Appendix A

Lincolnshire County Council:

Greenhouse Gas Emissions Report 2022/23

1.0 Executive Summary

Headline Greenhouse Gas Emissions Figures – 2022/23

This is the second annual report from Lincolnshire County Council on greenhouse gas emissions from the operations of the Council.

This report provides details on the progress that Lincolnshire County Council has made in reducing its emissions of greenhouse gases. In its Green Masterplan document the Council set a target to reach net zero carbon emissions by 2050, as part of the national response to climate change.

The tables and figures below show the headline data on greenhouse gas emissions from the operations of the Council.

Scope	Greenhouse Gas Source	Emissions in 2021/22 (Tonnes of CO_2e)	Emissions in 2022/23 (Tonnes of CO_2e)	
Scope 1	Gas Consumption	5,408	4,528	↓
	Oil Consumption	1,464	1,059	↓
	Lincolnshire Fire & Rescue Fleet	640	716	↑
	Winter Maintenance Fleet	181	207	↑
Scope 2	Electricity Consumption	6,134	5,359	↓
Scope 3	Business Travel	1,769	2,207	↑
	Staff Commuting	2,677	2,677	-
	Outsourced Services	1,048	1,050	↑
	Transmission of Electricity	543	490	↓
	Water Consumption and Treatment	71	67	↓
	Total	**19,935**	**18,360**	↓

Figure One: Lincolnshire County Council - Greenhouse Gas Emissions by Source in 2021/22 and 2022/23

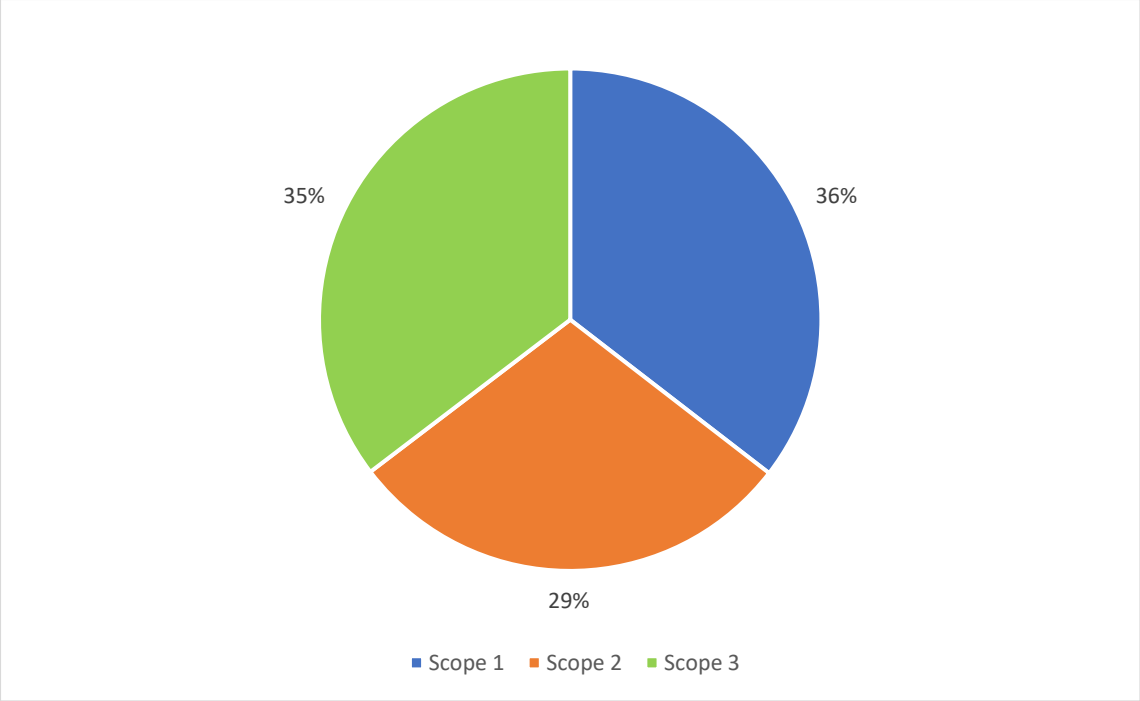

Figure Two: Greenhouse Gas Emissions by Scope in 2022/23

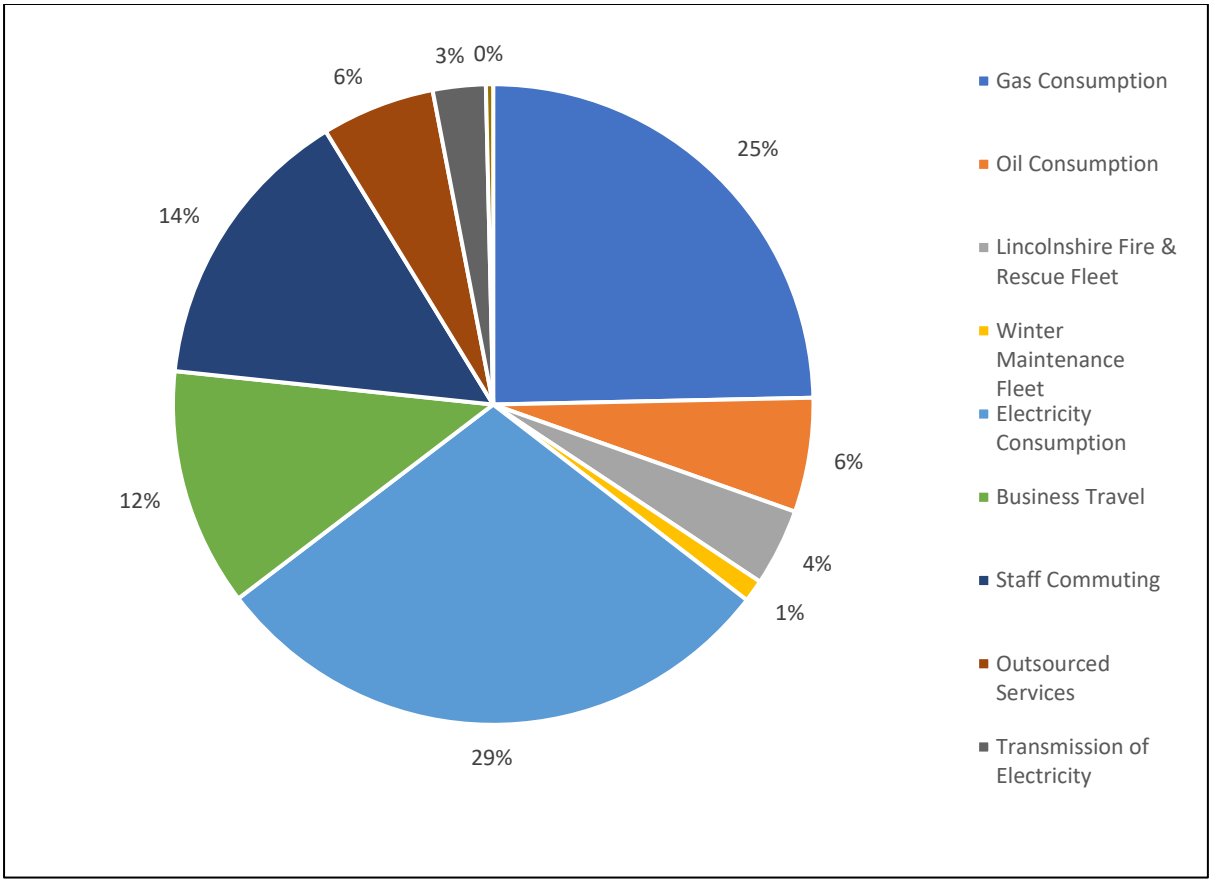

Figure Three: Greenhouse Gas Emissions by Source in 2022/23

The headline greenhouse gas emissions figure for 2022/23 is equivalent to 18,360 tonnes of carbon dioxide – the various sources of these emissions are outlined in Figures One and Three. This represents a 7.9% fall from the 2021/22 emissions figure of 19,935 tonnes.

The reduction has been achieved through significant falls in gas and oil consumption due to the mild winter in 2022/23 and the ongoing decarbonisation of the electricity network as more renewables are added to the electricity generation mix. In some areas, particularly in business miles and fleet miles emissions rose – this was mainly due to activity returning to normal following the coronavirus pandemic.

Figure Two shows that the use of fuel in the buildings and vehicles operated directly by the County Council generates 36% of the emissions identified in this report – these are classed as Scope 1 emissions. The use of electricity (Scope 2) generated 29% of emissions and other indirect emissions (Scope 3) generated 35% of emissions.

This report adds new information on Scope 3 (indirect) greenhouse gas emissions, which has not previously been available – such as data on emissions due to staff commuting and emissions due to the transmission of electricity. As a result, it is not possible to make a direct comparison with previous years. Therefore, the table below compares just Scope 1 and 2 emissions over the period since 2016/17 (the baseline year, which was set in the Carbon Management Plan published by the Council in 2018).

Emission Source	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Gas	5,978	5,963	5,365	5,654	5,541	5,408	4,528
Oil	1,613	1,353	1,344	1,627	2,008	1,464	1,059
Vehicle Fuel	863	633	760	822	700	821	923
Electricity	15,974	11,397	8,687	7,942	6,513	6,134	5,359
Total	24,428	19,346	16,156	16,045	14,762	13,827	11,869
Percentage Change	0.0	-20.8	-33.9	-34.3	-39.6	-43.4	-51.4

Figure Four: Greenhouse Gas Emissions from 2016/17 to 2022/23 in Equivalent Tonnes of Carbon Dioxide

Figure Four shows that Scope 1 and 2 greenhouse gas emissions generated by Lincolnshire County Council during the period from 2016/17 to 2021/23 have fallen by 51.4%. The bulk of this reduction is from falls in emissions from the use of electricity – the electricity grid has decarbonised, and the County Council has invested in energy efficiency schemes such as LED streetlighting. Emissions from the other sources have shown smaller falls and some of these reductions may just be changes due to the coronavirus pandemic.

When compared to emissions in 1990 there has been an even larger fall. Analysis in the report below shows that emissions compared to 1990 have fallen by 71.9% - this is for electricity, gas, oil, water, vehicle fuel and business travel.

The report provides additional details on the emissions for each source of greenhouse gas. Where possible, the data has been provided for back to 2016/17, but for some areas this has not been possible. The report includes details on renewable electricity generated by the photovoltaic solar panels that have been installed on the Council's buildings.

Section Nine of the report has recommendations on how future iterations of the report can be improved by including additional data on Scope 3 emissions. At present it is not possible to provide data on emissions due to procurement activity and this is expected to be a large source of carbon dioxide.

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2.0 Introduction

Lincolnshire Council has set a target to reach net zero carbon by 2050 for both its own operations and for the wider economy in Lincolnshire. In order to reduce greenhouse gas emissions from its own operations and from across the economy the County Council has develop a "Green Masterplan" which covers the policy response to climate change.

To set out the opportunities for reducing greenhouse gas emissions from the activities of the Council three successive Carbon Management Plans have been produced. The latest version covers the period from 2018 to 2023. To Council has been assisted by the Carbon Trust to develop the Carbon Management Plans. A fourth Carbon Management Plan is currently in development and should be published by early in 2024.

As part of the development of the third Carbon Management Plan the Carbon Trust also produced a "Science Based Targets" carbon assessment for the Council. The Science Based Targets" approach sets out how much and how quickly an organisation needs to reduce their greenhouse gas emissions to prevent the worst effects of climate change.

2.1 Greenhouse Gas Emission Types

Lincolnshire County Council has excellent data one energy use within its buildings, going back to the 1990s. This allows a good understanding of energy use patterns and their associated greenhouse gas emissions. The indirect emissions from activities such as commuting, and procurement are less well understood and previously the Council has provided limited reporting on these areas.

Greenhouse gas emissions get divided up into three areas or scopes – these are:

Scope 1: covers direct emissions from owned or controlled sources. This tends to cover emissions from burning fuels on site to heat buildings or provide hot water (such as gas used in a boiler) and from fuel used in vehicles owned by the organisation.

Scope 2: covers indirect emissions from the generation of purchased electricity, steam, heating, and cooling. This includes the emissions generated from the usage of electricity in the buildings and for other electrically powered services such as streetlighting.

Scope 3: covers all other indirect emissions that occur within an organisation's wider value chain. This is generally the most difficult category for accurate data collection as the activities are typically farther along the supply chain, where the reporting company may not have direct contact with the suppliers. Examples include emissions generated from business travel and commuting and the emissions generated during the usage phase of a product.

This report provides details of the Scope 1 and 2 emissions for Lincolnshire County Council and begins the process of calculating the Scope 3 emissions. Figure Five (from the Greenhouse Gas Protocol) shows the different types of activity that produce greenhouse gas emissions in each of the scope areas:

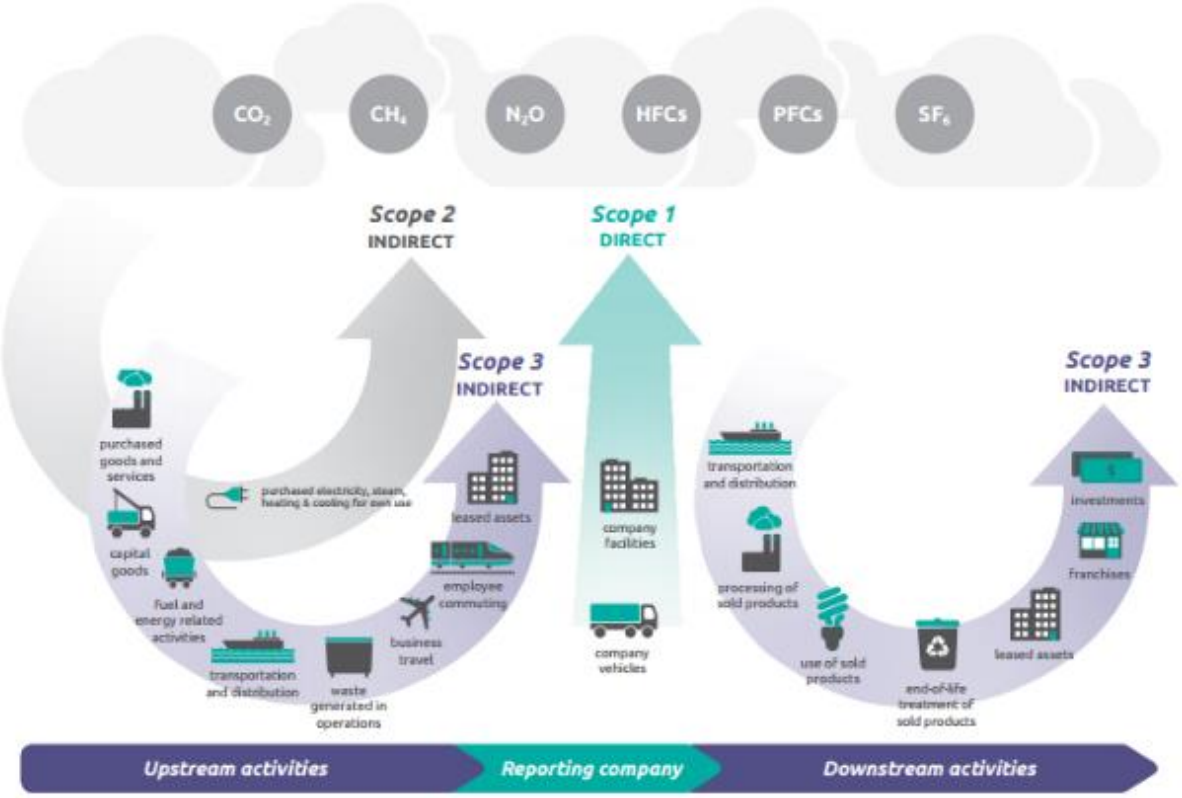

Figure Five: Sources of Greenhouse Gas Emissions (from Greenhouse Gas Protocol)

Throughout this report the data is provided in units that give the greenhouse gas emissions in tonnes or kilograms of carbon dioxide equivalents (t of CO_2e or kg of CO_2e). Carbon dioxide is the main anthropogenic greenhouse gas, but there are other significant global warming gases emitted by human activity. These include methane, nitrous oxide, and hydrofluorocarbons. These gases have global warming impacts much larger than carbon dioxide – they are converted to equivalent values of carbon dioxide. For example, methane has a global warming potential 27 to 30 times larger than carbon dioxide. Therefore, one tonne of methane emitted would be converted into 27 tonnes of carbon dioxide equivalents.

3.0 Greenhouse Gas Emission Baselines

The greenhouse gas emission baselines for Lincolnshire County Council are:

1990 Baseline: 55,701 tonnes of carbon dioxide (tCO2e)

2016/17 Baseline: 28,679 tonnes of carbon dioxide (tCO2e)

The County Council has two baselines for greenhouse gas emissions that are used:

- 1990 Baseline – this baseline was developed as part of the Science Based Carbon Targets process undertaken by the Carbon Trust and estimates the level of emissions from 1990, which is the main international baseline for carbon dioxide emissions.
- 2016/17 – the Carbon Management Plan 3, which was published in 2018, sets out a baseline from which delivery of the Carbon Management Plan can be measured.

1990 Baseline

The Climate Change Act 2008 sets a legal framework for the UK to cut greenhouse gas emissions to 80% below 1990 levels by 2050. The targets from the Act were subsequently updated to reaching net zero carbon by 2050. As a result, the Council has attempted to quantify its emission levels in 1990.

In 2019 the County Council commissioned a report from the Carbon Trust on Science Based Carbon Targets. The report looked at how quickly the Council would need to reduce its carbon dioxide emissions to play its part in keeping climate change related temperature rises to below 1.5 °C.

The Carbon Trust report looked at historic energy use and transport data for the Council, finding information for the period between 1993 and 2018. The Carbon Trust then extrapolated the 1993 carbon emissions data back to give an estimate for carbon emissions in 1990.

The Carbon Trust estimated that in 1990 the County Council's greenhouse gas emissions were 47,608 tonnes of carbon dioxide equivalent (±17%). This gives an upper limit for emissions in 1990 of 55,701 tonnes.

The changes in greenhouse gas emissions over the period from 1990 to 2018 are shown in Figure Six below. The units are tonnes of carbon dioxide equivalents.

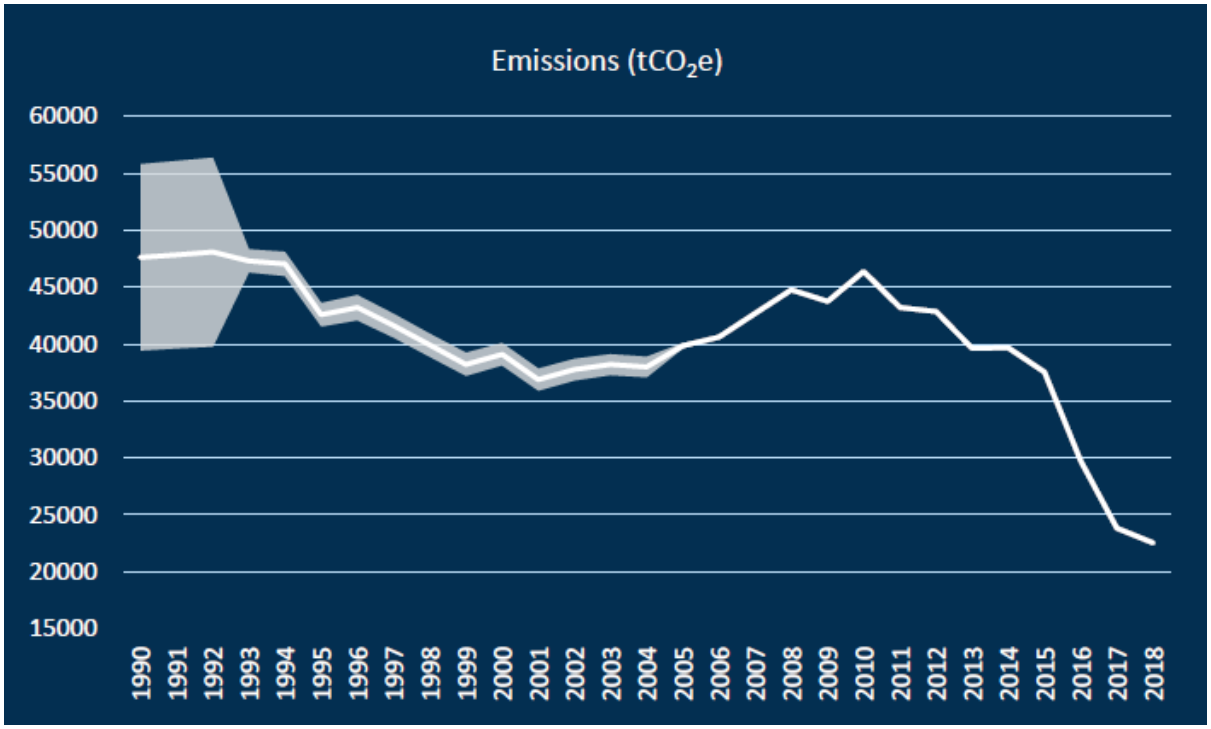

Figure Six: Baseline from the Lincolnshire County Council Climate Plan (2019) produced by the Carbon Trust

Comparison with 2021/22 Emissions

The extrapolation that the Carbon Trust did for 1990 used data on emissions from electricity, gas, oil, water, fuel in vehicles and business travel. The 2022/23 greenhouse gas emissions for these sources are 14,143 tonnes. This is the equivalent to a reduction of 74.6% compared to the higher estimate for 1990/91 of 55,701 tonnes of CO_2e.

2016/17 Baseline

The Carbon Management Plan 3 sets 2016/17 as the baseline year to compare progress against carbon reduction targets to. The Plan was produced by the Carbon Trust. The baseline covers energy consumption used to deliver the Council's services, as well as business travel emissions and emissions related to water consumption.

The greenhouse gas level for 2016/17 was equivalent to 28,679 tonnes of carbon dioxide (tCO_2e).

4.0 Key Performance Indicators

The intention is that this report will be produced annually to show progress towards meeting the 2050 greenhouse gas emission that was established in the Green Masterplan. As part of this annual review of emissions a set of key performance indicators has been developed to monitor progress towards the target

- **Gas and electricity consumption per metre squared of building space**

Will show the progress in reducing the energy consumption of the buildings owned and operated by the County Council.

2021/22 KPI Gas – 79.8 kWh/m^2
2022/23 KPI Gas – 66.7 kWh/m^2

2021/22 KPI Electricity – 47.9 kWh/m^2
2022/23 KPI Electricity – 45.3 kWh/m^2

- **Carbon dioxide emissions from gas and electricity consumption per metre squared of building space**

Will identify how greenhouse gas emissions are falling from the activities of the Council. This will show the influence of emissions from the electricity grid as it decarbonises.

2021/22 KPI Carbon Dioxide from gas and electricity – 31.2 kg of CO_2e/m^2
2022/23 KPI Carbon Dioxide from gas and electricity – 26.5 kg of CO_2e/m^2

- **Carbon dioxide emissions per employee**

According to the latest Workplace Profile report for the Council on 31 March 2020, there were 5,345 employees and in 2022 there were 5,372.

2021/22: 19,935 tonnes of carbon dioxide equivalents / 5,345 staff = **3.7 tonnes of CO_2e per employee**
2022/23: 18,360 tonnes of carbon dioxide equivalents / 5,372 staff **= 3.4 tonnes of CO_2e per employee**

5.0 Scope One Emissions

Scope One greenhouse gas emissions are direct emissions from sources that an organisation owns or controls directly. This could be from uses such as gas for heating, where gas is burnt on site or diesel used in a council owned vehicle.

5.1 Gas Consumption

Year	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
LCC Buildings (kWh)	17,928,004	17,296,042	15,242,408	15,890,636	14,475,922	14,099,345	12,392,095
Schools (kWh)	14,560,489	15,085,011	13,922,998	14,862,837	15,657,717	15,424,198	12,461,612
Total (kWh)	32,488,493	32,381,054	29,165,406	30,753,474	30,133,638	29,523,543	24,853,707
Change from Baseline (%)	0.00	-0.33	-10.23	-5.34	-7.25	-9.13	-23.50

Figure Seven: Gas Consumption Overview

Figure Seven shows that gas consumption in both the buildings and schools operated by the County Council fell significantly in 2022/23 – from 29.5 Gigawatt-hours (GWh) to 24.8 GWh a fall of over 23% since the baseline year of 2016/17. A significant proportion of the reduction is due to the fact that 2022/23 was a warmer year, with a much lower level of degree heating days. The number of heating degree days based on weather records from the Waddington Weather Station were 1,914.8 in 2022/23 – a fall of 6% on the level recorded in 2021/22. This warmer winter would have reduced heating demand across the buildings.

There was a particularly large fall in gas in consumption in schools – this may be due to the impacts of the coronavirus pandemic unwinding. In the winter of 2021/22, many schools had to operate with increased ventilation and had external windows open. This was not the case during the winter of 2022/23. In addition, there was considerable publicity on the price of energy during 2022/23 as prices rose following the war in Ukraine. As a result, there could have been greater emphasis on energy efficiency.

The graph in Figure Eight shows that gas consumption in both schools and other buildings operated by the County Council has been falling over the last six years.

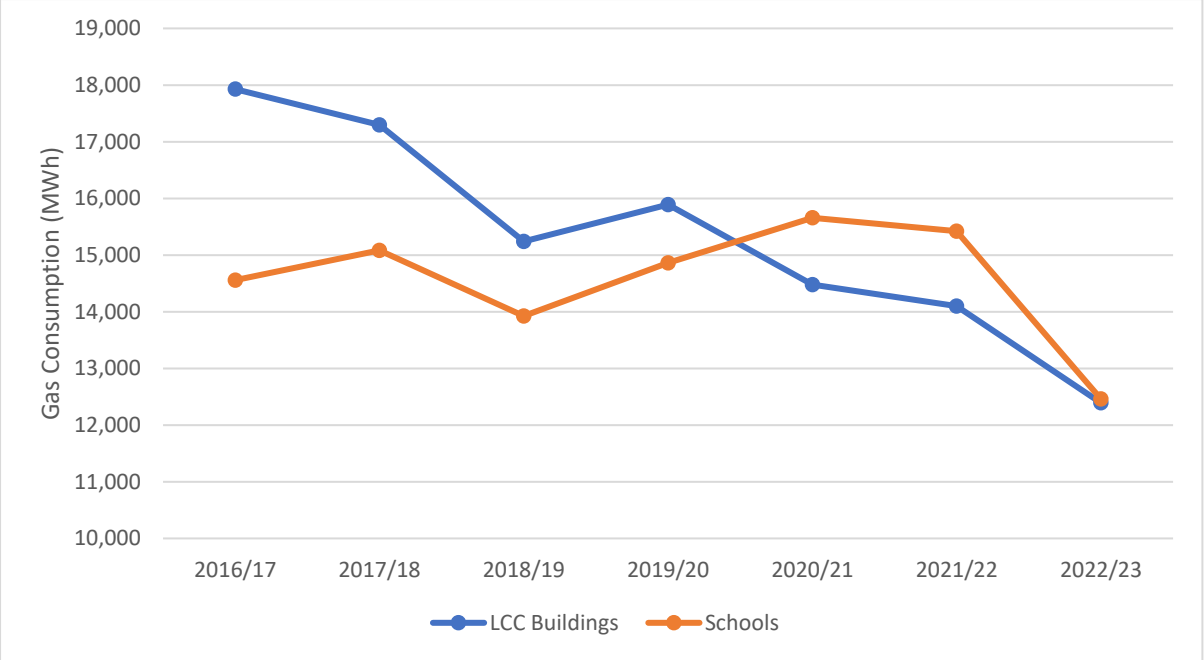

Figure Eight: Lincolnshire County Council Gas Consumption

Gas consumption figures can be influenced by changes in the size of the property estate. Figure Nine shows the gas consumption levels in kilowatt-hours per metre squared. The gas consumption levels in Council operated buildings have fallen from 128.8 kWh/m^2 to 90.3 kWh/m^2 over the period from 2016 to 2022. This demonstrates that the reductions in gas consumption are due to reductions in energy demand rather than a reduction in the size of the estate.

Year	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
LCC Buildings	128.82	131.48	114.23	117.78	100.93	99.94	90.30
Schools	64.97	66.71	61.26	65.12	68.24	67.34	52.93

Figure Nine: Gas Consumption in Kilowatt-hours per Metre Squared

The fall in gas consumption seen in 2018/19 seen in both schools and Council operated buildings is due to the milder weather during this year. There were 1,989 heating degree days in 2018/19 compared to 2,246 in 2021/22. This represented a significant fall in the heating requirement during 2018/19.

A heating degree day measures how much (degrees) and for how long (days) the outside temperature sits below a certain level. In the UK, the most readily available heating degree days come with a base temperature of 15.5°C; this is to stay that any temperature below this will require heating.

5.2 Gas Consumption – Greenhouse Gas Emissions

The greenhouse gas emissions are calculated by multiplying the amount of energy used during a year by the greenhouse gas emissions factor for a particular fuel. The emissions factor takes into account the emissions of different greenhouse gases from the fuel use. For example, use of natural gas causes emissions of carbon dioxide, nitrous oxide, and methane. The emissions factors for the different gases are combined to give an overall factor for natural gas which has the units of “equivalent tonnes of carbon dioxide”.

The emissions factor for natural gas has fallen from 0.184 kilograms per kilowatt-hour in 2016/17 to 0.1822 kg/kWh in 2022/23. This fall is mainly due to biogas being blended into the gas network reducing the overall carbon intensity of the fuel (there are also variations due to changes in the overall calorific value of gas). The changing emissions factors are shown in Figure 11.

Figures 10 and 11 show how greenhouse gas emissions due to gas consumption have changed over the period from 2016 to 2023. Overall, there has been a 24.25% fall from 5,978 tonnes to 4,528 tonnes of carbon dioxide equivalent emissions (tCO_2eq). This fall is mainly due to reduced gas consumption in buildings operated by the County Council.

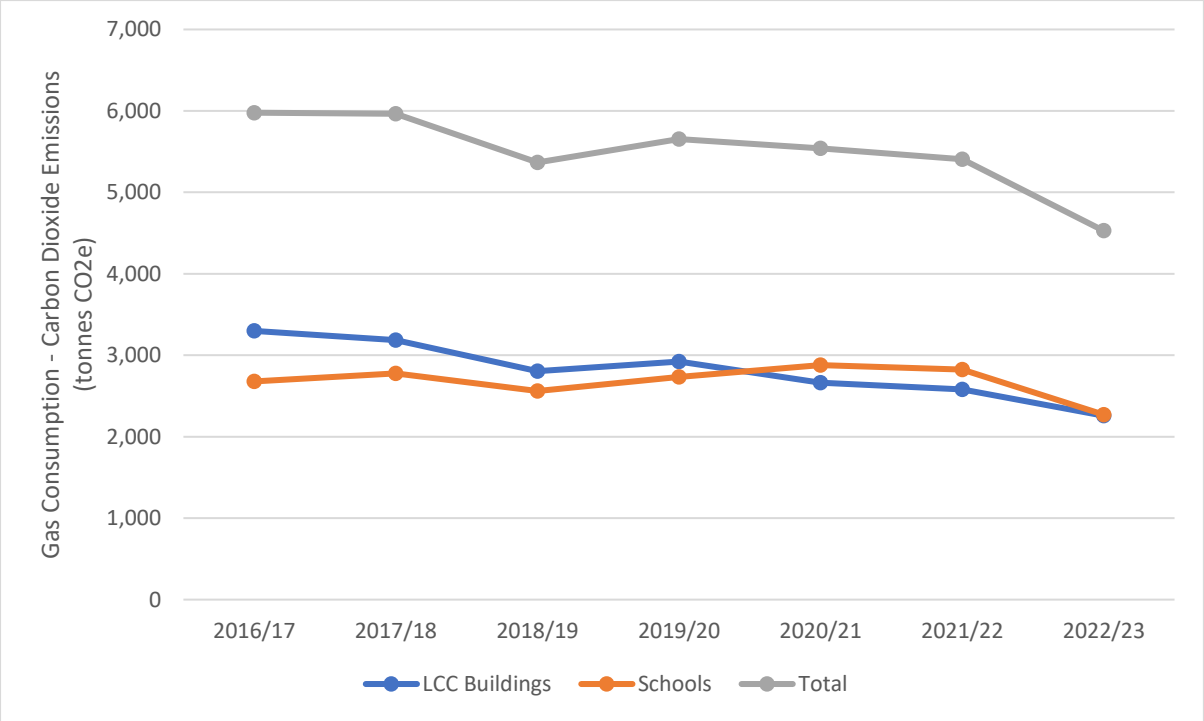

Figure Ten: Greenhouse Gas Emissions from Gas Consumption
Units: Tonnes of Carbon Dioxide Equivalent Emissions (tCO_2eq)

Year	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Gas Emissions Factor ($kgCO_2e/kWh$)	0.1840	0.1842	0.1840	0.1839	0.1839	0.1832	0.1822
LCC Buildings (Tonnes)	3,299	3,185	2,804	2,921	2,662	2,582	2,258
Schools (Tonnes)	2,679	2,778	2,561	2,733	2,879	2,825	2,270
Total (Tonnes)	5,978	5,963	5,365	5,654	5,541	5,408	4,528
Change (%)	0.00	-0.24	-10.25	-5.42	-7.31	-9.54	-24.25

Figure 11: Greenhouse Gas Emissions from Gas Consumption in LCC Buildings and Schools

5.3 Oil Consumption in Buildings

Large parts of Lincolnshire do not have connections to the national gas grid network. As a result, buildings in many parts of the county have to use alternative fuels for heating such as kerosene heating oil. In the East Lindsey district over half of the properties are not on the gas network.

The County Council has a small number of buildings and schools that have oil fired heating and hot water. It is not straight-forward to measure oil consumption, therefore, the usual method is to calculate the oil delivery levels to each property over the course of a year. In the long term these will average out as annual consumption levels.

The oil consumption levels over recent years are:

Category	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
LCC Schools	6,021,616	4,424,929	4,728,054	4,903,369	6,921,248	5,315,896	3,688,436
LCC Buildings	517,438	1,060,265	722,256	1,694,513	1,220,337	620,736	622,484

Figure 12: Oil consumption in kilowatt-hours

The school oil consumption has varied considerably from year to year, this variation may be caused by schools holding stocks of oil over the summer months. As with the gas data there is evidence of lower consumption in 2018/19 and 2022/23 when degree days levels were significantly lower.

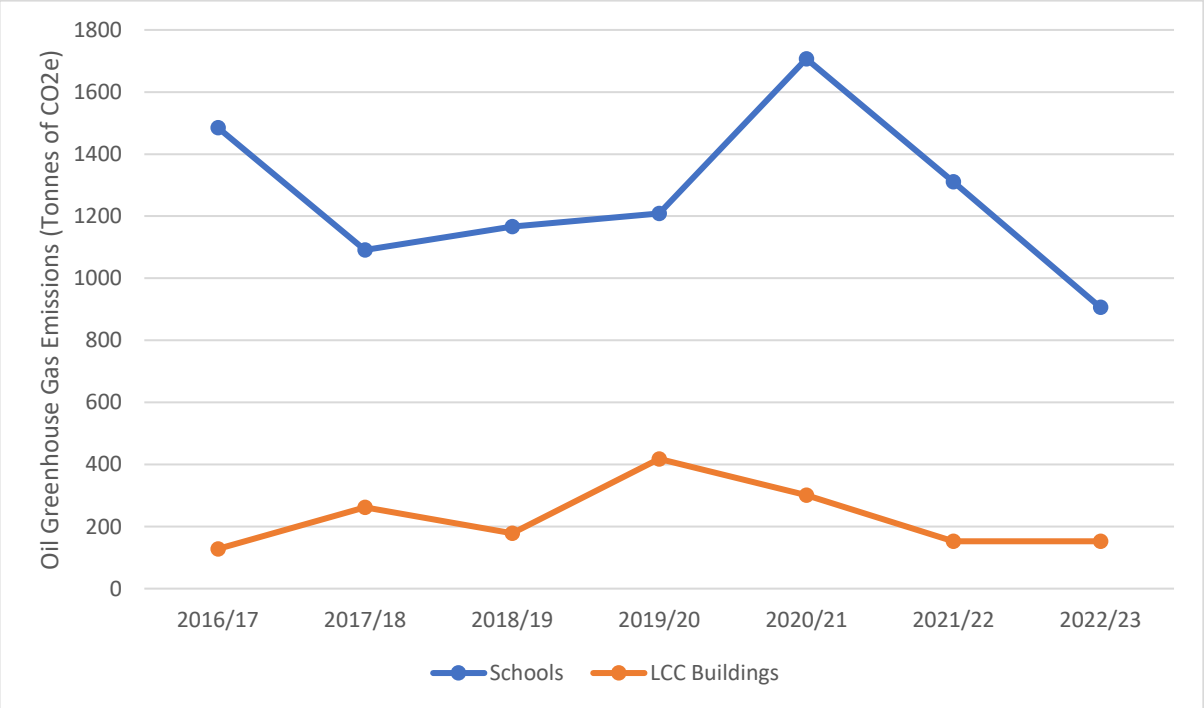

Figure 13: Greenhouse Gas Emissions from Oil Consumption

	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Schools	1485	1091	1166	1209	1707	1311	906

LCC Buildings	128	262	178	418	301	153	153

Figure 14: Greenhouse gas emissions from oil consumption (tonnes of carbon dioxide)

5.4 Fuel Consumption in Fleet Vehicles

Lincolnshire County Council has two sets of vehicles that are directly owned and controlled by the Council – these are the winter maintenance vehicles and the Lincolnshire Fire & Rescue vehicles. The fuel used in these vehicles contributes to the greenhouse gas emissions from the organisation.

Category	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Fire & Rescue (km travelled)	2,099,737	1,720,317	1,855,776	1,739,155	1,211,203	1,660,611	1,858,293
Winter Maintenance (km travelled)	236,753	197,230	191,075	294,333	431,883	324,215	371,728

Figure 15: Distance travelled by vehicles controlled by Lincolnshire County Council

There was a significant impact on the distance travelled by the Lincolnshire Fire & Rescue fleet during the coronavirus pandemic. This would be expected as a large proportion of the population were in lockdown from late March until June 2020. Distances travelled have increased to pre-pandemic levels.

The distance travelled by the winter maintenance vehicles is linked to the number days where roads require gritting over the course of the year.

5.5 Greenhouse Gas Emissions from Fleet Vehicles

The Sustainability Team collected data on distances travelled by the fleet vehicles. This data was then combined with the relevant emissions factor for each of the different vehicle types to give an overall greenhouse gas emissions level in equivalent tonnes of carbon dioxide.

Category	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Fire & Rescue	731	523	653	658	459	640	716
Winter Maintenance	132	110	107	164	241	181	207

Figure 16: Greenhouse Gas Emissions from fuel use in Lincolnshire County Council vehicles

Overall, there has been significant variations in the level of emissions form LCC vehicles, with no clear trend. The emissions from winter maintenance vehicles varies with the number of days each year when road gritting is required.

The emissions from Fire & Rescue vehicles showed a significant decline in the first year of the coronavirus pandemic when much of the population was locked-down for three months. However, emissions rose to pre-pandemic levels in 2021/22 and rose again in 2022/23.

The vehicle types in use by the Council and their associated emissions factors are:

Winter maintenance 0.5580 kgCO_2. (HGV Rigid >3.5-7.5tonnes)

Fire and Rescue vehicle types:

- Fire & Rescue – 0.9774 kgCO_2. (HGV Rigid >17tonnes)
- Fire & Rescue – 0.5580 kgCO_2. (HGV Rigid >3.5-7.5 tonnes)
- Fire & Rescue – 0.1421 kgCO_2 Small diesel car, from 1.7 to 2.0 litre
- Fire & Rescue – 0.1706 kgCO_2 Medium diesel car, from 1.7 to 2.0 litre
- Fire & Rescue – 0.1544 kgCO_2 Diesel van (Class I), up to 1.305 tonne
- Fire & Rescue – 0.2429 kgCO_2 Diesel van (Class II), 1.305 to 1.74 tonne

6.0 Scope 2 Emissions

Scope 2 greenhouse gas emissions are: purchase electricity, heat, steam or cooling. This is where an organisation is purchasing energy that is generated off-site. The County Council does not currently purchase heat or steam from a district heat network. Therefore, the Scope 2 emissions for the County Council are emissions related to the consumption of electricity.

6.1 Electricity Consumption

Electricity usage at sites controlled by Lincolnshire County Council has fallen by over a quarter over the period between 2016 and 2023, this equates to a fall of more than 11 million kilowatt-hours. This represents both a major cost and environmental benefit to the Council. If these electricity consumption reductions had not been made electricity costs would have been around £4.5 million higher than they were in 2023.

The majority of this reduction has been achieved through changes to the way street-lighting is used. The number of hours that the lights operate for has been reduced and lamps have been switched from sodium to LED lamps. The LED lamps use significantly less electricity than traditional sodium lamps.

The electricity consumption in Council controlled buildings and schools has fallen, but at a lower level than the street-lighting.

	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
LCC Buildings (kWh)	9,825,810	9,933,610	9,705,021	10,395,679	8,914,029	9,247,795	9,039,473
Schools (kWh)	9,211,167	8,862,366	8,379,292	8,523,335	7,371,734	8,495,152	7,831,002
Street Lighting (kWh)	19,731,361	13,623,463	12,603,679	12,153,281	11,648,343	11,147,771	10,840,612
Total (kWh)	38,768,338	32,419,440	30,687,992	31,072,296	27,934,105	28,890,718	27,711,087
Change from Baseline (%)	0.00	-16.38	-20.84	-19.85	-27.95	-25.48	-28.52

Figure 17: Electricity Consumption from Lincolnshire County Council Activities

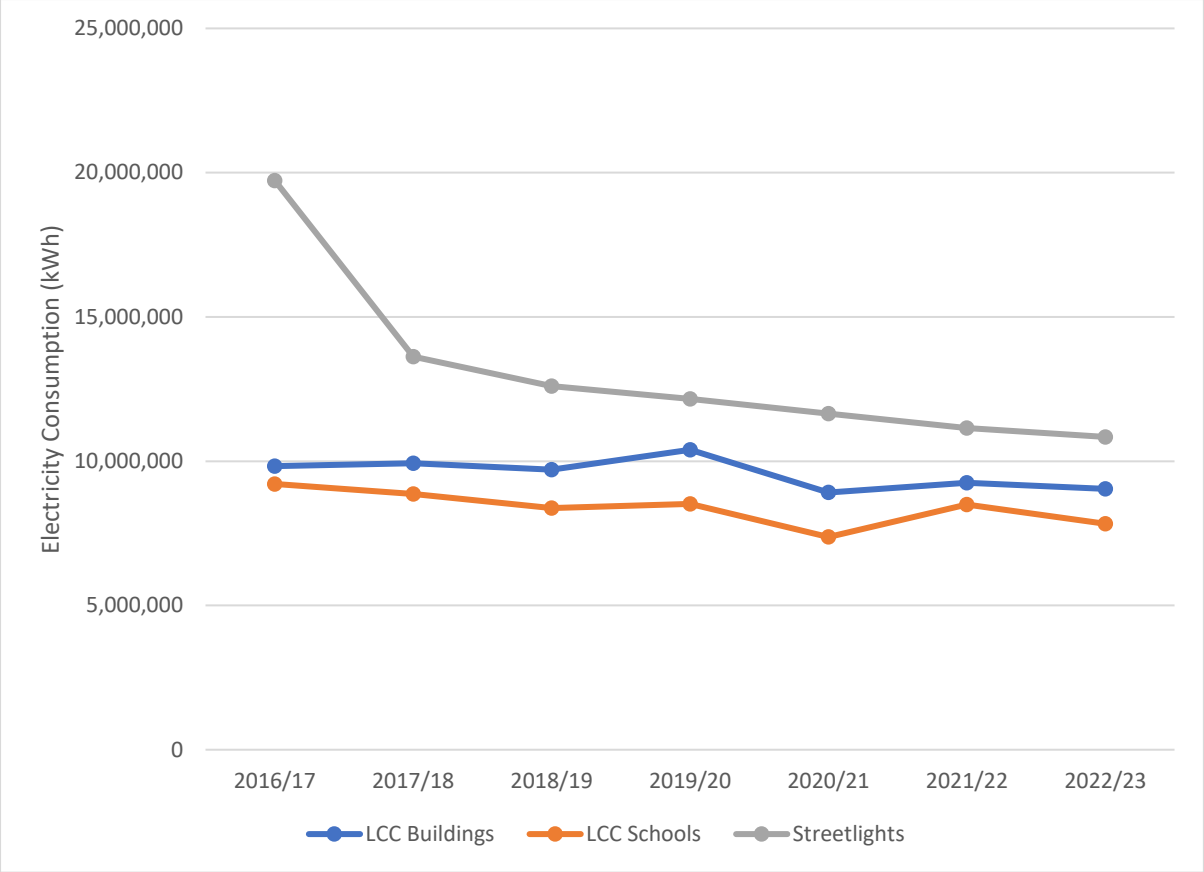

Figure 18: Lincolnshire County Council Electricity Consumption

6.2 Building Estate Impacts on Electricity Consumption

The size of the building estate can be a significant factor in the level of electricity consumption. It is important to determine if falls in consumption are due to changes in the size of the estate or due to energy efficiency measures.

The table below shows the electricity consumption level per metre squared of floor space for both LCC Buildings and LCC controlled schools. The results show that electricity consumption per metre squared has fallen over the period from 2016 to 2023. In LCC Buildings the energy intensity rate was increasing until the start of the coronavirus pandemic in 2020.

Figure 19 shows that electricity consumption by area is largely unchanged from the previous year for LCC Buildings in 2022/23. However, the consumption by area in schools has fallen – this is likely to be due to the return to normal ventilation rates in schools following the coronavirus pandemic.

Year	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
LCC Buildings	70.60	75.51	72.73	77.05	62.15	65.55	65.87
Schools	41.10	39.19	36.87	37.34	32.13	37.09	33.26

Figure 19: Electricity Consumption per Metre Squared (kWh/m^2)

6.3 Electricity Consumption: Greenhouse Gas Emissions

The greenhouse gas emission factor for electricity in the UK has fallen significantly over the last twenty years as the methods of electricity generation have changed. Prior to 2010 most of the electricity used in the UK was generated at coal fired power stations, which have a high carbon intensity. Since then, there has been a switch to first gas fired power stations and then to increased use of renewable electricity generation. As a result, the greenhouse gas factor has consistently fallen over recent years – as shown in Figure 20. Over the period from 2016 to 2023 the emissions factor has more than halved and is now at 0.19338 kilograms of carbon dioxide emitted for every kilowatt-hour of electricity used.

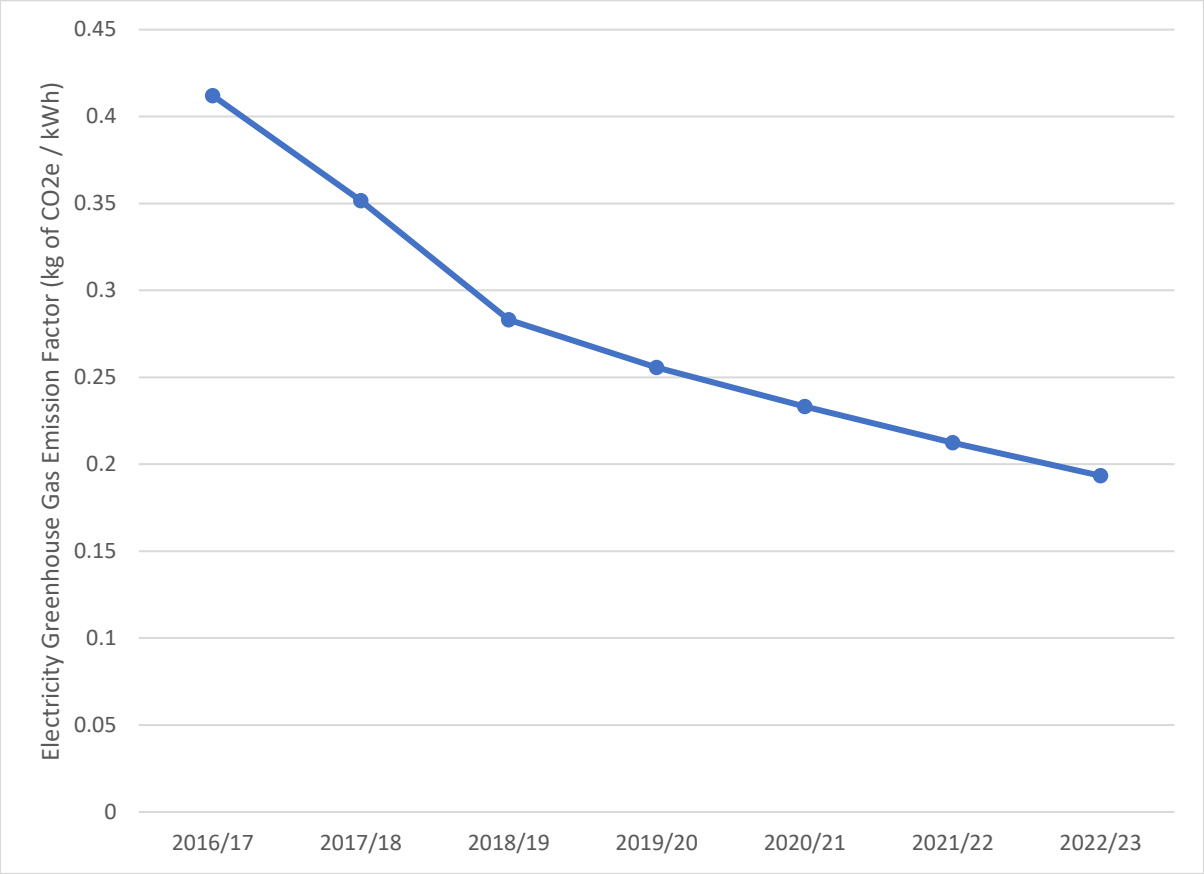

Figure 20: Greenhouse Gas Emissions Factor for UK Electricity

The fall in the emissions factor means that even if organisations have kept their electricity consumption at a constant level their greenhouse gas emissions will have fallen significantly.

Year	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Greenhouse Gas Factor (Kg of CO_2e / kWh)	0.41205	0.35156	0.28307	0.2556	0.23314	0.21233	0.19338
LCC Buildings (Tonnes of CO_2e)	4,049	3,492	2,747	2,657	2,078	1,964	1,748
LCC Schools (Tonnes of CO_2e)	3,795	3,116	2,372	2,179	1,719	1,804	1,514
Streetlights (Tonnes of CO_2e)	8,130	4,789	3,568	3,106	2,716	2,367	2,096
Total (Tonnes of CO_2e)	**15,974**	**11,397**	**8,687**	**7,942**	**6,513**	**6,134**	**5,359**
Percentage Change	0.00	-28.65	-45.62	-50.28	-59.23	-61.60	-66.45

Figure 21: Greenhouse Gas Emissions from Electricity Consumption

Figure 21 shows that greenhouse gas emissions from electricity have fallen by 66.45% between 2016/17 and 2022/23. This has been achieved through the significant reduction in electricity consumption coupled with the fall in the greenhouse gas emissions factor for electricity.

Greenhouse gas emissions are down significantly across all areas of consumption. Emissions from LCC controlled buildings and schools are down by 56.8% and 60.1% respectively between 2016/17 and 2022/23. Emissions from the use of streetlights are down by 74.2% over the same period.

6.4 Identifying the Source of Greenhouse Gas Emission Reductions in Electricity Consumption

It is useful to understand how much of the reduction in greenhouse gas emissions is due to reductions in consumption that the County Council has achieved and how much is down to the national decarbonisation changes in the electricity generation mix.

Figure 22 shows the proportion of the greenhouse gas emission reductions that can be attributed to reductions in electricity consumption. The table shows that in 2021/22 41.36% of the fall in electricity related greenhouse gas emissions was due to reductions in electricity consumption that the County Council achieved. The rest of the reductions were due to the decarbonisation of the national electricity generation mix.

Year	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Emissions if GHG Factor Stayed Constant	15,974	13,358	12,645	12,803	11,510	11,904
Actual Emissions	15,974	11,397	8,687	7,942	6,513	6,134

Year	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Reduction if GHG Factor was Constant (tonnes of CO_2e)	0	1,961	3,958	4,861	4,998	5,770
Actual Emissions Reduction (Tonnes of CO_2e)	0	4,577	7,288	8,032	9,462	9,840
Emissions reduction due to falling consumption (Tonnes of CO_2e)	0	2,616	3,330	3,171	4,464	4,070
Percentage fall due to consumption reductions	0	57.16	45.69	39.48	47.18	41.36

Figure 22: Source of Greenhouse Gas Emissions Reductions from Electricity Use

7.0 Scope 3 Greenhouse Gas Emissions

Scope 3 greenhouse gas emissions include all indirect emissions that occur due to the activities of an organisation. For example, the use of water at the County Council generates emissions from the treatment, purification and pumping of the water. Other activities such as staff commuting and the procurement of goods generate greenhouse gas emissions, which contribute to the overall carbon footprint of the Council.

Scope 3 emissions are often difficult to calculate with any level of accuracy and there is a risk of the double counting of emissions between different organisations. The County Council has started to measure its Scope 3 emissions. The Action Plan at the end of this report sets out plans for improvements to the collection and extent of Scope 3 data.

7.1 Business Travel – Distance Travelled

The Sustainability Team collected data on the annual mileage claimed for different modes of business travel by road. This includes information on lease cars (cars on long term rental to employees who have a high level of mileage claims), rental cars (cars on daily or short term lease to staff) and general travel claims by staff for business journeys in their own vehicles. The data for the period between 2016 and 2023 is shown in the table below:

Category	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
LCC Lease (km)	2,469,970	3,822,055	3,617,543	3,155,131	800,028	1,444,171	1,786,909
LCC Rental (km)	432,345	394,887	127,664	564,763	308,146	398,498	590,428
LCC Business (km)	6,613,942	8,494,952	11,732,279	12,140,759	5,622,758	7,790,588	9,699,817
Total (km)	9,516,257	12,711,894	15,477,486	15,860,653	6,730,932	9,633,257	12,077,154

Figure 23: Business Travel at Lincolnshire County Council

Prior to the coronavirus pandemic there had been consistent growth in the amount of business travel claimed for at the County Council – rising from 6.6 million kilometres in 2016/17 to 12.1 million in 2019/20.

There was a significant drop in all forms of vehicle business mileage during the first year of the coronavirus pandemic. For example, business mileage claims from employees for journeys completed in their own cars dropped by over 6 million kilometres or 53.7% in 2020/21 in comparison with the previous year. In 2021/22 and 2022/23 business travel has started to grow again, but it was still significantly below immediate pre-pandemic levels. However, the reductions in business travel seen in 2022/23 have only brought the total distance travelled back to the levels seen in 2017/18.

Some meetings need to be held in person, but many can now be held online reducing the need for business travel. The greater use of home working and online meetings should ensure that business mileage rates do not increase back to the levels seen in 2019/20.

7.2 Greenhouse Gas Emissions from Business Travel

The data on distance travel was combined with the emissions factor for a medium sized car to give an overall business travel emissions level in tonnes of carbon dioxide equivalents.

Category	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
LCC Lease (km)	362	599	567	486	114	239	284
LCC Rental (km)	63	58	19	106	58	74	110
LCC Business (km)	1,238	1,590	2,195	2,271	1,051	1,456	1,813
Total (km)	1,663	2,247	2,781	2,863	1,223	1,769	2,207

Figure 24: Greenhouse Gas Emissions from Business Travel

The figure above shows that greenhouse gas emissions from business travel were showing year on year growth prior to the coronavirus pandemic. As a result of the pandemic emissions fell in 2020/21, but have risen in both 2021/22 and 2022/23.

The Council ran a Smarter Working programme, which looked to secure benefits from wider use of information technology and flexible working. As a result, a large number of employees spend a proportion of the week working from home and there is greater use of online meeting platforms, such as Teams and Zoom. In theory the Smarter Working programme should mean that there is a reduced need to travel to meetings.

The greater use of electric and hybrid vehicles should start to reduce the level of business travel emissions over the coming years.

7.3 Commuting to Work by Employees

Employees of the Council generate greenhouse gas emissions from their travel to and from work and these need to be included as part of the Scope 3 emissions assessment.

In September 2022 the Sustainability Team undertook a Staff Travel Survey, which collected information on how often and how far staff travelled to work. From this information it was possible to calculate the average distance travelled from home to work, how often the employee travelled to work, and the mode of transport used. This information was combined with the DEFRA greenhouse gas emissions figures for modes of transport. The results are displayed in the table below.

Transport Mode	Tonnes of Carbon Dioxide	Percentage of GHG Emissions
Car - Diesel	1,198.3	44.77
Car - Petrol	1,227.9	45.88
Car - Hybrid	139.1	5.20
Car - Plugin Hybrid	1.1	0.04
Car - Battery	17.9	0.67
Bus	63.6	2.38
Train	28.7	1.07
Total	**2,676.6**	

Figure 25: Greenhouse gas emissions from staff commuting 2022/23

In 2022/23 the estimated greenhouse gas emissions from commuting at Lincolnshire County Council were 2,676.6 tonnes of carbon dioxide.

The calculation shows that over 90% of the staff commuting greenhouse gas emissions at Lincolnshire County Council come from petrol and diesel cars. This indicates that there are significant opportunities to reduce these emissions in the near future as hybrid and battery powered vehicles become increasingly common.

A new staff travel survey is planned for November 2023, which will give up-to-date information on the level of electric battery and hybrid vehicles in use by staff.

The 2021 DEFRA Greenhouse Gas Emission Factors show the carbon intensity of different vehicle types:

Engine Type	GHG Emission Factor (kg of CO_2e / mile)
Diesel	0.26549
Petrol	0.30231
Hybrid	0.17635
Plug-in Hybrid	0.14639
Battery	0.08455

Figure 26: Greenhouse Gas Emission Factors by Car Engine Type

As the national vehicle fleet switches to hybrid and fully electric vehicles the greenhouse gas emissions from commuting should begin to fall rapidly. In addition, as the national electricity grid decarbonises the greenhouse gas emissions from battery and hybrid vehicles will fall further.

In 2022 16.6% of new car sales were Battery Electric Vehicles (BEVs). (Data source: Heycar)

The data obtained in the Staff Travel Survey shows that the pandemic has had a significant impact on commuting patterns. Unfortunately, there had not been a recent staff travel survey conducted prior to the coronavirus pandemic occurring and it is therefore difficult to make comparisons. The data from the 2022 Staff Travel Survey shows that staff now have flexible working arrangements and are taking a hybrid approach with part of the week in the office, with the rest of the working week being spent at home.

Normally, staff travel surveys would be held every two years, but due to the impacts of the coronavirus pandemic a follow up survey will be conducted in November 2023. This will allow further data to be collected on commuting greenhouse gas emission.

7.4 Outsourced Services

The County Council has contracts with private sector contractors to deliver some of the services provided by the Council through the Highways Department. The contractors are:

- Balfour Beatty
- Colas
- Kier
- WSP

The contractors have been asked to provide details on their electricity, oil, and vehicle usage.

Category	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Electricity (kWh)	335,658	457,455	450,594	452,321	305,895	306,923	294,788
Oil (kWh)	0	3,491,764	2,182,408	1,813,092	0	0	0
Transport Diesel (Litres)	601,567	0	0	214,495	314,256	334,978	346,608
Transport Petrol (Litres)	9,098	0	0	0	9,274	0	0
Business Travel (km)	142,561	780,738	1,789,305	695,269	235,244	199,521	159,578

Figure 27: Data on Contractor Energy Consumption and Business Travel

Annual data has been provided for electricity consumption and business travel. However, data for the other areas has been sporadic. The data was combined with the relevant greenhouse gas emission factor to give the carbon dioxide emissions in tonnes:

Category	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2021/23
Electricity	138	176	138	115	71	65	61
Gas Oil	0	963	538	500	0	0	0
Transport Diesel	1,571	0	0	574	840	896	910
Transport Petrol	80	0	0	0	20	0	0
Business Travel	20	197	839	166	94	87	79
Combined Total	1,809	1,336	1,515	1,355	1,025	1,048	1,050

Figure 28: Greenhouse Gas Emissions from the Outsourced Contracts (Tonnes of Carbon Dioxide)

The sporadic nature of the data on outsourced emissions makes it difficult to make any firm conclusions on the data. An objective for the action plan for future iterations of this report will be to improve these data sets.

7.5 Electricity Transmission and Distribution Losses

When electricity is transmitted across the national electricity grid there are some losses from electrical resistance in the power lines. There are losses in the national high voltage transmission network (the electricity pylon network) and in the local distribution network. As a result, additional electricity has to be generated to make up for these losses. There are greenhouse gas emissions associated with this electricity generation – they are counted as Scope 3 emissions rather than being included in the UK grid electricity greenhouse gas emission factor.

In 2022 the greenhouse gas emissions factor for electricity transmission and distribution losses was 0.01769 kg of carbon dioxide equivalent per kilowatt-hour of electricity consumption.

In 2022/23 the total electricity use by Lincolnshire County Council was 27,711,087 kWh.

The transmission and distribution losses emissions for the County Council were:

27,711,087 x 0.01769 = 490,209.1 kg of CO_2e or **490.2 tonnes of CO_2e**

2021/22: 542.9 tonnes of CO_2e
2022/23: 490.2 tonnes of CO_2e

7.6 Water Consumption and Treatment

The processes of distributing water and treating effluent generate greenhouse gas emissions. These are indirect emissions as the activities of the water company generate the emissions, but the emissions would not have occurred if the Council had not required water.

Figure 29 shows the water consumption in LCC buildings and schools over the period from 2016 to 2023. Consumption had already fallen prior to the coronavirus pandemic from around 250,000 m^3 per annum to 180,000 m^3.

Category	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Water LCC & Schools (m^3)	248,990	246,305	189,199	185,942	141,756	179,521	170,520

Figure 29: Water Consumption in LCC Buildings and Schools

The DEFRA greenhouse gas emissions factors for water consumption and water treatment were used to get an emissions total for water use. The Anglian Water bills assume that 90% of the water supplied to a property goes down the sewers to the water treatment works.

Category	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23

Water Consumption	37	37	28	28	21	27	25
Water Treatment	61	60	46	46	35	44	42
Total	98	97	75	73	56	71	67

Figure 30: Greenhouse Gas Emissions from Water Consumption and Treatment

Greenhouse gas emissions associated with water usage and treatment have fallen from just under 98 tonnes in 2016/17 to 67 tonnes in 2022/23. Greater use of percussion taps, urinal sensors and other water saving devices has gradually reduced water consumption at the Council. In addition, half hourly monitoring of water consumption at Lincoln Castle has been installed to ensure that any major leaks are quickly identified.

8.0 Renewable Electricity Generation

The County Council has invested considerable funds in adding solar photovoltaic systems to its buildings. In 2021/22 the Council had solar panels capable of generating 677 kilowatts of electricity on its buildings. There were 38 buildings with solar panels on the roofs in 2022. A full list of the properties with solar panels and their capacities is added as an appendix to this report.

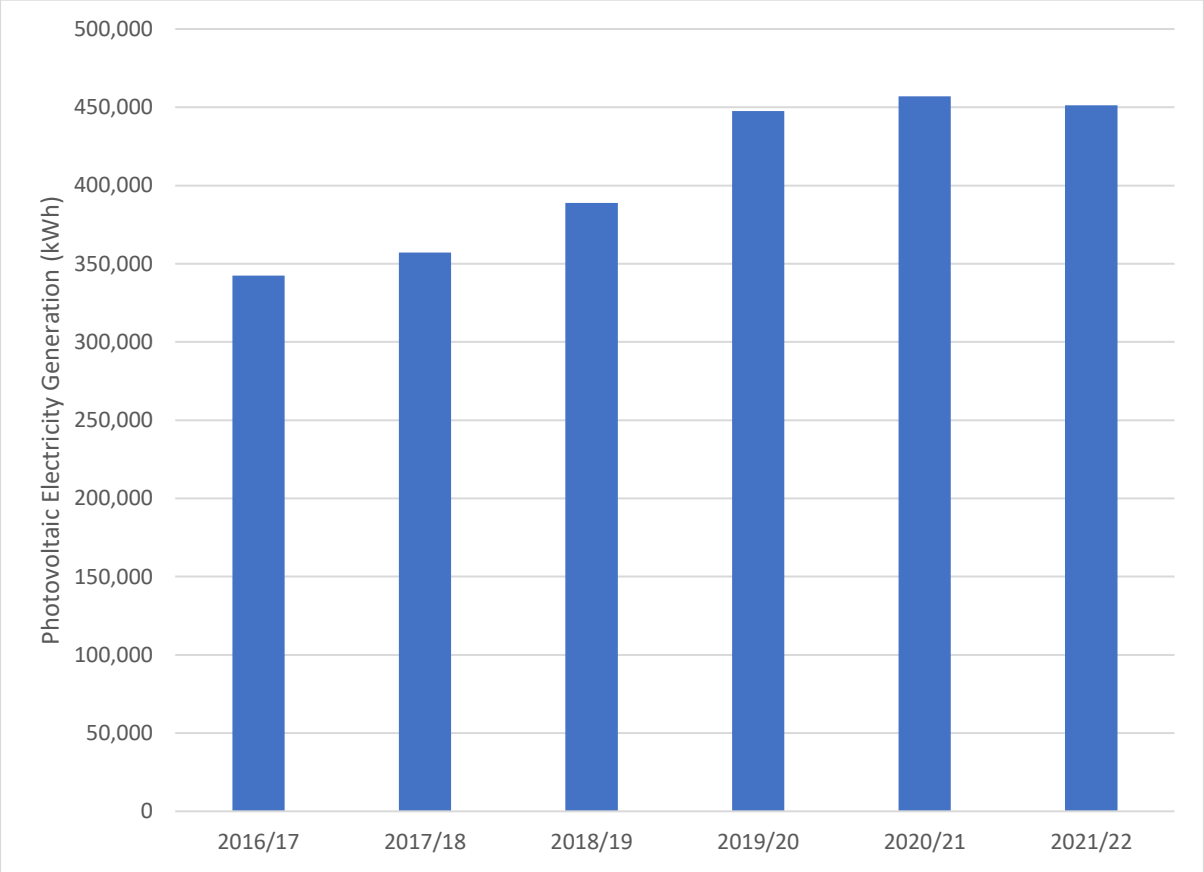

Figure 31: Solar Photovoltaic Electricity Generation at Lincolnshire County Council Buildings

The amount of electricity generated from the Council operated solar panels has increased to 451,270 kilowatt-hours in 2021/22. The increase has been achieved as new systems have been added to buildings – the latest being at Orchard House.

In 2021/22 451,270 kilowatt-hours of electricity were generated from the solar panels. This equated to 1.56% of total electricity consumption.

9.0 Action Plan for Future Iterations of this Report

This report is the first such overview report from Lincolnshire County Council on its Greenhouse Gas Emissions. It is intended to be an annual update report. The action plan below sets out how the report will be improved for future years to give a broader view of greenhouse gas emissions at the Council. The updates will especially focus on improving information on Scope 3 (indirect emissions).

Action / Improvement	**Comments**	**Partners**
New Carbon Management Plan	In 2023 a new Carbon Management Plan will be produced for the Council. The new CMP is currently being developed. The updated report will set out the next set of targets for greenhouse gas emissions over the next six years. The report will identify projects that can produce reductions in emissions for the activity controlled by the Council. Funding for a Heat Decarbonisation Plan has been secured in a joint project between the Corporate Property and Sustainability Teams. The resulting report will identify how the top 20 energy using buildings operated by the Council can be decarbonised.	Property
F-Gas Data	Fluorinated gases that are used in air conditioning and cooling systems are very damaging global warming gases. For example, 1 kilogram of the R-401A gas, which is used in many air conditioning systems, has a global warming potential 2088 times larger than carbon dioxide. Information on the F-gases that the Council uses will be collated for future reports and data from air conditioning inspection and maintenance reports will be used to identify any gases that have been lost / leaked from systems.	Property / Contractors
Highways Carbon Footprint	Highways are working with the Future Highways Research Group (FHRG) to develop a carbon footprint for their service. The Sustainability Team is supporting this work and providing baseline data for the project. The overall project is a collaboration between FHRG and ADEPT – and will work with five highways authorities around England to establish a detailed carbon footprint analysis. Once the initial baseline report has been produced it should be a straight-forward process to produce an annual update on greenhouse gas emissions from the service.	Highways / Contractors

Waste Management Carbon Footprint	The Sustainability Team is working with the Waste Management Team to develop a carbon footprint analysis for the whole household waste management system in Lincolnshire. This will cover the collection of waste (managed by district councils) and the disposal of waste (managed by the County Council), as well as the transport used to move the waste around. The results from the carbon footprint analysis will be part of future updates to this report.	Waste / District Councils / Waste Contract Operators
Business Travel – Data Improvements	The information within this report includes data on business travel by roads, but the Council does not currently collect data on business travel by other modes of travel – such as rail and air. For the next update of this report efforts to collect data on these modes of travel will be made.	Finance / HR
Travel to Work Improvements	This report includes an initial assessment of carbon dioxide emissions from staff travel to work. As part of the Sustainable Travel Plan project a staff travel survey was conducted. The data from this report has been used to develop a basic model of carbon emissions. It would be useful to update the survey as working patterns change after the coronavirus pandemic.	Communications
Working from Home	Since the coronavirus pandemic a large amount of staff time is spent working at home. As a result staff members are using energy at home that they would not previously have used. The energy is being used to deliver services for the Council. It should be counted as indirect greenhouse gas emission from the Council. Getting an accurate figure for this energy use will be very difficult as it will depend on the insulation level and boiler efficiency of each employee's property. However, several methodologies that take a broad approach to give an approximate figure have been developed. These methodologies will be used to get an estimated figure for the Council.	Human Resources
Emissions from Procurement Activity	Evidence from other local government and public sector organisations shows that greenhouse gas emissions from items that organisations purchase are the single largest source of greenhouse gas emissions. In the NHS procurement activity accounted for around two thirds of greenhouse gas emissions. The Sustainability Team will work with colleagues in the Procurement Team to get a better understanding of procurement related emissions at the County Council.	Procurement / Finance

Appendix A – Solar Photovoltaic Sites

Property Type	Property	Size (kWp)
Fire Station	Bardney Fire Station	7.02
Fire Station	Bardney Fire Station (Wind Turbine?)	7.02
Fire Station	Bardney Fire Station (Field)	69.00
Fire Station	Billingborough Fire Station	9.60
Fire Station	Bourne Fire Station	3.96
Fire Station	Brant Broughton Fire Station	7.43
Fire Station	Caistor Fire Station	2.70
Fire Station	Crowland Fire Station	9.90
Fire Station	Horncastle Fire Station	3.96
Fire Station	Lincoln North Fire Station	7.43
Fire Station	Long Sutton Fire Station	9.00
Fire Station	Mablethorpe Fire Station	2.70
Fire Station	Market Rasen Fire Station	7.02
Fire Station	Metheringham Fire Station	3.96
Fire Station	North Hykeham Fire Station	3.96
Fire Station	Saxilby Fire Station	3.15
Fire Station	Skegness Fire Station	9.86
Fire Station	Spalding Fire Station	7.02
Fire Station	Spalding Fire Station (House)	4.00
Fire Station	Stamford Fire Station	9.90
Fire Station	Wainfleet Fire Station	2.70
Fire Station	Woodhall Spa Fire Station	5.40
Fire Station	Wragby Fire Station	9.90
Primary Schools	Baston Church of England Primary School	19.80
Primary Schools	Deeping St Nicholas Primary School	12.04
Resources - Office Accommodation	Lincoln Lancaster House	26.40
Resources - Office Accommodation	Louth Keily House	29.76
Primary Schools	Market Deeping Community Primary School	6.48
Fire Station	Lincoln South Park Campus	50.40
Resources - Office Accommodation	Lincoln Orchard House B	44.88
Resources - Office Accommodation	Sleaford Area Office & Fire Station and Ambulance Station	14.79
Museums & Art Galleries	Lincoln Museum of Lincolnshire Life	29.25
Museums & Art Galleries	Lincoln The Collection	27.00
Waste Services	Boston Waste Transfer Station	10.00
Waste Services	Gainsborough Waste Transfer Station	50.00
Waste Services	Grantham Waste Transfer Station	50.00
Waste Services	Louth Waste Transfer Station	50.00
Waste Services	Sleaford Waste Transfer Station	50.00

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