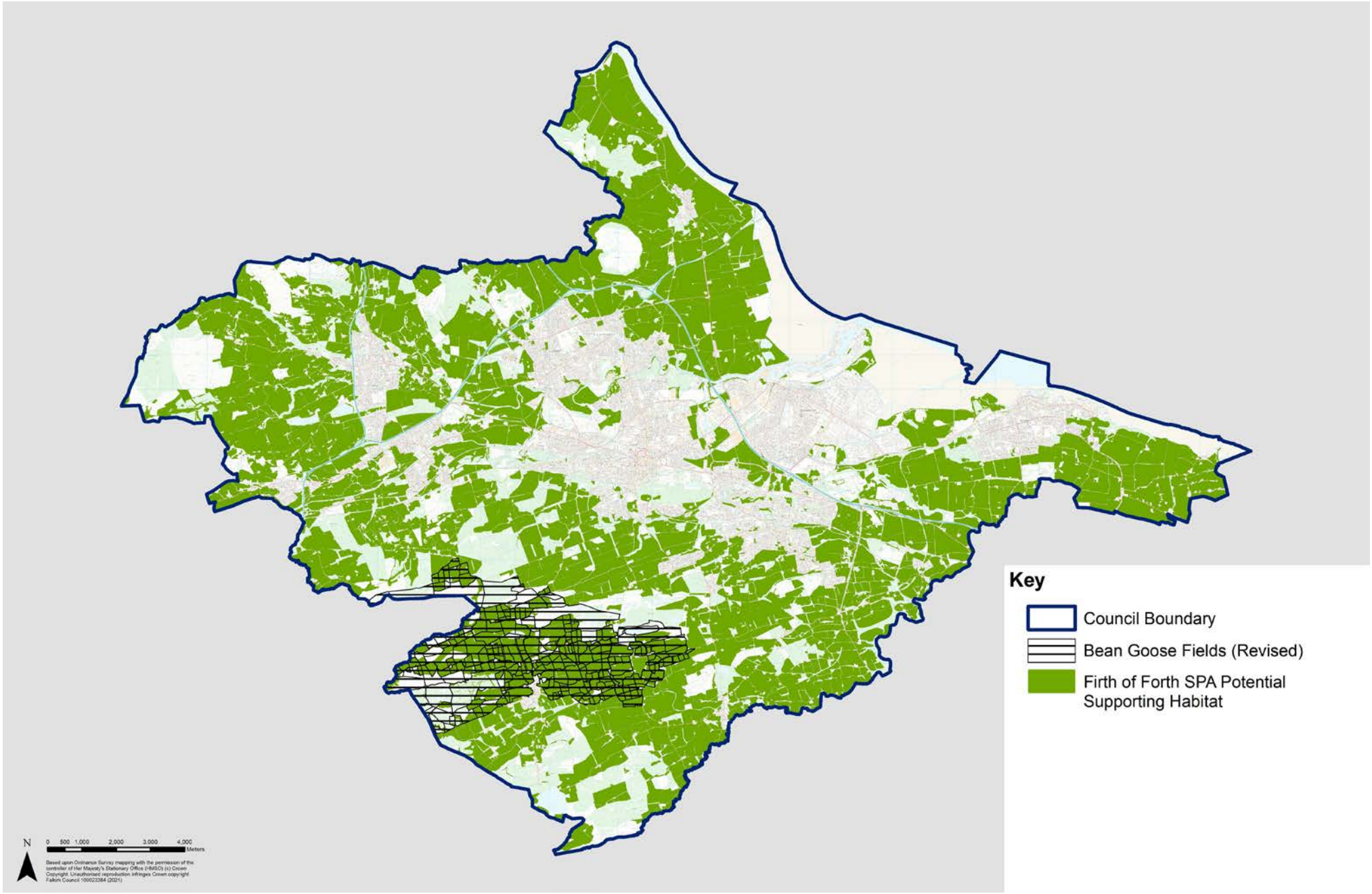
Key
Council Boundary
Bean Goose Fields (Revised)
Firth of Forth SPA Potential Supporting Habitat
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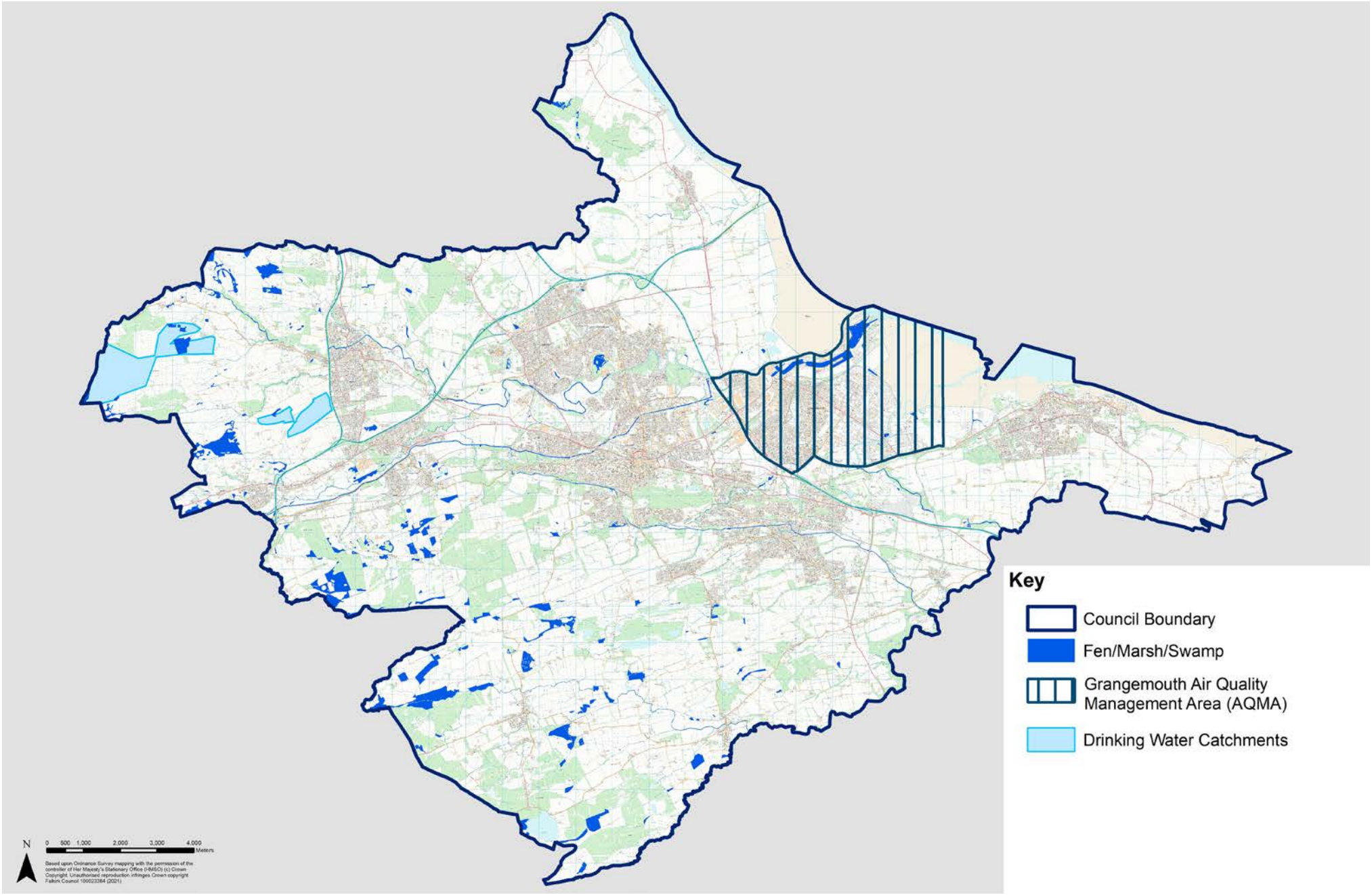
Key
Council Boundary
Fen/Marsh/Swamp
Grangemouth Air Quality Management Area (AQMA)
Drinking Water Catchments
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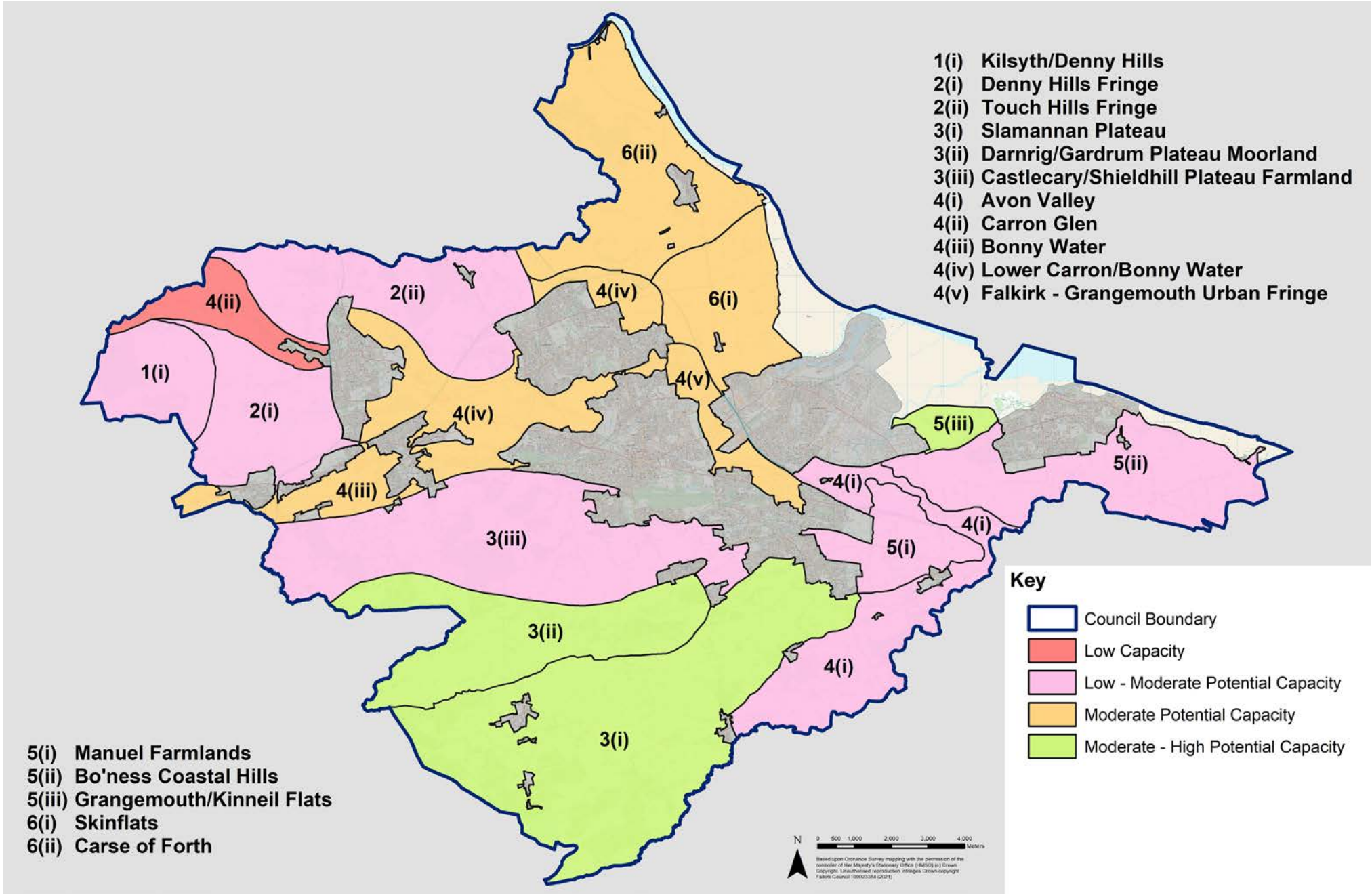
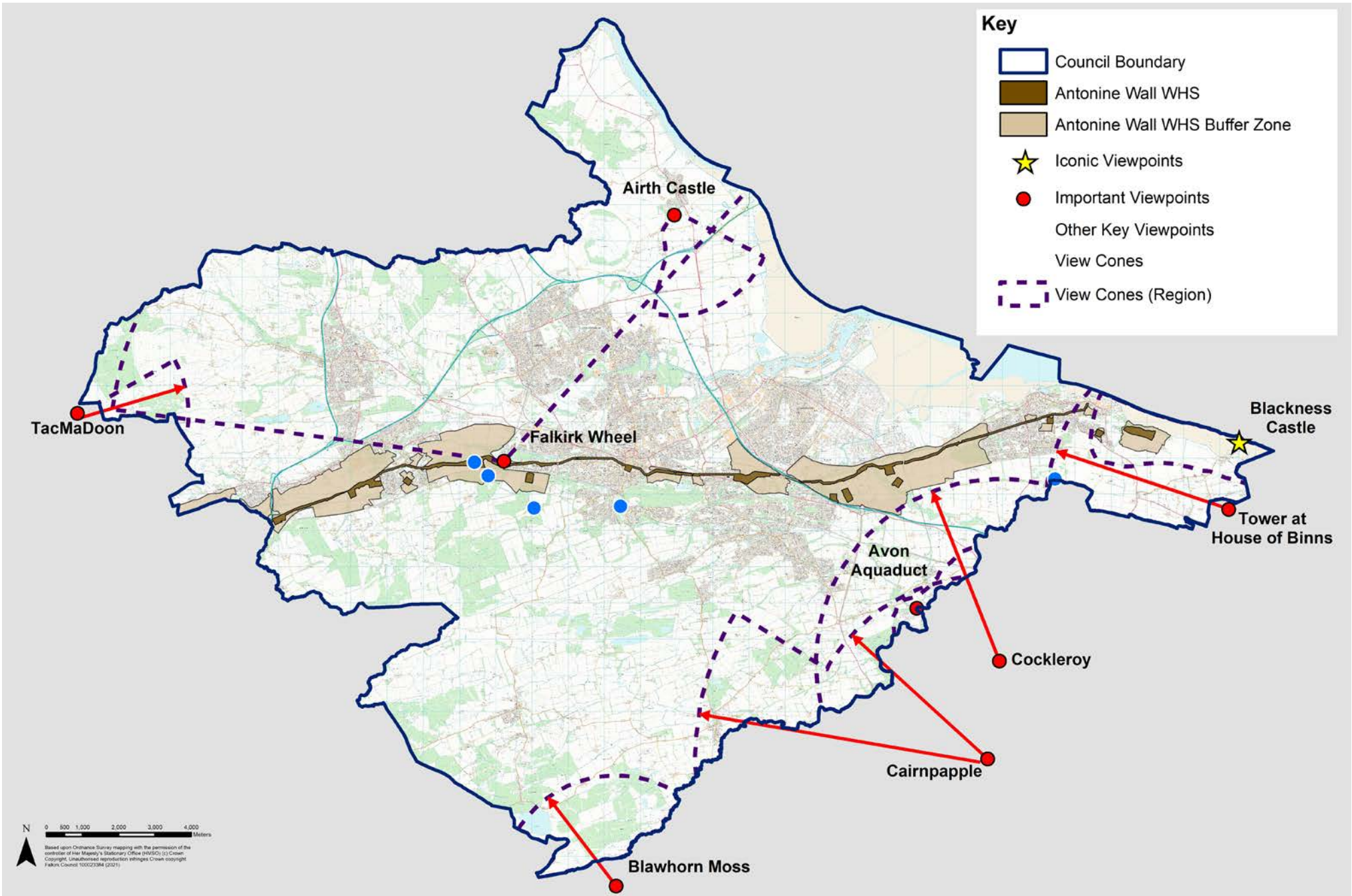
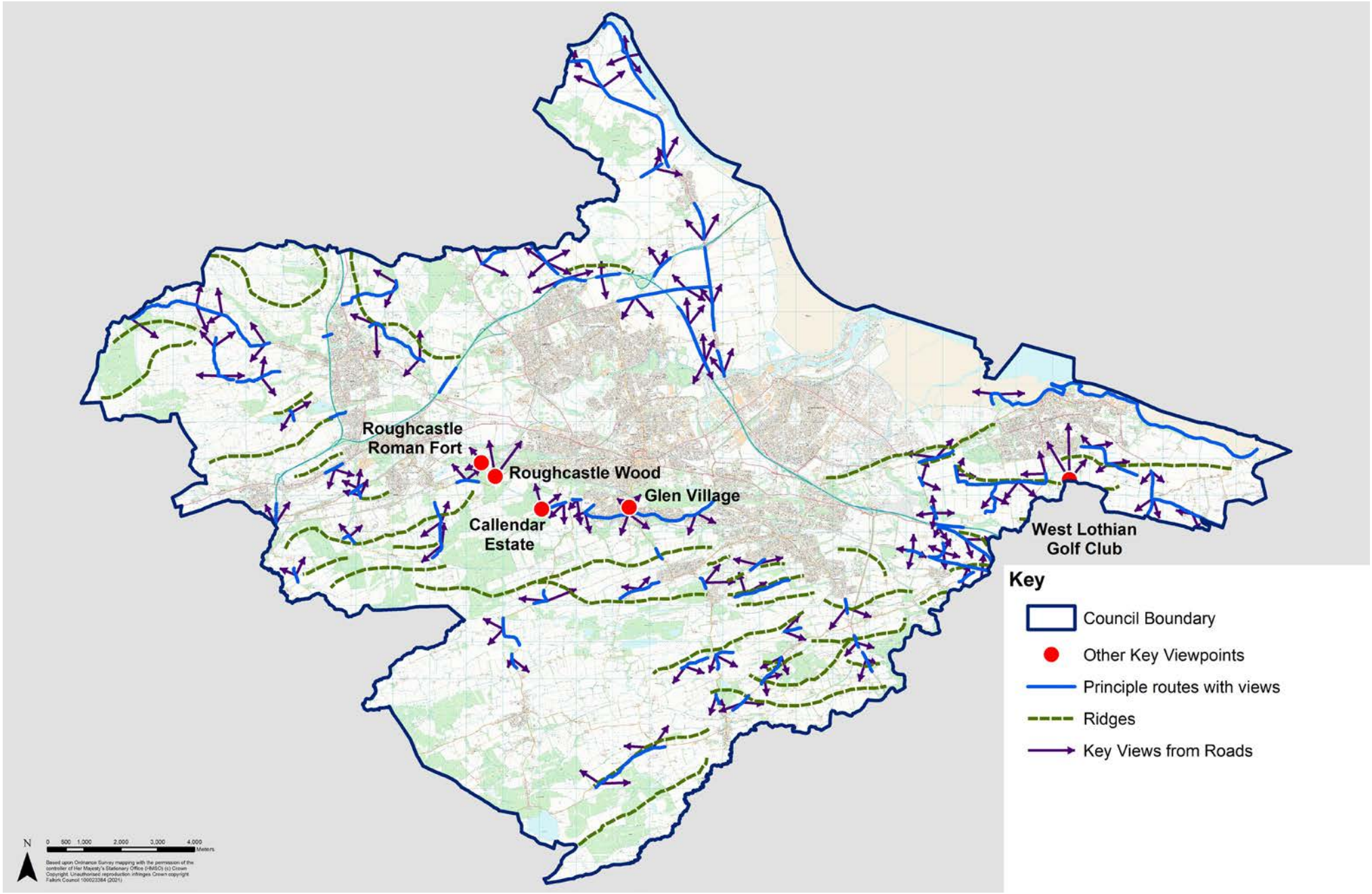
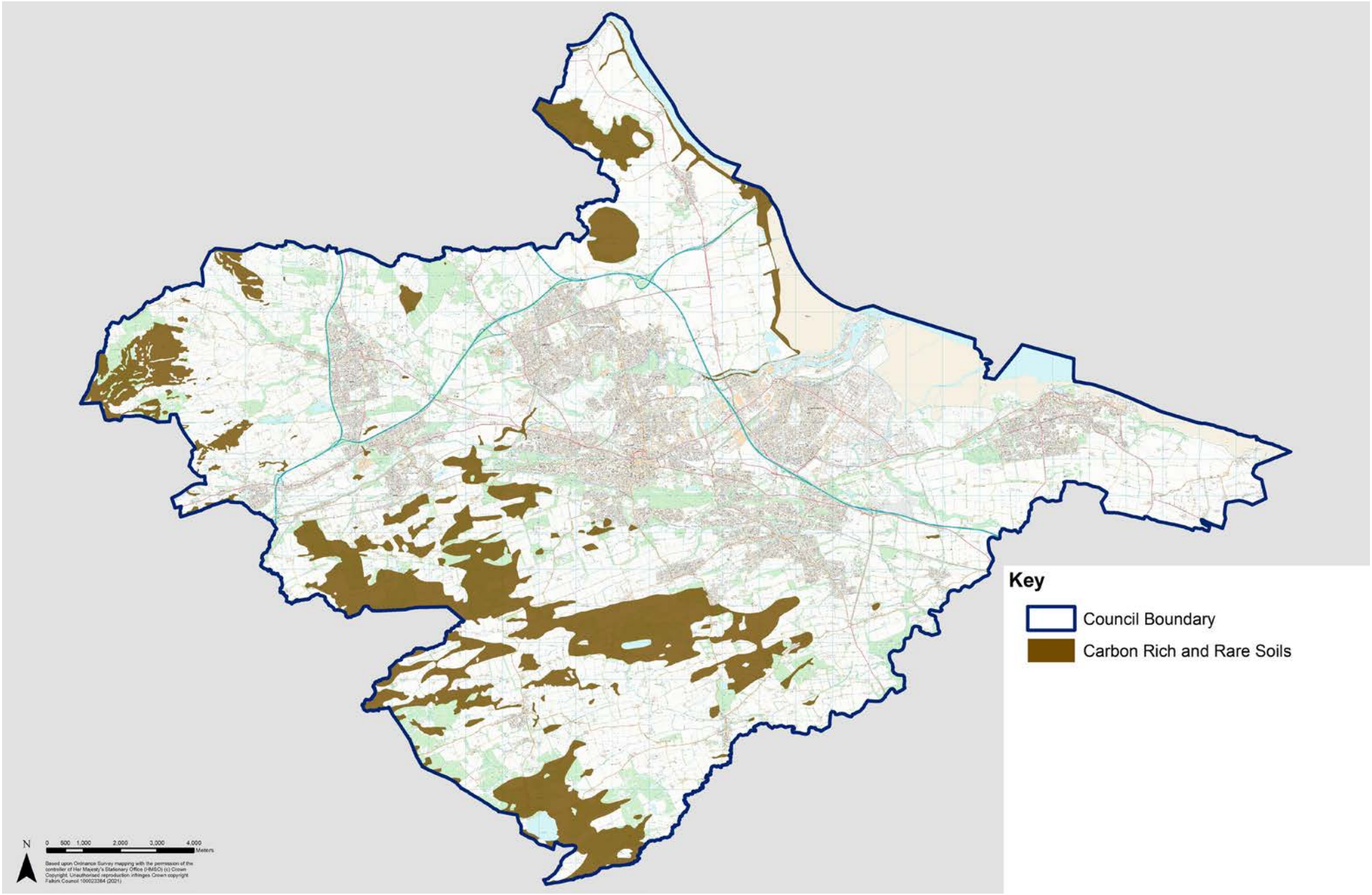
Meters


1(i) Kilsyth/Denny Hills
2(i) Denny Hills Fringe
2(ii) Touch Hills Fringe
3(i) Slamannan Plateau
3(ii) Darnrig/Gardrum Plateau Moorland
3(iii) Castlecary/Shieldhill Plateau Farmland
4(i) Avon Valley
4(ii) Carron Glen
4(iii) Bonny Water
4(iv) Lower Carron/Bonny Water
4(v) Falkirk - Grangemouth Urban Fringe
5(i) Manuel Farmlands
5(ii) Bo'ness Coastal Hills
5(iii) Grangemouth/Kinneil Flats
6(i) Skinflats
6(ii) Carse of Forth
Key
Council Boundary
Low Capacity
Low - Moderate Potential Capacity
Moderate Potential Capacity
Moderate - High Potential Capacity
N
0 500 1,000 2,000 3,000 4,000
Meters


Key
Council Boundary
Antonine Wall WHS
Antonine Wall WHS Buffer Zone
Iconic Viewpoints
Important Viewpoints
Other Key Viewpoints
View Cones
View Cones (Region)
Airth Castle
TacMaDoon
Falkirk Wheel
Blackness Castle
Tower at House of Binns
Avon Aquaduct
Cockleroy
Cairnpapple
Blawhorn Moss
N
0 500 1,000 2,000 3,000 4,000 Meters


Roughcastle
Roman Fort
Roughcastle Wood
Glen Village
Callendar
Estate
West Lothian
Golf Club
Key
Council Boundary
Other Key Viewpoints
Principle routes with views
Ridges
Key Views from Roads
N
0 500 1,000 2,000 3,000 4,000
Meters


Key
Council Boundary
Carbon Rich and Rare Soils
N
0 500 1,000 2,000 3,000 4,000
Meters
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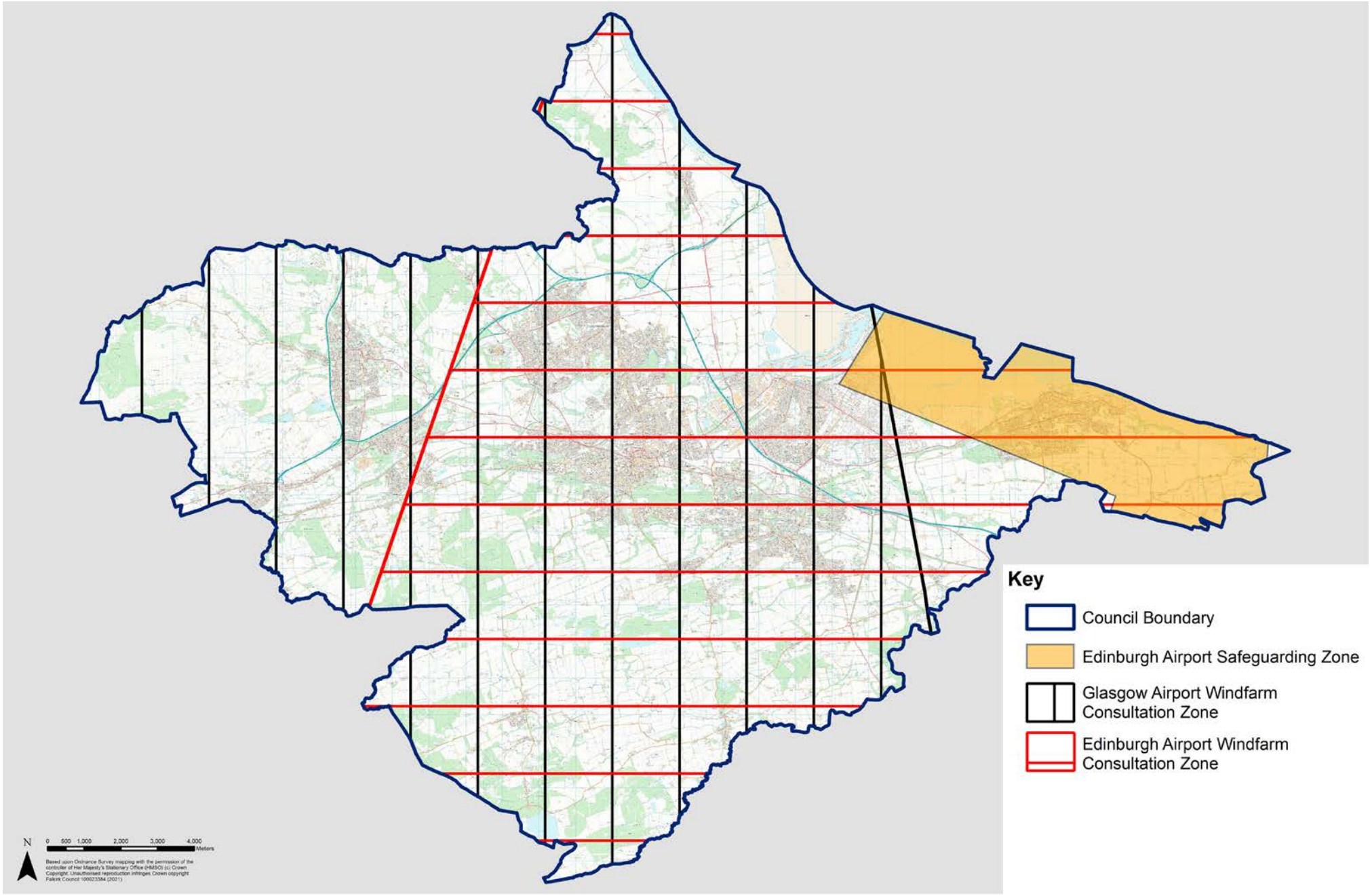
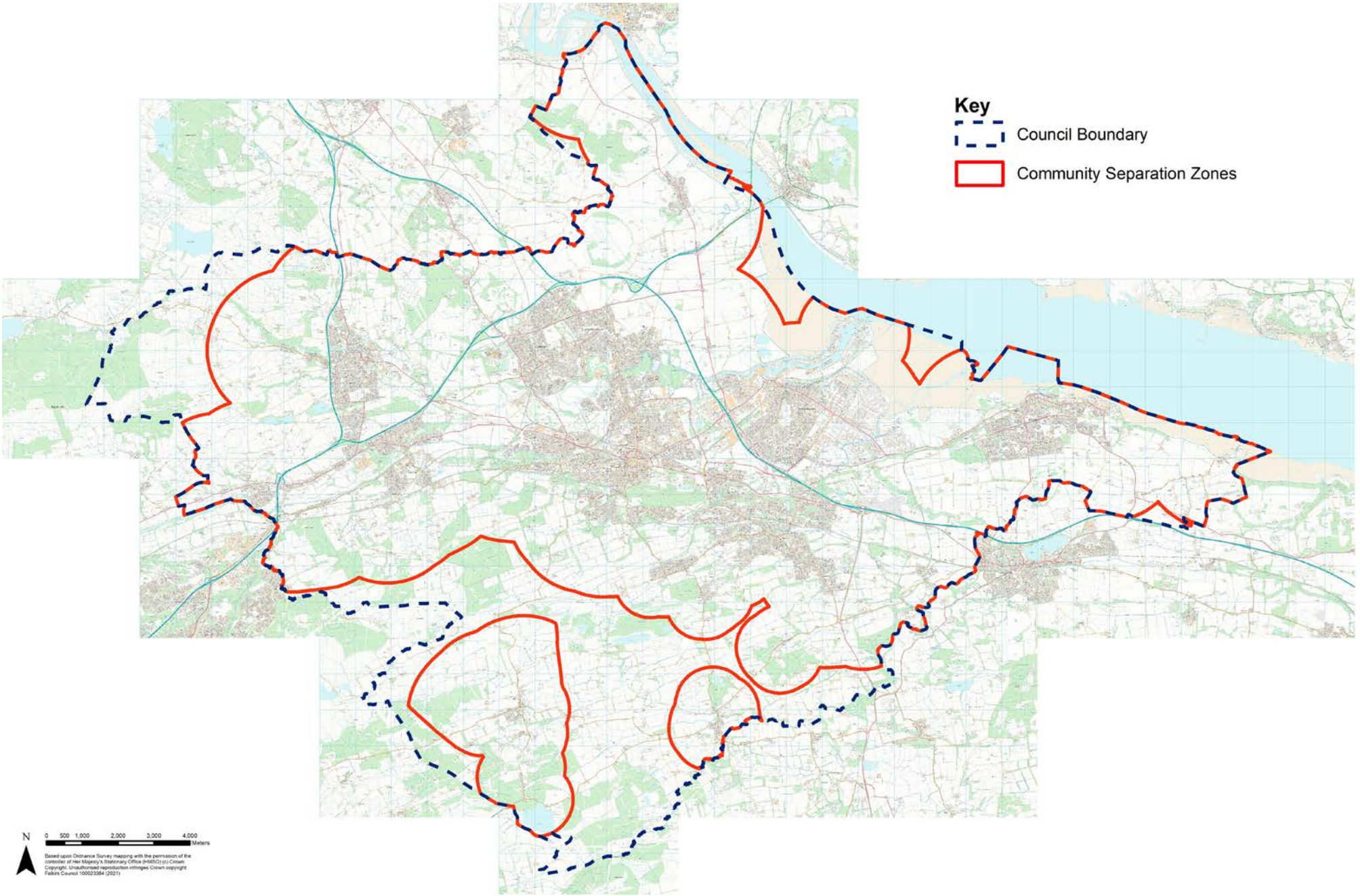

Key
Council Boundary
Edinburgh Airport Safeguarding Zone
Glasgow Airport Windfarm Consultation Zone
Edinburgh Airport Windfarm Consultation Zone
N
0 500 1,000 2,000 3,000 4,000
Meters


Key
Council Boundary
Community Separation Zones
N
0 500 1,000 2,000 3,000 4,000
Meters

Appendix 2 : Development Management Checklist For Energy Developments

- [ ] A Landscape & Visual Assessment (See Appendix 3 for level of information required)
- [ ] EIA Screening Request and Scoping
- [ ] Traffic Management Plan
- [ ] Design and Access Statement
- [ ] Environmental statement (EIA or Non-EIA)/ecological appraisal addressing the Landscape and Visual assessment, ecology, water environment including relevant cumulative assessments of factors to consider in combination with other development (energy or non-energy related)
- [ ] Amenity Assessments: Glint and Glare, shadow flicker, noise, air, pollution
- [ ] Assessment of economic benefit. This may include community ownership potential, contribution to national targets and alleviation of fuel poverty
- [ ] Flood Risk Assessment (where appropriate)
- [ ] Provision for future energy storage and/or district heating opportunities
- [ ] Amenity Assessments: Glint and Glare, shadow flicker, noise, air, pollution
- [ ] HSE (Health and Safety Executive) assessments such as impact on pipeline corridors or any Hazardous Substances Consent requirements
- [ ] Construction Management Plan
- [ ] Site Decommissioning Plan

Appendix 3 : Landscape Capacity Guidance for Wind Energy Developments

All applications will be decided on their own merits and must include detailed landscape and visual impact assessment (unless agreed otherwise) including consideration of all criteria within this specific guidance and within SG09 Landscape Character Assessment and Landscape Designations. A number of the Landscape Character Areas contain Local Landscape Areas, and further information on the characteristics of each of these can be found in Appendix 2 in SG09.

Capacity within Local Landscape Character Area 1(i) Kilsyth/Denny Hills

Capacity for Wind Energy Development: Low - Moderate

Main Landscape Objective: Protect and maintain the existing landscape character and visual resource, to retain or reinforce its present character and protect its quality and integrity.

Important Landscape Features:

- The LCU falls within the Denny Hills Local Landscape Area (LLA), which are locally valued special landscapes with particular qualities and characteristics relative to the surrounding area;
- Turbines located on prominent ridges or which affect important views to the hills or from the hills to other hill features or the Forth;
- Views to/from the Antonine Wall;
- Important viewpoints at TacMaDoon and the Falkirk Wheel should be safeguarded;
- There are smaller scale and simple landforms within this LCU. Proposals should not disrupt the intactness and unity of the continuity of long sweeping horizons. Proposals should avoid breaching the skyline in many views. The more rugged northern end of LCU limits development potential for taller structures such as turbines;
- Turbines and associated infrastructure could undermine perceptions of naturalness and sense of seclusion in the southern end away from busy roads.

Cumulative Impacts:

- Potential cumulative effects of new development seen within views of existing windfarms at Craigengelt and Earlsburn will need careful assessment;
- There is the potential for ‘in combination’, ‘in succession’ and/or ‘sequential’ cumulative effects from locations within the Kilsyth/Denny Hills and when travelling through adjacent character areas which could create the perception of a landscape dominated by wind turbines where the landscape, and in particular visual sensitivity, is unable to accept such a level of change;
- Views to/from the Antonine Wall;
- In particular views from sensitive routes such as the B818 through the Carron Glen require careful analysis;
- Proposals should consider impact of development in conjunction with commercial forestry operations and the resultant changes in the landscape;
- Solar development (larger scale) is identified as a force for change in SG09.

Turbines of less than 50m to tip: Small scale development less than 50m in height may be acceptable. Proposals should consider the following:

- Turbines should relate well to the existing landscape and existing buildings in terms of scale and design;
- Small turbines could be a better fit with the scale and simple landform but they could disrupt the intactness and unity of the continuity of long sweeping horizons as well as the skylines;
- The more rugged northern end limits development potential;
- Turbines and associated infrastructure could undermine perceptions of naturalness and sense of seclusion in the southern end away from busy roads.

Turbines over 50m to tip: Unlikely to be acceptable, with potentially significant effects on key visual criteria in particular. Larger turbines would be out of scale with the landscape.

Capacity within Local Landscape Character Area 2(i) Denny Hills Fringe

Capacity for Wind Energy Development: Low - Moderate

Main Landscape Objective: Protect and maintain the existing landscape character and visual resource, to retain or reinforce its present character and protect its quality and integrity.

Important Landscape Features:

- The LCU falls within the Denny Hills Local Landscape Area (LLA), which are locally valued special landscapes with particular qualities and characteristics relative to the surrounding area;
- All turbines would be highly visible from an extensive area;
- Views from important viewpoints and sensitive routes cover significant parts of the area, and prominent ridges are important to intervisibility where wind turbines would be particularly visible. There are important views from the Denny Hills Fringe to the Kilsyth/Denny Hills and across the Carron Glen to the Touch Hills Fringe and the Touch Hills beyond the Falkirk Council boundary, where wind turbines would be harmful to the setting and landscape context of the landscape character area;
- The southern part of the landscape character area has a strong visual relationship with the Antonine Wall World Heritage Site (WHS) with views to and from the WHS where development has the potential to affect the setting of the Wall;
- Turbines could intrude on views from popular walking routes. They would contrast with the settled nature and scale of the landscape. When seen in views of features in the distance, for example from the Falkirk Wheel 'important' viewpoint, they could intrude on the composition and affect the perception of distance;
- Turbines could affect the perception of vertical scale of the hill fringes due to their limited height and small-medium scale, and could detract from the moulded landform of the relatively smooth, interlocking organic forms of small dips and hills.

Cumulative Impacts:

- Turbines would add to the existing clutter of man-made elements and compete visually with the transmitters at Myot Hill, and existing electricity transmission lines and pylons. Existing wind turbines within the landscape will also contribute to cumulative impact;
- Solar development (larger scale) is identified as a force for change in SG09.

Turbines of less than 50m to tip: Small scale development less than 50m in height may be acceptable. Proposals should consider the following:

- Turbines should relate well to the existing landscape and existing buildings in terms of scale and design;
- Small turbines could be a better fit with the scale and simple landform but they could disrupt the intactness and unity of the continuity of long sweeping horizons as well as the skylines;
- The more rugged northern end limits development potential;
- Turbines and associated infrastructure could undermine perceptions of naturalness and sense of seclusion in the southern end away from busy roads.

Turbines over 50m to tip: Unlikely to be acceptable, with potentially significant effects on key visual criteria in particular. Larger turbines would be out of scale with the landscape.

Other Renewable and Low Carbon Technologies:

- Solar development (larger scale) is identified as a force for change in SG09 which may be difficult to accommodate within parts of the LCU. Depending on the scale, there are sensitive viewpoints within the LCU which may be affected by solar developments.

Capacity within Local Landscape Character Area 2 (ii) Touch Hills Fringe

Capacity for Wind Energy Development: **Low - Moderate**

Main Landscape Objective: Protect and maintain the existing landscape character and visual resource, to retain or reinforce its present character and protect its quality and integrity.

Important Landscape Features:

- The LCU falls within the Denny Hills Local Landscape Area (LLA), which are locally valued special landscapes with particular qualities and characteristics relative to the surrounding area;
- Key landscape characteristics sensitive to wind energy development are the generally small, enclosed nature of the hill fringes. They feature in views from an extensive area, providing a distinctive raised fringe to the north of the Falkirk Council area, with hills beyond. Turbines would be highly visible and could contrast with and be out of proportion when seen within views of the existing turbines in the Stirling Council area;
- Turbines located within views from important viewpoints or on prominent ridges would be particularly damaging. Large turbines would dominate the undulating landform and adversely affect the perception of vertical scale due to the limited height of the hill fringes and their small-medium scale. The areas distinctly rural and diverse character would be diminished by regimented rows of turbines.

Cumulative Impacts:

- Cumulative impact with turbines in the Stirling Council area will require careful assessment;
- Solar development (larger scale) is identified as a force for change in SG09.

Turbines of less than 50m to tip: Small scale development less than 50m in height may be acceptable. Proposals should consider the following:

- Some areas with an urban fringe character where there is existing infrastructure may be able to accommodate some wind energy development as long as overall landscape character and visual amenity is retained;
- Small scale development less than 50m in height may be acceptable where it relates well to the existing landscape in terms of scale and design, and where it relates well to existing buildings in terms of scale and location.

Turbines over 50m to tip: Unlikely to be acceptable, with potentially significant effects on key visual criteria in particular. Larger turbines would be out of scale with the landscape.

Other Renewable and Low Carbon Technologies:

- Solar development (larger scale) is identified as a force for change in SG09 which may be difficult to accommodate within parts of the LCU. Depending on the scale, there are sensitive viewpoints within the LCU which may be affected by solar developments.

Capacity within Local Landscape Character Area 3(i) Slamannan Plateau

Capacity for Wind Energy Development: **Moderate - High**

Main Landscape Objective: Landscape accommodation is the most appropriate objective. There may be important landscape-related constraints in terms of the siting and scale of wind energy development, but suitably designed wind turbine groups which generally fit within the landscape could potentially be accommodated even though they may have an impact on the landscape locally. The landscape could become a landscape with some wind energy development.

Important Landscape Features:

- The north western part of the area is covered by the Slamannan Plateau /Avon Valley Local Landscape Area;
- The Slamannan Plateau extends over much of the Falkirk Council area, with a complexity and variety of landcover. The gently undulating farmland forms a series of distinctive folds and a pronounced west-east pattern with a generally flattened, softly-contoured landform with unobtrusive valleys where large turbines would dominate;
- The larger wind turbine typology heights and groups of turbines would be appropriate in some parts of the plateau. In other parts larger turbines would introduce new large-scale industrial elements into a landscape generally free from intrusive elements such as power lines, pylons and other infrastructure.

Cumulative Impacts:

- Cumulative impact with the significant number of operational and consented turbines will require careful assessment;
- Solar development (larger scale) is identified as a force for change in SG09.

Turbines of less than 50m to tip: Smaller turbines could be accommodated subject to careful siting and cumulative assessment.

Turbines over 50m to tip: The larger wind turbine typology heights and groups of turbines would be appropriate in some parts of the plateau. In other parts larger turbines would introduce new large-scale industrial elements into a landscape generally free from intrusive elements such as power lines, pylons and other infrastructure.

Capacity within Local Landscape Character Area 3(ii) Darnrig/Gardrum Plateau Moorland

Capacity for Wind Energy Development: **Moderate - High**

Main Landscape Objective: Landscape accommodation is the most appropriate objective. There may be important landscape-related constraints in terms of the siting and scale of wind energy development, but suitably designed wind turbine groups which generally fit within the landscape could potentially be accommodated even though they may have an impact on the landscape locally. The landscape could become a landscape with some wind energy development.

Important Landscape Features:

- A small part of the area is covered by the Slamannan Plateau /Avon Valley Local Landscape Area;
- The simple, featureless and unsettled composition of landcover on the Darnrig / GardrumPlateau Moorland contrasts with the more complex and varied character of the Slamannan Plateau;
- Turbines could relate to the simplicity of landform and absence of notable features. Turbines would not provide unfavourable scale comparison with buildings due to the sparse settlement but the perception of vertical scale due to minor changes in topography and the presence of occasional shelterbelts north of Wester Jaw would limit acceptable turbine height.

Cumulative Impacts:

- Cumulative impact with the significant number of operational and consented turbines will require careful assessment.

Turbines of less than 50m to tip: Smaller turbines either in groups or single turbines are likely to appear too small and trivial on the broader, more open moorland areas. Areas of former industrial or quarry workings would be preferable, where infrastructure elements are already present. Turbines should avoid features that add interest to the landscape and which draw the eye - however even relatively small turbines would become new foci in this simple, featureless landscape.

Turbines over 50m to tip: The strong visual integrity of the open moor would be affected by large turbines, and careful siting and design would be necessary to avoid impacts on the more remote and natural areas of moorland.

Capacity within Local Landscape Character Area 3(iii) Castlecary/Shieldhill Plateau Farmland

Capacity for Wind Energy Development: Low - Moderate

Main Landscape Objective: Landscape protection should be the objective to maintain the existing landscape character and visual resource, to retain or reinforce its present character and protect its quality and integrity.

Important Landscape Features:

- The Castlecary/Shieldhill Plateau Farmlands form an undulating, gently rising ridge of high ground when viewed from the lowland, settled urban edge to the north. The setting of the farmlands, which provide an important backdrop and transition between the sheltered, largely urbanised lowland river valley and the exposed moorland plateau, is a key landscape sensitivity;
- Key visual sensitivities are views from sensitive routes and prominent ridges, other views to landscape features including the Ochil Hills and the Kilsyth/Denny Hills, and to the Firth of Forth, and views to / from the Antonine Wall, as well as a number of popular walking and cycling routes;
- The farmlands are sensitive to larger turbines due to the appreciation of vertical scale. Turbines would be highly visible from an extensive area, where they would add to the clutter of existing man-made elements and visually compete with the Westerglen transmitters, although woodland would provide some containment and screening;
- The semi-complex character due to the fragmented pattern of agricultural land use, forestry and infrastructure would suggest that some small scale wind energy development could be accommodated, but impacts on key visual criteria would potentially be significant.

Cumulative Impacts:

- Cumulative impact with the significant number of operational and consented turbines will require careful assessment.

Turbines of less than 50m to tip: Small scale development less than 50m in height may be acceptable where it relates well to the existing landscape in terms of scale and design, and where it relates well to existing buildings in terms of scale and location.

Turbines over 50m to tip: The larger wind turbine typology heights above 50m are unlikely to be acceptable, with potentially significant effects on key visual criteria in particular.

Capacity within Local Landscape Character Area 4(i) Avon Valley

Capacity for Wind Energy Development: **Low - Moderate**

Main Landscape Objective: Landscape protection should be the objective to maintain the existing landscape character and visual resource, to retain or reinforce its present character and protect its quality and integrity.

Important Landscape Features:

- Key landscape characteristics sensitive to wind energy development are the generally small, enclosed nature, and the steep sided valley of the River Avon;
- Key visual sensitivities are views from 'important' viewpoints at Cockleroy, Cairnpapple in West Lothian and the Avon Aqueduct, and prominent ridges;
- The Avon Valley has a variable pattern of woodlands and small scale farmland, with a strong relationship between landform and landcover;
- Turbines would affect the appreciation of the intimate scale of the landscape and could not be physically accommodated on the steep slopes and in the valley bottom. Turbines would diminish the perception of containment and depth of the valley if located within or on the valley tops;
- Turbines would affect the proportion and balanced, harmonious pattern of open space/farmland/woodland and would disrupt the strong relationship between landscape elements and appreciation of the diverse land cover. Even small turbines would become a dominant focus in some views even where woodland cover offers some screening;
- Turbines would introduce new industrial features where little currently exists, diminishing the largely undeveloped, strongly rural character of the river valley. Visually turbines would extend beyond the containment of the valley and appear truncated in many views when travelling through the area.

Cumulative Impacts:

- There are a number of consented and operational wind energy developments within this landscape character area. Cumulative assessment will be required to assess the 'in combination' visual impacts on sensitive receptors and from key viewpoints.

Turbines of less than 50m to tip: Small scale development less than 50m in height may be acceptable where it relates well to the existing landscape in terms of scale and design, and where it relates well to existing buildings in terms of scale and location.

Turbines over 50m to tip: Larger turbines would be incompatible in scale, form and style of existing settlements. The small-scale landscape together with key visual sensitivities means that larger typologies are unlikely to be able to be accommodated.

Capacity within Local Landscape Character Area 4(ii) Carron Glen

Capacity for Wind Energy Development: Low

Main Landscape Objective: Landscape protection should be the objective to maintain the existing landscape character and visual resource, to retain or reinforce its present character and protect its quality and integrity.

Important Landscape Features:

- Key characteristics of this area are the small scale, in parts narrow and enclosed, steep sided valley where the River Carron winds its way between adjacent character areas of the Lowland Hills and Lowland Hill Fringes LCTs which provide a distinctive and in parts dramatic setting and important backdrop to the valley;
- Wind energy development could have a significant effect on key landscape characteristics creating significant character change. Turbines would affect the appreciation of the intimate scale of the landscape and could not be physically accommodated on the steep slopes and in the valley bottom;
- Turbines would diminish the perception of containment and depth of the valley if located within or on the valley tops;
- Wind turbine development could create significant adverse visual impact in views from sensitive routes and prominent ridges, or which affect views of the surrounding hills and hill fringes which are important to the setting of the area. Turbines on the valley tops would be out of scale and produce an unbalanced view, creating cumulative impacts. The differentiation between neighbouring character types would be lost with wind energy development on the valley sides, and it would be better to restrict turbines to the hills. Visually turbines would extend beyond the containment of the valley and appear truncated in many views from outside the area.

Cumulative Impacts:

- There are views of the existing turbines at Earlsburn and Craigengelt in Stirling Council area.

Turbines of less than 50m to tip: All wind turbine typology heights above 20m are unlikely to be acceptable, with potentially significant effects on key landscape and visual criteria. Small scale development less than 20m in height may be acceptable if it relates well to the existing landscape in terms of scale and design, and if it relates well to existing buildings in terms of scale and location.

Turbines over 50m to tip: Larger turbines are unlikely to be supported.

Capacity within Local Landscape Character Area 4(iii) Bonny Water

Capacity for Wind Energy Development: **Moderate**

Main Landscape Objective: Landscape protection is required in those areas where the objective is to maintain the existing landscape character and visual resource, to retain or reinforce its present character and protect its quality and integrity. In other areas suitably designed wind turbine groups which generally fit within the landscape could potentially be accommodated even though they may have an impact on the urban fringe landscape locally.

Important Landscape Features:

- Turbines would affect important views from sensitive routes to the hills or hill fringes or up to the plateau farmlands which would create significant visual impact;
- In particular, the Bonny Water lowland river valley lies almost completely within the Antonine Wall World Heritage Site buffer zone which is designed to protect the landscape setting of the World Heritage Site, where wind energy development could create significant visual impact;
- Some wind energy development within the urban fringe may be appropriate where it is in keeping with the character of the landscape, where existing transport routes, associated infrastructure and other development may combine to reduce the impact of new turbines.

Cumulative Impacts:

- There are cumulative impacts in relation to infrastructure and other existing and proposed development. If it was considered that the addition of new development would breach the threshold or 'tipping point' of landscape change, the Council would need to consider whether the resulting landscape, visual and cumulative effects would be acceptable, particularly where sited close to residential property.

Turbines of less than 50m to tip: Small scale development less than 50m in height may be acceptable where it relates well to the existing landscape in terms of scale and design, and where it relates well to existing buildings in terms of scale and location.

Turbines over 50m to tip: Larger turbines are unlikely to be acceptable.

Capacity within Local Landscape Character Area 4(iv) Lower Carron/Bonny Water

Capacity for Wind Energy Development: **Moderate**

Main Landscape Objective: Landscape protection is required in those areas where the objective is to maintain the existing landscape character and visual resource, to retain or reinforce its present character and protect its quality and integrity. In other areas suitably designed wind turbine groups which generally fit within the landscape could potentially be accommodated even though they may have an impact on the urban fringe landscape locally.

Important Landscape Features:

- The Lower Carron /Bonny Water valley covers a wide swathe of the central Falkirk Council area, between main built up areas with a complexity and variety of land uses including major communication routes;
- Its character is largely influenced by the surrounding urban and industrial land uses which may combine to reduce the impact of new turbines;
- Urban and industrial influences have less of an impact on the character of the River Carron valley east of Denny where mixed farming, woodland and tree belts provide an attractive, more intimate valley landscape with confined views northwards into the wooded hill fringes. Here turbines would affect the appreciation of the intimate scale of the landscape and could not be physically accommodated on the steep slopes and in the valley bottom. Turbines would diminish the perception of containment and depth of the valley if located within or on the valley tops;
- Turbines which affect views from the Falkirk Wheel 'important' viewpoint and other key views could create significant visual impact. In particular, the Bonny Water corridor to the south of the area lies almost completely within the Antonine Wall World Heritage Site buffer which is designed to protect the landscape setting of the World Heritage Site, where wind energy development other than small single turbines could create significant visual impact.

Cumulative Impacts:

- There are cumulative impacts in relation to infrastructure and other existing and proposed development. If it was considered that the addition of new development would breach the threshold or 'tipping point' of landscape change, the Council would need to consider whether the resulting landscape, visual and cumulative effects would be acceptable, particularly where sited close to residential property.

Turbines of less than 50m to tip: Small scale development less than 50m in height may be acceptable where it relates well to the existing landscape in terms of scale and design, and where it relates well to existing buildings in terms of scale and location.

Turbines over 50m to tip: Larger turbines are unlikely to be acceptable.

Capacity within Local Landscape Character Area 4(v) Falkirk - Grangemouth Urban Fringe

Capacity for Wind Energy Development: **Moderate**

Main Landscape Objective: Landscape protection is required in those areas where views or the setting of the Antonine Wall could be affected. In other areas suitably designed wind turbine groups which generally fit within the landscape could potentially be accommodated even though they may have an impact on the urban fringe landscape locally.

Important Landscape Features:

- A relatively narrow, flat open valley between Falkirk and Grangemouth, its character is heavily influenced by adjacent industrialisation, other built development and major communication routes. At the northern end the area widens out where the River Carron meets the Forth & Clyde Canal, providing landscape interest including the location of Helix Park and the Kelpies, which is an important visitor attraction;
- The area lies within views from many residential properties in the urban fringe;
- Some wind energy development within the urban fringe may be appropriate where it is in keeping with the character of the landscape, where existing transport routes, associated infrastructure and other development may combine to reduce the impact of new turbines.

Cumulative Impacts:

- There are cumulative impacts in relation to infrastructure and other existing and proposed development. If it was considered that the addition of new development would breach the threshold or 'tipping point' of landscape change, the Council would need to consider whether the resulting landscape, visual and cumulative effects would be acceptable, particularly where sited close to residential property.

Turbines of less than 50m to tip: Small scale development less than 20m in height may be acceptable where it relates well to the existing landscape in terms of scale and design, and where it relates well to existing buildings in terms of scale and location, as well as avoiding impact on the Antonine Wall World Heritage Site and its setting.

Turbines over 50m to tip: Larger turbines are unlikely to be acceptable.

Capacity within Local Landscape Character Area 5(i) Manuel Farmlands

Capacity for Wind Energy Development: Low - Moderate

Main Landscape Objective: Landscape protection from wind energy development.

Important Landscape Features:

- The Manuel Farmlands is a small-medium scale, smoothly rolling landscape, with a variety of landuses, some a legacy of previous minerals working, with surrounding farmland and isolated estate houses with policy woodlands. The semi-complex character due to the fragmented pattern of land uses would suggest that some wind energy development could be accommodated, but impacts on key visual criteria would need to be carefully considered;
- Turbines located on prominent ridges or which affect views from the 'important' viewpoint at Cockleroy in West Lothian or sensitive routes to the Bathgate Hills or the Forth, or from/to the Antonine Wall, could create significant visual impact.

Cumulative Impacts:

- The Landscape Capacity Study identified the Strategic Growth Area at Whitecross as a significant sensitive receptor and driver of change in the LCA. Whilst this is reduced in scale since the study, there are new development sites which will require consideration as sensitive receptors in terms of visual and community impacts.

Turbines of less than 50m to tip: Small scale development less than 50m in height may be acceptable where it relates well to the existing landscape in terms of scale and design, and where it relates well to existing buildings in terms of scale and location.

Turbines over 50m to tip: Larger turbines are unlikely to be acceptable.

Capacity within Local Landscape Character Area 5(ii) Bo'ness Coastal Hills

Capacity for Wind Energy Development: **Low - Moderate**

Main Landscape Objective: Landscape protection should be the objective to maintain the existing landscape character and visual resource, to retain or reinforce its present character and protect its quality and integrity.

Important Landscape Features:

- Views from 'important' viewpoints at the House of Binns Tower and Cockleroy in West Lothian, and from sensitive routes cover significant parts of the area. These include popular walking routes including the John Muir Way;
- There are important 'iconic' views from Blackness Castle across the eastern part of the Bo'ness Coastal Hills where wind energy development would be inappropriate;
- Prominent ridges are important to intervisibility where wind turbines would be particularly visible;
- There are important views from the Bo'ness Coastal Hills to the Bathgate Hills and across the Firth of Forth to the Ochil Hills beyond the Falkirk Council boundary, where wind turbines would be harmful to the setting and landscape context of the landscape character area;
- The northern part of the landscape character area has a strong visual relationship with the Antonine Wall World Heritage Site (WHS) with views to and from the WHS where development has the potential to affect the setting of the Wall.
- Turbines would contrast with the settled nature and scale of the landscape. When seen in views of features in the distance they could intrude on the composition and affect the perception of distance;
- Despite proximity to the Forth there is not a strong horizontal emphasis to the area due to the undulating hills which provide great contrast in views and limit scale to medium. Large turbines would affect openness when viewed against the coast and would not fit with the scale and semi-open character.

Cumulative Impacts:

- There is the potential for 'in combination', 'in succession' and/or 'sequential' cumulative effects from locations within the Bo'ness Coastal Hills and when travelling through adjacent character areas which could create the perception of a landscape dominated by wind turbines where the landscape, and in particular visual sensitivity, is unable to accept such a level of change.
- Potential cumulative effects of new development seen within views of the existing turbines at Muirhouse will need careful assessment. The six 20m tall operational turbines within farmland at Muirhouse lie within the Bo'ness Coastal Hills. These generally relate well to the existing simple pattern of the landscape in terms of location, scale and design. Any similar turbine development must relate to the field pattern and maintain separation to avoid cumulative impacts.

Turbines of less than 50m to tip: Small scale development less than 50m in height may be acceptable where it relates well to the existing landscape in terms of scale and design, and where it relates well to existing buildings in terms of scale and location.

Turbines over 50m to tip: Larger turbines are unlikely to be acceptable.

Capacity within Local Landscape Character Area 5(iii) Grangemouth/Kinneil Flats

Capacity for Wind Energy Development: **Moderate - High**

Main Landscape Objective: Landscape accommodation or landscape change is the most appropriate objective where the landscape could become a landscape with some wind energy development.

Important Landscape Features:

- The character area occupies the flat reclaimed saltmarsh between Grangemouth and Bo'ness. Despite being largely open, it has a unique, developed coastal character due to the presence of the petrochemical works, docks and other industrial installations on the wide, expansive, large scale coastal flats alongside the Forth.

Cumulative Impacts:

- There is likely to be a complex cumulative assessment in combination with the existing industrial development. Visual impacts from settlements in conjunction with this is likely to be important.

Turbines of less than 50m to tip: Small scale development of less than 50m in height is could appear trivial and out of scale in the context of nearby industry.

Turbines over 50m to tip: Large turbines taller than 100m could relate visually to the vertical nature of the industrial development nearby. Blade movement could have a visual relationship with the movement of flames, steam and other outputs from the oil refinery and chemical works.

Capacity within Local Landscape Character Area 6(i) Skinflats

Capacity for Wind Energy Development: **Moderate**

Main Landscape Objective: Landscape protection is required in those areas where the objective is to maintain the existing landscape character and visual resource, to retain or reinforce its present character and protect its quality and integrity. In other areas suitably designed wind turbine groups which generally fit within the landscape could potentially be accommodated even though they may have an impact on the urban fringe landscape locally.

Important Landscape Features:

- Key landscape characteristics are the large scale, open, flat and very low lying, and horizontal coastal margin. The scale and character of the coastal landscape would suggest that larger turbines and groups could be an appropriate fit. However, the Skinflats are highly sensitive visually with extensive views of the Forth and to the Ochil Hills beyond from sensitive transport corridors and other amenity routes;
- The setting of the character area and in particular the contrast between the flat open coastal margins and the distinctive landmark hills is especially sensitive. Turbines could interrupt the strong horizon of the Forth and views of the long horizontal form of the Ochils, and it is important that turbines do not detract from these key characteristics;
- There is a relatively narrow visual cone from the 'important' viewpoint at Airth Castle where wind energy development would be inappropriate where the character of the landscape and visual amenity was adversely affected.

Cumulative Impacts:

- There are close views of existing power lines and pylons which appear as incongruous vertical features into this characteristically flat landscape. Turbines could create visual confusion with the dominant foci of pylons, and would accentuate the visual impact. Even small turbines could appear out of scale with the wide open landscape, where fields are large and skies are huge.

Turbines of less than 50m to tip: Small scale development less than 50m in height may be acceptable where it relates well to the existing landscape in terms of scale and design, and where it relates well to existing buildings in terms of scale and location.

Turbines over 50m to tip: The larger wind turbine typology heights above 50m are unlikely to be acceptable.

Capacity within Local Landscape Character Area 6(ii) Carse of Forth

Capacity for Wind Energy Development: **Moderate**

Main Landscape Objective: Landscape protection is required in those areas where the objective is to maintain the existing landscape character and visual resource, to retain or reinforce its present character and protect its quality and integrity. In other areas suitably designed wind turbine groups which generally fit within the landscape could potentially be accommodated even though they may have an impact on the urban fringe landscape locally.

Important Landscape Features:

- Key landscape characteristics are the large scale, open, flat and very low lying, and horizontal coastal margin. The scale and character of the coastal landscape would suggest that larger turbines and groups could be an appropriate fit. However, the Carse of Forth is highly sensitive visually with extensive views of the Forth and to the Ochil Hills beyond from sensitive transport corridors and other amenity routes;
- The setting of the character area and in particular the contrast between the flat open coastal margins and the distinctive landmark hills is especially sensitive. Turbines could interrupt the strong horizon of the Forth and views of the long horizontal form of the Ochils, and it is important that turbines do not detract from these key characteristics;
- There is a relatively narrow visual cone from the 'important' viewpoint at Airth Castle where wind energy development would be inappropriate where the character of the landscape and visual amenity was adversely affected.

Cumulative Impacts:

- There are close views of existing power lines and pylons which appear as incongruous vertical features into this characteristically flat landscape. Turbines could create visual confusion with the dominant foci of pylons, and would accentuate the visual impact. Even small turbines could appear out of scale with the wide open landscape, where fields are large and skies are huge.

Turbines of less than 50m to tip: Small scale development less than 50m in height may be acceptable where it relates well to the existing landscape in terms of scale and design, and where it relates well to existing buildings in terms of scale and location.

Turbines over 50m to tip: The larger wind turbine typology heights above 50m are unlikely to be acceptable.

Appendix 4 : Energy Statement Template

Click Here for Link to Appendix 4 : Energy Statement Template pdf

Completion of this template demonstrates compliance with LDP policy by showing detail of renewable and low carbon technologies integrated into development. It should be updated at two stages in the planning application process.

Stage 1 – Application Assessment: Stage 1 is designed to assist applicants to set out their intentions to incorporate low carbon and renewable energy within their development, in the form of decentralised heat networks and low and zero-carbon technologies. This allows applicants to highlight how they considered the most appropriate technologies. Implementation will be addressed through planning conditions which form part of the consent.

Stage 2 – Condition Purification (Post Approval): Stage 2 sets out the percentage reduction in CO_2 emissions required by policy IR13 'Low and Zero Carbon Development' of the Falkirk Council LDP, in order to purify planning conditions. This stage should be completed by a registered SAP assessor (for domestic) or Low Carbon Energy Assessor (for non-domestic).

Application Reference Number (if known)

Location of Development

Name of Applicant

Name of Agent (if relevant)

Description of Development

STAGE 1: Application Validation

Low and Zero-Carbon generating technologies

What LZCGT technologies do you propose to implement in your development?

Photovoltaics		Solar thermal		Geothermal heat	
Wind Energy		Air Source Heat Pump		Biomass	
Hydro		Ground Source Heat Pump		Combined Heat and Power (CHP)	
Energy Storage		Water Source Heat Pump		Heat exchange and recovery	
Other (please state)					

Please provide a description of how you propose to integrate LZCGT into the development. This information should include: Size of scheme, approximate projected CO_2 savings, location of technology within the site, and in relation to other buildings or sensitive receptors on-site (such as ecological sites or historic buildings).

Decentralised Heat

Is there any existing or proposed heat network in the area (within 500m of site boundary)?	Yes/No
Will the development provide a link to an existing network?	Yes/No
Will the development install its own heat network?	Yes/No

Energy source: Please provide details of the overall baseline energy requirements of the site and how heat will be delivered. Explain how the choice of fuel for the development was arrived at.

Site constraints: Set out details of the proposed decentralised energy scheme (you may wish to refer to additional supporting information). Identify the scope and nature of any physical constraints which may impact the ability to deliver a heat network and infrastructure within the development. Section 3 of the SG provides more detail on the type of constraints which may affect development.

Financial viability: Where a decentralised heat network is not proposed, explain how the viability of the project would be affected by the installation of decentralised energy network infrastructure. Section 2 of the SG provides more detail but this will include:

- The cost of pipe infrastructure (per metre) and the cost of any energy centre for the whole energy requirement of the site; and
- Any other significant upfront development and infrastructure costs, or adverse level of financial risk associated with the development.
- Demonstration that additional sources of funding (see Section 4 of the SG) for decentralised energy have been explored.

Electric Vehicle Infrastructure

Please confirm that the development will incorporate EV charging connection points in line with Section 4 in the SG.

Yes ☐

No ☐ (Explain any technical or viability issues which would prevent the installation of EV charging infrastructure)

STAGE 2: Condition Purification (Post Approval)

Using the Standard Assessment Procedure Energy Rating (SAP) for dwellings and the Simplified Building Energy Model (SBEM) for all other developments, please supply the following:

1	The Target Emissions Rate (TER), which is an output from the SAP/SBEM calculation	
2	The Dwelling or Building Emissions Rate (DER/BER), which is the predicted CO_2 emissions for the actual proposal, which includes the low and zero carbon generating technology (LZCGT)	
3	Re-calculation of the DER/BER excluding any low and zero carbon generating technologies	
4	The percentage reduction in carbon due to renewables: [(Step 1 - (Step 2 ÷ Step 3)) x100]	

Name of SAP/LCEA assessor	
Name of SAP/LCEA assessor company	
Regulator registration details	