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THE CLIMATE OF WEST LOTHIAN

by

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Introduction

West Lothian is a small but in parts highly populated county situated in the industrial belt of Scotland on the southern shores of the Firth of Forth.

The county is bounded on the east by the River Almond and the Breich Water, on the west by the River Avon, and on the north by the Firth of Forth. The southwest boundary practically coincides with the watershed between the Forth and Clyde.

The topography of the county is extremely varied and rises from the flat carse land between Grangemouth and Bo'ness in the north, up to the Knock (1023 feet) and Cairnpapple Hills some seven miles inland. These summits form part of a broken ridge known as the Bathgate Hills which extend north and south for five miles between Bathgate and Linlithgow. The northern end of the ridge is cut across by a valley in which the county town, Linlithgow, is situated 150 feet above sea level. A mile or so north of Linlithgow the land rises again to the 550 feet Airngath Hill near Grange. To the east of the county, several small isolated hills are found between Queensferry and the Midlothian county boundary. To the south of the county are the high bleak uplands of the West Calder (Midlothian) and Whitburn (West Lothian) districts.

It can be seen from the relief and drainage map at Figure 1 that more than half the area of the county lies at an elevation of between about 400 and 600 feet and also that nearly a quarter lies at an elevation of about 600 to 800 feet. The best agricultural land is found in the lower areas near the Forth and also to the east of the Bathgate Hills. South-west of Bathgate, the land rises again and above the 400 feet contour, the sub-soil is largely composed of boulder clay often covered with gravel and peat. On the windswept heights the arable limit is about 700 feet.

The rivers and streams in the area flow in a general west to east direction and the main highways in the county follow the same direction. The undulating nature of the country is perhaps the most striking feature of the topography and communications in the north-south direction are hampered by the terrain; the north to south roads are consequently less convenient for traffic.

The county is disfigured by numerous coal mining waste "bings" in the Bo'ness, Bathgate and Fauldhouse areas. Similarly, great heaps of spent shale from the oil-shale workings in the Broxburn and Winchburgh areas mar the appearance of otherwise attractive, cultivated countryside. There is no doubt that in both the upper and lower lying parts of the county the extensive coal and oil shale mining operations have completely upset the natural drainage of what once must have been large tracts of good agricultural land. For example, drainage dislocations due to mining activity are mainly responsible for the degeneration and confused disposition of arable, permanent grass and rough grazing in the marginal land of south western West Lothian.

General Climate

In broad terms the climate of West Lothian is typical of that of the eastern side of Scotland. The hours of sunshine are high in relation to the latitude and the average rainfall is well below the average for the United Kingdom as a whole. However, it should be borne in mind that the populated parts of West Lothian stretch from sea level to almost 1,000 feet and a study of the vegetation during even a brief journey from north to south across the county will illustrate the effects of the considerable range of climates within the county borders ranging from the genial climate of the agricultural areas near the Forth coastline to the harsh, windswept climate of the Armadale-Harthill-Fauldhouse district where the dismal moors are rendered the more melancholy by the debris of coal mining.

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There is a marked absence of cultivated land in the southern part of West Lothian and in the adjoining district of western Midlothian. Here, a rainfall which frequently exceeds 35 inches is associated with soils consisting mainly of cold intractable clays, conditions which taken together are no encouragement to the arable farmer. North and eastwards, this region gradually merges with the zone of more or less continuous arable cultivation which, interrupted by the Pentlands and Edinburgh, stretches from the Avon to the North Sea coast of East Lothian.

The topography of the county exposes much of it to the full effect of the wind and local increases in the general wind speed are experienced throughout the county on ridges or where features of the landscape form a wind funnel. Although the lee of local high ground affords shelter from the wind in some places, there is, in general, a distinct lack of sheltering trees throughout the county particularly in the higher central and southern areas, although some of the estates surrounding the great country houses are extremely well-wooded. The absence of shelter from the wind, coupled with high humidities and low temperatures, contributes to the "rawness" of the climate during the winter and spring months.

The separate aspects of the climate of West Lothian are discussed in the following paragraphs under the headings of Rainfall, Temperature, Sunshine, Winds, Fog, Snow, Relative Humidity and Thunderstorms. However, it should be mentioned at this point that there is a paucity of basic weather records of all kinds from the county of West Lothian. Indeed, the only records which are available are from a rather scant network of stations making measurements of amounts of rainfall. Estimating temperatures, winds, snow cover etc. in the complete absence of records is not an easy matter, particularly in the county which has so varied a topography. Such estimates are made by applying approximate rules or surmises which are based on general meteorological experience rather than on directly applicable observational evidence and in the case of temperature for example, it has been necessary to decide which of the records from stations in adjoining counties are likely to be most typical of the various regions of West Lothian.

1. RAINFALL

The annual average rainfall over the county of West Lothian (see Annual Average Rainfall Map at Figure 2) gradually increases from the flat coastal stretch along the Forth southwestwards to the high ground in the southwest corner of the county. It ranges from a value of less than $27\frac{1}{2}$ inches along the stretch of coast in the Dalmeny/Forth Road Bridge area to over 40 inches in the Whitburn/Fauldhouse area.

Broadly speaking, the average rainfall over the drier parts of the county is about the same as that of Edinburgh, and not much more than that in the London area, while the wetter parts of the county have an annual rainfall similar to that in the Glasgow area.

Monthly and Annual Averages of Rainfall for a number of rainfall measuring stations within or near the fringe of the county are given in Tables 1 and 1A. The rainfall averages quoted in Table 1 are actual averages over the 35 years from 1916 to 1950 (the standard period for rainfall averages in current use in the Meteorological Office), while the averages quoted in Table 1A have been estimated from short term records.

Cumulative Frequencies of Daily Rainfall for Grange, Linlithgow, which give the total number of days in 35 years having specified amounts of rainfall, are given in Table 1B. Grange, which is situated about one mile north of Linlithgow, has the longest and most complete record of daily rainfall measurements within the county. The daily rainfalls at Grange should give a reasonably close guide to the daily rainfalls likely to be experienced in other parts of the county.

Maximum Daily Rainfalls at Grange, Linlithgow, recorded in each month during the 54 years from 1912 to 1965 are given in Table 1C.

The Number of Hours with Rain at Turnhouse (Edinburgh) Airport between the hours of 7 a.m. and 5 p.m. Greenwich Mean Time (8 a.m. and 6 p.m. British Summer Time) in each month and year during the 10 year period from 1955 to 1964 are given in Table 1D. Turnhouse Airport, which lies just outside the eastern boundary of West Lothian, is the only station near the general area of the county for which these data are available. However, these values for Turnhouse Airport should be broadly representative of most of West Lothian.

Intense Falls of Rain in Short Periods of Time

In general, the more intense the rainfall, the less likely it is to last for a given number of minutes or hours. The probability that rainfall of a certain intensity will last for a certain time is less in West Lothian than in the upland parts of Scotland and the more thundery areas in central and south-west Scotland. It is appreciably less for the shorter durations than in the south of England and the Midlands which have a much higher incidence of thunderstorms and thundery downpours than West Lothian.

In the absence of suitable long term records of rainfall intensities for the West Lothian area, the values quoted in Table 1E have been computed from the well known Bilham formula for rainfall intensities. The rainfall intensities obtained from the Bilham formula for durations of up to a few hours are probably too high when related to West Lothian and experience suggests that a 20 per cent reduction should be made to the amounts quoted in Table 1E to relate the intensities to sewer and culvert design purposes etc. in the county

Driving Rain

Driving rain can be represented by an index which is proportional to the product of the wind speed and rainfall amount, but there is a complete absence of suitable wind records from places within the county. Nevertheless, driving rain is a factor which should be borne very much in mind at the building design and siting stage because large areas of West Lothian are exposed to the full effect of the wind, particularly districts in the higher parts of the county or on or near the crests of the numerous ridges which traverse the lower lying areas. Owing to the complex topography, the worst winds will vary in direction from place to place depending on the siting of individual buildings and the amount of local shelter. Depending on the exposure of the site and the amount of local shelter, driving rain in West Lothian could be experienced from almost any point of the compass but in general, the worst directions are likely to be from the quadrant between south and west.

Evapotranspiration

Estimates for West Lothian of the water loss due to evaporation and transpiration can only be approximate and, as in the case of the other meteorological parameters, the actual values for a particular place will depend very largely on the local topography etc.

Estimated average monthly totals of evapotranspiration for the months of the growing season, with cumulative totals in inches for summer and winter, are given below for West Lothian. These values have been taken from "Irrigation" - Bulletin No. 138 of the Ministry of Agriculture, Fisheries and Food.

Average Values of Evapotranspiration (P.T.) in inches

<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Summer</u>	<u>Winter</u>	<u>Year</u>
1.70	2.80	3.25	3.10	2.50	1.40	14.75	2.90	17.65

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Comparing the above values with the averages of rainfall given in Tables 1 and 1A it can be seen that there is a risk of a soil water deficit in the spring and early summer over the lower lying drier parts of West Lothian. The risk will be greatest after a dry winter and the balance may not be restored until the rains of the late summer and autumn.

2. TEMPERATURE

In winter, temperatures over the lower lying more densely populated parts of West Lothian are comparable with those of London or other places near the east coast. However, the rise of temperature at the end of winter is much slower in West Lothian than it is in the south and consequently, although not much more severe than in the south, the winters last longer and spring is later and cooler than it is in the south. In summer and early autumn, temperatures in West Lothian are several degrees lower than they are in the south.

The temperature regime in West Lothian is complex and the complete absence of temperature records from places within the county does not help to define it. Generally speaking, day time temperatures are highest on the lower ground, particularly in the more sheltered areas, but this is offset to some extent by a tendency to lower night temperatures in these same areas, except in the immediate vicinity of the Forth coastline. This effect is most marked in still clear weather. It is the result of air which has been cooled by contact with the ground, and which has consequently become relatively dense, draining downhill and stagnating in the valleys and hollows. The cold air is replaced at the higher levels by rather warmer air which has not been in contact with the ground. On a still clear frosty night in winter, the temperature in a valley or hollow in West Lothian could be more than 20 degrees Fahrenheit lower than on the crest of a nearby three or four hundred feet high ridge. As mentioned previously, the undulating nature of the ground is perhaps the most striking features of the topography of West Lothian and it follows that this "frost hollow" effect is widespread throughout the county. The areas most likely to suffer from it are the most sheltered and flatter parts of the basins and valleys of the numerous streams which flow through the county. In windy, cloudy weather, the surface of the ground cools less rapidly at night and the air near the surface is too well-mixed to show the effect.

It should perhaps be explained at this point that air ("shade") temperatures are read from thermometers exposed in louvered wooden screens at a height of four feet above ground level and an 'air frost' occurs when the temperature at four feet falls below 32°F. However, at night time and particularly on clear, calm nights the air in close contact with the ground is nearly always cooled to below the temperature at four feet. Consequently, the incidence of 'ground frost' is much higher than the incidence of air frost. No records of 'ground frost' are available for West Lothian but in any case it would be difficult to provide representative statistics of ground frost as conditions will vary considerably over quite short distances from place to place depending on the composition of the surface (e.g. grass, bare soil, tarmacadam or concrete) and whether a particular site lies in a sheltered place or is exposed to the wind. Because of the excellent insulating characteristics of grass, a grass-covered surface will normally have a higher frequency of ground frosts than the other surfaces mentioned. At a low lying and sheltered grass covered site in West Lothian away from the coast, the average number of days with ground frost per year is likely to be about twice the average number of air frosts.

In dealing with problems involving heat loss, whether it is related to human comfort, heating of buildings or frost penetration, it is necessary to consider the combined effect of temperature and wind. As a general rule, the heat loss will be greatest in the higher parts of the county, on the crests of ridges in the lower parts, and in the upper storeys of high buildings which are more exposed to the wind than their surroundings. The effect of

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wind on frost intensity is illustrated by the following table which is used by the Meteorological Office to define their descriptions of frost.

<u>Term</u>	Corresponding to air temperature (°F)	
	Wind Speed less than 11 m.p.h. (10 knots)	Wind Speed more than 11 m.p.h. (10 knots)
Slight Frost	32° - 27°	32° - 31°
Moderate Frost	26° - 21°	30° - 28°
Severe Frost	20° - 11°	27° - 23°
Very Severe Frost	Below 11°	Below 23°

The absence of shelter from the wind over large areas of West Lothian, particularly the tree-less moorland areas in the south and west, is a very important consideration because it is this factor which contributes to the rawness of the climate in winter and spring and even on warm, sunny days in the summer the strength of the wind in these unsheltered areas leads to the feeling that temperatures are much lower than they actually are.

Averages and Extremes of Air Temperature for several places near to the county border of West Lothian are given in Tables 2, 2A and 2B. The standard period for temperature averages in current use in the Meteorological Office is the 30 years from 1931 to 1960 but all the averages quoted in Table 2 have been estimated from shorter periods or broken periods of records.

The temperature figures quoted for Turnhouse (Edinburgh) Airport and Falkirk should provide a reasonably close guide to the temperature regime in the milder parts of West Lothian near the Forth coastline although the extreme temperatures quoted for Turnhouse Airport are likely to be more typical of the extreme temperatures in low lying sheltered places near the coast. The temperatures quoted for Midcalder should be broadly representative of places in West Lothian at an elevation of 400 to 500 feet while those for Carnwath should be fairly typical of places at an elevation of 600 to 700 feet although there are no doubt some favoured places in the county at an elevation of 600 to 700 feet where the temperatures are more similar to those at Balerno and Midcalder.

The Growing Season

The growing season is defined as that period of the year during which on the average the mean daily temperature is 42°F (5.6°C) or above. The growing season in the most favoured districts of West Lothian near the Forth coastline will usually begin during the last week in March and will last until well after the middle of November giving a length of from 225 to 250 days. At the 400 to 700 feet level, the start is likely to be delayed until early April and the end will come early in November. The very slow rate of accumulation of warmth in the Spring particularly at heights above 400 feet can be noted from the mean temperatures in Table 2. These temperatures also demonstrate the reluctance of autumn to give way to winter dormancy.

The Percentage Amount of Time with Air Temperatures below Certain Limits at Turnhouse Airport is given in Table 2C. These figures should provide a reasonably reliable guide for planning purposes to the durations of air temperatures in the lower lying more densely populated parts of West Lothian.

The Numbers of Days with Maximum Air Temperatures exceeding 60°F, 65°F, 70°F, 75°F and 80°F at Turnhouse Airport are given in Table 2D. Again, these data should be fairly typical of the lower lying, more densely populated parts of West Lothian. The Number of Days with Air Frost, the longest periods of continuous frost, and the average and extreme dates of the first and last air frosts for certain representative stations near to West Lothian are given in Tables 2E and 2F.

A Table for converting degrees Fahrenheit to degrees Centigrade is given at Table 2G.

3. SUNSHINE

West Lothian has a fairly good sunshine record particularly when its northerly latitude is taken into account. No measurements of sunshine duration are available from places within the county but the average annual duration of sunshine is likely to range from about 1315 hours per year in the flatter drier parts of the county near the Forth coastline to about 1270 hours in the higher wetter parts of the county. Estimated monthly averages of sunshine duration (in hours) for altitudes of 100 feet and 600 to 700 feet above sea level are given below but it should be borne in mind that these averages will relate only to places where the horizon is not obstructed by nearby hills, buildings or trees with an elevation exceeding about 3 degrees.

Table 3

100 feet above mean sea level

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Year</u>
Monthly Total	50	70	100	145	180	185	160	135	120	90	55	35	1,325 hours
Daily Mean	1.6	2.5	3.2	4.8	5.8	6.2	5.2	4.4	4.0	2.9	1.8	1.1	3.6 hours

600 to 700 feet above mean sea level

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Year</u>
Monthly Total	50	70	100	135	170	175	145	135	115	90	55	35	1,275 hours
Daily Mean	1.6	2.5	3.2	4.5	5.5	5.8	4.7	4.4	3.8	2.9	1.8	1.1	3.5 hours

The sunniest places in West Lothian should have an average annual duration more or less the same as the Central London districts of Kingsway and Regent's Park which have 1,359 hours and 1,353 hours per year respectively. However, there is a seasonal difference between West Lothian and Central London in that the sunnier parts of West Lothian will normally have a longer duration of sunshine during the winter and early spring but London will have the better record during the summer.

The path of the sun across the sky depends on the latitude and the time of year. Figure 3 is a solar chart for latitude 56 degrees North which shows the elevation and azimuth of the sun at various times of day, for the solstices, equinoxes and for certain intermediate dates. For a given site the various obstructions can be plotted on the chart and their effect in cutting off the sun's radiation at various times can then be evaluated. In winter for example, a hill to the south in West Lothian with an elevation greater than $10\frac{1}{2}$ degrees would cut off practically all the sunshine.

4. WINDS

At an open level site near the Forth coastline of West Lothian, the average wind speed near the ground is of the order of 12 m.p.h. Over the Forth itself the wind speed is appreciably higher owing to funnelling effects and the lack of surface obstructions. The average wind speed near the water surface is probably nearer 15 m.p.h. As mentioned previously, the topography of the county exposes much of it to the full effect of the wind and local increases in the general wind speed are experienced on ridges or where features of the landscape form a wind funnel. There is a considerable variation in shelter to the wind from place to place depending on the lie and orientation of the high ground but the general windiness is one of the most unpleasant features of the climate and there is no doubt that the preservation of sheltering woodland and the planting of large numbers of new trees is of the utmost importance particularly in the higher more windswept districts. Large areas of West Lothian still have an attractive rural appearance and apart from sheltering buildings and houses from wind and weather, absorbing the sound of traffic, screening the houses from the roads and "bings" and providing land marks in new development areas, the trees would help to maintain the very desirable "country look".

In the "average" year, about 45 to 50 per cent of all winds are likely to blow from directions in the quadrant between south and west. However, in common with other places on the east coast of Scotland, West Lothian will

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have a very high frequency of cold winds from between north east and east in the spring and early summer and winds from this sector are likely to be the prevailing winds during this period of the year.

A special mention of the high gustiness of winds from between south and west should be made and fine sunny days in the summer are often marred by the boisterous nature of winds from these directions. The gustiness is usually greatest in the middle of the afternoon when the speed reached in gusts is often more than twice the average wind speed.

No wind records are available from West Lothian but fairly flat, open sites near the coast are likely to experience wind directions and speeds very similar to those recorded at Turnhouse (Edinburgh) Airport. The Pentland Hills immediately to the south of Turnhouse Airport give some shelter to strong winds from the south and places near the coast in West Lothian which lie much further away from this sheltering influence may have a higher incidence of strong winds from the south, particularly high gusts of wind.

Owing to the complex topography, it is not possible to generalise about the wind speeds and directions in the higher parts of West Lothian away from the coast. However, the high wind speeds recorded at the Royal Observatory, Blackford Hill, Edinburgh which lies on a very exposed ridge at an elevation of 450 feet on the south side of the city, serve as a useful indication of the high speeds likely to be experienced at similar exposed sites at quite moderate elevations in West Lothian. A statistical treatment of the highest mean hourly wind speeds (i.e. the highest wind speeds averaged over the 60 minutes between hours) and highest gusts recorded in each hour over a long period of years at the Royal Observatory, Blackford Hill, Edinburgh gives the following results.

- A. Maximum Mean Hourly Wind Speeds at 33 feet above the ground likely to be exceeded only once in the stated number of years:

<u>10 years</u>	<u>20 years</u>	<u>50 years</u>	<u>100 years</u>
58 m.p.h.	60 m.p.h.	63 m.p.h.	67 m.p.h.

- B. Maximum Gust Speeds at 33 feet above the ground likely to be exceeded only once in the stated number of years:

<u>10 years</u>	<u>20 years</u>	<u>50 years</u>	<u>100 years</u>
99 m.p.h.	104 m.p.h.	109 m.p.h.	114 m.p.h.

It follows that special care should be taken in the design of buildings and the specifications of glass window panes etc. and advice on extreme wind speeds for design purposes should be obtained from the Meteorological Office.

A gale is said to occur when the average wind speed near the ground reaches 39 m.p.h. or more. A gale becomes "severe" when the average wind speed exceeds 46 m.p.h. During a gale, gusts of over 50 m.p.h. are common and may exceed 100 m.p.h. in a severe gale. The duration of a high gust of wind is of the order of 3 to 5 seconds but nevertheless, gusts are usually responsible for the more common types of "gale damage", e.g. the removal of roof tiles and chimney pots, blown-down fences and hoardings, damage to trees, crops and glass window panes etc. Most gales in West Lothian will blow from directions between south and west but easterly gales, although much less frequent, are not uncommon.

Annual and Seasonal Frequencies of Wind Direction and Speed for Turnhouse (Edinburgh) Airport are given in Tables 4 and 4A.

Actual and Average Numbers of Days with Gales at Turnhouse Airport are given in Table 4B.

5. FOG

On the whole, most of the east coast of Scotland experiences very good visibility and its remoteness from the industrial and populous areas of Great Britain and their smoke-soiled air means that smoke fogs are relatively unknown except in the immediate surroundings of Edinburgh, Dundee and Aberdeen. Although thick fogs (visibility less than 220 yards) are likely to occur in West Lothian on about 20 days per year, the persistence of thick fog for more than a few hours is a fairly rare event especially when West Lothian is compared say with Glasgow, London or the Midlands of England.

No visibility records are available for West Lothian but the records from Turnhouse Airport, which like West Lothian lies to the west (i.e. mainly to the windward) of Edinburgh, are likely to be broadly representative of most of West Lothian although the Dalmeny/Forth Road Bridge area and the adjacent coastal strip of West Lothian may suffer rather more than Turnhouse from the incidence of North Sea fogs (haars). These North Sea fogs occur from time to time during the period from April to September and are perhaps the most unpleasant type of fog in that they often ruin potentially brilliantly fine days during the spring and summer. The basic cause of these fogs is the moistening and cooling of warm air from the Continent by the cold waters of the North Sea and the Firth of Forth. Haars are especially prevalent during the spring and summer following a particularly cold winter when the sea temperature of the coastal waters is well below average. The haar is normally fairly shallow. When it occurs at ground level in the lower parts of West Lothian near the coast, the higher districts may be in sunshine above it. Frequently by the time it has reached West Lothian, the haar has lifted into an unbroken layer of low stratus cloud, obscuring the higher ground and buildings but with reasonably good visibility beneath it. When it reaches the ground, visibilities of less than 25 yards are not unknown. Occasionally, the haar may have sufficient depth to give rise to drizzle, particularly when it encounters rising ground. During daylight hours, the sun's heat tends to "burn off" the haar. The thinner haars may disappear with dramatic suddenness leaving a cloudless sky but they are likely to reform again towards sunset. The deeper haars may persist all day, a frustrating situation which is not helped by the knowledge that places a few miles further inland or further west are enjoying glorious sunshine.

The higher hills or a long land track tend to break up the haar, and areas to the west of the county, particularly those which are sheltered from the east by the Pentlands, suffer less from haar than do the eastern parts of the county or those parts with no high ground to the east of them.

The areas most prone to winter fogs are the lower lying more densely built up areas of West Lothian particularly those near the Forth. Thick fogs during the winter half year are usually associated with calm or light easterly winds but light westerly winds sometimes thicken the fogs with industrial and domestic smoke from Glasgow, Falkirk and Grangemouth and other places in the Forth-Clyde valley. There are a few occasions in most winters when low cloud reduces visibility on the roads traversing the high ground in West Lothian but visibility on these occasions is seldom bad enough to impede seriously the flow of traffic.

In the summer half year, thick fogs are nearly always associated with light easterly winds.

In common with Edinburgh, there will be a fairly well marked diurnal variation in poor visibility, the worst visibilities being experienced between about midnight and 9 a.m. The months of November and December usually have the highest frequency of thick fogs.

Percentage Frequencies of Occurrence of Visibilities less than 1,100 yards according to month and hour are given for Turnhouse Airport in Table 5.

The variations of poor visibilities with wind directions are given in Table 5A.

The number of days and hours with thick fog are given for Turnhouse Airport in Table 5B.

/ 6. SNOW

6. SNOW

In West Lothian, as elsewhere in the British Isles, the incidence of snow falling and the persistence of snow cover are two of the most variable of all the meteorological elements. For example, in the severe winter of 1962/63 there were 39 mornings with snow lying on the ground at Turnhouse Airport compared with only 2 mornings during the following winter of 1963/64.

At Turnhouse Airport there are, on average, about 28 days per year with snow or sleet falling. The highest number of days in a year during the 17 years from 1949 to 1965 with snow or sleet falling is 46 days during 1965 and the lowest number of days in a year is 11 days during 1953. Most of the days with snow-fall occur in December, January, February and March but snow can fall on low ground in West Lothian as late as May or as early as October, although snow falling in May or October seldom lies on the ground for any length of time.

Up to heights of about 200 feet, there is not much variation from place to place in the incidence of snowfall and the Turnhouse Airport figures of the number of days of snow or sleet falling can be taken as reasonably representative of the lower lying parts of West Lothian. The Meteorological Office at Turnhouse Airport is the only weather station in the Lothians keeping a 24 hour watch on the weather and is therefore the only weather station for which complete records of snow falling at any time of the day or night are available. However, the number of days with snow falling increases fairly rapidly with the height above sea level and as a good approximate rule, there is one day more per year with snow falling in West Lothian for each 50 feet of elevation above 200 feet.

Whether snow will lie, after it has fallen, in sufficient depth to cause difficulty to transport, depends on a number of complex factors but a greater height above sea level and a north or east facing aspect of the surface will certainly increase the number of days with snow lying. As most of the slopes in West Lothian face north or east, the persistence of snow cover can be a nuisance particularly over the high ground. No systematic records are available but after a fall of snow in West Lothian, the variation in snow cover and depth between the lower lying parts of the county near the Forth and over the higher parts of the county is often quite remarkable.

During a severe winter with snow lying on the ground, the partial thaws during the daytime do little to clear the roads traversing the higher ground in the county where the snow becomes compacted and even more treacherous to road users especially at night when the compacted snow or wet parts of the road have an icy surface. There is the further point that the daily expansion and contraction caused by the freezing and thawing processes plays havoc with the tarmacadam road surfaces which often need extensive repairs after a severe winter. Because of its penetration and other characteristics, rain is much the best thawing agent but it should be remembered that precipitation falling in temperatures up to about 36 degrees Fahrenheit will almost certainly fall as snow.

It should be mentioned that in the Meteorological Office, a 'day with snow lying' is counted only when half or more of the ground surrounding the weather station is covered with snow and the snow depth is only measured on these occasions. The depths of snow measured daily at 9 am relate to the uniform "undrifted" depth. The criterion "half or more than half the ground covered" is difficult to apply at stations where the view is restricted and small depths of snow may accumulate to cover more than half the ground locally in a sheltered site when it would not do so at an open airfield. This may well account for the occasional considerable differences between Turnhouse Airport and the Royal Botanic Garden, Edinburgh (see Table 6A) particularly in the smaller depths where general considerations would lead one to expect similar figures at both places.

The Actual and Average Number of Days with Snow or Sleet Falling at Turnhouse Airport are given in Table 6.

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The Numbers of Mornings per Winter with Snow Lying at Specified Depths are given in Table 6A for the Royal Botanic Garden, Edinburgh, Turnhouse Airport and Carnwath, Lanarkshire. These figures should give a reasonably reliable guide to the variation of snow cover and depths between places at similar elevations in West Lothian.

Monthly Frequencies of Snow Depths are given in Table 6B for the Royal Botanic Garden, Edinburgh and for Carnwath.

7. RELATIVE HUMIDITY

In West Lothian as elsewhere in the British Isles, the relative humidity reaches 90 per cent or thereabouts on most nights of the year. As a good general rule, the highest values of relative humidity occur in association with the lowest air temperature of the day i.e. usually around dawn, while the lowest values of relative humidity occur in association with the highest air temperatures of the day i.e. usually in the middle of the afternoon. The main departures from this general rule occur in misty or foggy weather or when rain is falling.

In addition to the well marked diurnal range of relative humidity, there is also a change from season to season in that relative humidities are higher for a longer period of time during the winter months and lower for a longer period of time in the months of April, May and June.

No records of relative humidity are available from West Lothian but one would not expect a significant difference in the relative humidity regime from place to place within the county, although considerable differences could exist at a particular time of day depending on the local weather prevailing at the time. For example, the lower lying parts of the county near the Forth could be shrouded in haar with high relative humidities while places away from the coast were enjoying bright sunshine with comparatively low relative humidities.

Turnhouse Airport is the nearest place to the county for which detailed records of relative humidity, wet bulb temperatures etc. are available and the Turnhouse Airport data quoted in Tables 7, 7A and 7B should be broadly representative of West Lothian.

Average Values of Relative Humidity and Corresponding Air Temperatures at certain times of the day are given in Table 7.

The Percentage Amount of Time with Wet Bulb Temperatures below certain limits is given in Table 7A.

The Absolute Highest Wet Bulb Temperatures and the Highest Wet Bulb Temperatures associated with Relative Humidities of 100 per cent are given in Table 7B.

8. THUNDERSTORMS

As mentioned previously in the section dealing with rainfall, West Lothian has a low incidence of thunderstorms. The average number of days with thunderstorms at the nearest recording station at Turnhouse Airport is seven days per year but in some years a thunderstorm is a rare event. For example, only one thunderstorm occurred at Turnhouse Airport in each of the years 1955 and 1957. It is rather unusual for thunderstorms to occur in West Lothian during the months from October to April and in the 17 years (1949 to 1965) for which records are available for Turnhouse Airport, it is interesting to note that a thunderstorm has never occurred in March. Most of the thunderstorms in West Lothian occur during the months of May to September but the 17 year average for each of these months works out at only one day with a thunderstorm per month.

There are no detailed records of thunderstorms from the high ground to the south and west of the county but these areas will have a higher incidence of thunderstorms than the lower lying parts.

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- | | |
|---|---|
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TABLE 1

MONTHLY AND ANNUAL AVERAGES OF RAINFALL (INCHES) 1916 TO 1950 FOR PLACES IN THE WEST LOTHIAN AREA

Station	Ht. (Ft)	N.G.R.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Falkirk	105	NS(26) 879803	4.10	2.92	2.42	2.05	2.60	2.25	3.22	3.44	3.22	3.93	3.59	3.45	37.19
Falkirk, Kerse	18	NS(26) 912817	3.66	2.45	2.12	1.85	2.45	2.05	3.02	3.29	2.96	3.56	3.22	2.96	33.59
Laurieston, Inglewood	133	NS(26) 914794	4.03	2.66	2.39	2.06	2.66	2.32	3.40	3.42	3.31	3.97	3.54	3.37	37.13
Lochoote near Torphichen	550	NS(26) 974737	3.75	2.57	2.38	2.12	2.74	2.32	3.24	3.41	3.26	3.83	3.44	3.03	36.09
Grange near Linlithgow	450	NT(36) 000787	3.22	2.23	2.05	1.79	2.60	2.15	3.16	3.36	2.82	3.41	2.91	2.73	32.43
Dalmeny House	20	NT(36) 163779	2.55	1.74	1.70	1.66	2.20	1.99	2.97	3.24	2.67	2.89	2.48	2.10	28.19
Uphall No. 8	577	NT(36) 024708	3.52	2.38	2.21	2.09	2.52	2.29	3.17	3.45	3.18	3.67	3.29	2.98	34.75
Middleton Hall	350	NT(36) 061716	3.43	2.38	2.10	2.06	2.46	2.20	3.13	3.49	3.13	3.56	3.11	2.79	33.84
Harperrig	900	NT(36) 102612	4.17	2.90	2.70	2.63	2.90	2.58	3.42	4.03	3.60	4.18	3.80	3.72	40.63
Addiewell	620	NT(36) 001626	4.00	2.61	2.28	2.29	2.58	2.36	3.34	3.60	3.63	3.98	3.52	3.50	37.69

Blackford Hill, Edinburgh	441	NT(36) 259706	2.45	1.68	1.60	1.62	2.21	1.88	3.03	3.15	2.55	2.83	2.42	2.11	27.53
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TABLE 1A

ESTIMATED MONTHLY AND ANNUAL AVERAGES OF RAINFALL 1916 TO 1950 FOR PLACES IN THE WEST LOTHIAN AREA

Station	N.G.R.	Ht. (ft)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year (inches)
Grangemouth Park	NS(26) 930816	15	3.69	2.41	2.14	1.87	2.48	2.10	3.09	3.36	2.99	3.59	3.26	2.95	33.93
Bathgate, North- bank Filters	NS(26) 981692	640	4.12	2.72	2.41	2.33	2.79	2.48	3.57	3.76	3.69	4.07	3.57	3.30	38.81
Stonerigg Filters	NS(26) 933676	620	3.87	2.59	2.23	2.15	2.59	2.34	3.29	3.58	3.40	3.98	3.40	3.11	36.53
Carribber Reservoir	NS(26) 972749	350	3.58	2.49	2.18	2.04	2.67	2.28	3.27	3.41	3.19	3.69	3.23	3.09	35.12
Cockleroy Reservoir	NS(26) 994749	521	3.62	2.48	2.23	2.09	2.73	2.30	3.33	3.50	3.23	3.66	3.26	3.01	35.44
Preston House	NS(26) 995758	350	3.65	2.47	2.25	2.11	2.79	2.33	3.36	3.54	3.25	3.70	3.29	3.04	35.78
Beecraigs	NT(36) 013743	477	4.00	2.71	2.47	2.35	3.06	2.59	3.69	3.81	3.57	4.05	3.61	3.34	39.25
Craiglenroan	NT(36) 001766	290	3.32	2.30	2.11	1.84	2.68	2.21	3.26	3.46	2.91	3.51	3.00	2.81	33.41
West Calder, Westwood	NT(36) 014643	480	3.65	2.39	2.12	2.12	2.43	2.19	3.09	3.33	3.30	3.72	3.26	3.12	34.72
Pateshill Reservoir	NS(26) 984595	939	4.48	2.92	2.54	2.58	2.87	2.66	3.76	4.06	4.06	4.48	3.93	3.93	42.27
Uphall No. 7	NT(36) 018712	640	3.57	2.41	2.23	2.12	2.58	2.34	3.22	3.50	3.26	3.76	3.36	3.04	35.39
Midcalder	NT(36) 053676	400	3.37	2.25	2.09	2.02	2.42	2.12	3.15	3.21	3.08	3.40	3.05	2.95	33.11
Crosswood	NT(36) 056575	950	4.18	2.84	2.44	2.52	2.80	2.56	3.61	3.90	3.86	4.35	3.82	3.74	40.62
Morton	NT(36) 074632	749	3.89	2.65	2.38	2.38	2.77	2.46	3.54	3.73	3.66	3.97	3.46	3.45	38.45
Turnhouse Airport	NT(36) 159739	114	2.43	1.65	1.56	1.59	2.16	1.86	2.91	3.10	2.54	2.78	2.37	2.02	26.97
Balerno	NT(36) 147651	700	3.67	2.49	2.30	2.30	2.74	2.37	3.63	3.71	3.45	3.83	3.37	3.23	37.09

TABLE 1B

Cumulative Frequencies of Daily Rainfall, in inches, 35 years from 1931 to 1965

GRANGE, LINLITHGOW, WEST LOTHIAN

Daily totals (inches)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	All Months
3.78					1								1
2.96							1						1
2.00 or more					1		1	1		1			4
1.90 " "					1		1	1		1			4
1.80 " "					1		2	1		1			5
1.70 " "					2		3	1		1	1	1	9
1.60 " "					2		4	2		1	1	1	11
1.50 " "					2		5	3	3	2	1	1	17
1.40 " "					3	1	7	4	5	3	1	1	25
1.30 " "			1		3	1	7	5	5	3	2	2	29
1.20 " "			1		4	1	7	7	10	7	3	2	42
1.10 " "			1	1	4	1	12	11	12	9	5	2	58
1.00 " "			1	1	6	2	15	16	13	11	7	6	78
0.90 " "	2	3	2	2	8	4	18	19	14	15	10	7	104
0.80 " "	11	4	3	4	12	8	24	25	16	16	17	13	153
0.70 " "	20	7	5	6	16	13	32	36	29	24	23	17	228
0.60 " "	28	13	11	8	22	18	40	46	35	35	31	24	311
0.50 " "	35	20	18	16	34	25	60	64	52	56	44	31	455
0.40 " "	69	36	32	36	55	40	92	86	67	75	65	56	709
0.30 " "	107	66	73	62	79	74	131	122	107	115	109	99	1144
0.20 " "	190	121	122	105	140	130	191	188	171	187	172	177	1894
0.10 " "	299	236	227	208	236	238	310	294	290	301	303	323	3265
0.04 " "	427	370	359	352	363	360	437	429	410	453	452	480	4892
0.005 " "	595	548	538	533	521	538	580	602	582	626	640	686	6989
less than .005 inches*	490	441	547	517	564	512	505	483	468	459	410	399	5795
Total No. of Days	1085	989	1085	1050	1085	1050	1085	1085	1050	1085	1050	1085	12784

* Including rainless days.

Example:- The entry at 0.20 inch or more under January (viz. 190) is the total number of days in January in the 35 years from 1931 to 1965 with falls of 0.20 inch or more.

TABLE 1C

Maximum Daily Rainfall in Inches - Grange, Linlithgow - 1912 to 1965

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
Maximum Daily Fall	1.28	1.04	1.39	1.16	3.78	1.48	2.96	3.70	1.58	2.00	1.94	1.76
Year of Occurrence	1918	1919	1950	1961	1941	1931	1951	1920	1956	1949	1917	1953

Example:-

The daily fall of 1.28 inches which occurred in January 1918 is the highest daily fall recorded at Grange, Linlithgow in any January during the period from 1912 to 1965.

TABLE 1D

Number of Hours with Rain (Any Amount) between the hours of 07h. and 17h. Greenwich Mean Time (08h. and 18h. British Summer Time) in each month and year during the 10 years period from 1955 to 1964

at TURNHOUSE (EDINBURGH) AIRPORT

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
1955	67	63	59	18	63	56	26	30	36	58	37	101	614
1956	62	85	53	35	63	77	78	91	54	69	21	112	800
1957	95	63	97	46	69	42	81	87	86	67	97	93	923
1958	79	87	98	74	95	66	87	106	71	55	49	113	980
1959	35	62	62	75	35	70	68	20	26	62	123	105	743
1960	106	65	84	73	52	70	125	92	65	118	77	70	997
1961	83	85	67	91	48	62	54	107	99	94	79	99	968
1962	107	88	58	92	83	62	62	124	76	54	96	96	998
1963	83	71	100	102	116	90	79	123	68	70	133	64	1099
1964	64	57	101	110	101	62	65	115	82	50	90	100	997
10 years total	781	726	779	716	725	657	725	895	663	697	802	953	9119
10 years average	78.1	72.6	77.9	71.6	72.5	65.7	72.5	89.5	66.3	69.7	80.2	95.3	911.9

TABLE 1E

Computed amounts of rain falling in stated times from Bilham's formula

	5 mins. or less	10 mins. or less	15 mins. or less	20 mins. or less	30 mins. or less	45 mins. or less	1 hour or less	2 hours or less	3 hours or less	4 hours or less	5 hours or less	6 hours or less	9 hours or less	12 hours or less	18 hours or less	24 hours or less
1 day per annum	.18	.23	.28	.31	.36	.41	.46	.58	.66	.72	.77	.82	.93	1.02	1.16	1.26
1 day per 2 yrs.	.24	.31	.36	.40	.46	.52	.58	.72	.82	.90	.96	1.01	1.15	1.26	1.43	1.56
1 day per 5 yrs.	.33	.43	.49	.55	.62	.71	.78	.98	1.09	1.19	1.28	1.35	1.53	1.66	1.88	2.04
1 day per 10 yrs.	.43	.54	.62	.68	.77	.88	.97	1.20	1.35	1.47	1.57	1.66	1.87	2.04	2.31	2.51
1 day per 20 yrs.	.54	.68	.78	.85	.97	1.10	1.20	1.47	1.66	1.81	1.93	2.04	2.30	2.51	2.82	3.07
1 day per 40 yrs.	.68	.85	.97	1.06	1.19	1.35	1.48	1.82	2.04	2.22	2.37	2.50	2.82	3.07	3.45	3.75
1 day per 160 yrs.	1.06	1.31	1.49	1.61	1.82	2.06	2.24	2.73	3.07	3.34	3.56	3.75	4.22	4.58	5.15	5.60

The above values were computed from the formula $\log n = 0.0952 + \log t - 3.55 \log (r + 0.1)$ where t = time in hours r = rainfall in inches n = number of occurrences in 10 years

TABLE 2

Estimated Averages of Daily Maximum, Minimum and Mean Temperature
in degrees Fahrenheit for Temperature Recording Stations on the fringe of the
County of West Lothian - (30 years period from 1931-1960)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
<u>FALKIRK</u> (altitude 100 feet)													
Maximum	42.4	44.1	48.4	53.9	60.0	65.5	67.7	66.8	62.5	55.4	48.3	44.6	55.0
Minimum	31.5	32.5	35.0	38.4	42.3	47.9	51.7	51.3	47.4	42.5	37.1	34.3	41.0
Mean	37.0	38.3	41.7	46.2	51.2	56.7	59.7	59.0	54.9	49.0	42.7	39.5	48.0
<u>CARNWATH</u> (altitude 706 feet)													
Maximum	39.6	40.9	45.8	50.7	57.1	62.1	64.3	63.3	58.9	52.2	45.8	42.1	51.9
Minimum	29.0	30.1	32.7	35.4	39.4	44.8	48.4	47.5	44.6	40.1	35.1	32.3	38.3
Mean	34.3	35.5	39.3	43.1	48.3	53.5	56.3	55.4	51.7	46.1	40.5	37.2	45.1
<u>BAIERNO</u> (altitude 700 feet)													
Maximum	41.1	40.9	46.1	51.6	57.8	63.0	65.4	65.1	60.7	54.9	47.3	43.9	53.1
Minimum	30.1	30.0	33.1	36.0	40.3	45.6	48.6	48.9	47.5	43.0	37.1	34.0	39.5
Mean	35.6	35.5	39.6	43.8	49.1	54.3	57.0	57.0	54.1	48.9	42.2	38.9	46.3
<u>MIDCALDER</u> (altitude 400 feet)													
Maximum	41.0	42.4	46.6	51.7	57.4	62.9	65.6	65.0	60.7	53.6	47.4	43.3	53.1
Minimum	30.4	31.1	34.5	37.0	41.2	46.4	49.9	49.2	46.3	42.1	36.0	33.5	39.8
Mean	35.7	36.7	40.5	44.3	49.3	54.7	57.7	57.1	53.5	47.9	41.7	38.4	46.5
<u>TURNHOUSE AIRPORT</u> (altitude 114 feet)													
Maximum	41.8	43.7	47.7	52.8	57.7	63.0	66.1	65.2	61.3	54.7	48.4	43.9	53.9
Minimum	32.1	32.6	35.0	37.5	42.2	47.5	51.2	50.3	47.2	42.6	37.3	35.1	40.9
Mean	37.0	38.2	41.3	45.1	49.9	55.2	58.6	57.7	54.2	48.7	42.8	39.5	47.4

TABLE 2A

Averages of the Highest and Lowest Temperature in Each Month
in degrees Fahrenheit for Temperature Recording Stations on the fringe of the
County of West Lothian

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
<u>FALKIRK</u> (altitude 100 feet) 19 years from 1947 to 1965													
Average of the Highest each Month	52	52	57	63	71	77	77	74	71	65	56	53	80 *
Average of the Lowest each Month	19	19	24	29	33	39	43	41	37	31	25	21	16 **
<u>CARNWATH</u> (altitude 706 feet) 14 years from 1952 to 1965													
Average of the Highest each Month	49	50	56	62	70	73	72	72	69	62	54	51	76 *
Average of the Lowest each Month	12	13	19	23	29	33	35	34	31	25	19	14	8 **
<u>BALERNO</u> (altitude 700 feet) 34 years from 1932 to 1965													
Average of the Highest each Month	50	48	55	61	68	74	73	73	68	61	55	51	77 *
Average of the Lowest each Month	19	20	23	27	32	38	41	41	36	29	25	22	16 **
<u>MIDCALDER</u> (altitude 400 feet) 13½ years from June 1948 to December 1961													
Average of the Highest each Month	52	52	57	63	69	74	74	74	69	64	55	52	78 *
Average of the Lowest each Month	18	18	24	27	31	36	40	38	35	29	25	20	14 **
<u>TURNHOUSE AIRPORT</u> (altitude 114 feet) 17½ years from July 1948 to December 1965													
Average of the Highest each Month	53	53	57	64	69	75	74	73	70	65	57	54	78 *
Average of the Lowest each Month	17	17	22	27	32	37	40	38	35	28	23	19	12 **

* = Average of the Highest EACH YEAR

** = Average of the Lowest EACH YEAR

TABLE 2B

Absolute Highest and Lowest Temperatures in degrees Fahrenheit recorded in Each Month at Temperature Recording Stations on the fringe of the County of West Lothian

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
<u>FALKIRK</u> (altitude 100 feet) 19 years from 1947 to 1965													
Absolute Highest in each Month	57	59	65	68	80	85	86	83	79	77	60	57	86 *
Absolute Lowest in each Month	12	7	8	25	27	34	40	36	30	25	15	14	7 **
<u>CARNWATH</u> (altitude 706 feet) 14 years from 1952 to 1965													
Absolute Highest in each Month	54	56	66	66	76	79	81	83	78	72	56	55	83 *
Absolute Lowest in each Month	0	4	6	19	23	30	31	29	23	19	11	0	0 **
<u>BALERNO</u> (altitude 700 feet) 34 years from 1932 to 1965													
Absolute Highest in each Month	56	59	67	70	76	82	82	80	76	74	61	56	82 *
Absolute Lowest in each Month	7	9	7	21	25	31	35	35	30	17	15	8	7 **
<u>MIDCALDER</u> (altitude 400 feet) 13½ years from June 1948 to December 1961													
Absolute Highest in each Month	56	56	65	68	76	81	82	82	77	75	59	56	82 *
Absolute Lowest in each Month	6	6	17	23	29	30	36	33	29	24	12	10	6 **
<u>TURNHOUSE AIRPORT</u> (altitude 114 feet) 17½ years from July 1948 to December 1965													
Absolute Highest in each Month	58	59	69	68	75	82	81	83	77	76	59	58	83 *
Absolute Lowest in each Month	5	3	13	22	29	32	37	35	27	23	16	8	3 **

* = Absolute Highest During Whole Period

** = Absolute Lowest During Whole Period

TABLE 2C

Percentage Amount of Time with Air ("Shade") Temperatures below
certain limits - degrees Fahrenheit
at TURNHOUSE (EDINBURGH) AIRPORT 9 years 1952 to 1960

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
.	%	%	%	%	%	%	%	%	%	%	%	%	%
32°F or below	24.8	21.9	7.3	3.3	0.2	0.0	0.0	0.0	0.1	1.6	7.1	12.9	6.5
36°F or below	44.9	46.2	19.4	9.1	2.1	0.1	0.0	0.0	0.5	4.4	13.5	26.3	13.7
40°F or below	67.8	67.4	42.2	20.7	6.9	0.9	0.1	0.3	2.0	9.9	28.1	49.1	24.5
46°F or below	88.3	87.1	77.9	51.8	24.1	7.3	1.8	2.9	10.4	27.6	64.1	81.1	43.5
50°F or below	97.0	96.1	92.0	73.1	49.8	23.5	7.0	9.9	23.4	51.8	86.9	93.0	58.3
56°F or below	99.9	99.9	99.3	94.5	80.3	60.7	38.2	41.7	61.3	87.5	99.2	99.7	80.1
60°F or below	100.0	100.0	99.9	98.8	91.5	82.1	66.6	69.4	83.3	96.1	100.0	100.0	90.5
66°F or below			100.0	99.9	98.5	95.3	91.8	92.9	96.4	99.7			97.7
70°F or below				100.0	99.6	98.7	97.2	98.2	99.1	99.9			99.3
76°F or below					100.0	99.9	99.5	99.8	100.0	100.0			99.7
80°F or below						100.0	99.9	100.0					99.9
82°F or below							100.0						100.0

TABLE 2D

Number of Days with Maximum Air Temperatures exceeding 60°F
at TURNHOUSE AIRPORT - 15 years from 1949 to 1963

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Total
1949				5	12	23	27	31	25	12			135
1950					6	26	28	28	12	2			102
1951					3	19	28	26	20	7			103
1952				3	13	18	29	25	7				95
1953			2	1	19	16	30	29	17	2			116
1954					9	15	27	19	12	5			87
1955				3	4	18	28	30	22	6			111
1956				2	17	14	22	16	12	2			85
1957			1	3	12	22	28	25	12	4			107
1958				4	6	16	25	27	27	2			107
1959				3	13	22	31	30	24	13			136
1960				5	22	28	28	26	14	2			125
1961			1	5	8	25	28	27	23	7			124
1962				3	3	25	16	25	8	7			87
1963				2	4	16	21	21	12	4			80
15 year average	0	0	<1	3	10	20	26	26	16	5	0	0	107

Number of Days with Maximum Air Temperatures exceeding 65°F
at TURNHOUSE AIRPORT - 15 years from 1949 to 1963

1949				2	5	10	22	17	14	5			75
1950					1	17	18	16	1				53
1951						6	21	8	4				39
1952				1	7	8	18	13					47
1953				1	5	7	14	17	4				48
1954					4	1	5	7	3				20
1955				1	2	9	24	24	10	1			71
1956					3	7	10	1	4				25
1957					1	13	13	10	1				38
1958				1	1	6	12	13	10				43
1959				1	3	9	24	23	14	7			81
1960					11	19	17	12	6				65
1961					2	6	9	14	10	1			42
1962				1	1	10	11	5	2				30
1963						3	8	5	3				19
15 year Average	0	0	0	1	3	9	15	12	6	1	0	0	47

TABLE 2D (cont.)

Number of Days with Maximum Air Temperatures exceeding 70°F
at TURNHOUSE AIRPORT - 15 years from 1949 to 1963

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Total
1949					2	4	14	5	2				27
1950						10	4	3					17
1951							2	2	1				5
1952					5	4	8	1					18
1953					2	3	0	4	3				12
1954									1				1
1955							14	11	1				26
1956					1	2	1						4
1957						6	5	1					12
1958					1	0	4	1	2				8
1959						3	10	13	8	1			35
1960					1	5	1	2					9
1961						2	0	3	1				6
1962						3							3
1963						1	4	1					6
15 year average	0	0	0	0	1	3	4	3	1	<1	0	0	13

Number of Days with Maximum Air Temperatures exceeding 75°F
at TURNHOUSE AIRPORT - 15 years from 1949 to 1963

1949						1	3	2	1				7
1950						5							5
1951													0
1952							2						2
1953						1	0	1					2
1954													0
1955							6	3					9
1956						1							1
1957						1							1
1958							1						1
1959						1	2	3	2	1			9
1960						3							3
1961								1					1
1962						3							3
1963							1						1
15 year average	0	0	0	0	0	1	1	1	<1	<1	0	0	3

NOTE: During the 15 year period from 1949 to 1963, there was a total of only four days with temperatures exceeding 80°F viz. one day in June 1950, one day in July 1949, one day in July 1955 and one day in August 1961.

TABLE 2E

Numbers of Days of Air Frost (Minimum Air Temperature 32°F or less)
at TURNHOUSE AIRPORT and CARNWATH
during 10 years from 1955 to 1964

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year total
<u>TURNHOUSE AIRPORT - Altitude 11¼ feet</u>													
1955	17	24	23	9	6	0	0	0	0	10	6	12	107
1956	18	21	7	11	3	0	0	0	0	3	8	6	77
1957	15	15	3	4	1	0	0	0	1	0	9	12	60
1958	18	13	17	7	3	0	0	0	0	1	6	12	77
1959	26	11	5	4	3	0	0	0	0	1	6	6	62
1960	18	21	6	2	1	0	0	0	0	2	10	15	75
1961	18	8	3	4	1	0	0	0	0	0	10	22	66
1962	9	7	18	7	0	1	0	0	0	3	11	17	73
1963	22	25	5	1	0	0	0	0	0	2	8	13	76
1964	9	9	8	2	0	0	0	0	1	5	9	14	57
10 year total	170	154	95	51	18	1	0	0	2	27	83	129	730

CARNWATH - Altitude 706 feet

1955	19	25	28	10	8	1	0	1	0	12	8	14	126
1956	21	23	12	18	4	1	0	1	2	4	11	8	105
1957	19	18	1	7	8	4	0	0	4	4	9	14	88
1958	19	17	21	13	5	0	0	0	0	2	12	16	105
1959	25	11	8	6	3	0	0	0	0	1	7	9	70
1960	23	20	6	7	3	0	0	0	3	2	10	20	94
1961	19	9	4	5	2	3	0	0	0	3	12	25	82
1962	15	17	23	10	4	2	0	1	1	4	11	22	110
1963	29	28	8	5	2	0	0	0	1	1	9	14	97
1964	9	10	15	2	0	0	0	3	2	10	12	20	83
10 year total	198	178	126	83	39	11	0	6	13	43	101	162	960

LONGEST PERIODS OF CONTINUOUS AIR FROST

TURNHOUSE AIRPORT: Air Temperatures continuously below freezing point for 6½ days in January 1955.

CARNWATH: Air Temperatures continuously below freezing point for 10 days in February 1955.

TABLE 2F

Average Number of Days of Air Frost (Minimum Air Temperature 32°F or less) at specified Stations

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
<u>TURNHOUSE AIRPORT</u> - altitude 114 feet (10 years 1955 to 1964)													
	17	15	9	5	2	<1	0	0	<1	3	8	13	73
<u>MIDCALDER</u> - altitude 400 feet (10 years 1952 to 1961)													
	19	17	10	7	2	<1	0	0	<1	3	8	13	79
<u>FALKIRK</u> - altitude 100 feet (10 years 1955 to 1964)													
	17	15	9	4	1	0	0	0	0	2	8	14	70
<u>CARNWATH</u> - altitude 706 feet (10 years 1955 to 1964)													
	20	18	13	8	4	1	0	1	1	4	10	16	96

AVERAGE AND EXTREME DATES OF FIRST AND LAST AIR FROSTS

		Average Date of First Air Frost	Average Date of Last Air Frost
TURNHOUSE AIRPORT	(1955-1964)	15th October	9th May
MIDCALDER	(1952-1961)	13th October	11th May
FALKIRK	(1955-1964)	29th October	27th April
CARNWATH	(1955-1964)	24th September	1st June
		Earliest Date of First Air Frost	Latest Date of Last Air Frost
TURNHOUSE AIRPORT	(1955-1964)	21st September	1st June
MIDCALDER	(1952-1961)	26th September	7th June
FALKIRK	(1955-1964)	12th October	21st May
CARNWATH	(1955-1964)	20th August	27th June

NOTE: Air Frosts occurred at CARNWATH on 6th July 1954, 8th August 1955 and 14th August 1962 but these isolated occurrences have not been counted when determining the average, earliest and latest dates quoted above.

Table 2G

Table for Converting Degrees Fahrenheit to Degrees Centigrade

<u>°F.</u>	<u>°C.</u>	<u>°F.</u>	<u>°C.</u>	<u>°F.</u>	<u>°C.</u>
0	minus 17.8	30	minus 1.1	60	15.6
2	minus 16.7	32	0.0	62	16.7
4	minus 15.6	34	1.1	64	17.8
6	minus 14.4	36	2.2	66	18.9
8	minus 13.3	38	3.3	68	20.0
10	minus 12.2	40	4.4	70	21.1
12	minus 11.1	42	5.6	72	22.2
14	minus 10.0	44	6.7	74	23.3
16	minus 8.9	46	7.8	76	24.4
18	minus 7.8	48	8.9	78	25.6
20	minus 6.7	50	10.0	80	26.7
22	minus 5.6	52	11.1	82	27.8
24	minus 4.4	54	12.2	84	28.9
26	minus 3.3	56	13.3	86	30.0
28	minus 2.2	58	14.4	88	31.1

TABLE 4

Annual Percentage Frequency of Wind Direction and Velocity at
TURNHOUSE (EDINBURGH) AIRPORT

Mean Wind Speed	Wind Directions in Degrees (true)												All Directions
	350-10	20-40	50-70	80-100	110-130	140-160	170-190	200-220	230-250	260-280	290-310	320-340	
0 m.p.h.	-	-	-	-	-	-	-	-	-	-	-	-	16.7%
1-3 "	0.3	0.7	0.7	0.5	0.3	0.2	0.2	0.3	0.7	0.9	0.3	0.2	5.3%
4-7 "	0.6	1.1	2.8	1.9	0.7	0.4	0.5	0.6	2.0	2.4	0.8	0.4	14.2%
8-12 "	0.7	1.4	5.9	2.8	1.5	0.8	0.8	1.7	5.8	4.3	1.1	1.4	28.2%
13-18 "	0.4	0.4	2.7	1.0	1.0	0.5	0.6	2.8	6.5	4.4	0.6	0.4	21.3%
19-24 "	0.1	0+	0.3	0.1	0.2	0.1	0.3	1.7	3.0	2.4	0.2	0.1	8.5%
25-31 "		0+	0+	0+	0.1	0+	0.1	1.0	2.0	1.1	0+	0+	4.3%
32-38 "					0+		0+	0.5	0.5	0.2	0+		1.2%
39-46 "							0+	0.1	0.2	0+			0.3%
47-54 "								0+					0+
55-63 "													0.0%

Total 4-12 m.p.h.	1.3	2.5	8.7	4.7	2.2	1.2	1.3	2.3	7.8	6.7	1.9	1.8	42.4%
Total 13-24 m.p.h.	0.5	0.4	3.0	1.1	1.2	0.6	0.9	4.5	9.5	6.8	0.8	0.5	29.8%
Total 25-38 m.p.h.		0+	0+	0+	0.1	0+	0.1	1.5	2.5	1.3	0+	0+	5.5%
Total 39 mph. or more							0+	0.1	0.2	0+			0.3%

Total 4 mph. or more	1.8	2.9	11.7	5.8	3.5	1.8	2.3	8.4	20.0	14.8	2.7	2.3	78.0%
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Notes:- 0+ = less than 0.05%

Under 4 m.p.h. 22.0%

Total 100.0%

The above frequencies have been computed from recordings made 8 times daily at 00h., 03h., 06h., 09h., 12h., 15h., 18h., and 21h. G.M.T. during the 5 year period from 1957 to 1961.

TABLE 4A

Percentage Frequency of Wind Direction and Velocity by Seasons at
TURNHOUSE (EDINBURGH) AIRPORT

S P R I N G

Wind Directions in Degrees (true)

Mean Wind Speed	350- 10	20- 40	50- 70	80- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	All Directions
Under 4 m.p.h.	-	-	-	-	-	-	-	-	-	-	-	-	18.2%
4-12 m.p.h.	1.8	3.1	12.2	6.8	3.0	1.3	1.0	1.7	6.0	4.6	1.9	1.3	44.7%
13-24 m.p.h.	0.5	0.3	5.6	1.3	2.3	0.5	1.0	4.5	7.0	6.9	1.1	0.4	31.4%
25-38 m.p.h.		0+	0+		0.1		0.1	1.5	2.2	1.6			5.5%
39 m.p.h. or more									0.1	0.1			0.2%
Total 4 m.p.h. or more	2.3	3.4	17.8	8.1	5.4	1.8	2.1	7.7	15.3	13.2	3.0	1.7	81.8%

S U M M E R

Under 4 m.p.h.	-	-	-	-	-	-	-	-	-	-	-	-	18.7%
4-12 m.p.h.	1.1	3.4	12.9	3.8	1.5	0.5	0.9	2.3	8.7	8.1	2.2	1.5	46.9%
13-24 m.p.h.	0.4	0.5	3.5	0.3	0.2	0.2	0.6	3.4	9.4	10.6	0.8	0.4	30.3%
25-38 m.p.h.							0.1	0.6	1.8	1.5	0+	0+	4.0%
39 m.p.h. or more								0+	0.1	0+			0.1%
Total 4 m.p.h. or more	1.5	3.9	16.4	4.1	1.7	0.7	1.6	6.3	20.0	20.2	3.0	1.9	81.3%

A U T U M N

Under 4 m.p.h.	-	-	-	-	-	-	-	-	-	-	-	-	24.3%
4-12 m.p.h.	1.1	2.1	6.6	4.5	2.1	1.4	2.1	3.3	8.9	6.4	1.7	1.1	41.3%
13-24 m.p.h.	0.5	0.4	2.2	1.4	0.9	1.0	1.0	5.3	10.6	5.4	0.5	0.7	29.9%
25-38 m.p.h.			0+		0+	0.1	0+	1.3	1.9	0.9	0+	0.1	4.3%
39 m.p.h.								0.1	0.1				0.2%
Total 4 m.p.h. or more	1.6	2.5	8.8	5.9	3.0	2.5	3.1	10.0	21.5	12.7	2.2	1.9	75.7%

W I N T E R

Under 4 m.p.h.	-	-	-	-	-	-	-	-	-	-	-	-	27.2%
4-12 m.p.h.	1.4	1.8	2.9	3.7	2.1	1.6	1.0	2.2	7.5	8.0	1.7	1.0	34.9%
13-24 m.p.h.	0.6	0.6	1.1	1.3	1.4	0.8	1.1	4.9	11.2	4.5	0.6	0.5	28.6%
25-38 m.p.h.			0.1	0+	0.1	0.1	0.3	2.3	4.2	1.2	0.1		8.4%
39 m.p.h. or more							0+	0.5	0.4	0+			0.9%
Total 4 m.p.h. or more	2.0	2.4	4.1	5.0	3.6	2.5	2.4	9.9	23.3	13.7	2.4	1.5	72.8%

Notes:- The above frequencies have been computed from recordings made 8 times daily at 00h., 03h., 06h., 09h., 12h., 15h., 18h., and 21h. G.M.T. during the 5 year period from 1957 to 1961.

0+ = less than 0.05%

TABLE 4B

Actual and Average Number of Days with Gales during
the 16 years from 1949 to 1964
at TURNHOUSE (EDINBURGH) AIRPORT

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Total
1949	6	4	2	2	0	1	0	1	0	1	0	1	18
1950	0	2	0	0	1	0	0	0	1	2	1	0	7
1951	0	1	0	2	0	0	0	0	0	0	0	4	7
1952	3	1	0	0	0	0	0	1	2	3	0	1	11
1953	3	1	0	2	0	0	0	0	1	0	1	0	8
1954	6	2	0	0	0	0	0	0	0	2	6	7	23
1955	1	2	1	0	1	1	0	0	0	0	0	6	12
1956	3	0	2	0	0	1	0	1	1	0	2	4	14
1957	8	2	1	1	0	0	0	1	1	2	1	3	20
1958	2	2	1	0	2	0	0	0	1	1	0	1	10
1959	1	4	0	0	0	1	0	0	0	0	2	3	11
1960	0	2	0	2	0	1	0	0	0	0	1	1	7
1961	2	3	2	0	0	1	1	1	2	1	0	0	13
1962	5	4	0	1	2	1	0	1	0	0	0	3	17
1963	1	0	2	1	0	0	0	0	1	2	1	1	9
1964	1	2	0	0	2	0	1	0	0	0	0	3	9
16 years total	42	32	11	11	8	7	2	6	10	14	15	38	196
16 years average	3	2	1	1	<1	<1	<1	<1	1	1	1	2	12

TABLE 5

Percentage Frequency of Occurrence of Visibilities less than
1,100 yards according to month and hour
at TURNHOUSE (EDINBURGH) AIRPORT

Time G.M.T.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
	%	%	%	%	%	%	%	%	%	%	%	%	%
00h. midnight	5	6	0.6	3	3	3	1	3	3	5	5	7	3.7
01h.	5	6	0.6	3	0.6	4	3	3	2	5	5	7	3.6
02h.	4	6	1	3	1	6	3	3	1	6	4	5	3.7
03h.	4	8	2	3	3	6	5	2	3	6	4	7	4.2
04h.	5	9	3	3	5	9	3	3	3	5	3	5	4.6
05h.	3	8	4	1	5	6	2	4	5	8	3	5	4.4
06h.	1	7	4	2	2	6	2	2	6	6	2	5	3.7
07h.	3	7	6	4	0.6	5	2	2	4	5	4	5	3.9
08h.	3	7	3	1	0.6	3	0.6	1	5	4	7	5	3.3
09h.	3	9	2	0.6	0.6	3	0.6	2	0.6	1	8	7	3.1
10h.	2	10	0.6	0.6	0.6	0.6	0	0.6	0.6	0.6	9	7	2.6
11h.	3	9	0.6	0.6	0.6	1	0	0.6	0.6	0	6	7	2.3
12h. noon	5	7	0	0.6	0	0.6	0	0	0.6	0	3	9	2.1
13h.	2	6	0.6	0.6	0.6	0	0	0	0.6	0	3	12	2.1
14h.	1	5	0	0.6	0	0	0	0.6	0	0	5	10	1.8
15h.	2	3	0	1	0	0	0	0	0	1	6	13	2.2
16h.	3	4	0	0.6	0	0.6	0.6	0	0.6	1	6	14	2.6
17h.	5	5	0.6	1	0	1	0.6	0.6	0.6	1	8	13	3.1
18h.	3	6	1	0.6	0	1	2	1	1	1	7	10	2.9
19h.	3	4	1	1	0.6	1	2	1	0.6	1	7	9	2.7
20h.	2	4	0.6	1	1	3	1	0	0.6	3	7	9	2.7
21h.	1	4	0.6	0.6	2	2	1	0.6	1	3	6	7	2.5
22h.	5	6	1	1	3	3	0.6	1	1	3	8	7	3.2
23h.	4	5	0.6	1	3	3	0	2	2	5	7	8	3.3

Percentage Amount of Total Time in each month with
Visibilities less than 1,100 yards at
TURNHOUSE (EDINBURGH) AIRPORT

3.1 6.3 1.4 1.5 1.4 2.8 1.2 1.4 1.7 2.9 5.4 8.0 3.1

Note: The above frequencies have been computed from hourly observations of
visibility made during the 5 year period from 1957 to 1961

TABLE 5A

Visibility at TURNHOUSE (EDINBURGH) AIRPORT During the Winter half-year
(October to March) and the Summer half-year (April-September),
According to Wind Direction*

Visibility Wind Direction (degrees)	<u>Winter Half-Year</u> % Probability			<u>Summer Half-Year</u> % Probability		
	Less than 440 yards	Less than 1100 yards	Less than 2200 yards	Less than 440 yards	Less than 1100 yards	Less than 2200 yards
350-010	0.2	1	7	0	0.2	0.9
020-040	0.9	2	13	0.8	2	6
050-070	1	3	14	1	4	9
080-100	0.3	2	10	0.5	1	5
110-130	0.5	2	5	0.5	1	3
140-160	0.7	2	4	0	0	0.3
170-190	0.6	0.6	0.9	0	0.4	0.9
200-220	0	0.1	0.3	0	0.1	0.1
230-250	0.2	0.4	2	0.1	0.1	0.3
260-280	0.5	2	5	0.1	0.1	0.3
290-310	0.7	1	5	0	0	0.3
320-340	1	2	5	0	0	0
Calms	11	19	39	3	6	11

* Results derived from hourly observations during the 5 years, 1957-1961

TABLE 5B

Number of Days During the 8 years from 1957 to 1964 on
which Visibility Fell to Below 220 yards (Thick Fog)
at TURNHOUSE (EDINBURGH) AIRPORT

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Total
1957	0	1	1	1	1	0	2	1	0	2	0	0	9
1958	0	0	1	1	1	5	1	1	4	1	6	2	23
1959	3	7	0	0	2	1	0	0	3	6	3	1	26
1960	1	3	1	0	1	0	1	2	0	5	5	6	25
1961	1	1	0	3	1	0	0	0	0	1	4	7	18
1962	4	0	1	2	0	0	0	0	1	3	0	2	13
1963	1	3	2	0	0	3	0	0	0	3	2	2	16
1964	3	1	1	3	1	2	1	0	3	3	5	0	23
8 year total	13	16	7	10	7	11	4	4	11	24	25	20	153
8 year average	2	2	1	1	1	1	1	1	1	3	3	3	19

Number of Hours During the 8 years from 1957 to 1964
in which the Visibility was Below 220 yards
(Thick Fog) at TURNHOUSE (EDINBURGH) AIRPORT

1957	0	2	3	1	1	0	5	2	0	4	0	0	18
1958	0	0	1	4	1	16	1	2	14	3	16	21	79
1959	8	70	0	0	3	1	0	0	10	26	11	1	130
1960	2	13	6	0	1	0	1	6	0	10	21	97	157
1961	4	1	0	8	1	0	0	0	0	1	25	31	71
1962	34	0	1	9	0	0	0	0	2	18	0	12	76
1963	3	8	7	0	0	12	0	0	0	24	10	18	82
1964	9	3	7	13	4	3	1	0	19	8	38	0	105
8 year total	60	97	25	35	11	32	8	10	45	94	121	180	718
8 year average	8	12	3	4	1	4	1	1	6	12	15	23	90

TABLE 6

Actual and Average Number of Days with Snow or Sleet Falling
at TURNHOUSE (EDINBURGH) AIRPORT - 17 years from 1949 to 1965

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Total
1949	2	2	4	1							1	5	15
1950	3	5	2	3	1						3	9	26
1951	8	8	10	7								5	38
1952	13	3	5								3	10	34
1953	2	7	0	1								1	11
1954	5	7	3	1	1						2	3	22
1955	7	14	8	0	3					1	0	6	39
1956	8	14	4	1	1						3	4	35
1957	7	7	1								1	4	20
1958	9	8	13	2								7	39
1959	7	1	1							1	2	1	13
1960	9	10	2									2	23
1961	5	4	2	1							3	10	25
1962	3	8	6	4							2	9	32
1963	17	16	0	1							4	5	43
1964	3	6	6	1	1						1	8	26
1965	11	4	12	1	1						12	5	46
17 years total	119	124	79	24	8					2	37	94	487
17 years average	7	7	5	1	<1					<1	2	6	29

TABLE 6A

Number of Days with Snow Lying at 9 a.m. at Depths
between Specified Limits

TURNHOUSE AIRPORT - Altitude 114 feet									Maximum Depth=6 inches
Depth -- Inches	0-1	2	3-4	5-6	7-8	9-12	13-16	Over 16	Total
Winter of:									
1956-57	4								4
1957-58	11	1	1	2					15
1958-59	10	1							11
1959-60	1	4	6	2					13
1960-61	1	1							2
1961-62	7	2	4						13
1962-63	17	11	6	5					39
1963-64	1	1							2
1964-65	7	8	3						18
1965-66	20	3	1						24
Total	79	32	21	9					141
% Total	56.0	22.7	14.9	6.4					100%

ROYAL BOTANIC GARDEN, EDINBURGH - Altitude 74 feet

Maximum Depth = 9 inches

Winter of:									
1949-50	2								2
1950-51	14	4	3						21
1951-52	20	3	4						27
1952-53	5								5
1953-54	6								6
1954-55	8	4	15		4	2			33
1955-56	18		5						23
1956-57	1								1
1957-58	18		2						20
1958-59	11								11
1959-60	14	2	3						19
1960-61	2	1							3
1961-62	15		1						16
1962-63	34	14	8						56
1963-64	1								1
1964-65	12	6	4						22
1965-66	21	1							22
Total	202	35	45	0	4	2			288
% Total	70.0	12.3	15.6	0.0	1.4	0.7			100%

TABLE 6A (contd.)

CARNWATH - Altitude 706 feet					Maximum Depth = 12 Inches				
Depth - Inches	0-1	2	3-4	5-6	7-8	9-12	13-16	Over 16	Total
Winter of:									
1953-54	16	1	1						18
1954-55	31	4	11						46
1955-56	33	3	2						38
1956-57	12								12
1957-58	16	6	4						26
1958-59	24	4							28
1959-60	11	5	1	5	1				23
1960-61	8								8
1961-62	26	6	2						34
1962-63	13	13	40	19					85
1963-64	13		1						14
1964-65	15	14	4		1	1			35
1965-66	18	4	6	1					29
Total	236	60	72	25	2	1			396
% Total	59.6	15.1	18.2	6.3	0.5	0.3			100.0%

TABLE 6B

ROYAL BOTANIC GARDEN - Altitude 74 feet

Monthly Frequencies for Each Year During the Sixteen Years from 1950 to 1965 of Days with Snow Lying at 9 a.m.
at Depths Between the Specified Limits

DEPTH : Inches	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	Total
NOVEMBER																	
0-1													1			6	7
2																1	1
3-4																	0
5-6																	0
7-8																	0
9-12																	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7	8
DECEMBER																	
0-1	5	1	3			4	1					10	2		3	4	33
2	2												2				4
3-4	2				1							1	2				5
5-6													1				0
7-8																	0
9-12																	0
TOTAL	9	1	3	0	1	4	1	0	0	0	0	11	5	0	3	4	42
JANUARY																	
0-1	2	8	15	1	3	2	3		8	11	3	1	4	23		2	86
2		1	3			2					1			1		3	8
3-4		1	4			10								1			19
5-6		1															0
7-8																	0
9-12																	0
TOTAL	2	10	22	1	3	14	3	0	8	11	4	1	4	25	0	5	113
FEBRUARY																	
0-1		1	3	1	3	3	11		5		10	1	1	8	1	1	49
2											1			11		4	18
3-4							5		2		3			6			20
5-6																	0
7-8																	4
9-12																	2
TOTAL	0	1	3	1	3	14	16	0	7	0	14	2	1	25	1	5	93

TABLE 6B (contd.)

ROYAL BOTANIC GARDEN

DEPTH : Inches	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	Total
MARCH																	
0-1			1			3			5		1					6	16
2		1				1										2	4
3-4																1	1
5-6																	0
7-8																	0
9-12																	0
TOTAL	0	1	1	0	0	4	0	0	5	0	1	0	0	0	0	9	21
APRIL - ALL DEPTHS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 6B (contd.)

CARNWATH - Altitude 706 feet

Monthly Frequencies for Each Year During the Thirteen Years from 1953 to 1965 of Days with Snow Lying at 9 a.m.
at Depths Between the Specified Limits

DEPTH : Inches	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	Total
NOVEMBER														
0-1				2	1		1		2	2	3	1	4	16
2													2	2
3-4										6			3	9
5-6													1	1
7-8														
9-12														
TOTAL	0	0	0	2	1	0	1	0	2	8	3	1	10	28
DECEMBER														
0-1		4	8	3		5		1	7	9	5	4	4	50
2			1						3	1		1	2	7
3-4										1			2	3
5-6										1			1	2
7-8														
9-12														
TOTAL	0	4	9	3	0	5	0	1	10	11	5	5	9	62
JANUARY														
0-1		3	11	14	5	7	19	2	4	1			4	70
2			1	1		1	4	2		3	12		5	29
3-4			3			1		2		1	10		1	16
5-6								2			9			11
7-8														
9-12														
TOTAL	0	3	15	15	5	9	23	6	4	5	31	0	10	126
FEBRUARY														
0-1	5	9	8	10	2	1		7	3	5		5	1	56
2			3	1		4		3		1			5	16
3-4			7	2		3		1			19	1		34
5-6								3			9			12
7-8								1						1
9-12														
TOTAL	5	9	18	13	2	8	0	15	3	6	28	6	6	119

TABLE 6B (contd.)

CARNWATH

DEPTH : Inches	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	Total
MARCH														
0-1			8			6		1		7	1		5	32
2						1					1		3	6
3-4			1								1		3	9
5-6											4			
7-8													1	1
9-12													1	1
TOTAL	0	6	9	0	0	7	0	1	0	7	6	0	13	49
APRIL														
0-1						1				4	1			7
2														
3-4														
5-6														
7-8														
9-12														
TOTAL	0	0	0	1	0	1	0	0	0	4	1	0	0	7

TABLE 7

Average Values of Relative Humidity and Dry Bulb Temperature at 03h., 09h.,
15h., and 21h. G.M.T. at TURNHOUSE (EDINBURGH) AIRPORT -
11 years from 1952 to 1962

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
<u>At 03h. G.M.T.</u>													
Average Relative Humidity per cent	87	87	87	88	89	90	92	92	91	89	89	88	89%
Average Dry Bulb Temperature °F.	35.8	36.0	38.2	40.3	44.6	49.0	52.3	52.3	50.1	46.6	41.1	38.1	43.7°F
<u>At 09h. G.M.T.</u>													
Average Relative Humidity per cent	87	86	82	76	74	75	78	81	83	86	89	87	82%
Average Dry Bulb Temperature °F.	35.7	36.3	40.5	46.5	51.5	56.2	58.7	58.1	54.5	48.9	41.3	38.3	47.2°F
<u>At 15h. G.M.T.</u>													
Average Relative Humidity per cent	81	76	70	64	64	67	70	71	72	75	81	84	73%
Average Dry Bulb Temperature °F.	39.8	41.9	46.0	51.5	56.3	60.1	62.9	62.5	59.1	53.6	46.1	41.1	51.7°F
<u>At 21h. G.M.T.</u>													
Average Relative Humidity per cent	86	86	83	82	81	82	85	87	87	87	88	87	85%
Average Dry Bulb Temperature °F.	36.2	37.2	40.5	44.3	49.0	54.3	56.6	55.8	52.5	47.9	42.0	38.8	46.3°F

TABLE 7A

Percentage Amount of Time with Wet Bulb Temperatures below certain limits
 - degrees Fahrenheit
 at TURNHOUSE (EDINBURGH) AIRPORT - 9 years 1952-1960

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
	%	%	%	%	%	%	%	%	%	%	%	%	%
32°F. or below	31.3	30.2	10.8	4.1	0.6	0.0	0.0	0.0	0.3	2.1	8.3	16.3	8.6
34°F. or below	43.0	44.2	18.8	7.6	1.6	0.0	0.0	0.0	0.5	3.8	11.8	23.9	12.8
36°F. or below	55.6	57.0	29.1	12.3	3.3	0.1	0.0	0.0	0.7	5.4	17.2	33.5	17.7
38°F. or below	66.5	66.9	42.1	20.9	6.2	0.5	0.0	0.1	1.5	9.1	24.9	46.7	23.6
40°F. or below	75.4	74.4	56.3	31.9	10.4	1.4	0.2	0.4	3.1	14.3	36.4	60.3	30.2
42°F. or below	82.2	81.1	69.1	45.5	16.6	3.4	0.5	1.0	5.9	20.0	49.3	71.9	37.0
44°F. or below	88.2	87.1	81.3	58.5	26.1	6.6	1.3	2.0	9.5	28.3	64.5	80.9	44.3
46°F. or below	92.8	92.2	89.9	72.3	38.8	14.0	2.6	4.0	15.1	40.2	77.2	87.3	52.0
48°F. or below	96.8	96.8	95.2	83.4	55.0	25.4	5.8	8.1	24.7	53.6	87.3	92.5	60.2
50°F. or below	99.2	99.3	97.8	92.2	72.2	40.1	12.6	16.4	37.1	68.2	95.0	96.7	68.8
52°F. or below	99.9	99.9	99.5	97.4	83.8	54.8	23.5	29.9	52.7	80.8	98.4	98.7	76.5
54°F. or below	100.0	100.0	99.8	99.2	91.6	70.5	41.4	44.7	66.9	89.8	99.9	99.7	83.6
56°F. or below			100.0	99.7	96.1	83.5	62.6	66.2	79.3	95.2	100.0	100.0	89.9
58°F. or below				99.8	97.9	91.4	80.3	78.9	89.5	97.7			94.7
60°F. or below				100.0	99.3	95.1	89.6	89.1	95.5	99.2			97.4
62°F. or below					99.9	97.9	94.9	95.7	98.1	99.9			99.0
64°F. or below					99.9	99.4	97.5	97.9	99.3	100.0			99.6
66°F. or below					100.0	99.9	99.0	99.4	99.7				99.9
68°F. or below						99.9	99.7	99.8	99.9				99.9
70°F. or below						100.0	99.9	100.0	100.0				99.9
72°F. or below							99.9						99.9
74°F. or below							100.0						100.0

TABLE 7B

Absolute Highest Values of Wet Bulb Temperature and Highest Values
of Wet Bulb Temperature Associated with Relative Humidities of
100 per cent extracted from Hourly Readings of Wet Bulb
Temperature made at TURNHOUSE (EDINBURGH) AIRPORT
during the 9 years from 1952 to 1960 -
(degrees Fahrenheit)

	<u>Absolute Highest</u> <u>Value of Wet</u> <u>Bulb Temperature</u> °F.	<u>Highest Value of</u> <u>Wet Bulb Temperature</u> <u>Associated with Relative</u> <u>Humidity of 100 per cent</u> °F.
January	54	52
February	54	52
March	56	54
April	60	54
May	66	62
June	70	66
July	74	66
August	70	66
September	70	66
October	64	62
November	56	56
December	56	56
Year	74	66

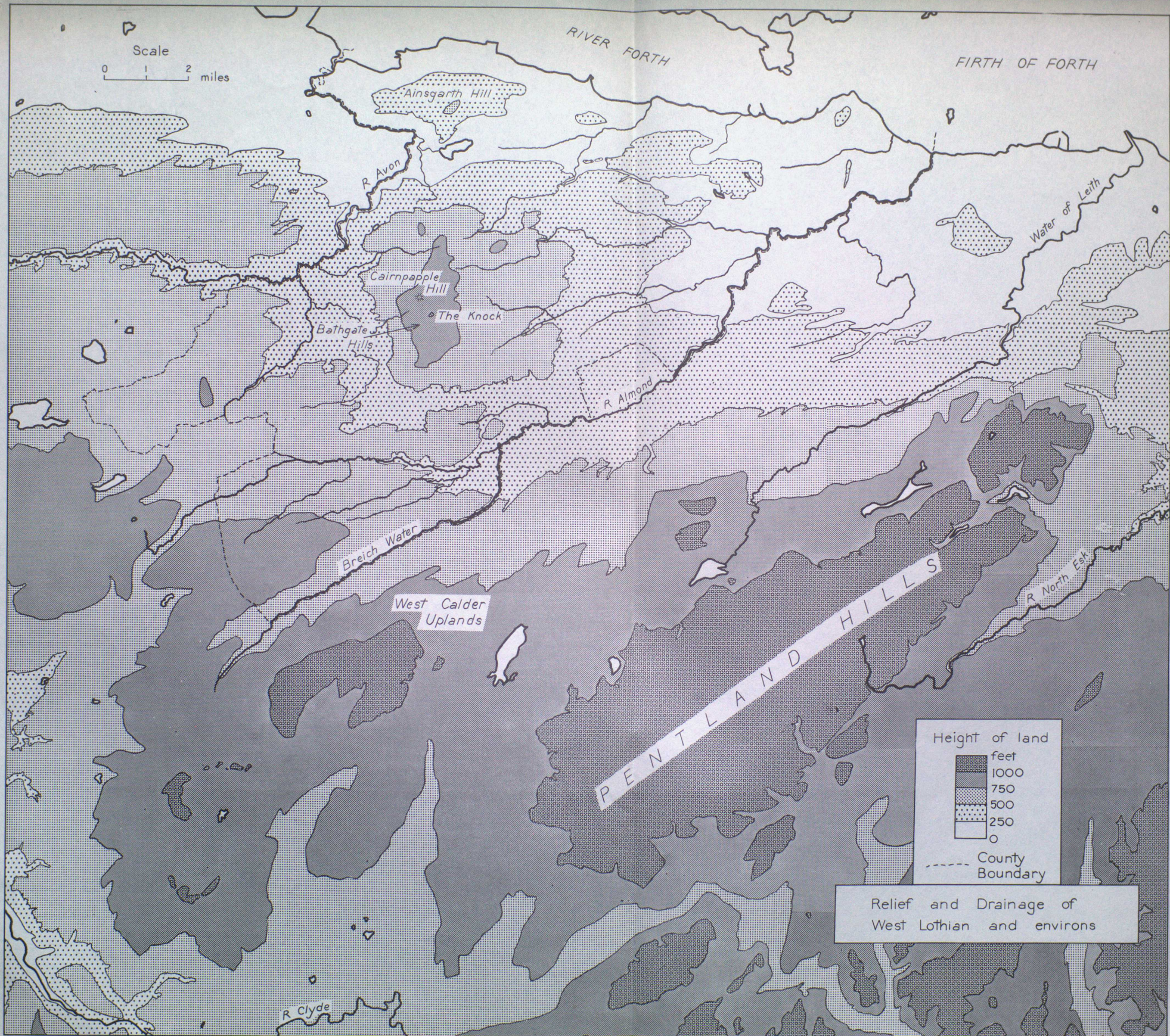


Fig 1

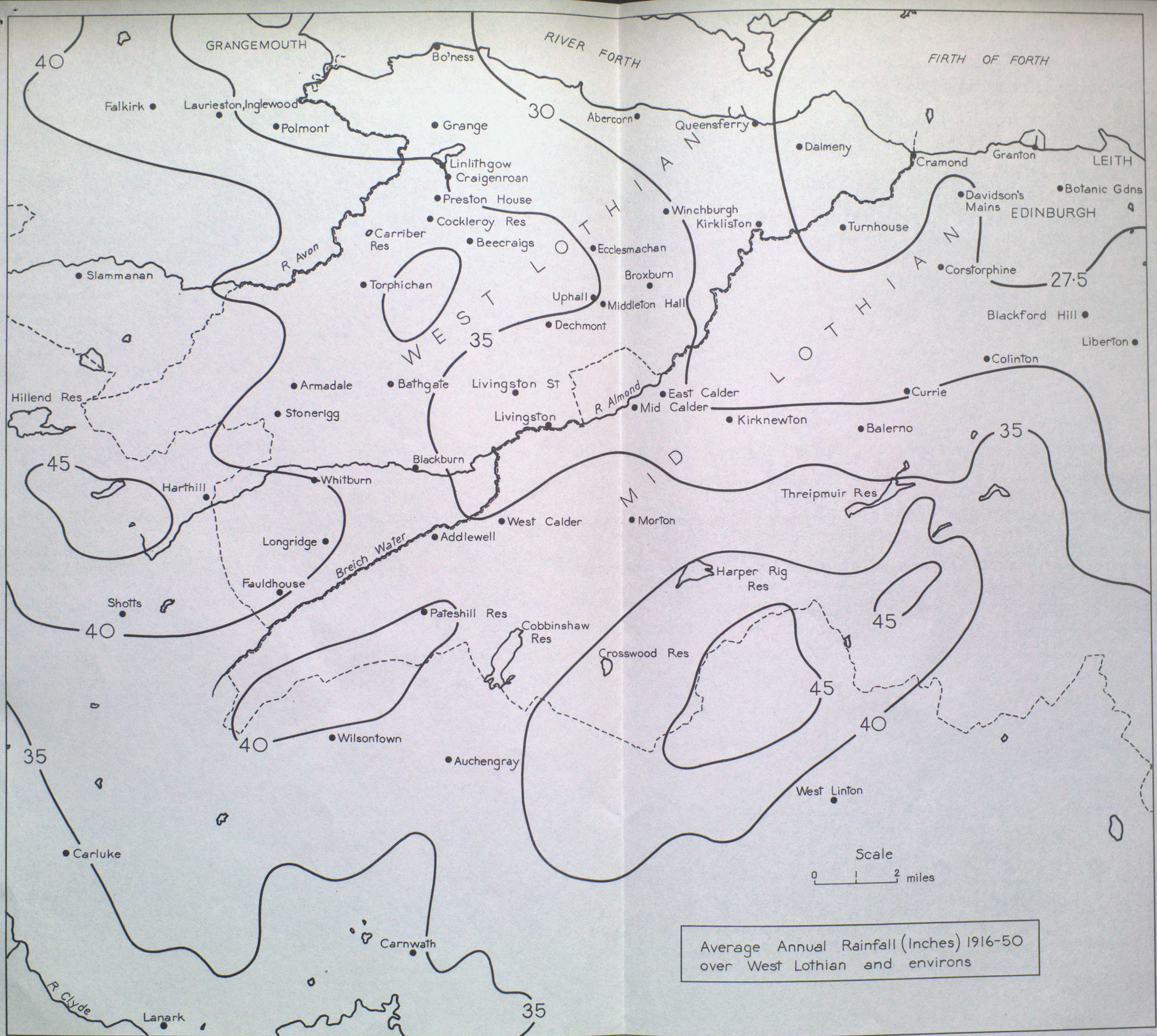


Fig 2

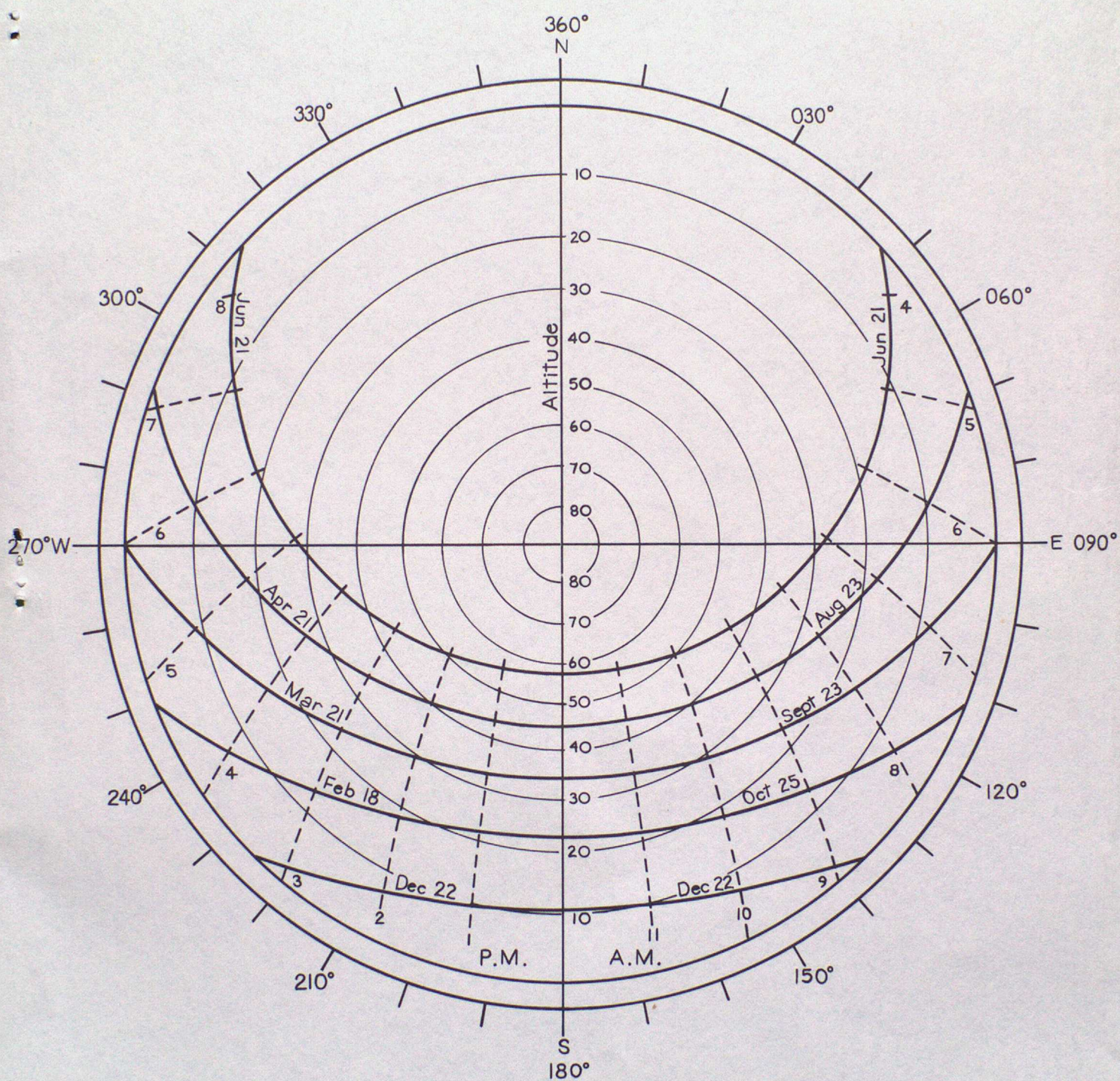


Fig 3. SOLAR CHART FOR Latitude 56°N