



ORKNEY
ISLANDS COUNCIL

2011 Air Quality Progress Report for Orkney Islands Council

In fulfillment of Part IV of the Environment Act 1995
Local Air Quality Management

April 2011

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Executive Summary

The 2011 Progress Report has concluded that there is no need to proceed to a detailed assessment for any pollutant.

Recently acquired monitoring data clearly shows that Orkney is currently meeting the 2010 air quality objectives. Pollutant levels have remained at a consistently low level and there is no significant risk of Orkney exceeding the air quality objectives.

The predominantly rural nature of Orkney, along with the lack of large scale industrial processes as they currently stand do not pose a risk to the air quality objectives.

The current monitoring regime within Orkney will continue to ensure that the high standard of air quality in the county continues.

The next course of action for Orkney Island Council will be to submit the 2012 Update and Screening Assessment.

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1 Introduction

1.1 Description of Local Authority Area

The Orkney Islands are situated between 5 and 50 miles north of mainland Scotland (59°N, 3°W). There are approximately 70 islands and 20 skerries in the island group. 17 of the islands are inhabited with an approximate population of 19,770. The largest town is Kirkwall with a population of around 7000.

The main traffic routes in Orkney are a series of A roads that link the west mainland to the east, through Kirkwall and southwards across the barriers to South Ronaldsay. The highest volume of traffic can be found within Kirkwall, with very light levels of traffic found across the mainland and the Outer Isles. The main airport is situated at Grimsetter, 2 miles outside Kirkwall. There are smaller airports across the Outer Isles providing links to Orkney Mainland. Large ferry services link Orkney to the Scottish mainland and Shetland with other numerous smaller inter-island links throughout Orkney. Other shipping activity is present within Orkney water's and tends to be concentrated around Scapa Flow.

Orkney's waters and in particular Scapa Flow, provides a sheltered environment for shipping. On a commercial basis, Orkney Islands Council Marine Services is seeing an increase in the number of tankers using the flow to lay anchor. There has also been an increase in the number in ship to ship transfers of oil. This increase in commercial shipping generates important income for the islands.

This activity within Scapa Flow will not increase the number of annual movements significantly as the tankers are at anchor for long periods. It is therefore envisaged that there will be no significant risk of increase in SO₂ to Orkney's air quality.

In addition, the Pentland Firth and waters around the County have recently been leased for the development of marine renewables. This development should not have any significant impact on air quality within Orkney. However, air quality would continue to be monitored to ensure maintenance of the County's high standards of air quality.

The County is overwhelmingly rural in character and there are few significant industrial processes in Orkney. The main industrial process comes from the oil activities at Flotta terminal. There are other smaller industrial processes i.e. fish processing and quarrying.

Previous reports concluded that there were no locations in Orkney where the air quality objectives were likely to be exceeded.

1.2 Purpose of Progress Report

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in Scotland are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland) (Amendment) Regulations 2002 (Scottish SI 2002 No 297), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre, $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in Scotland.

| Pollutant | Concentration | | Date to be achieved by |
|---|---|---------------------|------------------------|
| | Concentration | Measured as | |
| Benzene | 16.25 $\mu\text{g}/\text{m}^3$ | Running annual mean | 31.12.2003 |
| | 3.25 $\mu\text{g}/\text{m}^3$ | Running annual mean | 31.12.2010 |
| 1,3-Butadiene | 2.25 $\mu\text{g}/\text{m}^3$ | Running annual mean | 31.12.2003 |
| Carbon monoxide | 10.0 mg/m^3 | Running 8-hour mean | 31.12.2003 |
| Lead | 0.5 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2004 |
| | 0.25 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2008 |
| Nitrogen dioxide | 200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year | 1-hour mean | 31.12.2005 |
| | 40 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2005 |
| Particles (PM ₁₀) (gravimetric) | 50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year | 24-hour mean | 31.12.2004 |
| | 50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 7 times a year | 24-hour mean | 31.12.2010 |
| | 40 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2004 |
| | 18 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2010 |
| Sulphur dioxide | 350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year | 1-hour mean | 31.12.2004 |
| | 125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year | 24-hour mean | 31.12.2004 |
| | 266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year | 15-minute mean | 31.12.2005 |

1.4 Summary of Previous Review and Assessments

The First stage review and assessment for Orkney Islands Council was published in December 1998 and revised in May 1999. This concluded that because Orkney is predominantly a rural island community with few significant industrial processes in the islands, and road traffic volumes are low. The risk of the air quality objectives for benzene, 1,3 butadiene, carbon monoxide, lead, nitrogen dioxide, sulphur dioxide and particulates being exceeded are considered negligible. It also concluded that there was not a requirement for a second stage review.

Further Updating and Screening Assessment of local air quality were published in October 2003 and April 2009 respectively. These reports concluded that air quality was currently meeting the national objectives and that it was not necessary to undertake a Detailed Assessment or to declare an Air Quality Management Area (AQMA).

The Council has also published Progress Reports on Air Quality, in July 2004, September 2005, November 2006, April 2008 and April 2010. These reports have confirmed that a Detailed Assessment for air quality within Orkney is not required for any pollutants, and further concluded that levels of pollutants in Orkney are way below the NAQS objectives and Orkney is not at risk of exceeding these objectives.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

There are no automatic monitoring sites with in Orkney.

2.1.2 Non-Automatic Monitoring

New data for 2010 has been gathered by Orkney Islands Council via a network of five diffusion tubes for Nitrogen Dioxide (NO₂) concentrations and three diffusion tubes for Benzene concentrations. The tubes are exposed on a monthly basis throughout the year. The locations of the tubes are presented in Figure 2.2.

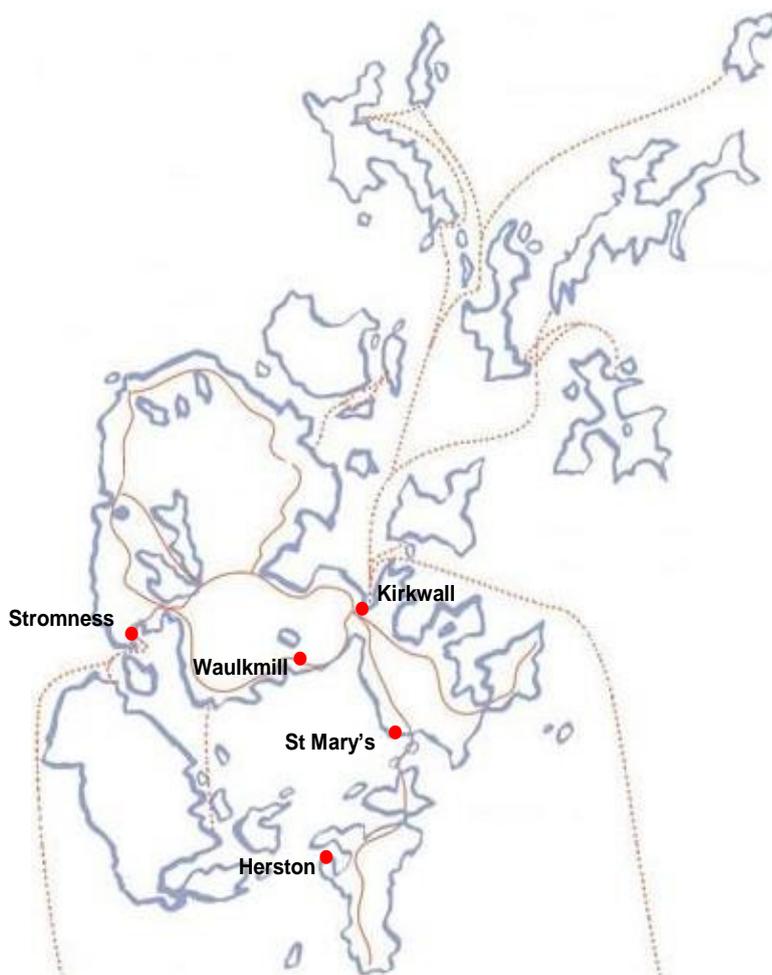


Figure 2.2 Map of Non-Automatic Monitoring Sites

Table 2.2 Details of Non- Automatic Monitoring Sites

| Site Name | Site Type | OS Grid Ref | Pollutants Monitored | In AQMA? | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road (N/A if not applicable) | Worst-case Location ? |
|-----------|-----------|-----------------|---------------------------|----------|---|--|-----------------------|
| Kirkwall | Roadside | 344812, 1011017 | NO ₂ | N | Y (1m) | 1m | Y |
| Stromness | Roadside | 325590, 1009553 | NO ₂ | N | Y (1m) | 1m | Y |
| St Mary's | Roadside | 347140, 1001235 | NO ₂ , Benzene | N | Y (2m) | 1m | Y |
| Waulkmill | Rural | 339525, 1006985 | NO ₂ , Benzene | N | N (250m) | 1.5m | Y |
| Herston | Rural | 341995, 991999 | NO ₂ , Benzene | N | Y (10m) | 2m | Y |

The QA/QC for the diffusion tubes are detailed in Appendix A

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

As stated previously, there is no automatic monitoring data with regards to Nitrogen dioxide, as it has been deemed unnecessary due to the islands rural landscape and low population. Therefore all monitoring data is obtained through the placement of diffusion tubes. As diffusion tubes cannot detect short term fluctuations in pollutant concentrations, it is not possible to compare the monitoring results against all NAQS objectives for NO₂. As can be seen from the data below, this is justified due to the County's very low NO₂ levels.

Diffusion Tube Monitoring Data

The annual mean concentrations for NO₂ are shown in Table 2.4. The full data set of results for 2009 can be seen in Appendix A.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

| Site ID | Location | Within AQMA? | Relevant public exposure? Y/N | Data Capture for full calendar year 2010 % | Annual mean concentrations ($\mu\text{g}/\text{m}^3$) | | |
|---------|-----------|--------------|-------------------------------|--|---|-------------------|-------------------|
| | | | | | 2008 ^a | 2009 ^b | 2010 ^c |
| KW | Kirkwall | N | Y | 100 | 12.6 | 14.0 | 18.9 |
| SN | Stromness | N | Y | 100 | 9.6 | 10.3 | 10.6 |
| SM | St Mary's | N | Y | 100 | 4.4 | 6.8 | 5.0 |
| WM | Waulkmill | N | Y | 100 | 3.3 | 4.8 | 4.0 |
| HE | Herston | N | Y | 100 | 2.8 | 2.6 | 2.8 |

^a Bias adjustment of 1.05

^b Bias adjustment of 0.93

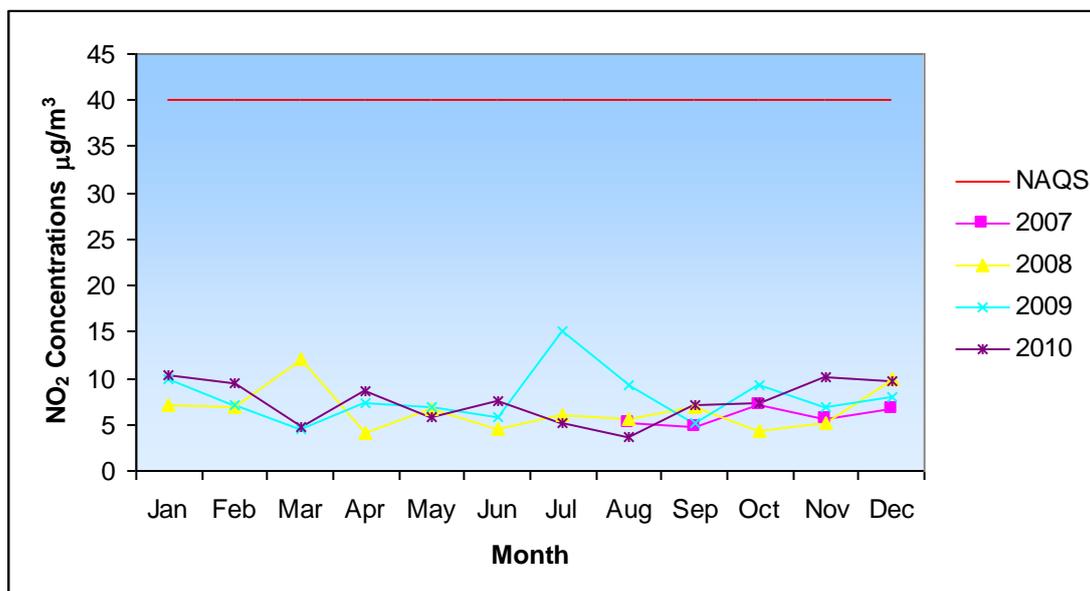
^c Bias adjustment of 0.95

As can be seen from the results in Table 2.4 above, in 2010 there has been no significant change in levels of NO₂. Kirkwall experiences the highest levels of NO₂ which is understandable considering it is Orkney's largest town and has the highest traffic flows.

Table 2.4 above shows Kirkwall to have an upward trend in its annual mean concentrations of NO₂. This reflects the re-location of the monitoring point within Kirkwall, to a busy crossroads, part way through 2009. This new location was deemed more indicative of the worst case in Kirkwall, due to the monitoring point's location outside residential properties and on a main route within the town. The local bus station is also located adjacent to the crossroads, with all out going traffic movements from the bus station having to leave through this junction. Despite this upward trend it is expected that results from 2011 will show a stabling of mean concentrations. Despite this rise, levels in Kirkwall are currently at 45% of the objective. Elsewhere in Orkney annual mean concentrations of NO₂ remain significantly unchanged.

Figure 2.4 below displays the trends of NO₂ concentrations within Orkney over the last 4 years. It is unlikely that levels will ever exceed the NAQS objective of 40 $\mu\text{g}/\text{m}^3$.

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Diffusion Tube Monitoring Sites.



2.2.2 PM₁₀

Orkney Islands Council does not undertake monitoring for PM₁₀. In previous reports background concentration maps were used and predicted that PM₁₀ pollution levels in Orkney will not exceed 15µg/m³ in 2010. Current background maps show Orkney to have PM₁₀ levels of approximately 7-8 µg/m³. Taking these facts into consideration it is concluded that there is no expected exceedance of the 2010 objective (18µg/m³) in Orkney.

2.2.3 Sulphur Dioxide

There is no new monitoring data for SO₂ in Orkney.

Real time of SO₂ was conducted in 2005 to measure ambient levels of SO₂ in Kirkwall, with the assistance of SEPA.

The resulting report from SEPA concluded that the ‘ambient air levels of SO₂ in Kirkwall never exceeded the limits set out by the air quality objectives’. ‘...effects are unlikely to be noticed even by individuals who are sensitive to air pollutants’.

Since these findings were published by SEPA and reported on in the Orkney Islands Council 2005 Progress Report and commented on in subsequent reports, there have been no significant changes within Kirkwall that would influence ambient SO₂ concentrations in the town.

It can therefore be concluded that SO₂ levels within Orkney are not likely to exceed the air quality objectives set out by NAQS.

2.2.4 Benzene

Monitoring of Benzene during 2010 has shown there have been no significant changes in the levels of benzene recorded at the three monitoring locations Herston, Waulkmill and St Mary's. Over 97% of the recorded values for this period were below the Limit of Detection (LOD) of 0.2ppb (0.65 µg/m³). Benzene levels in Orkney are well within the NAQS objectives. Full monitoring data for Benzene can be seen in Appendix A.

It can therefore be concluded that benzene levels within Orkney are not likely to exceed the NAQS air quality objectives.

2.2.5 Other pollutants monitored

Orkney Islands Council does not monitor any other pollutants.

2.2.6 Summary of Compliance with AQS Objectives

Orkney Islands Council has examined the results from monitoring in Orkney. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

Orkney Islands Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

Orkney Islands Council confirms that all the following have been considered –

- **Road traffic sources**
- **Other transport sources**
- **Industrial sources**
- **Commercial and domestic sources**
- **New developments with fugitive or uncontrolled sources.**

4 Local / Regional Air Quality Strategy

Orkney Islands Council does not have a Local Air Quality Strategy in place. This is because Orkney Islands Council has not had to declare an AQMA and is unlikely to in the future. Results also indicate that levels are considerably lower than the levels set out in the AQS objectives.

5 Planning Applications

There has been no planning applications approved or in the process of being assessed that are deemed to have a possible impact on air quality in Orkney.

6 Air Quality Planning Policies

Orkney Islands Council existing Local Development Plan addresses the importance of air quality through the planning process.

Local Plan Policies LP/DC1 – Criteria for Development and;
LP/DC6 – Development Impact Assessments:

address requirements with regards to air quality.

Orkney Islands Council is currently in the process of updating planning policy documents and guidance. This is currently under going a consultation process and the final draft due for adoption in early 2012.

Any changes impacting on the way air quality is addressed in Orkney will be discussed in the next update screening and assessment report in 2012.

7 Local Transport Plans and Strategies

Orkney Islands Council existing local transport strategy is for 2007 - 2010

The Local Transport Strategy is a framework for how the Council intends to deliver on its own and national objectives at a local level. The Local Transport Strategy 2007-2010 is available along with related documents at;

<http://www.orkney.gov.uk/Service-Directory/L/Local-Transport-Strategy-2007---2010.htm>

The Local Transport Strategy is currently being reviewed.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

The recently acquired monitoring data that has been included within this report shows that Orkney is currently meeting the 2010 air quality objectives. Comparing historic data against the current data clearly shows that pollutant levels have remained at a consistently low level and that there is no significant risk of Orkney exceeding the air quality objectives.

It has therefore been concluded that there is no need to proceed to a Detailed Assessment for any pollutant

8.2 Proposed Actions

It is proposed that the current monitoring regime within Orkney with regards to NO₂ will continue to ensure that the high standard of air quality in the county continues.

It is envisaged that the monitoring of Benzene will continue in the short term through the continued use of diffusion tubes. However, all results from 2010 were below the limits of detection and it is therefore felt that another form of monitoring for benzene should be explored. Any changes will be discussed in the next round of reporting.

The next course of action for Orkney Island Council will be to submit the 2012 Update and Screening Assessment.

9 References

DEFRA Local Air Quality Management Technical Guidance LAQM.TG(09) 2009

Orkney Islands Council Update and Screening Assessment Report 2009

Orkney Islands Council Progress Report 2010

Appendices

Appendix A: QA/QC Data

Appendix B: Emissions Inventory

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

All diffusion tubes are analysed by Edinburgh Scientific Services.

A Bias Adjustment of 0.95 was used.

Factor from Local Co-location Studies

There has been no co-location studies conducted in Orkney.

Discussion of Choice of Factor to Use

The national bias adjustment factor was used as there has been no local bias adjustment factor calculated through a co-location study.

PM Monitoring Adjustment

There has been no recent PM monitoring within Orkney

Short-term to Long-term Data adjustment

No adjustment is required for short term monitoring as all monitoring data is conducted on a monthly basis over the entire year.

QA/QC of automatic monitoring

There are no automatic monitoring sights in Orkney

QA/QC of diffusion tube monitoring

Bias and Precision taken from data supplied on R & A website.

Nitrogen Dioxide Results

Concentrations expressed in microgrammes per cubic metre (ug/m3)

Annual Average (with bias adjustment)

| 2010 | | | | | | | | | | | | |
|----------------------|------|------|------|------|------|------|------|-----|------|------|------|------|
| Site / Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| 1 Kirkwall (control) | <1.0 | 2.3 | <1.0 | <1.0 | 2.1 | 1.4 | <1.0 | 1 | 1.5 | <1.0 | 1.4 | <1.0 |
| 2 Kirkwall | 20.3 | 22 | | 18.2 | | 18.3 | 13.3 | | 17.7 | 16.1 | 26 | 27.2 |
| 3 Stromness | 13.1 | 11.6 | 10.6 | 10.9 | 11.4 | 10.1 | 7 | | 9.4 | 11.9 | 13.7 | 12.8 |
| 4 Herston | 5.7 | 3.7 | 4.5 | 2.4 | 2.7 | 2.6 | 1 | | 2.5 | 2.2 | 2.9 | 2.5 |
| 5 Waulkmill | 7.2 | 5.4 | 4.1 | 3 | 4.1 | 3.6 | 3 | 3.8 | 3.4 | 4.4 | 4.9 | 3.0 |
| 6 St.Mary's | 8.5 | 7.4 | 1 | 11 | | 4.6 | 2.4 | 3.7 | 4.7 | 3.4 | 5.5 | 5.2 |

18.9

10.6

2.8

4.0

5.0

Annual
Average

| | | | | | | | | | | | | | |
|---|------|------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|
| Monthly Averages | 11.0 | 10.0 | 5.1 | 9.1 | 6.1 | 7.8 | 5.3 | 3.8 | 7.5 | 7.6 | 10.6 | 10.1 | 7.8 |
| Bias Adjustment (0.95 for Edinburgh Scientific Services) | 10.4 | 9.5 | 4.8 | 8.6 | 5.8 | 7.4 | 5.1 | 3.6 | 7.2 | 7.2 | 10.1 | 9.6 | 7.4 |

Benzene Results

Concentrations expressed parts per billion (ppb)

| 2010 | | | | | | | | | | | | |
|--------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Site / Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| 1 Herston | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 2 Waulkmill | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | 0 | <0.2 | <0.2 |
| 3 St.Mary's | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |

Appendix B: Emissions Inventory

| Part A Processes | | | |
|-------------------------|------------------------|---------------------|----------------------|
| <i>Operator</i> | <i>Process Address</i> | <i>Process Type</i> | <i>Description</i> |
| Talisman | Flotta, Orkney | Petroleum | Oil terminal |
| Talisman | Flotta, Orkney | Combustion | Gas and Oil turbines |
| Kingsdale Landfill | Firth, Orkney | Landfill | Landfill |
| Bossack Quarry | Bossack, Tankerness. | Landfill | Landfill |

| Part B Processes | | | |
|-------------------------|-----------------------------------|-------------------------|--------------------|
| <i>Operator</i> | <i>Process Address</i> | <i>Process Type</i> | <i>Description</i> |
| Orkney Islands Council | Cursiter Quarry, Finstown, Orkney | Stone Crushing | Quarrying |
| Orkney Islands Council | Cursiter Quarry, Finstown, Orkney | Tar & Bitumen processes | Roadstone Coating |
| Orkney Aggregates Ltd | Hedde Quarry, Finstown. | Stone Crushing | Quarrying |
| Gairsty Quarry Ltd | Quoyloo, Sandwick | Stone Crushing | Quarrying |
| Seatter | Hoy | Stone Crushing | Mobile Crusher |
| Launderama | Kirkwall, Orkney | Dry cleaning | Laundrette |
| Northern Isles Salmon | Hatston, Kirkwall | Fish Ensiling | Fish Ensiling |

Note: This information was provided by SEPA, Norlantic House, Hatston, Kirkwall, Orkney.