



**North Ayrshire Council**  
Comhairle Siorrachd Àir a Tuath



**2015 Air Quality  
Updating & Screening Assessment  
and Detailed Assessment for  
North Ayrshire Council**

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

**Date (April 2015)**

<b>Local Authority Officer</b>	Willie McNish, Contaminated Land Officer
--------------------------------	---

<b>Department</b>	Environmental Health Economy and Communities
-------------------	---

<b>Address</b>	Cunninghame House, Friars Croft, Irvine, Ayrshire, KA12 8EE
----------------	--

<b>Telephone</b>	01294 324300
------------------	--------------

<b>e-mail</b>	<a href="mailto:wmcnish@north-ayrshire.gov.uk">wmcnish@north-ayrshire.gov.uk</a>
---------------	--

<b>Report Ref No.</b>	2015 NAC USA 001
-----------------------	------------------

<b>Date</b>	April 2015
-------------	------------

**Cover Photo:** Arran across the Firth of Clyde

## Executive Summary

The Environment Act 1995 makes a requirement for Local Authorities to review and assess air quality in their areas. The Air Quality Regulations 1997 provided National Air Quality objectives for 7 key pollutants and local authorities must assess whether these objectives are liable to be met. If any area is identified where air quality objectives are not met, then the Local Authority must declare an Air Quality Management Area (AQMA).

This report was prepared in accordance with the Local Air Quality Management, Technical Guidance LAQM, TG(09) and sets out the air quality monitoring carried out in North Ayrshire, with results and conclusions.

With regard to NO<sub>2</sub>, it was predicted that a localised area of approximately 10m diameter on the High Street, Irvine would continue to be the subject of elevated levels bordering on or exceeding the NO<sub>2</sub> air quality annual mean objective of 40µg/m<sup>3</sup>. Based on diffusion tube monitoring this year there have been 2 exceedances of 53.1µg/m<sup>3</sup> and 45µg/m<sup>3</sup>.

The High Street in Irvine is used as a bus terminus and adjacent tubes in the same street, 10 metres away, were well within the objective level at 34µg/m<sup>3</sup>.

Three mobile automatic AQ Mesh air monitor pods have been purchased in 2015 that will enable more accurate data to be collected in the area of the identified hot spot and enable more informed decisions to be made.

The automatic roadside monitoring (ROMON) unit is located nearby and recorded an NO<sub>2</sub> annual mean concentration of 29µg/m<sup>3</sup>, indicating that compliance with the objective for NO<sub>2</sub> in High Street, Irvine is being achieved.

Since the 2012 Updating Screening and Assessment Report a Detailed Assessment has been carried out for High Street, Irvine to consider the situation and offer an explanation for the occurrence of this distinctive hot spot, and provide options to remedy the problem.

Plans approved in June 2013 for a new leisure centre in the vicinity of High Street, Irvine have provided an opportunity to review traffic and pedestrian movements in the town centre with a view to remove the localised hotspot without the need to declare

an AQMA. Greater detail is provided within the 2013 Detailed Assessment Report <http://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/EnvironmentalHealth/detailed-assessment-of-nitrogen-dioxide-concentrations-high-street-irvine.pdf>

Work on the new leisure centre started earlier this year (2015) and Public Realm works are also to be undertaken which will have a positive impact on the long term hot spot in the High Street. In consultation with the bus operators, Strathclyde Passenger Transport and North Ayrshire Council's Road Transport Section designs are being discussed to widen the pavement and to relocate bus stops away from where the hot spot is being recorded. This will not only move the source of pollution away from the receptor, but will also allow better dilution and dispersion of pollutants. The Public Realm project as a whole is currently at the consultation stage with the wider stakeholder community, and depending on the outcomes, work may start sometime in 2016.

The automated monitoring site in High Street, Irvine also tests for airborne particulate matter (PM<sub>10</sub>) and the annual mean was 16µg/m<sup>3</sup>. The Scottish annual mean air quality objective for PM<sub>10</sub> is set at 18µg/m<sup>3</sup>. The European objective (40µg/m<sup>3</sup>) was not exceeded for PM<sub>10</sub>.

The Beta-attenuation Particulate Monitor 1020 (BAM1020) housed within the ROMON for monitoring of particulate matter was replaced by a Fidas 200 fine dust and monitoring immission measurement system for the continuous and simultaneous measurement of PM<sub>1</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> on 14<sup>th</sup> April 2015. Monitoring results from the Fidas 200 will form part of future Air Quality Reports.

The 2014 annual mean for nitrogen dioxide (NO<sub>2</sub>) diffusion tube locations in Dalry continue to be below the 40 µg/m<sup>3</sup> air quality objective with the exception of one tube that exceeded the level at 42.4 µg/m<sup>3</sup>. Extrapolating the data back to the closest relevant receptor gave a value of 38.5 µg/m<sup>3</sup>, illustrating that the local air quality objectives are still being maintained in this location.

It is anticipated that NO<sub>2</sub> levels will be reduced significantly in Dalry once the proposed A737 Dalry Bypass, which is currently going through the statutory processes, is constructed. This location will continue to be monitored until there is significant confidence that NO<sub>2</sub> levels will remain below the objective limits and long

term trends are established. Additional monitoring will be initiated in 2016 to further assess traffic pollution impact on the area using AQ Mesh pods which can provide real time data.

# Table of contents

<b>1</b>	<b>Introduction .....</b>	<b>2</b>
1.1	Description of Local Authority Area .....	2
1.2	Purpose of Report.....	3
1.3	Air Quality Objectives .....	3
1.4	Summary of Previous Review and Assessments .....	5
<b>2</b>	<b>New Monitoring Data .....</b>	<b>11</b>
2.1	Summary of Monitoring Undertaken.....	11
2.1.1	Automatic Monitoring Sites .....	11
2.1.2	Non-Automatic Monitoring Sites .....	14
2.2	Comparison of Monitoring Results with AQ Objectives .....	17
2.2.1	Nitrogen Dioxide .....	17
2.2.2	PM <sub>10</sub> .....	27
2.2.3	Sulphur Dioxide.....	31
2.2.4	Benzene.....	31
2.2.5	Other pollutants monitored .....	32
2.2.6	Summary of Compliance with AQS Objectives .....	34
<b>3</b>	<b>Road Traffic Sources .....</b>	<b>35</b>
3.1	Narrow Congested Streets with Residential Properties Close to the Kerb .....	35
3.2	Busy Streets Where People May Spend 1-hour or More Close to Traffic.....	35
3.3	Roads with a High Flow of Buses and/or HGVs. ....	35
3.4	Junctions.....	38
3.5	New Roads Constructed or Proposed Since the Last Round of Review and Assessment. 38	
3.6	Roads with Significantly Changed Traffic Flows.....	38
3.7	Bus and Coach Stations .....	38
<b>4</b>	<b>Other Transport Sources.....</b>	<b>39</b>
4.1	Airports.....	39
4.2	Railways (Diesel and Steam Trains) .....	39
4.2.1	Stationary Trains.....	39
4.2.2	Moving Trains .....	39
4.3	Ports (Shipping) .....	39
<b>5</b>	<b>Industrial Sources.....</b>	<b>40</b>
5.1	Industrial Installations .....	40
5.1.1	New or Proposed Installations for which an Air Quality Assessment has been Carried Out	40
5.1.2	Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced .....	40
5.1.3	New or Significantly Changed Installations with No Previous Air Quality Assessment...	40

5.2	Major Fuel (Petrol) Storage Depots .....	41
5.3	Petrol Stations.....	41
5.4	Poultry Farms.....	41
<b>6</b>	<b>Commercial and Domestic Sources .....</b>	<b>42</b>
6.1	Biomass Combustion – Individual Installations .....	42
6.2	Biomass Combustion – Combined Impacts.....	42
6.3	Domestic Solid-Fuel Burning .....	42
<b>7</b>	<b>Fugitive or Uncontrolled Sources.....</b>	<b>43</b>
<b>8</b>	<b>Conclusions and Proposed Actions.....</b>	<b>44</b>
8.1	Conclusions from New Monitoring Data .....	44
8.2	Proposed Actions.....	45
<b>9</b>	<b>References.....</b>	<b>47</b>

**List of Tables**

Table 1.1	Air Quality Objectives included in Regulations for the purpose of LAQM in Scotland
Table 2.1	Details of Automatic Monitoring Sites
Table 2.2	Details of Non-Automatic Monitoring Sites
Table 2.3	Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with Annual Mean Objective
Table 2.4	Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective
Table 2.5	Results of Nitrogen Dioxide Diffusion Tubes in 2014
Table 2.6	Results of Nitrogen Dioxide Diffusion Tubes (2010 to 2014)
Table 2.7	Results of Automatic Monitoring of PM <sub>10</sub> : Comparison with Annual Mean Objective
Table 2.8	Results of Automatic Monitoring for PM <sub>10</sub> : Comparison with 24-hour mean Objective
Table 8.1:	Drop-off with Distance for NO <sub>2</sub> Tube Exceedences

**List of Figures**

Figure 2.1	Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites
Figure 3.1	Proposed Pavement Alterations (High St, Irvine)



## Appendices

- Appendix 1 Figure 1: Map of Locality & Surrounding Area
- Appendix 2 Ricardo - AEA Air Pollution Report
- Appendix 3 Figure 2: Automatic Monitoring Site Location
- Appendix 4 Figure 3: Non-automatic Monitoring Locations
- Appendix 5 Diffusion Tube Accuracy NAC
- Appendix 6 Historical NO<sub>2</sub> Results (2001-2014)
- Appendix 7 QA & QC Data
- Appendix 8: Bias Factor Spreadsheet (Gradko)
- Appendix 9: Tube Precision & WASP Results
- Appendix 10: NO<sub>2</sub> Levels – Distance From Road Calculator (45 New St)
- Appendix 11: Town Centre Irvine
- Appendix 12: Irvine, High St (2010) NO<sub>2</sub> µg/m<sup>3</sup>
- Appendix 13: Irvine, High St (2011) NO<sub>2</sub> µg/m<sup>3</sup>
- Appendix 14: Irvine, High St (2012) NO<sub>2</sub> µg/m<sup>3</sup>
- Appendix 15: Irvine, High St (2013) NO<sub>2</sub> µg/m<sup>3</sup>
- Appendix 16: Irvine, High St (2014) NO<sub>2</sub> µg/m<sup>3</sup>
- Appendix 17: Dalry (Ordnance Survey)
- Appendix 18: Dalry - Town Centre
- Appendix 19: Dalry – Townhead St/New St (2010) NO<sub>2</sub> µg/m<sup>3</sup>
- Appendix 20: Dalry – Townhead St/New St (2011) NO<sub>2</sub> µg/m<sup>3</sup>
- Appendix 21: Dalry – Townhead St/New St (2012) NO<sub>2</sub> µg/m<sup>3</sup>
- Appendix 22: Dalry – Townhead St/New St (2013) NO<sub>2</sub> µg/m<sup>3</sup>
- Appendix 23: Dalry – Townhead St/New St (2014) NO<sub>2</sub> µg/m<sup>3</sup>

# 1 Introduction

## 1.1 Description of Local Authority Area

North Ayrshire can be divided roughly into four main regional character classifications based on landscape and topography. Isle of Arran represents a landscape distinct from the mainland, whilst at the same time offering a variety of landscape types that have caused it to be referred to as 'Scotland in Miniature'. The Inner Firth of Clyde is another distinctive character area that includes the northern coastal fringe and the Cumbrae Islands. Inland from this, the topography is dominated by the Renfrew heights, which cover the northern part of North Ayrshire. These hills narrow towards a point near Ardrossan and are largely unsettled. The final area comprises the northern part of the Ayr Basin that is heavily populated in comparison with the neighbouring areas, with a dense network of roads and settlements.

The major trunk road network within North Ayrshire consists of the A78 coastal route running from Irvine, to Largs and the A737 Garnock Valley link to the M8 and Glasgow conurbation. Other major routes are the A736 to Barrhead; and the A71 to Kilmarnock road. North Ayrshire is also well served by the rail network and there are stations on the main Glasgow Central to Ayr line at Dalry, Glengarnock, Kilwinning and Irvine; served by a frequent passenger service. In addition the Largs line continues on from Kilwinning and serves the towns of Stevenston, Saltcoats, Ardrossan, West Kilbride, Fairlie and Largs.

North Ayrshire has commercial ports at Ardrossan and Hunterston; which has a deep sea terminal, and leisure facilities are also available at Largs, Irvine, Saltcoats and Millport. Ferry services connect Ardrossan to Brodick (Arran), Largs to Millport (Cumbrae), and Lochranza to Claonaig in Argyll.

Main sources of relevant pollutant exposures are from road traffic vehicles. Areas particularly affected are High Street, Irvine and Townhead Street/New Street, Dalry. Key focus of this and previous reports has been on these areas. The installation of Biomass boilers is becoming popular in commercial, educational and leisure facilities. A map of the area is shown in Figure 1 (Appendix 1).

## 1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

## 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,  $\text{mg}/\text{m}^3$  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 LAQM in Scotland

Pollutant	Air Quality Objective		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 $\text{mg}/\text{m}^3$	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 ( $\text{PM}_{10}$ ) (gravimetric)	50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	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

Report	Summary
<p>Stage 1 Review and Assessment (1998)</p>	<p>It is recommended that a second stage review and assessment be undertaken for nitrogen dioxide and that the current air quality monitoring work in North Ayrshire be continued. This will provide data to indicate compliance with the objectives and will be useful in the next review and assessment to be undertaken before 2005.</p>
<p>Stage 2 Review and Assessment (2000)</p>	<p>The air quality objective for nitrogen dioxide is likely to be met by the end of 2005. It will therefore not be necessary to proceed to a stage three review and assessment.</p>
<p><b>2003</b> Updating and Screening Assessment</p>	<p>DMRB screening shows that there are no areas within North Ayrshire likely to fail the objective due to Road Traffic. The annual mean nitrogen dioxide levels over a short length of High Street, Irvine, however, are marginally in excess of the annual mean objective in 2002. When the “year correction factors” are applied, as allowed in the guidance, all Annual Mean levels for 2005 should meet the Air Quality Objective. It is believed also that the traffic management scheme, already proposed by North Ayrshire Council, will minimise the risk of any further increase.</p> <p>Passive monitoring for nitrogen dioxide should continue in High Street, Irvine to assess the effect of the proposed traffic management scheme.</p> <p>There are no significant industrial sources of nitrogen dioxide within North Ayrshire.</p> <p>There is no requirement to proceed to a detailed assessment for nitrogen dioxide.</p>
<p><b>2004</b> Progress Report</p>	<p>With the exception of nitrogen dioxide all guideline limits for the National Air Quality Standards shall be met for 2004.</p> <p>With regard to nitrogen dioxide, it is predicted that a highly localised area of High Street, Irvine shall continue to be subject to concentration levels in excess of the guideline limit for the annual mean (<math>40\mu\text{g}/\text{m}^3</math>) national air quality standard at the end of 2005.</p> <p>With regard to <math>\text{PM}_{10}</math>, whilst the predicted estimated annual mean concentration for 2004 (<math>21.39\mu\text{g}/\text{m}^3</math>) shall be well below the U.K. Air Quality Objective, for 2010 it is predicted to be <math>19.75\mu\text{g}/\text{m}^3</math>, marginally exceeding the much reduced Scottish Air Quality Objective of <math>18\mu\text{g}/\text{m}^3</math>.</p>

Report	Summary
<p><b>2004</b> Progress Report (cont.)</p>	<p>Passive sampling shall continue in the area to monitor ambient levels of nitrogen dioxide. Additionally, the TEOM particulate monitor is due to be re-sited in the area from May 2005 for twelve months. At the end of that period the effects of the traffic management scheme can be further assessed.</p>
<p><b>2005</b> Progress Report</p>	<p>With the exception of nitrogen dioxide all guideline limits for the National Air Quality Standards shall be met for 2004.</p> <p>With regard to nitrogen dioxide, a highly localised area of High Street, Irvine continues to be subject to concentration levels in excess of the guideline limit for the annual mean (<math>40\mu\text{g}/\text{m}^3</math>) national air quality standard at the end of 2005. However, this is not an area of relevant public exposure. Consequently, a detailed assessment for nitrogen dioxide remains unnecessary.</p> <p>There is no need to proceed to a detailed assessment for any of the seven air pollutants.</p>
<p><b>2006</b> Updating and Screening Assessment Report</p>	<p>The Annual Mean Objective for nitrogen dioxide is now being complied with throughout North Ayrshire as demonstrated by passive monitoring. However, monitoring should continue, especially in High Street, Irvine, to ensure the improvement in air quality is maintained.</p> <p>DMRB screening shows that there are no areas within North Ayrshire, which are likely to fail the objective due to road traffic.</p> <p>There are no significant industrial sources of nitrogen dioxide within, either North Ayrshire or neighbouring areas that would adversely affect local air quality in North Ayrshire.</p>
<p><b>2007</b> Progress Report</p>	<p>All guideline limits for the National Air Quality Standards should be met for 2010.</p> <p>With regard to nitrogen dioxide, it is predicted that a highly localised area of High Street, Irvine <b>may</b> have concentrations levels in excess of the guideline limit for the annual mean (<math>40\mu\text{g}/\text{m}^3</math>) national air quality standard. However it is expected that a new updated traffic management scheme will see these figures fall. On the advice of the Scottish Government and the Scottish Environment Protection Agency, a detailed assessment for nitrogen dioxide will be carried out for this area.</p>

Report	Summary
<p><b>2008</b> Progress Report &amp; Detailed Assessment</p>	<p>NO<sub>2</sub> monitoring results for <b>Townhead Street, Dalry</b> and <b>New Street, Dalry</b> show consistent exceedences for the <b>40 µg/m<sup>3</sup></b> level limit. Previous modelling of this area suggested there would be no breaches, however the modelling did not fully account for stationary traffic on an incline at traffic lights.</p> <p>A highly localised area at the façade of <b>75 High Street, Irvine</b> may continue to be subject to concentration levels in excess of the guideline limit for the annual mean (40µg/m<sup>3</sup>) national air quality standard.</p> <p>With regard to PM<sub>10</sub>, whilst the predicted estimated annual mean concentration for 2004 (21.39µg/m<sup>3</sup>) shall be well below the U.K. Air Quality Objective, for 2010 it is predicted to be 19.75µg/m<sup>3</sup>, marginally exceeding the much reduced Scottish Air Quality Objective of 18µg/m<sup>3</sup>.</p> <p>With regards to Townhead Street/New Street, Dalry North Ayrshire Council shall progress to a detailed assessment of NO<sub>2</sub> once a full calendar year of data is available. However the narrowness of the street and the level of traffic flow will limit the options for carrying out more detailed monitoring in the area.</p>
<p><b>2009</b> Air Quality Updating and Screening Assessment</p>	<p>High Street, Irvine continues to have erratic results bordering on the 40 µg/m<sup>3</sup> limit. The results do not warrant declaration of an AQMA. However all sampling locations, old and new, will remain within the monitoring programme to establish a more accurate picture of nitrogen dioxide levels in this locality.</p> <p>High Street, Irvine will continue to be closely monitored using nitrogen dioxide diffusion tubes and the automatic monitoring site (ROMON) located in High Street, Irvine which will also be operational for 2009. The ROMON contains a BAM and NO<sub>2</sub> analyser and will allow better analysis of NO<sub>2</sub> daily trends to identify keys sources affecting the higher readings at tubes in this location.</p> <p>The ROMON will also be the site used in 2009 for a co-location study for nitrogen dioxide diffusion tubes.</p> <p>Nitrogen dioxide levels in Townhead Street/New Street, Dalry continue to exceed 40µg/m<sup>3</sup> at two relevant locations and are consistent in suggesting a strong correlation with previous traffic congestion in the area. Since 2009 monitoring has shown a reduction in levels as a result of the new traffic management system put in place.</p>

Report	Summary
<p><b>2010</b> Progress Report</p>	<p>With regard to nitrogen dioxide (NO<sub>2</sub>), it was predicted that a localised area of High Street, Irvine would continue to be subject to elevated levels bordering or exceeding the guideline limit for the annual mean (40µg/m<sup>3</sup>) national air quality standard. There has been increased focus and sampling in this area with additional diffusion tube monitoring sites established to better define the extent of any possible exceedences. Of the total 37 diffusion tubes in North Ayrshire Council, 17 are located in High Street, Irvine within a 50m stretch of road.</p> <p>This year there have been no annual mean exceedences for High Street, Irvine, however this area will continue to be intensely monitored until long term trends are established.</p> <p>Previous NO<sub>2</sub> monitoring results (2007 &amp; 2008) for Townhead Street, Dalry and New Street, Dalry showed consistent exceedences for the 40 µg/m<sup>3</sup> level limit.</p> <p>The 2009 report concluded that a full calendar year of data for 2009 would be required to assess the impact of the traffic management system.</p> <p>The 2009 annual mean concentrations for NO<sub>2</sub> diffusion tube locations in Dalry were all below the 40 µg/m<sup>3</sup> level limit, suggesting the newly implemented traffic management system has been successful. These locations will be continued to be closely monitored until long term trends are established and there is significant confidence that the levels will remain below the objective limits.</p>
<p><b>2011</b> Progress Report &amp; Detailed Assessment</p>	<p>Monitoring data for 2010 has shown that 3 very localised NO<sub>2</sub> diffusion tubes, out of a total of 37, failed to meet the air quality objective. All other NO<sub>2</sub> diffusion tube sites and automatic monitoring complied with the 40 µg/m<sup>3</sup> NO<sub>2</sub> air quality objective set out in the directive.</p> <p>The 3 tubes that failed the objective are located in High Street, Irvine, adjacent to a major bus route in the town. Diffusion tube monitoring has shown that the area is highly localised and only covers an area approximately 10m wide. The next nearest tubes are about 10m away and had NO<sub>2</sub> annual mean concentrations of 31 µg/m<sup>3</sup> and 33 µg/m<sup>3</sup>. All the remaining tubes in the same vicinity ranged between 25 µg/m<sup>3</sup> and 32 µg/m<sup>3</sup> confirming that the majority of the street used by the buses complies with the air quality objective and the exceedences are concentrated in a very focused spot.</p> <p>The Scottish air quality objective of 18 µg/m<sup>3</sup> for PM<sub>10</sub>, was exceeded by 1 µg/m<sup>3</sup> in High Street, Irvine. The European Directive air quality directive (40 µg/m<sup>3</sup>) was not exceeded.</p>



Report	Summary
<p><b>2011</b> Progress Report &amp; Detailed Assessment (cont)</p>	<p>For the second year running, annual mean concentration of NO<sub>2</sub> in Townhead Street/New Street continues to meet the air quality objective. However the results are borderline and this are will continue to be closely monitored.</p> <p>A review of NO<sub>2</sub> diffusion tube sampling locations was undertaken to identify areas where sampling could confidently be reduced. The results of this and any changes will be included in the 2012 Report. The co-location NO<sub>2</sub> diffusion tubes will continue to be used to provide locally derived bias adjustment factors.</p>
<p><b>2012</b> Updating and Screening Assessment and Detailed Assessment</p>	<p>NO<sub>2</sub> diffusion tube monitoring data for 2011 has shown exceedances for High street Irvine and New Street, Dalry. All other NO<sub>2</sub> diffusion tube sites and automatic monitoring complied with the 40µg/m<sup>3</sup> NO<sub>2</sub> air quality objective set out in the directive.</p> <p>The two tubes that failed the objective located in High Street, Irvine are adjacent to a major bus route through the town. This street is the hub of the public transport (buses) serving North Ayrshire.</p> <p>Diffusion tube monitoring has shown that the exceedance area is highly localised and only covers an area approximately 10m wide. The two nearest tubes are about 10m away and both revealed NO<sub>2</sub> annual mean concentrations of 34µg/m<sup>3</sup>. All the remaining tubes in the vicinity ranged between 25µg/m<sup>3</sup> and 34µg/m<sup>3</sup>, confirming that the street overall complies with the air quality objective and the exceedances are concentrated in one spot.</p> <p>Annual mean concentration of NO<sub>2</sub> in Townhead Street/New Street, generally met the air quality objective, however there was one tube that exceeded the 40µg/m<sup>3</sup> objective with a measurement of 42µg/m<sup>3</sup>. Extrapolating the data back to the receptor would suggest that the actual annual mean would be 38.2µg/m<sup>3</sup>.</p>
<p><b>2013</b> Progress Report</p>	<p>Monitoring results for 2012 indicated that NO<sub>2</sub> diffusion tube data continue to show exceedance of the objective for High street Irvine and New Street, Dalry. All other NO<sub>2</sub> diffusion tube sites and automatic monitoring complied with the 40µg/m<sup>3</sup> NO<sub>2</sub> air quality objective.</p> <p>The two tubes located in High Street, Irvine that are adjacent to a major bus route through the town continued to fail the objective. Both the Progress Report and the Detailed assessment showed that the exceedance area only covers an area approximately 10m wide.</p> <p>Plans approved for a new leisure centre in the vicinity of High Street, Irvine has provided an opportunity to move the bus terminus from its present location and to remove the localised hotspot without the need to declare an AQMA.</p> <p>One diffusion tube in New Street, Dalry that failed the 40µg/m<sup>3</sup> objective with a measurement of 44µg/m<sup>3</sup>. Extrapolating the data back to the receptor would suggest that the actual annual mean would be 39.9µg/m<sup>3</sup>.</p>

	<p>On 8 February 2012 Ministers announced that preparation work for the A737 Dalry Bypass would commence, with Draft Orders for the scheme in place and subject to completion of the necessary statutory procedures, construction is anticipated to start in 2014. The construction of the new bypass will resolve this matter. This location will continue to be monitored until after the completion of the project.</p>
<p><b>2014 Progress Report</b></p>	<p>Diffusion tube data continued to show an exceedance of the air quality objective for the NO<sub>2</sub> annual mean concentration of 40µg/m<sup>3</sup> in the southern area of High street Irvine due to a small, localised hotspot of around 10m diameter as the location is used as a bus terminus.</p> <p>Plans approved in June 2013 for a new leisure centre in the vicinity have provided an opportunity to review traffic and pedestrian movements in the town centre. Greater detail is provided within a 2013 Detailed Assessment Report.</p> <p>Airborne particulate matter (PM<sub>10</sub>) recorded an annual mean of 21µg/m<sup>3</sup> in High Street, Irvine that exceeded the Scottish annual mean air quality objective for PM<sub>10</sub> of 18µg/m<sup>3</sup>. The European objective of 40µg/m<sup>3</sup> was not exceeded for PM<sub>10</sub>.</p> <p>North Ayrshire Council is working with Strathclyde Passenger Transport and local bus operator Stagecoach to achieve a resolution to resolve the elevated levels in the High Street.</p> <p>Funds were applied for to replace the BAM1020 for a Fidas 200 or TEOM FDMS PM<sub>10</sub> analyser and AQ Mesh NO<sub>2</sub> analysers to capture data more frequently and accurately to support better decision making.</p> <p>In Dalry one NO<sub>2</sub> diffusion tube exceeded the air quality objective limit of 40µg/m<sup>3</sup> with an annual mean of 45µg/m<sup>3</sup>. Extrapolating the data back to the closest relevant receptor gave a value of 40.8µg/m<sup>3</sup>, illustrating that the local air quality objectives are borderline in this location. Draft Orders for the A737 Dalry Bypass scheme were published in Spring 2013 and construction was due to start in 2014. The construction of the new bypass will resolve this matter.</p> <p>NO<sub>2</sub> diffusion tube monitoring will continue in Dalry until after the completion of the new bypass to allow a comparison to be made.</p>

## 2 New Monitoring Data

### 2.1 Summary of Monitoring Undertaken

#### 2.1.1 Automatic Monitoring Sites

A fixed ROMON unit containing NO<sub>2</sub> analyser and Beta Attenuation Monitor 1020 for PM<sub>10</sub> (BAM 1020) is located in High Street, Irvine. This monitoring station has been operational since early 2009 and is the site being used for the triplicate co-location of diffusion tubes.

Due to problems being sent via a dial up modem funding was granted in 2012 for the purchase of a web logger. This problem has now been solved. In the middle of 2014 there was data loss from the NO<sub>x</sub> analyser due to pipework sampling air from within the cabinet and air conditioning breakdowns due to high ambient air temperatures outside the cabinet resulting in a data capture of 82.8% for NO<sub>2</sub> and NO<sub>x</sub>.

Data capture was also lost at various times in 2014 from the BAM1020 PM<sub>10</sub> particulate monitor due to tape breakage and slippage, nozzle leakages and air conditioning breakdowns due to high ambient air temperatures outside the cabinet resulting in a data capture of 75.6%.

The BAM 1020 was replaced by a Fidas 200 fine dust and monitoring immission measurement system for the continuous and simultaneous measurement of PM<sub>1</sub>, PM<sub>2.5</sub> as per EN 14907 and PM<sub>10</sub> as per EN12341 on 14<sup>th</sup> April 2015. Monitoring results from the Fidas 200 will form part of future Air Quality reports.

Calibration checks are conducted every 2 weeks on site by Local Authority Officers and collected data is forwarded to Ricardo - AEA who validate and ratify the data. The unit is calibrated by Ricardo - AEA every 6 months. Ricardo - AEA reports are included in Appendix 2.

All collected data is available on the Scottish Air Quality website [www.scottishairquality.co.uk](http://www.scottishairquality.co.uk).

#### **Map(s) of Automatic Monitoring Sites**

The location of the ROMON is detailed in Figure 2 in Appendix 3.



Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
		X	Y						
GroundHog	Roadside	232188	638861	NO <sub>2</sub> , PM <sub>10</sub> , CO	Permanently replaced by ROMON beginning of 2009				
ROMON	Roadside	232188	638861	NO <sub>2</sub> , PM <sub>10</sub>	NO <sub>x</sub> & BAM 1020	No	Y 20m	2.5m	Y

### **2.1.2 Non-Automatic Monitoring Sites**

Monitoring of nitrogen dioxide was undertaken at 22 sites using passive diffusion tubes. Tubes were previously relocated during 2008 from long term sites to more important positions within Detailed Assessment areas (High Street, Irvine and Townhead/New Street, Dalry).

Maps of Non-Automatic Monitoring Sites and surrounding areas are included in Figure 3 in Appendix 4 whilst their details are shown in Table 2.2 below.

Table 2.2 Details of Non-Automatic Monitoring Sites

Site ID			Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
No.	Unique Ref No. (URN)	Name									
1	199802	35 East Road Irvine	K	232323	638892	NO <sub>2</sub>	N	N	N	5m	N
2	200801	18 Bank St, Irvine	K	232202	638952	NO <sub>2</sub>	N	N	Y (1m)	3m	Y
3	200101	147 High Street, Irvine	K	232077	638990	NO <sub>2</sub>	N	N	Y	3m	Y
4	200805	85 High St, Irvine	K	232158	638882	NO <sub>2</sub>	N	N	Y (1m)	3m	Y
5	199807	79 High St, Irvine	K	232169	638878	NO <sub>2</sub>	N	N	N	3m	Y
6	200806	75 High St, Irvine HIGH	K	232170	638871	NO <sub>2</sub>	N	N	Y (1m)	3m	Y
7	199901	65a High Street, Irvine, (ROMON)	K	232188	638861	NO <sub>2</sub>	N	Y	N	2.5m	Y
8	200701	65 High Street, Irvine, (ROMON)	K	232188	638861	NO <sub>2</sub>	N	Y	N	2.5m	Y
9	200702	63 High Street, Irvine, (ROMON)	K	232188	638861	NO <sub>2</sub>	N	Y	N	2.5m	Y
10	199809	34 Kirkgate Irvine	UB	232085	638774	NO <sub>2</sub>	N	N	N	N/A	N
11	199902	25 Main Rd, Springside	K	236813	638659	NO <sub>2</sub>	N	N	N	N/A	N
12	200001	Auchengate (Bridge)	SP	233332	635558	NO <sub>2</sub>	N	N	N	N/A	N
13	199811	Dalry Rd , Kilwinning	K	229928	643400	NO <sub>2</sub>	N	N	N	N/A	N
14	201101	Vernon St, Saltcoats	K	224697	641366	NO <sub>2</sub>	N	N	N	1m	Y

North Ayrshire Council

Site ID			Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
No.	Unique Ref No. (URN)	Name									
15	200703	12 Garnock St, Dalry	UB	229326	649250	NO <sub>2</sub>	N	N	Y (1m)	1.5m	N
16	200808	67 New St, Dalry	K	229338	649337	NO <sub>2</sub>	N	N	Y (1m)	2m	Y
17	200705	45 New St Dalry	K	229286	649365	NO <sub>2</sub>	N	N	Y (1m)	1.5m	Y
18	200708	2 Townhead St, Dalry	K	229230	649338	NO <sub>2</sub>	N	N	Y (1m)	2m	Y
19	199907	Highfield Hamlet , Dalry	K	230943	650280	NO <sub>2</sub>	N	N	N	N/A	N
20	199812	85 Main Street , Largs	K	220333	659322	NO <sub>2</sub>	N	N	N	N/A	N
21	200007	Hunterston Road	SP	219582	650020	NO <sub>2</sub>	N	N	N	N/A	N
22	201201	Princess St/Glasgow St, Ardrossan	K	219582	650020	NO <sub>2</sub>	N	N	N	2m	Y

Location of exceedance



## **2.2 Comparison of Monitoring Results with AQ Objectives**

### **2.2.1 Nitrogen Dioxide**

Nitrogen dioxide continues to be the primary pollutant of concern in the North Ayrshire Council district. Key affected areas are Townhead Street/New Street, Dalry and High Street, Irvine. There were exceedences for the Annual Mean objective in both locations and this is discussed in greater detail in the Conclusions.

#### **Automatic Monitoring Data**

North Ayrshire Council had its first official co-location study start in 2009 which has been continued for each report since then. The sampling point for the co-location is at the ROMON site, High Street, Irvine, where NO<sub>2</sub> diffusion tubes are located ~20cm away from the ROMON sampling inlet.

The corresponding data was entered in the “Checking Precision and Accuracy of Triplicate Tubes” spreadsheet provided by AEA Energy & Environment (Appendix 5). The resulting Bias Correction Factor is **0.91**.

Table 2.3 Results of Automatic Monitoring of Nitrogen Dioxide: **Comparison with Annual Mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %	Valid Data Capture 2014 %	Annual Mean Concentration $\mu\text{g}/\text{m}^3$				
					2010	2011	2012	2013	2014
ROMON	Roadside	N	82.8	82.8	34	31	31	31	29

Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: **Comparison with 1-hour mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %	Valid Data Capture 2014 %	Number of Exceedences of Hourly Mean ( $200 \mu\text{g}/\text{m}^3$ )				
					2010	2011	2012*	2013	2014
ROMON	Roadside	N	82.8	82.8	1	0	0(117)	0	0

In **bold**, exceedance of the  $\text{NO}_2$  hourly mean AQS objective ( $200\mu\text{g}/\text{m}^3$  – not to be exceeded more than 18 times per year)

\*Data capture for full calendar was less than 90%, (99.8<sup>th</sup> percentile of hourly means in brackets)

### **Diffusion Tube Monitoring Data**

The most recent review of diffusion tube locations was in 2011, resulting in sampling ceasing at a number of sites. Most of the long term background sites have been retained to allow comparison when selecting the most appropriate bias factor. A table containing the last 14 years historical data for NO<sub>2</sub> diffusion tube monitoring annual mean results is included in Appendix 6. The table also reflects all the changes in sampling locations throughout this period.

Results of NO<sub>2</sub> Diffusion Tubes for 2014 are shown in Table 2.5 below whilst 2010 – 2014 results are shown in 2.6 below.

Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites in Irvine and Dalry from 2007 to 2014 are shown in Figure 2.1 below.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2014

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.91)
								2014 ( $\mu\text{g}/\text{m}^3$ )
1	35 East Road Irvine	K	N	N	11	n/a	N	23
2	18 Bank St, Irvine	K	N	N	11	n/a	N	25
3	147 High Street, Irvine	K	N	N	12	n/a	N	34
4	85 High St, Irvine	K	N	N	12	n/a	N	32
5	79 High St, Irvine	K	N	N	12	n/a	N	<b>53.1</b>
6	75 High St, Irvine HIGH	K	N	N	12	n/a	N	<b>45</b>
7	65a High Street, Irvine, (ROMON)	K	N	Triplicate & Collocated	12	n/a	N	28.8

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.91)
								2014 ( $\mu\text{g}/\text{m}^3$ )
8	65 High Street, Irvine, (ROMON)	K	N	Triplicate & Collocated	12	n/a	N	28
9	63 High Street, Irvine, (ROMON)	K	N	Triplicate & Collocated	12	n/a	N	27.1
10	34 Kirkgate Irvine	UB	N	N	12	n/a	N	11
11	25 Main Rd, Springside	K	N	N	12	n/a	N	15.1
12	Auchengate (Bridge)	SP	N	N	12	n/a	N	11
13	Dalry Rd , Kilwinning	K	N	N	10	n/a	N	22
14	12, Garnock St., Dalry	K	N	N	12	n/a	N	11.4
15	67New St., Dalry	UB	N	N	12	n/a	N	29.9

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = <b>0.91</b> )
								2014 ( $\mu\text{g}/\text{m}^3$ )
16	45 New St., Dalry	K	N	N	12	n/a	N	42.4
17	2 Townhead St., Dalry	K	N	N	11	n/a	N	32
18	Highfield Hamlet, Dalry	K	N	N	12	n/a	N	23
19	85 Main St., Dalry	K	N	N	11	n/a	N	19
20	Hunterston, Largs	K	N	N	12	n/a	N	7
21	Princes St., Ardrossan	SP	N	N	12	n/a	N	18
22	Vernon St., Saltcoats	K	N	N	12	n/a	N	21

**Location of exceedance**

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2010 to 2014)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$					
			2010 (Bias Adjustment Factor = 0.93)	2011 (Bias Adjustment Factor = 0.79)	2012 (Bias Adjustment Factor = 0.91)	2013 (Bias Adjustment Factor = 1)	2014 (Bias Adjustment Factor = <b>0.91</b> )	
1	35 East Road Irvine	K	N	27	23	27	27	23
2	18 Bank St, Irvine	K	N	27	26	28	28	25
3	147 High Street, Irvine	K	N	26	30	31	31	34
4	85 High St, Irvine	K	N	31	34	34	36	32
5	79 High St, Irvine		N	<b>50</b>	<b>54</b>	<b>59</b>	<b>59</b>	<b>53.1</b>
6	75 High St, Irvine HIGH	K	N	<b>41</b>	<b>46</b>	<b>46</b>	<b>48</b>	<b>45</b>
7	65a High Street, Irvine, (ROMON)	K	N	32	30	32	32	28.8
8	65 High Street, Irvine, (ROMON)	K	N	31	31	31	32	28

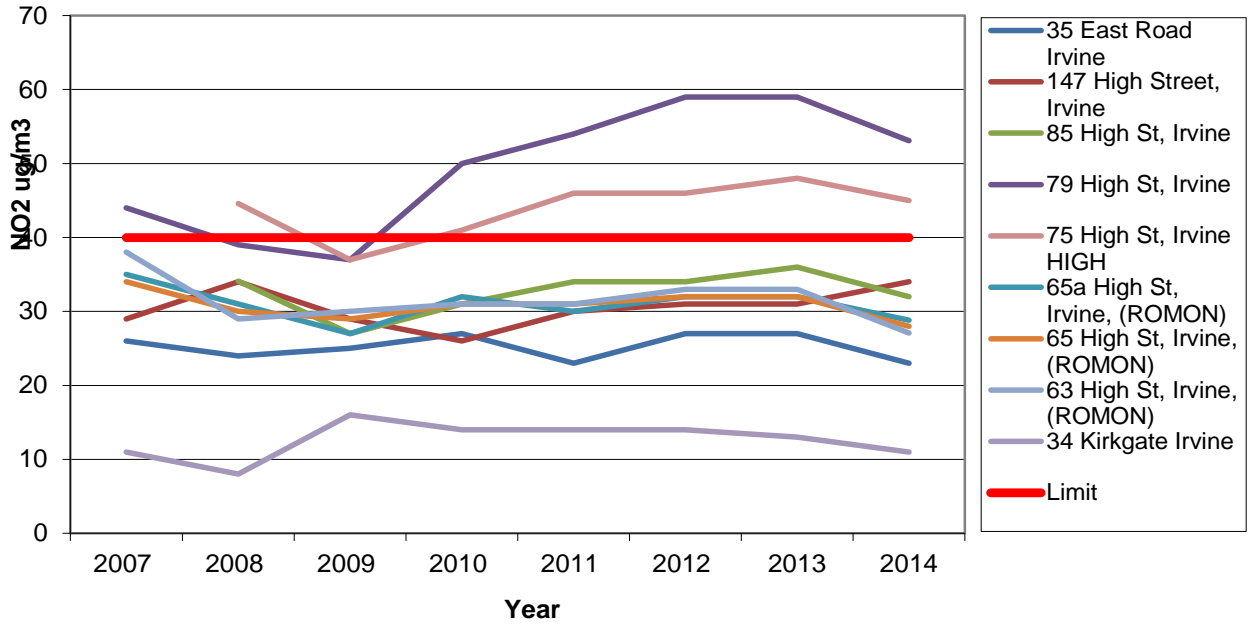
Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$					
			2010 (Bias Adjustment Factor = 0.93)	2011 (Bias Adjustment Factor = 0.79)	2012 (Bias Adjustment Factor = 0.91)	2013 (Bias Adjustment Factor = 1)	2014 (Bias Adjustment Factor = <b>0.91</b> )	
9	63 High Street, Irvine, (ROMON)	K	N	31	31	33	33	27.1
10	34 Kirkgate Irvine	UB	N	14	14	14	13	11
11	25 Main Rd, Springside	K	N	17	16	19	17	15.1
12	Auchengate (Bridge)	SP	N	13	12	13	12	11
13	Dalry Rd , Kilwinning	K	N	21	23	26	23	22
14	12 Garnock St., Dalry	UB	N	15	11	14	14	11.4
15	67 New St., Dalry	K	N	33	32	36	33	29.9
16	45 New St., Dalry	K	N	37	<b>42</b>	<b>44</b>	<b>45</b>	<b>42.4</b>



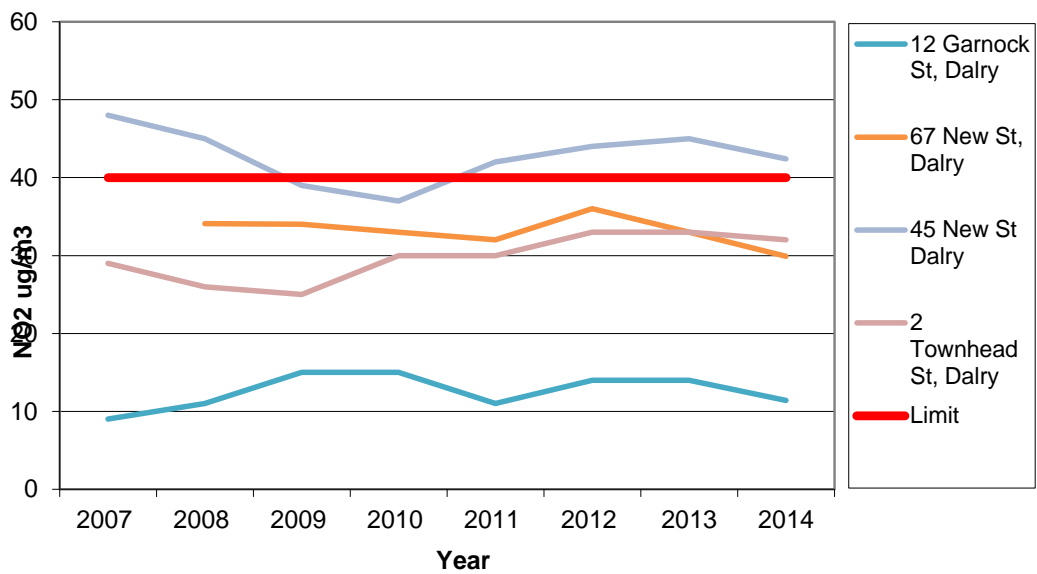
Site ID		Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
				2010 (Bias Adjustment Factor = 0.93)	2011 (Bias Adjustment Factor = 0.79)	2012 (Bias Adjustment Factor = 0.91)	2013 (Bias Adjustment Factor = 1)	2014 (Bias Adjustment Factor = 0.91)
17	2 Townhead St., Dalry	K	N	30	30	33	33	32
18	Highfield Hamlet, Dalry	K	N	19	20	21	22	23
19	85 Main St., Largs	K	N	23	19	24	25	19
20	Hunterston Cycle track, Largs	SP	N	6	6	7	7	7
21	Princes St., Ardrossan	K	N			19 (Annulised 7 Months)	23	18
22	Vernon St., Saltcoats	K	N			25	26	21

Figure 2.1 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites in Irvine and Dalry.

Trends for Irvine Area 2007 - 2014



Trends for Dalry Area 2007 - 2014



### 2.2.2 PM<sub>10</sub>

The automatic monitoring site (ROMON) also houses a Met-One Beta Attenuation Monitor (BAM) which has been monitoring PM<sub>10</sub> since the ROMON was commissioned in February 2009. The monitor is checked every 2 weeks during calibration of the NO<sub>2</sub> monitor and the filter tape is replaced every 8 weeks. This unit continues to be a permanent installation and will allow data collection for each full year.

The Air Quality objective of “50µg/m<sup>3</sup> (24 Hour Mean) not to be exceeded more than 7 times a year” has not been exceeded during any monitoring. In 2014 the annual mean objective for PM<sub>10</sub> averaged 16µg/m<sup>3</sup>. Only 9 months data was captured and when annualised gives a result of 15.94µg/m<sup>3</sup>, confirming compliance with the objective of 18µg/m<sup>3</sup>

The European Air Quality objective of 40µg/m<sup>3</sup> has never been exceeded at this location.

The unheated BAM1020 is suspected of over-reading concentrations due moisture and was replaced by a Fidas 200 fine dust and monitoring immission measurement system for the continuous and simultaneous measurement of PM<sub>1</sub>, PM<sub>2.5</sub> as per EN 14907 and PM<sub>10</sub> as per EN12341 on 14<sup>th</sup> April 2015. Monitoring results from the Fidas 200 will form part of future Air Quality Reports.

Monitoring results for PM<sub>10</sub> are shown in Table 2.7 and 2.8 below whilst Annualised data is presented in Table 2.9.

Trends in Annual Mean PM10 Concentrations Measured at Automatic Monitoring Station (ROMON) are shown in Figure 2.2 below.

Quality Assurance & Quality Control details are included in Appendix 7.

Table 2.7 Results of Automatic Monitoring of PM<sub>10</sub>: **Comparison with Annual Mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %	Valid Data Capture 2014 %	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration µg/m <sup>3</sup>				
						2010	2011	2012	2013	2014
ROMON	Roadside	N	75.6	75.6	Y (Factor 0.83333)	<b>19</b>	18	17	<b>21</b>	16

In bold, exceedance of the PM<sub>10</sub> **Annual Mean** AQS objective of **18µg/m<sup>3</sup>**

Table 2.8 Results of Automatic Monitoring for PM<sub>10</sub>: **Comparison with 24-hour mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % <sup>a</sup>	Valid Data Capture 2011 % <sup>b</sup>	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 µg/m <sup>3</sup> )				
						2010	2011	2012	2013	2014
ROMON	Roadside	N	75.6	75.6	Y (Factor 0.83333)	0	0	<b>2</b>	<b>1</b>	0

In **bold**, exceedance of the PM<sub>10</sub> **daily mean** AQS objective (**50µg/m<sup>3</sup>** – not to be exceeded more than 7 times per year)

**Table 2.9 Annualised Data**

Site: **High St., Irvine – BAM1020** (9 months)

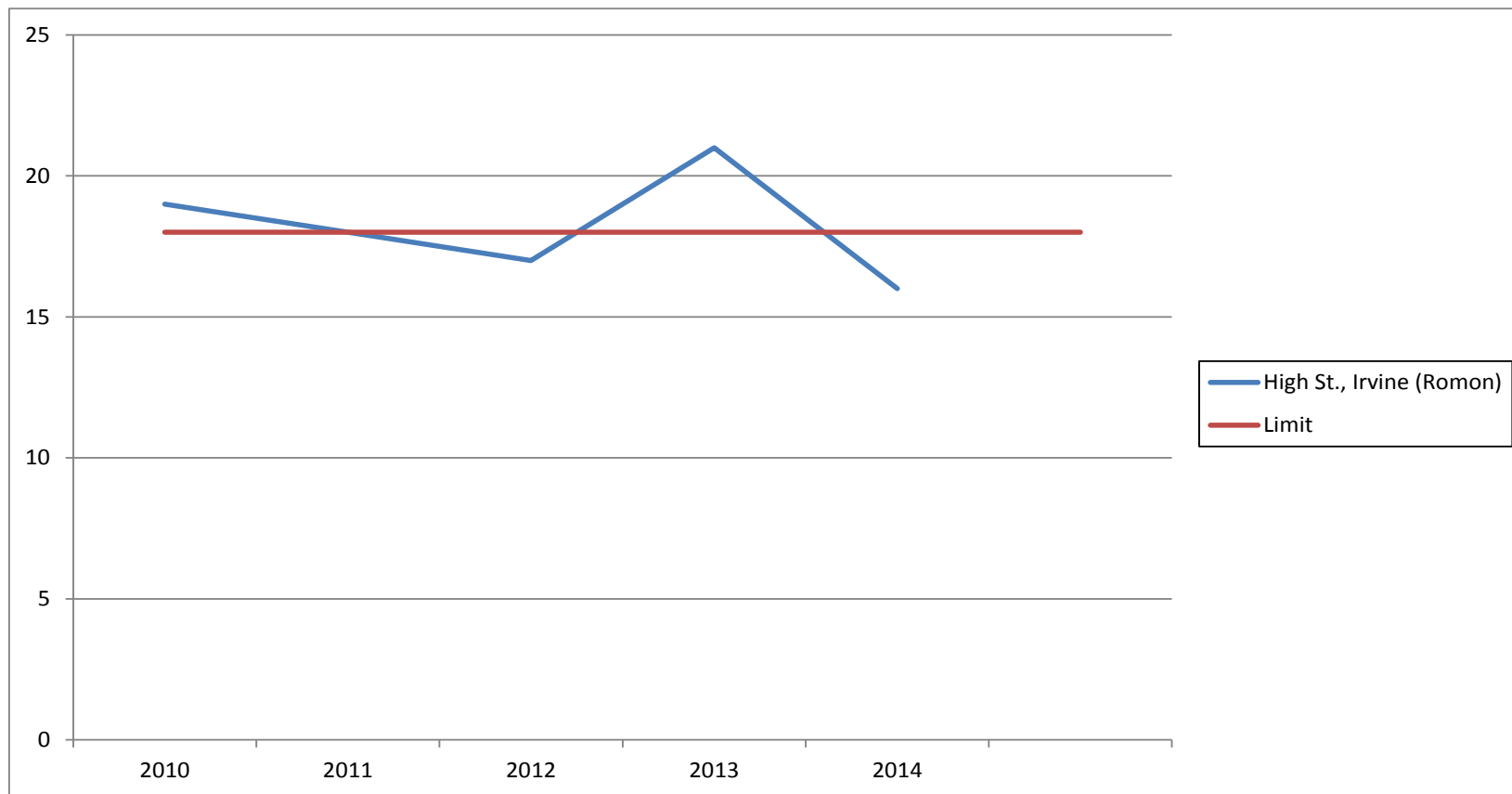
Long Term Site	Annual Mean 2014 (Am)	Period Mean 2014 (Pm)	Ratio (Am/Pm)
Auchencroth Moss	6.5µg/m <sup>3</sup>	6.5µg/m <sup>3</sup>	1
Glasgow Townhead	11.08µg/m <sup>3</sup>	11.22µg/m <sup>3</sup>	0.987
South Ayrshire, Harbour St.	12.25µg/m <sup>3</sup>	12.22µg/m <sup>3</sup>	1
<b>Average (R<sub>a</sub>)</b>			<b>0.996</b>

Data Sources:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Auchencroth Moss</b>	6	5	8	9	7	6	6	5	11	5	6	4
	92%	72%	99%	100%	99%	99%	95%	89%	99%	100%	100%	99%
<b>Glasgow Townhead</b>	10	9	13	13	10	9	10	7	16	11	13	12
	66%	8%	98%	100%	86%	100%	88%	90%	99%	100%	100%	19%
<b>South Ayr., Harbour St.</b>	13	9	15	15	12	11	13	11	17	10	10	11
	20%	90%	96%	80%	99%	98%	45%	89%	99%	99%	100%	99%

**Estimated Annual Mean** = Mean Concentration (M) x Average Ratio (R<sub>a</sub>) = 16µg/m<sup>3</sup> x 0.996 = **15.94µg/m<sup>3</sup>**

**Figure 2.2 Trends in Annual Mean PM10 Concentrations Measured at Automatic Monitoring Station (ROMON)**



PM10 annual mean results illustrate a fluctuation around the air quality objectives for High Street, Irvine, between 2008 and 2011 however there has been a steady increase since then.

### 2.2.3 Sulphur Dioxide

Monitoring for sulphur dioxide and smoke has been discontinued in North Ayrshire since 2004. Historical monitoring data is available for nearly every town in the area and there is no indication from these results that the air quality standard is likely to be breached even around local industrial sources.

Previous reviews concluded that:

1. The extensive smoke control programme undertaken by Cunninghame District Council has improved sulphur dioxide levels in the area due to the shift to natural gas and electricity.
2. The extensive historical monitoring programmes for sulphur dioxide in North Ayrshire covered every urban area.
3. There is no need to progress to a detailed assessment for sulphur dioxide.
4. The rail link serving North Ayrshire is electrified therefore there are no diesel-powered passenger trains. Goods trains on the network are diesel-powered. There are no major stockyards apart from those serving Hunterston coal terminal. These, however, are not within 15 metres of a relevant location, nor are there any stations or signal junctions where diesel locomotives are likely to be stationary for 15 minutes or more within 15 metres of a relevant exposure.

There has been no evidence of any change to sulphur dioxide production or release in North Ayrshire. Similarly, there has been no development likely to result in any increase in sulphur dioxide levels at locations where there could be relevant public exposure.

### 2.2.4 Benzene

No recent monitoring of benzene has been undertaken. However, previous reviews have concluded that:

1. There was no significant industrial source of benzene located either within North Ayrshire or neighbouring areas likely to adversely affect air quality within North Ayrshire.
2. There was no need to proceed to a detailed assessment for benzene.

Since the last report there has been no evidence of any change to benzene production or release in North Ayrshire. Similarly, there has been no development likely to result in any increase in benzene levels at locations where there could be relevant public exposure.

## **2.2.5 Other pollutants monitored**

### **Radiation Monitoring**

North Ayrshire Council previously had a Radiation – Food and Environment Programme which involved collecting monthly samples of foods, soils, seawater, etc for analysis by Glasgow Scientific Services, for the purpose of monitoring background levels of radiation in the environment. This sampling programme was terminated in 2010.

Additional environmental monitoring continues to be conducted by officers on a quarterly basis using a portable Mini 680 radiation monitor to measure background levels of radiation at 6 sites located throughout the district.

### **Dust Deposition**

Three dust deposit gauges located in Fairlie specifically to monitor dust from the coal stockyard at Clydeport Hunterston were reduced to two in 2011. The dust deposit gauges are checked every month in conjunction with the NO<sub>2</sub> diffusion tubes being changed. The samples are sent to Glasgow Scientific Services and analysed for total rainfall, pH, Total Dissolved Solids (TDS), Total Dried Undissolved Matter (TDUM), Combustible Matter and ash. Reports will include breakdown of additional parameters (metals etc) if detected at significant levels.

There are no British Standards with which to compare results. Assessment is based on any significant changes in the amount of particulates, etc which are present in the samples. Following a review of staff resources and analysis of the long term sampling results no significant changes were noted therefore sampling ceased in September 2013.



**PM<sub>1</sub> and PM<sub>2.5</sub>**

A Fidas 200 fine dust and monitoring and immission measurement system for the measurement of PM<sub>1</sub>, PM<sub>2.5</sub> as per EN 14907 as well as PM<sub>10</sub> as per EN12341 replaced the BAM 1020 in the ROMON High Street, Irvine on 14<sup>th</sup> April 2015. PM<sub>1</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> are being monitored continuously and simultaneously by the Fidas 200 but do not form part of this report.

## Summary of Compliance with AQS Objectives

**North Ayrshire Council** has measured concentrations of **Nitrogen Dioxide** above the **annual** mean objective at relevant locations. However, as a Detailed Assessment was carried out in 2013 and discussions are on-going with Strathclyde Passenger Transport, the local bus operator and NAC Roads Dept to address the issues and there is no further information to present, therefore North Ayrshire Council **will not need to proceed to a Detailed Assessment\***, for **High Street, Irvine at this time.**

\*There were 3 failures for NO<sub>2</sub> diffusion tubes within North Ayrshire which were located in:

- **High Street, Irvine – \*Detailed assessment available (2013 report)**  
This is a known hot spot anomaly at a bus stance and is well documented in previous reports. All other tubes in this street were all below the local air quality objectives.
- **New Leisure Centre and Public Realm Work Proposals, Townhead Street, Irvine**  
These proposals have presented the opportunity to review the whole traffic system within the town centre area.
- **Townhead Street/New Street, Dalry**  
The proposed bypass to serve Dalry will remove the bulk of the traffic affecting this area. The scheme is now progressing through its advanced preparatory stages at this time.

There is a separate Detailed Assessment Report (2013) which has considered the exceedances at the High Street, Irvine and is available at

<http://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/EnvironmentalHealth/detailed-assessment-of-nitrogen-dioxide-concentrations-high-street-irvine.pdf>

## **3 Road Traffic Sources**

### **3.1 Narrow Congested Streets with Residential Properties Close to the Kerb**

North Ayrshire Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

### **3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic**

North Ayrshire Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

### **3.3 Roads with a High Flow of Buses and/or HGVs.**

North Ayrshire Council confirms that there are no new/newly identified roads with high flows of buses/HGVs.

As elevated levels of NO<sub>2</sub> have been recorded in High Street, Irvine for number of years a Detailed Assessment was undertaken in 2013 with a view to establishing the conditions and extent of use by public transport in the area. Traffic restrictions have been in place preventing access by private vehicles into this area for a number of years, hence the focus was primarily on the bus network. In addition, plans were revealed in 2011 for a new leisure centre and Public Realm works in this location.

In the intervening period various meetings involving the Leisure Centre Design Team, North Ayrshire Transportation, Stagecoach and Strathclyde Partnership for Transport (SPT) revealed the following information regarding High Street, Irvine.

- **All Stagecoach fleet buses are Euro 4 or 5 classification**
- **All Stagecoach fleet buses are now fitted with auto shut off systems which turn off the engines after 3 minutes of idling**

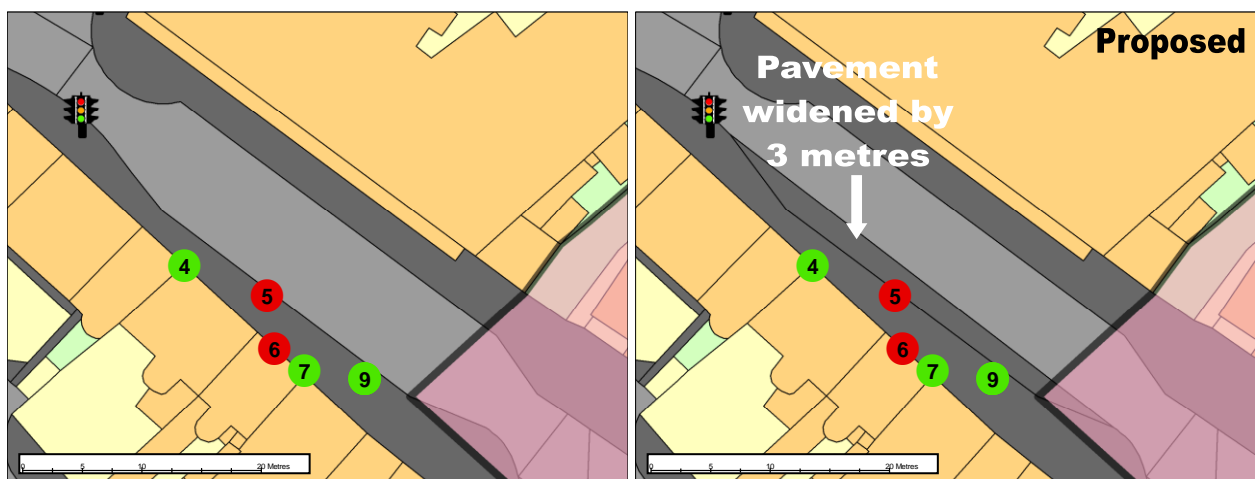
- All of the Stagecoach fleet buses run on B5 fuel with 70% of the Irvine fleet running on B30 for the last 6 months
- There has been no increase in the number of buses using this route in the last 3 years
- Leisure centre scheduled to be completed by May 2016. Transport issues relating to local air quality are being carefully considered
- There are plans for major improvements in High Street which will include significantly widening the pavement immediately adjacent to the highest NO<sub>2</sub> readings (Figure 3.1).

The fleet being a high standard of Euro class ensures optimal reductions in levels of pollution at source which coupled with the idling cut-off switches suggests that the best practicable means are being adopted to minimise pollution from the buses.

Planning permission has been granted for the proposed leisure centre and work has started. The centre is expected to be completed by May 2016 and is estimated to attract a further 150 cars each day into the town centre, and there has now been a new long stay car park constructed approximately 500m away. The project design team are aware of the potential for increased traffic levels and congestion leading to deterioration in local air quality and are giving it careful consideration in the design of the Public Realm works proposed for the High Street.

The most significant proposal from the meetings is that the pavement adjacent to the main traffic route in High Street, Irvine where the hot spot is located, will be extended out into the road. This will result in the pavement nearly doubling in width and displacing the stationary buses a further 3 meters away from the building façade.

**Figure 3.1 Proposed Pavement Alterations (High St, Irvine)**



It is anticipated this will have a significant impact on reducing the NO<sub>2</sub> levels at this location by allowing better dilution and dispersal of pollutants. The drop-off with distance calculator was used to predict reductions and is discussed in the Conclusions.

One new AQ Mesh mobile air monitoring pod to measure NO<sub>2</sub> and PM<sub>10</sub> has already been purchased in 2015 and is currently co-located within the ROMON for calibration prior to it being deployed in the area of the High Street to monitor ambient air quality. An additional two AQ Mesh pods are ordered and will be deployed on the High Street in due course.

### **3.4 Junctions**

North Ayrshire Council confirms that there are no new/newly identified busy junctions/busy roads.

### **3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment**

North Ayrshire Council confirms that there are no new/proposed roads.

### **3.6 Roads with Significantly Changed Traffic Flows**

North Ayrshire Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

### **3.7 Bus and Coach Stations**

North Ayrshire Council confirms that there are no relevant bus stations in the Local Authority area.

Irvine town centre is the administrative hub of the district and the absence of an official bus station has resulted in heavy use of the High Street by public transport. Currently 60 buses per hour travel along high street which runs though the middle of the town. As discussed earlier in the report, this is the main area of concern for Local Air Quality in North Ayrshire. Traffic restrictions have been in force here for some time preventing private vehicles entering the area during office hours so the primary source of pollution is public transport. Plans are also being discussed to change routes and stops to address the NO<sub>2</sub> hot spot issue in the High Street.

## **4 Other Transport Sources**

### **4.1 Airports**

North Ayrshire Council confirms that there are no airports in the Local Authority area.

### **4.2 Railways (Diesel and Steam Trains)**

#### **4.2.1 Stationary Trains**

North Ayrshire Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

#### **4.2.2 Moving Trains**

North Ayrshire Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

### **4.3 Ports (Shipping)**

North Ayrshire Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

## **5 Industrial Sources**

### **5.1 Industrial Installations**

#### **5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out**

North Ayrshire Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

In the last Updating and Screening Assessment Report it was confirmed that there were proposals to have a coal fired power station with carbon capture and storage technology located at Hunterston, Clydeport, Fairlie. Given the nature and size of the development, the application was being handled by the Scottish Government. The Applicant withdrew the application prior to any decision being taken. An Environmental Impact Assessment & Statement was submitted in support of the application which covered air quality issues and concluded that there would be no detrimental impact on the Local Air Quality Objectives.

#### **5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced**

North Ayrshire Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

#### **5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment**

North Ayrshire Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.



## **5.2 Major Fuel (Petrol) Storage Depots**

There are no major fuel (petrol) storage depots within the Local Authority area.

## **5.3 Petrol Stations**

North Ayrshire Council confirms that there are no petrol stations meeting the specified criteria.

## **5.4 Poultry Farms**

North Ayrshire Council confirms that there are no poultry farms meeting the specified criteria.

## **6 Commercial and Domestic Sources**

### **6.1 Biomass Combustion – Individual Installations**

North Ayrshire Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

A total of fifteen individual biomass combustion plants have been installed at various locations throughout the North Ayrshire Council area since the last Updating and Screening Assessment in 2012. Assessment has shown that no installation source exceeds the relevant threshold.

### **6.2 Biomass Combustion – Combined Impacts**

North Ayrshire Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

### **6.3 Domestic Solid-Fuel Burning**

North Ayrshire Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

North Ayrshire Council's Smoke Control programme declared four Areas between 1981 and 1993. The reason that smoke control areas were necessary was due to poor local air quality from smoke and sulphur dioxide principally emitted from coal fires. The Council's smoke control programme dramatically improved local air quality.

## 7 Fugitive or Uncontrolled Sources

North Ayrshire Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

## 8 Conclusions and Proposed Actions

### 8.1 Conclusions from New Monitoring Data

NO<sub>2</sub> diffusion tube monitoring data for 2014 has shown exceedences for High street Irvine and New Street, Dalry. All other NO<sub>2</sub> diffusion tube sites and automatic monitoring complied with the 40µg/m<sup>3</sup> NO<sub>2</sub> air quality objective set out in the directive.

The two tubes that failed the objective located in High Street, Irvine are adjacent to a major bus route through the town. As outlined earlier in other reports, this street is the hub of the public transport (buses) serving North Ayrshire.

Diffusion tube monitoring has shown that the exceedence area is highly localised and only covers an area approximately 10m wide. The two nearest tubes are approximately 10m away and both revealed NO<sub>2</sub> annual mean concentrations of 34µg/m<sup>3</sup>. All the remaining tubes in the vicinity ranged between 25µg/m<sup>3</sup> and 34µg/m<sup>3</sup>, confirming that the street overall complies with the air quality objective and the exceedences are concentrated in one spot.

In addition, the “drop off with distance” calculator was used to more accurately quantify the NO<sub>2</sub> level at the receptors for 2014 results and also to predict the likely levels when the new widening of the pavement is in place at this location. The results are detailed in the Table 8.1 below. It is anticipated that the amended pavement layout will have a significant impact on dispersion and dilution of the pollutants from buses and will result in significantly lower annual mean levels.

Annual mean concentration of NO<sub>2</sub> in Townhead Street/New Street, Dalry, generally met the air quality objective, however there was one tube that exceeded the 40µg/m<sup>3</sup> objective with a measurement of 42.4µg/m<sup>3</sup>. Extrapolating the data back to the receptor would suggest that the actual annual mean would be 38.5µg/m<sup>3</sup>, as detailed in Table 8.1 below.

**Table 8.1: Drop-off with Distance for NO<sub>2</sub> Tube Exceedences**

Location	Distance from Kerb		Annual Mean NO <sub>2</sub>		Predicted NO <sub>2</sub> at Receptor
	Site	Receptor	Background	Site	
79 High Street, Irvine <i>(Actual)</i>	0.7m	5.2m	6ug/m <sup>3</sup>	53.1ug/m <sup>3</sup>	35.3ug/m <sup>3</sup>
<i>NEW widened pavement (predicted)</i>	<i>0.7m</i>	<i>8.2m</i>	6ug/m <sup>3</sup>	53.1ug/m <sup>3</sup>	31.8ug/m <sup>3</sup>
75 High Street, Irvine <i>(Actual)</i>	5.7m	5.7m	6ug/m <sup>3</sup>	45ug/m <sup>3</sup>	45ug/m <sup>3</sup>
<i>NEW widened pavement (predicted)</i>	<i>5.7m</i>	<i>8.8m</i>	6ug/m <sup>3</sup>	45ug/m <sup>3</sup>	39.7ug/m <sup>3</sup>
45 New Street, Dalry	1.2m	2m	6ug/m <sup>3</sup>	42ug/m <sup>3</sup>	38.5ug/m <sup>3</sup>

The Scottish air quality objective of 18µg/m<sup>3</sup> for PM<sub>10</sub>, was not exceeded with the annual mean measured at 16µg/m<sup>3</sup> in High Street, Irvine. The European Directive air quality directive (40µg/m<sup>3</sup>) was not exceeded. Automated monitoring at this site will continue for 2015.

## 8.2 Proposed Actions

### Irvine

In view of the monitoring data and planned alterations at High Street, Irvine, it is expected that the street layout and Public Realm changes will have the desired impact on reducing NO<sub>2</sub> levels at the localised hot spot. It is proposed that NO<sub>2</sub> sampling continues in this area with close supervision of future developments.

The BAM 1020 particulate monitor was replaced at the High Street by a Fidas 200 fine dust and monitoring immission measurement system for the continuous and simultaneous measurement of PM<sub>1</sub>, PM<sub>2.5</sub> as per EN 14907 and PM<sub>10</sub> as per EN12341 on 14<sup>th</sup> April 2015. Data will continue to be recorded and monitoring results from the Fidas 200 will form part of future Air Quality reports.

## **North Ayrshire Council**

One new AQ Mesh mobile air monitoring pod to measure NO<sub>2</sub> and PM<sub>10</sub>, which can provide real time data over an online connection, has already been purchased in 2015 and is currently co-located within the ROMON for calibration with the NO<sub>x</sub> reference method prior to it being deployed in the area of the High Street to monitor ambient air quality. An additional two AQ Mesh pods are ordered and will be deployed in due course. The AQ Mesh pods will allow more accurate data to be collected in the area of the identified hot spot and enable more informed decisions to be made.

### **Dalry**

It is proposed that monitoring is continued in this area and, in addition to the existing NO<sub>2</sub> diffusion tubes, AQ Mesh pods also may be deployed in this area which will allow more robust data to be collated on a real time basis.

The status of the A737 Dalry Bypass on Transport Scotland's website advises that it is currently being taken through the statutory process.

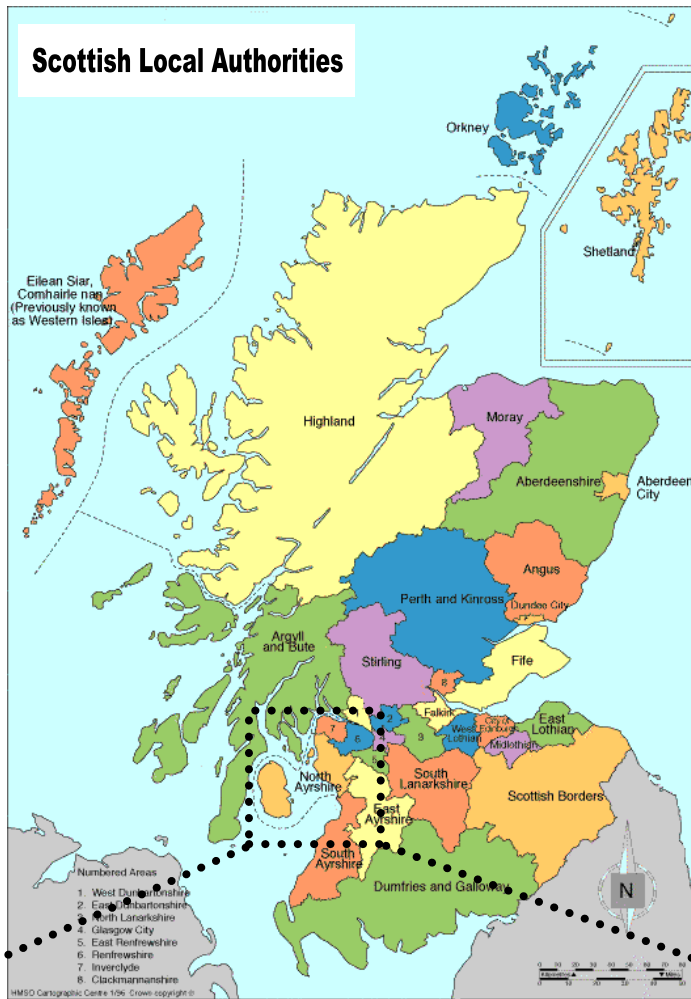
## 9 References

1. Local Air Quality Management, Technical Guidance LAQM.TG (09), February 2009.
2. Checking Precision and Accuracy of Triplicate Tubes (Version 05 - Feb 2012) . (Appendix 5)
3. [www.scottishairquality.co.uk](http://www.scottishairquality.co.uk) – Download CSV Format Background Map Data for 2010 to 2030 (Appendix \*\*\*\*\*)
4. [www.laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html](http://www.laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html) – Distance from Roads Calculator (Appendix \*\*\*\*\*)

# Appendices



# Appendix 1: Figure 1. District Map of Locality & Surrounding Area



## Appendix 2: RICARDO-AEA Air Pollution Report

# Air Pollution Report

Produced by RICARDO-AEA on behalf of the Scottish Government

## NORTH AYRSHIRE IRVINE HIGH ST 1<sup>st</sup> January to 31<sup>st</sup> December 2014

These data have been fully ratified by RICARDO-AEA

POLLUTANT	PM <sub>10+</sub>	NO <sub>2</sub>	NO <sub>x</sub>
Maximum hourly mean	143 µg m <sup>-3</sup>	170 µg m <sup>-3</sup>	669 µg m <sup>-3</sup>
Maximum daily mean	50 µg m <sup>-3</sup>	77 µg m <sup>-3</sup>	178 µg m <sup>-3</sup>
99.8 <sup>th</sup> percentile of hourly means		122 µg m <sup>-3</sup>	330 µg m <sup>-3</sup>
98.08 <sup>th</sup> percentile of daily means	36 µg m <sup>-3</sup>		
Average	16 µg m <sup>-3</sup>	29 µg m <sup>-3</sup>	66 µg m <sup>-3</sup>
Data capture	75.6 %	82.8 %	82.8 %

\* PM10 Indicative Gravimetric Equivalent µg m<sup>-3</sup>

+ PM10 instruments:

BAM using a gravimetric factor of 0.83333 for Indicative Gravimetric Equivalent from 1st January 2014

All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.

NO<sub>x</sub> mass units are NO<sub>x</sub> as NO<sub>2</sub> µg m<sup>-3</sup>

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM <sub>10</sub> Particulate Matter (Gravimetric)	Daily mean > 50 µg m <sup>-3</sup>	0	0
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 18 µg m <sup>-3</sup>	0	-
Nitrogen Dioxide	Annual mean > 40 µg m <sup>-3</sup>	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m <sup>-3</sup>	0	0

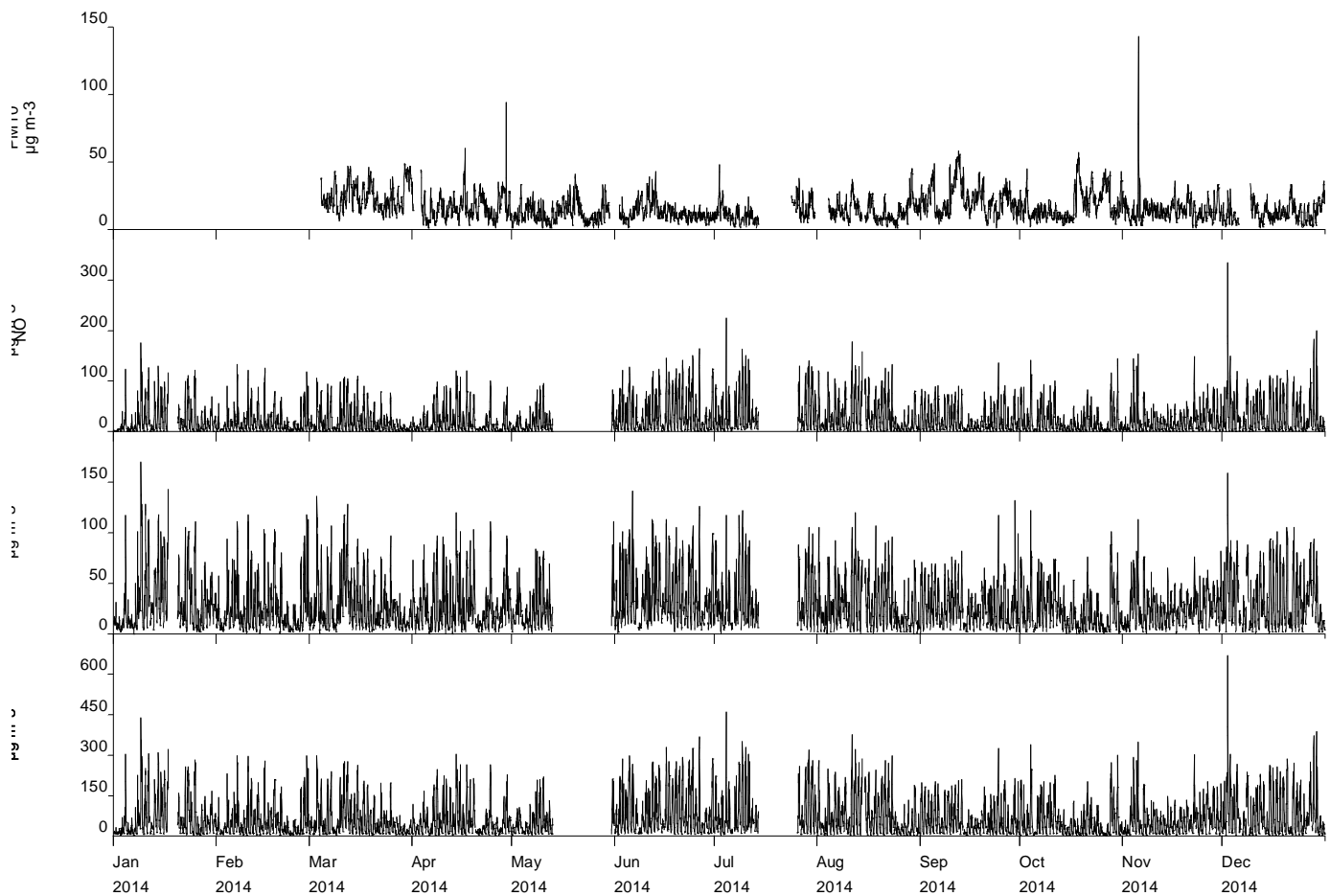
Note: For a strict comparison against the objectives there must be a data capture of &gt;90% throughout the calendar year

Appendix 2: RICARDO-AEA Air Pollution Report (cont)

# Air Pollution Report

Produced by RICARDO-AEA on behalf of the Scottish Government

North Ayrshire Irvine High St  
Hourly Mean Data for 1<sup>st</sup> January to 31<sup>st</sup> December 2014



Date Created: 14/04/2015



# CERTIFICATE OF CALIBRATION

18 Blythswood Square, Glasgow, G2 4AD  
Telephone 01235 753642

0401

Approved Signatories:

D. Hector

S. Stratton

Signed:

Date of Issue: 4<sup>th</sup> April 2014

Certificate Number: 2956

Page 1 of 2

Customer Name and Address:

Scottish Government  
Water, Air, Soils and Flooding Division  
Environmental Quality Directorate  
Scottish Government  
Victoria Quay  
Edinburgh  
EH6 6QQ

Description:

Calibration factors for the air monitoring station at North Ayrshire Irvine High Street.

Site / Date Test Carried Out	Species	Analyser Serial No.	Zero Response <sup>1</sup>	Uncertainties ppb	Calibration Factor <sup>2</sup>	Uncertainties %	Converter eff. (%) <sup>3</sup>
Irvine High St 14 <sup>th</sup> Feb 2014	NO <sub>x</sub>	2981873	0.0	2.8	1.3501	5.2	100.9
	NO		0.0	2.7	1.3654	3.5	

Site / Date Test Carried Out	Species	Analyser Serial No.	Parameter	Specified Value	Measured Value	Deviation %	Uncertainty %
Irvine High St 14 <sup>th</sup> Feb 2014	BAM PM10	H3190	Main Flow <sup>4</sup>	16.67	15.96	-4.3	±2.2

*The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.*

*This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognized national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.*

[www.ricardo-aea.com](http://www.ricardo-aea.com)

**Ricardo-AEA Head Office:** Gemini Building • Fermi Avenue • Harwell • Didcot • Oxfordshire, OX11 0QR, UK • Tel: +44 (0)870 190 1900  
**Ricardo-AEA Registered Office:** Shoreham • Technical Centre • Shoreham-by-Sea • West Sussex, BN43 5FG, UK

**Registered in England No:** 08229264 • VAT Registration No. GB 144024745

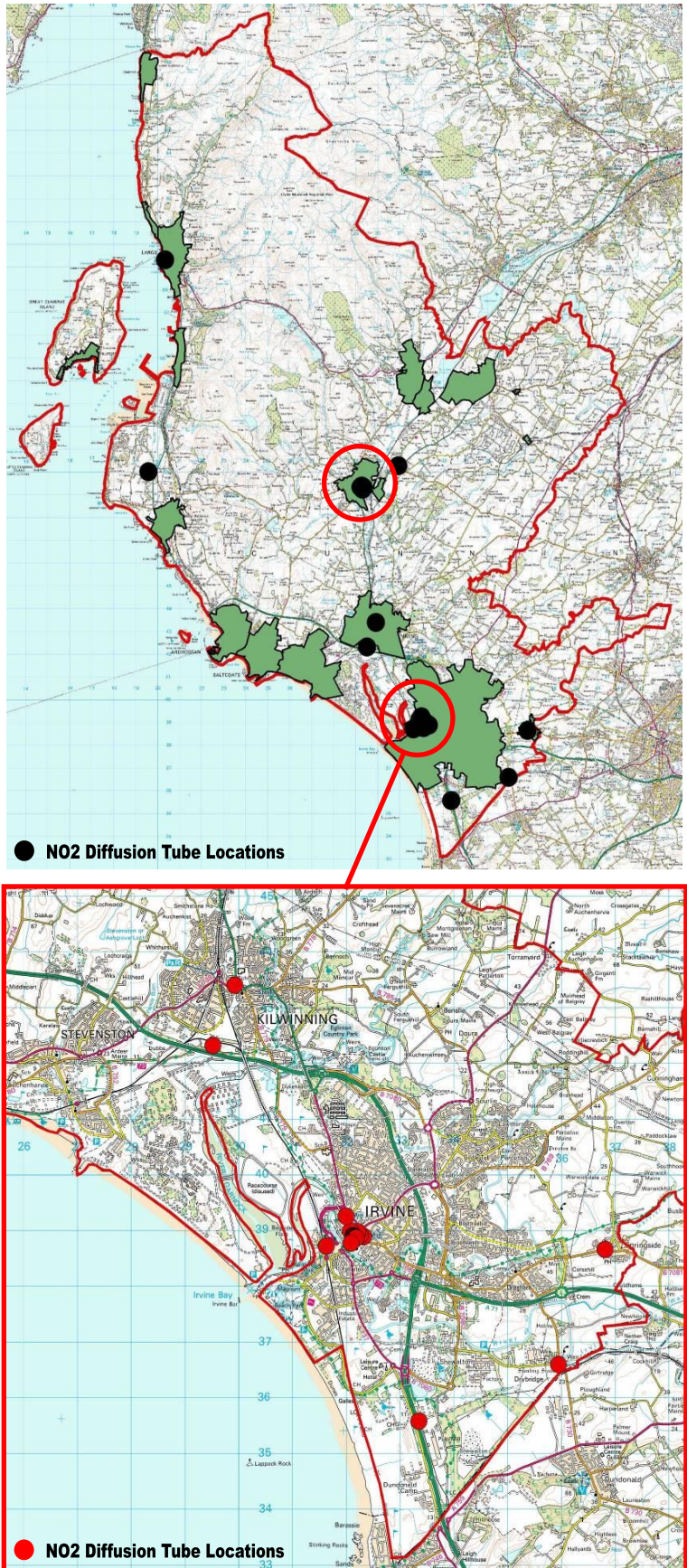


### Appendix 3: Figure 2 Automatic Monitoring Site Location





### Appendix 4: Figure 3 Map of Non Automatic Monitoring Sites



## Appendix 5: Diffusion Tube Accuracy NAC

### Checking Precision and Accuracy of Triplicate Tubes



Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{gm}^{-3}$	Tube 2 $\mu\text{gm}^{-3}$	Tube 3 $\mu\text{gm}^{-3}$	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	08/01/2014	05/02/2014	34.8	34.0	34.6	34	0.4	1	1.0
2	05/02/2014	05/03/2014	29.2	30.0	25.9	28	2.2	8	5.4
3	05/03/2014	02/04/2014	30.0	32.8	30.0	31	1.6	5	4.0
4	02/04/2014	30/04/2014	34.2	33.9	33.0	34	0.6	2	1.6
5	30/04/2014	28/05/2014	32.3	20.7	25.4	26	5.8	22	14.5
6	28/05/2014	02/07/2014	32.5	32.7	28.8	31	2.2	7	5.5
7	02/07/2014	30/07/2014	29.5	31.5	31.0	31	1.0	3	2.6
8	30/07/2014	27/08/2014	35.0	35.6	35.8	35	0.4	1	1.0
9	27/08/2014	01/10/2014	35.0	39.2	33.7	36	2.9	8	7.1
10	01/10/2014	30/10/2014	31.3	30.3	30.5	31	0.5	2	1.3
11	30/10/2013	03/12/2014	27.8	25.6	20.5	25	3.7	15	9.3
12	03/12/2014	07/01/2015	27.7	28.4	27.7	28	0.4	1	1.0
13									

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
32	83	Good	Good
25	91	Good	Good
28	92	Good	Good
28	92	Good	Good
25	39	Poor Precision	or Data Captu
37	92	Good	Good
34	54	Good	or Data Captu
28	88	Good	Good
26	91	Good	Good
22	92	Good	Good
25	91	Good	Good
34	90	Good	Good

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Overall survey -->

Good precision	Poor Overall DC
-------------------	--------------------

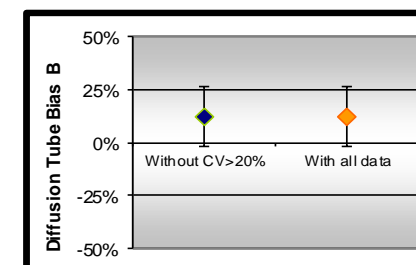
(Check average CV & DC from Accuracy calculations)

Site Name/ID:	High Street, Irvine
---------------	---------------------

<b>Accuracy (with 95% confidence interval)</b>	
without periods with CV larger than 20%	
Bias calculated using 10 periods of data	
Bias factor A	0.91 (0.8 - 1.04)
Bias B	10% (-4% - 24%)
Diffusion Tubes Mean:	31 $\mu\text{gm}^{-3}$
Mean CV (Precision):	5
Automatic Mean:	29 $\mu\text{gm}^{-3}$
Data Capture for periods used:	90%
Adjusted Tubes Mean:	29 (25 - 33) $\mu\text{gm}^{-3}$

Precision	11 out of 12 periods have a CV smaller than 20%
-----------	---

<b>Accuracy (with 95% confidence interval)</b>	
WITH ALL DATA	
Bias calculated using 10 periods of data	
Bias factor A	0.91 (0.8 - 1.04)
Bias B	10% (-4% - 24%)
Diffusion Tubes Mean:	31 $\mu\text{gm}^{-3}$
Mean CV (Precision):	5
Automatic Mean:	29 $\mu\text{gm}^{-3}$
Data Capture for periods used:	90%
Adjusted Tubes Mean:	29 (25 - 33) $\mu\text{gm}^{-3}$



Jaume Targa, for AEA  
Version 04 - February 2011

## Appendix 5: Diffusion Tube Accuracy NAC (cont'd)

### Adjustment of SINGLE Tubes



Diffusion Tube Measurements															
Site Name/ID	Periods													Raw Mean	Valid periods
	1	2	3	4	5	6	7	8	9	10	11	12	13		
1. 35 East Road Irvine	28.4	25.6	26.2	27.0		23.6	21.7	13.0	26.8	28.5	30.8	26.4		25.3	11
2. 18 Bank St, Irvine (Pitchers)	29.8	36.0	27.6	28.8	27.1	23.2	20.8	16.8	25.5	32.5	30.8			27.5	12
3. 147 High Street, Irvine	41.9	42.1	32.3	27.4	40.1	27.8	26.4	26.5	29.6	42.5	81.0	32.3		37.5	12
4. 85 High St, Irvine	42.0	45.2	33.6	38.7	39.9	21.0	34.3	31.8	33.4	40.8	15.8	39.6		34.7	12
5. 79 High St, Irvine	56.4	60.2	57.1	60.6	51.4	58.2	71.1	72.3	67.9	62.5	38.5	44.6		58.4	12
6. 75 High St, Irvine (HIGH)	42.3	47.9	51.7	79.2	63.5	44.7	50.5	58.9	48.3	45.7	27.7	35.3		49.6	12
7. 65a High Street, Irvine	34.8	29.2	30.0	34.2	32.3	32.5	29.5	36.0	35.0	31.3	27.8	27.7		31.7	12
8. 65 High Street, Irvine	34.0	30.0	32.8	33.9	20.7	32.7	31.5	35.6	39.2	30.3	25.6	28.4		31.2	12
9. 63 High Street, Irvine	34.6	25.9	30.0	33.0	25.4	28.8	31.0	35.8	33.7	30.5	20.5	27.7		29.7	12
10. 34 Kirkgate Irvine	16.7	10.0	9.9	13.1	11.9	8.3	8.3	7.3	10.9	30.2	12.1	7.0		12.1	12
11. 25 Main Rd, Springside	23.6	14.5	17.2	16.4	15.9	15.2	11.4	11.3	18.8	19.7	18.2	16.8		16.6	12
12. Auchengate (Bridge)	16.1	9.3	11.3	13.5	11.1	9.7	8.4	7.6	11.2	16.0	11.0	14.6		11.7	12
13. Dalry Rd , Kilwinning	25.7			23.6	25.0	16.4	16.5	15.4	24.1	48.3	23.9	24.1		24.3	10
14. Vernon St, Saltcoats	26.7	22.8	23.6	2.1	28.8	23.9	25.6	19.7	27.9	23.2	26.2	23.3		22.8	12
15. Princes St/Glasgow St	24.2	16.9	6.8	31.1	24.4	20.6	21.0	17.1	24.7	22.4	15.9	16.6		20.1	12
16. 12 Garnock St, Dalry	19.8	13.5	25.5	13.7	10.6	8.1	6.7	6.0	9.8	12.7	15.3	8.9		12.6	12
17. 67 New St Dalry	39.7	38.9	13.5	33.9	30.2	31.3	31.2	37.0	35.2	33.7	26.8	43.5		32.9	12
18. 45 New St, Dalry	62.4	53.9	33.5	48.3	46.2	41.8	44.1	41.0	43.7	47.6	50.3	46.4		46.6	12
19. 2 Townhead St, Dalry	45.3		47.6	36.9	37.6	33.1	30.6	28.0	36.1	38.7	26.4	21.0		34.7	11
20. Highfield Hamlet	27.3	23.4	30.0	27.0	25.0	19.6	17.3	18.3	26.3	25.6	30.4	27.0		24.8	12
21. 85 Main St, Largs	25.0	19.6	2.0	27.1	24.9	24.5	27.3		31.2	22.0	13.2	13.0		20.9	11
22. HunterstonRd/Cycle track	9.4	3.5	19.9	9.2	7.1	6.9	5.5	5.5	8.3	7.3	4.7	2.3		7.5	12

Adjusted measurement (95% confidence interval) with all the data 10 periods used in this calculations	
Bias Factor A 0.91 (0.8 - 1.04) Bias B 10% (-4% - 24%) Tube Precision: 5 Automatic DC: 90%	
Adjusted with 95% CI	23 ( 20 - 26 )
Adjusted with 95% CI	25 ( 22 - 29 )
Adjusted with 95% CI	34 ( 30 - 39 )
Adjusted with 95% CI	32 ( 28 - 36 )
Adjusted with 95% CI	53 ( 47 - 61 )
Adjusted with 95% CI	45 ( 40 - 52 )
Adjusted with 95% CI	29 ( 25 - 33 )
Adjusted with 95% CI	28 ( 25 - 32 )
Adjusted with 95% CI	27 ( 24 - 31 )
Adjusted with 95% CI	11 ( 10 - 13 )
Adjusted with 95% CI	15 ( 13 - 17 )
Adjusted with 95% CI	11 ( 9 - 12 )
Adjusted with 95% CI	22 ( 19 - 25 )
Adjusted with 95% CI	21 ( 18 - 24 )
Adjusted with 95% CI	18 ( 16 - 21 )
Adjusted with 95% CI	11 ( 10 - 13 )
Adjusted with 95% CI	30 ( 26 - 34 )
Adjusted with 95% CI	42 ( 37 - 48 )
Adjusted with 95% CI	32 ( 28 - 36 )
Adjusted with 95% CI	23 ( 20 - 26 )
Adjusted with 95% CI	19 ( 17 - 22 )
Adjusted with 95% CI	7 ( 6 - 8 )

*The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.*



## Appendix 5: Diffusion Tube Accuracy NAC (cont'd)

### Adjustment of DUPLICATE or TRIPLICATE Tubes AEA Energy & Environment From the AEA group

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{gm}^{-3}$	Tube 2 $\mu\text{gm}^{-3}$	Tube 3 $\mu\text{gm}^{-3}$	Triplicate Average	Standard Deviation	CV	95% CI mean
1	08/01/2014	05/02/2014	34.8	34.0	34.6	34.5	0.42	1.21	1.03
2	05/02/2014	05/03/2014	29.2	30.0	25.9	28.4	2.17	7.66	5.40
3	05/03/2014	02/04/2014	30.0	32.8	30.0	30.9	1.62	5.23	4.02
4	02/04/2014	30/04/2014	34.2	33.9	33.0	33.7	0.62	1.85	1.55
5	30/04/2014	28/05/2014	32.3	20.7	25.4	26.1	5.83	22.33	14.49
6	28/05/2014	02/07/2014	32.5	32.7	28.8	31.3	2.20	7.01	5.46
7	02/07/2014	30/07/2014	29.5	31.5	31.0	30.7	1.04	3.39	2.59
8	30/07/2014	27/08/2014	35.0	35.6	35.8	35.5	0.42	1.17	1.03
9	27/08/2014	01/10/2014	35.0	39.2	33.7	36.0	2.87	7.99	7.14
10	01/10/2014	30/10/2014	31.3	30.3	30.5	30.7	0.53	1.72	1.31
11	30/10/2013	03/12/2014	27.8	25.6	20.5	24.6	3.74	15.20	9.30
12	03/12/2014	07/01/2015	27.7	28.4	27.7	27.9	0.40	1.45	1.00
13									

Data Quality Check
Diffusion Tubes Precision Check
Good
Good
Good
Good
Poor Precision
Good
Good
Good
Good
Good
Good
Good

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Site Name/ ID: **High Street, Irvine**

Jaume Targa, for AEA

Version 04 - February 2011

<p><b>Adjusted measurement (95% confidence level)</b>  <b>Without periods with CV larger than 20%</b>                  Bias calculated using 10 periods of data                  Tube Precision: 5      Automatic DC: 90%                  Bias factor A: 0.91 (0.8 - 1.04)                  Bias B: 10% (-4% - 24%)</p> <p><i>Information about tubes to be adjusted</i>                  Diffusion Tube average: 31 <math>\mu\text{gm}^{-3}</math>                  Average Precision (CV): 5                  Adjusted Tube average: 28 +/- 4 <math>\mu\text{gm}^{-3}</math></p>
---

<p><b>Adjusted measurement (95% confidence level)</b>  <b>with all data</b>                  Bias calculated using 10 periods of data                  Tube Precision: 5      Automatic DC: 90%                  Bias factor A: 0.91 (0.8 - 1.04)                  Bias B: 10% (-4% - 24%)</p> <p><i>Information about tubes to be adjusted</i>                  Diffusion Tube average: 31 <math>\mu\text{gm}^{-3}</math>                  Average Precision (CV): 6                  Adjusted Tube average: 28 +/- 4 <math>\mu\text{gm}^{-3}</math></p>
---

### Appendix 6: Historical NO<sub>2</sub> Diffusion Tube Results (2001 – 2014)

URN	Tube No.s in Report	RESULTS IN UG/M3	EAST INGS	NORTH INGS	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
199801		Cunninghame House, Irvine	231627	638718	10.1	13.7	15.7	11.9	11.8	14	12	10	12	13				
<b>199802</b>	<b>1</b>	<b>35 East Road Irvine</b>	<b>232323</b>	<b>638892</b>	20.1	30	31.4	26.2	22.9	33.2	26	24	25	27	23	27	27	23
199803		Irvine Police Station	232255	638910	9.9	14.9	15.1	12.6	11.8	15	12	12	13	15				
199804		74 High Street, Irvine	232195	638878	18	21.3	28.5	23.7	19.2	25	25	23.6						
199805		70 High Street Irvine	232172	638894	25.1	31.3	32.7	27.9	22.5	31	29	26	25	33				
<b>200801</b>	<b>2</b>	<b>18 Bank St, Irvine</b>	<b>232202</b>	<b>638952</b>								32.5	26	27	26	28	28	25
200401		19 Bank St, Irvine	232182	638960				22.9	22.6	28	24	28.5						
200402		19 Bank St Irvine	232210	638976				24.4	22.1	31	28	26	23	25				
<b>200101</b>	<b>3</b>	<b>147 High Street, Irvine</b>	<b>232077</b>	<b>638990</b>	19.1	30.2	31.5	27.8	23.3	31	29	34	29	26	30	31	31	34
200802		3 Bridgegate,	232122	638908								23.9	22	24				
199806		97 High St, Irvine	232142	638897	21.9	32.7	37.1	33.3	26.9	38	32	28	28	30				
200803		97 High St, Irvine HIGH	232142	638897								29.4	29	29				
200804		91 High St, Irvine LOW	232147	638892								34.1	32	33				
<b>200805</b>	<b>4</b>	<b>85 High St, Irvine</b>	<b>232158</b>	<b>638882</b>								34.1	27	31	34	34	36	32
<b>199807</b>	<b>5</b>	<b>79 High St, Irvine</b>	<b>232169</b>	<b>638878</b>	30.7	40.8	49.6	45.6	31.2	43	44	39	37	50	54	59	59	53.1
199808		75 High St, Irvine LOW	232170	638871	25.8	36.2	41.9	36.3	30.5	43	48	37	35	44				
<b>200806</b>	<b>6</b>	<b>75 High St, Irvine HIGH</b>	<b>232170</b>	<b>638871</b>								44.6	37	41	46	46	48	45
<b>200807</b>		<b>71 High St, Irvine</b>	<b>232174</b>	<b>638868</b>								34.8	29	33	34	42		
<b>199901</b>	<b>7</b>	<b>65a High St, Irvine, (ROMON)</b>	<b>232182</b>	<b>638867</b>	8.5	30.9	33.1	37	28.9	37	35	31	27	32	30	32	32	28.8
<b>200701</b>	<b>8</b>	<b>65 High St, Irvine, (ROMON)</b>	<b>232182</b>	<b>638867</b>							34	30	29	31	31	32	32	28
<b>200702</b>	<b>9</b>	<b>63 High St, Irvine, (ROMON)</b>	<b>232182</b>	<b>638867</b>							38	29	30	31	31	33	33	27.1
<b>199809</b>	<b>10</b>	<b>34 Kirkgate Irvine</b>	<b>232085</b>	<b>638774</b>	8.5	13.9	15.9	11	11.5	14	11	8	16	14	14	14	13	11
199810		Eglinton Street Irvine	231997	639252	17.4	23.4	25.2	21.8	19.4	26	22	27	26	27				
<b>199902</b>	<b>11</b>	<b>25 Main Rd, Springside</b>	<b>236813</b>	<b>638659</b>	10.3	14.5	16.8	15.8	15.5	19.2	17	16	17	17	16	19	17	15.1
199903		Greenwood Academy	234409	637921	12.3	14.8	17.71	16.6	14.7	21.5	17	15.8						
199904		Main St, Drybridge	235946	636597	7.5	9.6	12.1	9.8	9.3	11.3	9	6	12	14				
199905		Shewalton Moss Estate	235751	636637	6.9	10	11.8	10.3	8	10.1	8	7.3						
199906		Dreghorn Primary School	235547	638410	11.3	15.9	18.19	14.9	15.2	18	13	13.1						
<b>200001</b>	<b>12</b>	<b>Auchengate (Bridge)</b>	<b>233332</b>	<b>635558</b>	10.1	13.3	15.8	14.8	13.5	15	14	12	15	13	12	13	12	11
200002		Auchengate (House)	233700	634078	8.5	11.5	13.1	12.1	11.8	15	13	11.6						
200003		Auchengate (Road)	233731	634067	7.6	10.2	12	10.7	10.5	12	11	11.3						
<b>199811</b>	<b>13</b>	<b>Dalry Rd , Kilwinning</b>	<b>229928</b>	<b>643400</b>	15.3	21.4	25	22.7	20.9	30	25	19	21	21	23	26	23	22
200004		Byrehill , Kilwinning	229520	642319	8.8	12	17	10.9	12.2	13	10	8	13	16				
<b>201101</b>	<b>14</b>	<b>Vernon Street, Saltcoats</b>	<b>224697</b>	<b>641366</b>											23	25	26	21
<b>200703</b>	<b>15</b>	<b>12 Garnock St, Dalry</b>	<b>229326</b>	<b>649250</b>							9	11	15	15	11	14	14	11.4
200704		69 New St Dalry	229360	649330							28	29	26	30				
<b>200808</b>	<b>16</b>	<b>67 New St, Dalry</b>	<b>229338</b>	<b>649337</b>								34.1	34	33	32	36	33	29.9
<b>200705</b>	<b>17</b>	<b>45 New St Dalry</b>	<b>229286</b>	<b>649365</b>							48	45	39	37	42	44	45	42.4
200809		60 New St Dalry	229311	649363								36.1	33	33				
200706		44 New St Dalry	229280	649380							47	45	39	39				
200707		3 Townhead St, Dalry	229222	649344							47	42	33	39				
<b>200708</b>	<b>18</b>	<b>2 Townhead St, Dalry</b>	<b>329230</b>	<b>649338</b>							29	26	25	30	30	33	33	32
<b>199907</b>	<b>19</b>	<b>Highfield Hamlet , Dalry</b>	<b>230943</b>	<b>650280</b>	10.4	15.9	18.9	14	13.6	19	15	15	21	19	20	21	22	23
<b>199812</b>	<b>20</b>	<b>85 Main Street , Largs</b>	<b>220333</b>	<b>659322</b>	13.1	18.7	22.1	22.2	20.2	26	26	22	19	23	19	24	25	19
200005		Goldenberry Farm Road	219199	651163	9.9	4.8	4.4	2.8	4.2	6	5	7.9						
200006		Seamill/ Hunterston Road	220017	650320	4.8	7.7	7.9	5.4	6.9	9	6	5.7						
<b>200007</b>	<b>21</b>	<b>Hunterston Cycle Track</b>	<b>219582</b>	<b>650020</b>	2.8	4.7	4.8	3.3	4.2	6	4	5	8	6	6	7	7	7
<b>201201</b>	<b>22</b>	<b>Princes St., Ardrossan</b>														20	23	18

Exceedence Result

Potential AQMA's

## Appendix 7: QA:QC Data

### Factor from Local Co-location Studies

The automatic monitoring station (ROMON) has been operational since early 2009 and is the site being used for three co-location tubes. The unit is permanently located here and allows for full “calendar year” data to be collected.

The ROMON has fortnightly checks carried out in accordance with the prescribed methodology as issued by Ricardo - AEA. The unit is audited every 6 months by Ricardo - AEA and is serviced every 6 months under contract to another company.

Corresponding data was entered in the “Checking Precision and Accuracy of Triplicate Tubes” spreadsheet provided by Ricardo - AEA Energy & Environment (Appendix 5). The resulting Bias factor for 2014 data is **0.91**.

### Diffusion Tube Bias Adjustment Factors

Diffusion tubes (20% TEA/Water) used in the sampling period for 2014 were supplied and analysed by Glasgow Scientific Services (GSS).

Diffusion Tube Bias Adjustment Factors for tubes provided by GSS are listed in Appendix 8. The resultant bias for GSS is **0.83** based on 2 studies with 2 poor precision.

### Discussion of Choice of Factor to Use

The co-location study for North Ayrshire Council has “good” precision and high quality results from the ROMON, although there has been poor data capture for 3 months of the year due to technical breakdowns on site.

Use of the local co-location bias factor reflects more accurately on the true values of air quality when considered over the entire district. This is particularly noticeable for the long term background results where there are no significant sources of pollution; using the local bias factor reflects a more realistic trend for NO<sub>2</sub> pollution levels.

### PM Monitoring Adjustment

The automatic monitoring station (ROMON – BAM) is visually checked every 2 weeks during the NO<sub>x</sub> calibration check. The inlet head and tape carrier are inspected and

cleaned each time the filter tape is replaced. The PM<sub>10</sub> data collected by the ROMON is processed and ratified by Ricardo - AEA. The Air Pollution Report for North Ayrshire, Irvine High Street for 1<sup>st</sup> January to 31<sup>st</sup> December 2014 is included in Appendix 2.

**Short-term to Long-term Data Adjustment**

**Site: High St., Irvine – BAM1020** (9 months)

In 2014 the annual mean objective for PM<sub>10</sub> averaged 16µg/m<sup>3</sup>. Only 9 months data was captured and when annualised gives a result of 15.94µg/m<sup>3</sup>, confirming compliance with the objective of 18µg/m<sup>3</sup>

The results are shown in the table below.

Site	Site Type	Annual Mean	Period Mean	Ratio
Auchencorth Moss	Background	6.5ug/m <sup>3</sup>	6.5ug/m <sup>3</sup>	1
Glasgow, Townhead	Background	11.08ug/m <sup>3</sup>	11.22ug/m <sup>3</sup>	0.987
South Ayrshire, Harbour St.	Background	12.25ug/m <sup>3</sup>	12.22ug/m <sup>3</sup>	1
			Average	0.996

The Period Mean used for the above sites corresponded to those months recorded at the BAM1020 for the complete period which was March to December. This resulted in an **Estimated Annual Mean** = Mean Concentration (M) x Average Ratio (R<sub>a</sub>) = 16µg/m<sup>3</sup> x 0.996 = **15.94µg/m<sup>3</sup>**.

**QA/QC of automatic monitoring**

The automatic monitoring station (ROMON – NOx) has an onsite calibration check conducted every 2 weeks by Local Authority Officers. All checks are carried out in accordance with procedures laid out by Ricardo - AEA and calibration check sheets are forwarded to them after each visit. The site is visited by Ricardo - AEA engineers every 6 months to carry out calibration tests and the unit is serviced twice yearly. Reports from these visits are included in Appendix 2.

**QA/QC of diffusion tube monitoring**

Workplace Analysis Scheme for Proficiency (WASP) for the diffusion tube provider, Glasgow Scientific Services is provided in Appendix 9.

## Appendix 8: Bias Factor Spreadsheet (Glasgow Scientific)

National Diffusion Tube Bias Adjustment Factor Spreadsheet							Spreadsheet Version Number: 03/15				
Follow the steps below <u>in the correct order</u> to show the results of <u>relevant</u> co-location studies										This spreadsheet will be updated at the end of June 2015 <a href="#">LAQM Helpdesk Website</a>	
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.											
The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.							Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.				
Step 1:	Step 2:	Step 3:	Step 4:								
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor <sup>3</sup> shown in blue at the foot of the final column.								
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data <sup>2</sup>	If you have your own co-location study then see footnote <sup>4</sup> . If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953								
Analysed By <sup>1</sup>	Method	Year <sup>5</sup>	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) ( $\mu\text{g}/\text{m}^3$ )	Automatic Monitor Mean Conc. (Cm) ( $\mu\text{g}/\text{m}^3$ )	Bias (B)	Tube Precision <sup>6</sup>	Bias Adjustment Factor (A) (Cm/Dm)	
Glasgow Scientific Services	20% TEA in water	2014	KS	Glasgow City Council	10	75	65	14.6%	P	0.87	
Glasgow Scientific Services	20% TEA in water	2014	KS	Marylebone Road Intercomparison	12	101	80	26.4%	G	0.79	
Glasgow Scientific Services	20% TEA in water	2014		<b>Overall Factor<sup>3</sup> (2 studies)</b>				<b>Use</b>		<b>0.83</b>	

## Appendix 9: Tube Precision & WASP Results

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent WASP/AIR NO<sub>2</sub> PT rounds and the percentage (%) of results submitted which were subsequently determined to be **satisfactory** based upon a z-score of  $\leq \pm 2$  as defined above.

WASP Round	WASP R121	WASP R122	WASP R123	WASP R124	AIR PT AR001	AIR PT AR003	AIR PT AR004	AIR PT AR006
Round conducted in the period	April – June 2013	July – September 2013	October – December 2013	January – March 2014	April – May 2014	July – August 2014	October – November 2014	January – February 2015
Aberdeen Scientific Services	100 %	100 %	NR [2]	75 %	100 %	100 %	100 %	100 %
Cardiff Scientific Services	100 %	100 %	100 %	100 %	NR [3]	NR [3]	NR [3]	NR [3]
Edinburgh Scientific Services	100 %	75 %	100 %	100 %	100 %	100 %	100 %	75 %
Environmental Services Group, Didcot [1]	100 %	100 %	100 %	100 %	100 %	100 %	100 %	87.5 %
Exova (formerly Clyde Analytical)	NR [2]	NR [2]	NR [2]	50 %	NR [3]	NR [3]	NR [3]	NR [3]
Glasgow Scientific Services	25 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Gradko International [1]	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Kent Scientific Services	75 %	100 %	100 %	100 %	NR [3]	NR [3]	NR [3]	NR [3]
Kirklees MBC	100 %	100 %	100 %	100 %	100 %	100 %	100 %	75 %
Lambeth Scientific Services	0 %	50 %	75 %	25 %	50 %	100 %	100 %	25 %
Milton Keynes Council	100 %	75 %	75 %	75 %	100 %	100 %	75 %	100 %
Northampton Borough Council	100 %	100 %	100 %	100 %	100 %	0 %	0 %	100 %
Somerset Scientific Services	100 %	75 %	100 %	100 %	100 %	100 %	100 %	100 %
South Yorkshire Air Quality Samplers	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Staffordshire County Council	100 %	100 %	100 %	100 %	100 %	25 %	100 %	100 %
Tayside Scientific Services (formerly Dundee CC)	100 %	100 %	100 %	100 %	NR [2]	100 %	100 %	100 %
West Yorkshire Analytical Services	100 %	50 %	100 %	75 %	75 %	100 %	75 %	100 %

[1] Participant subscribed to two sets of test samples (2 x 4 test samples) in each WASP/AIR PT round.

[2] NR No results reported

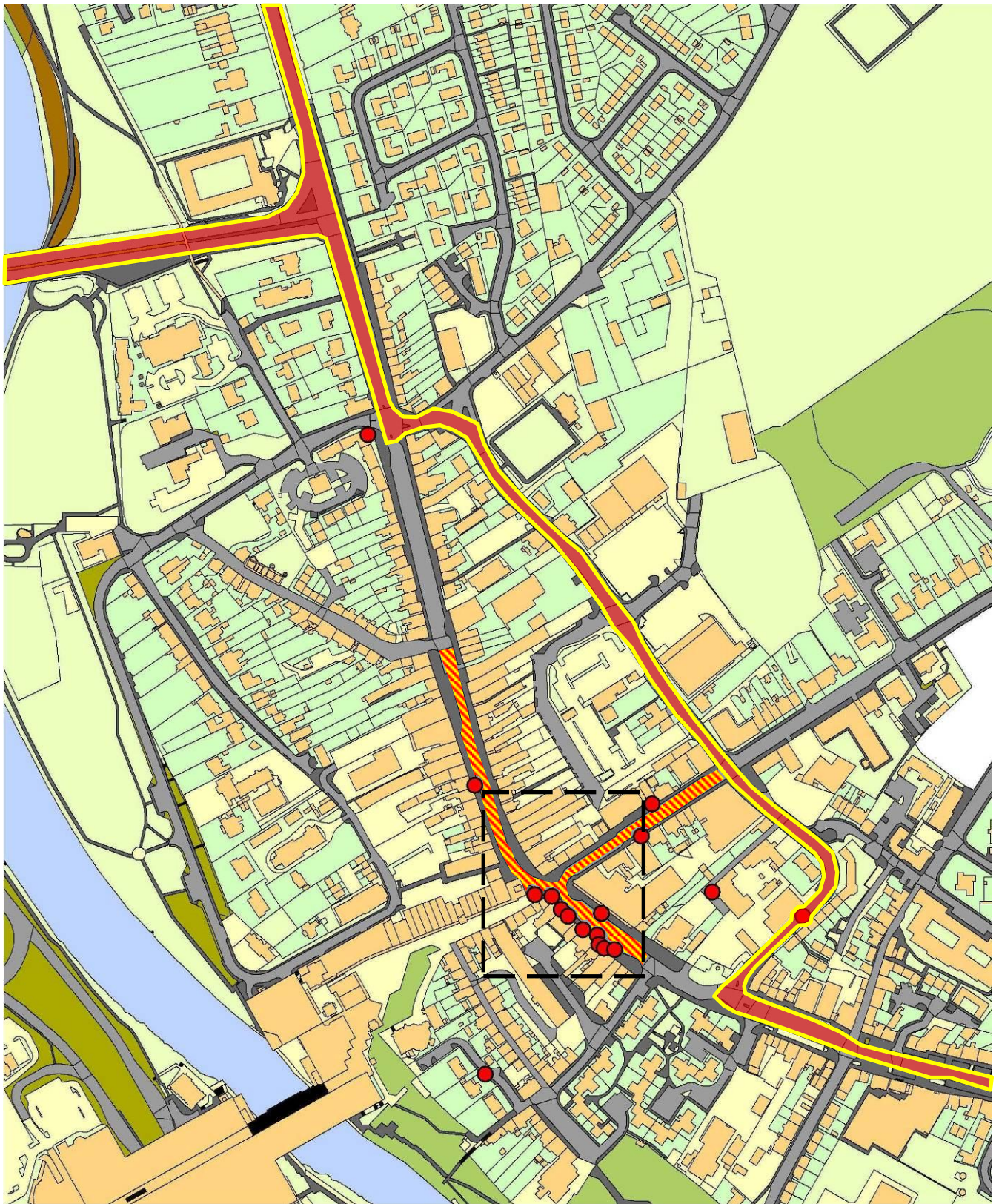
[3] Kent Scientific Services, Cardiff Scientific Services and Exova (formerly Clyde Analytical) no longer carry out NO<sub>2</sub> diffusion tube monitoring and therefore did not submit results.




# **Irvine Area**

## **Appendices 10 to 15**



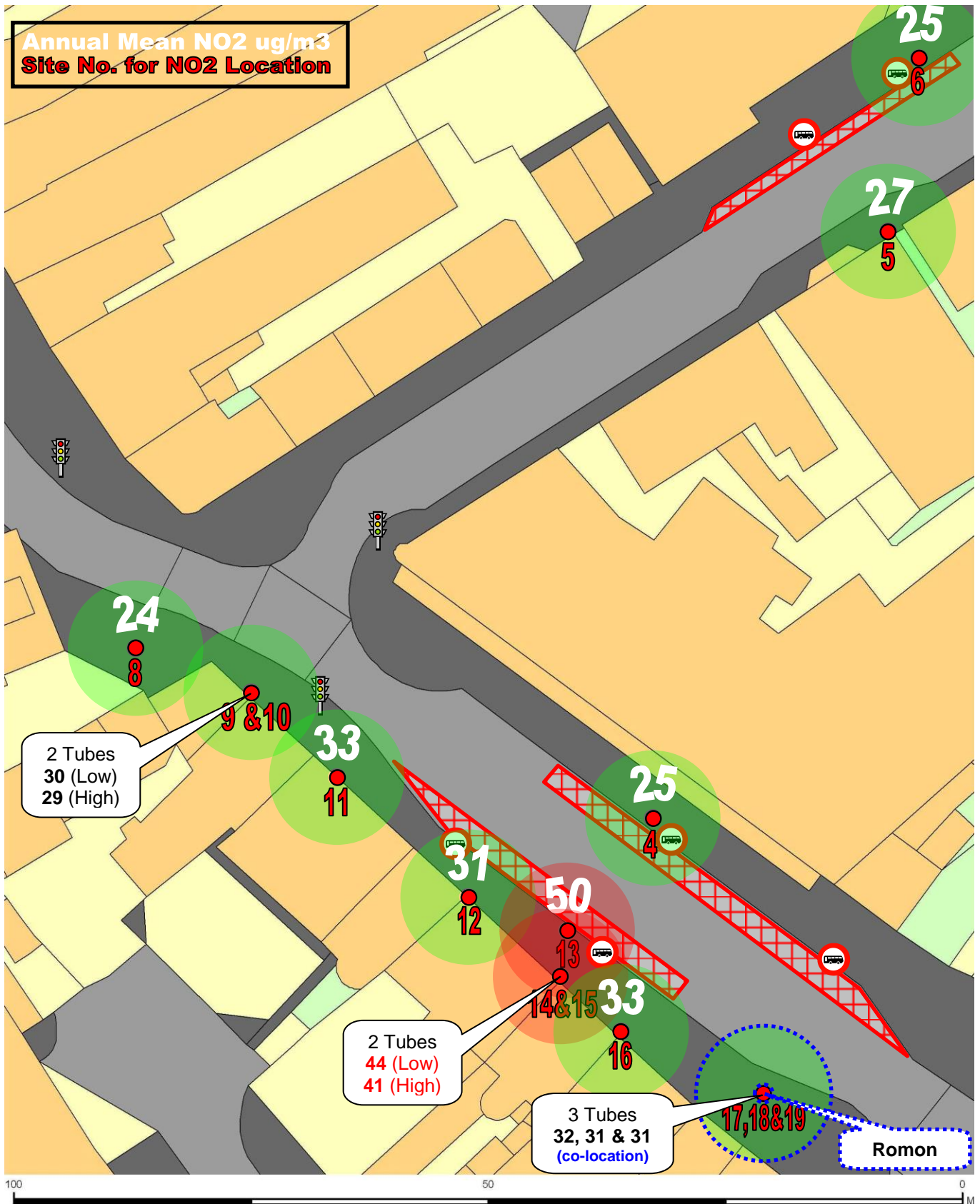
# Appendix 10 Irvine Town Centre



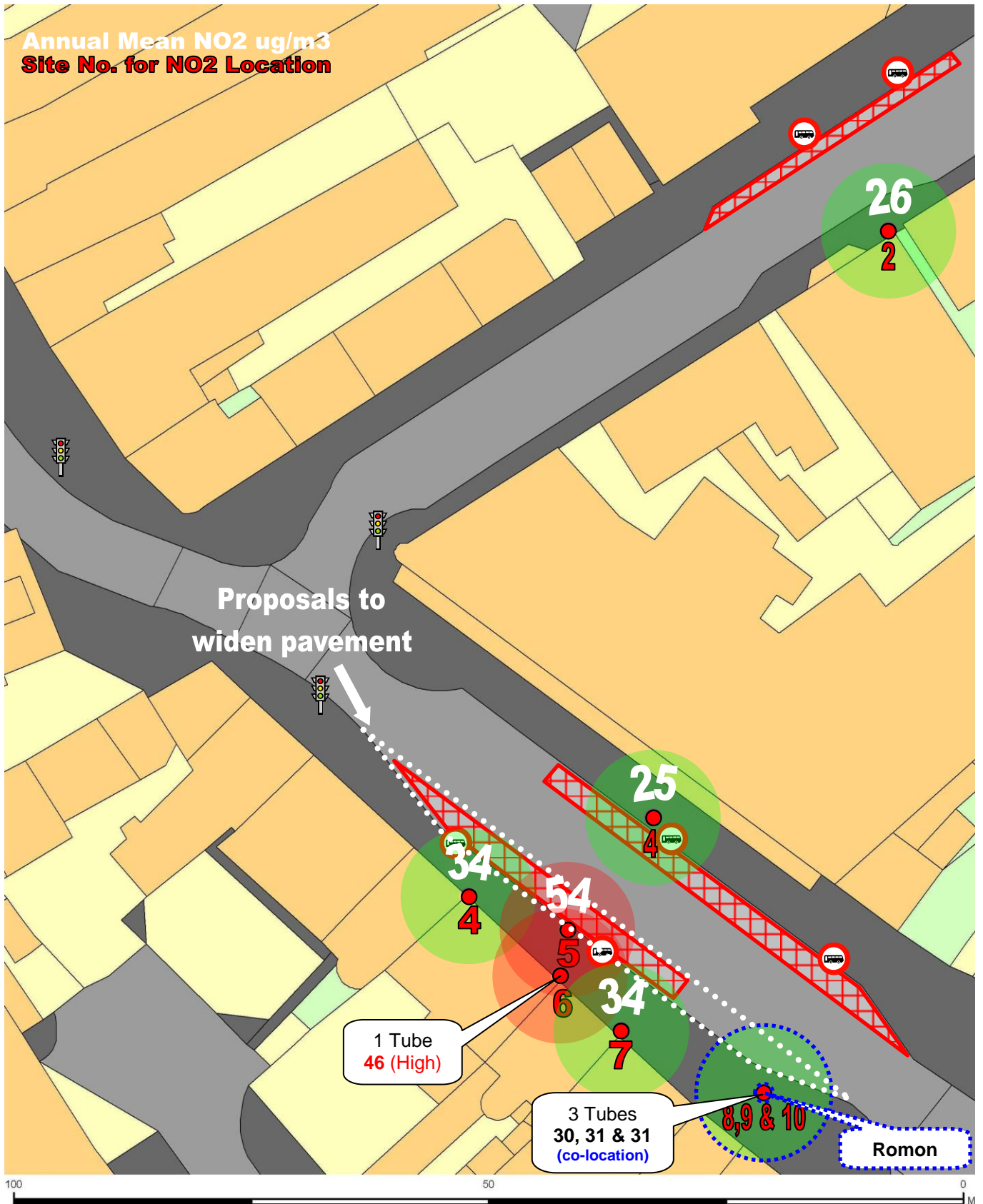
-  **Main traffic route**
-  **Restricted Area (buses, taxis & loading only)**
-  **NO2 diffusion tubes (Including Historic Sites)**



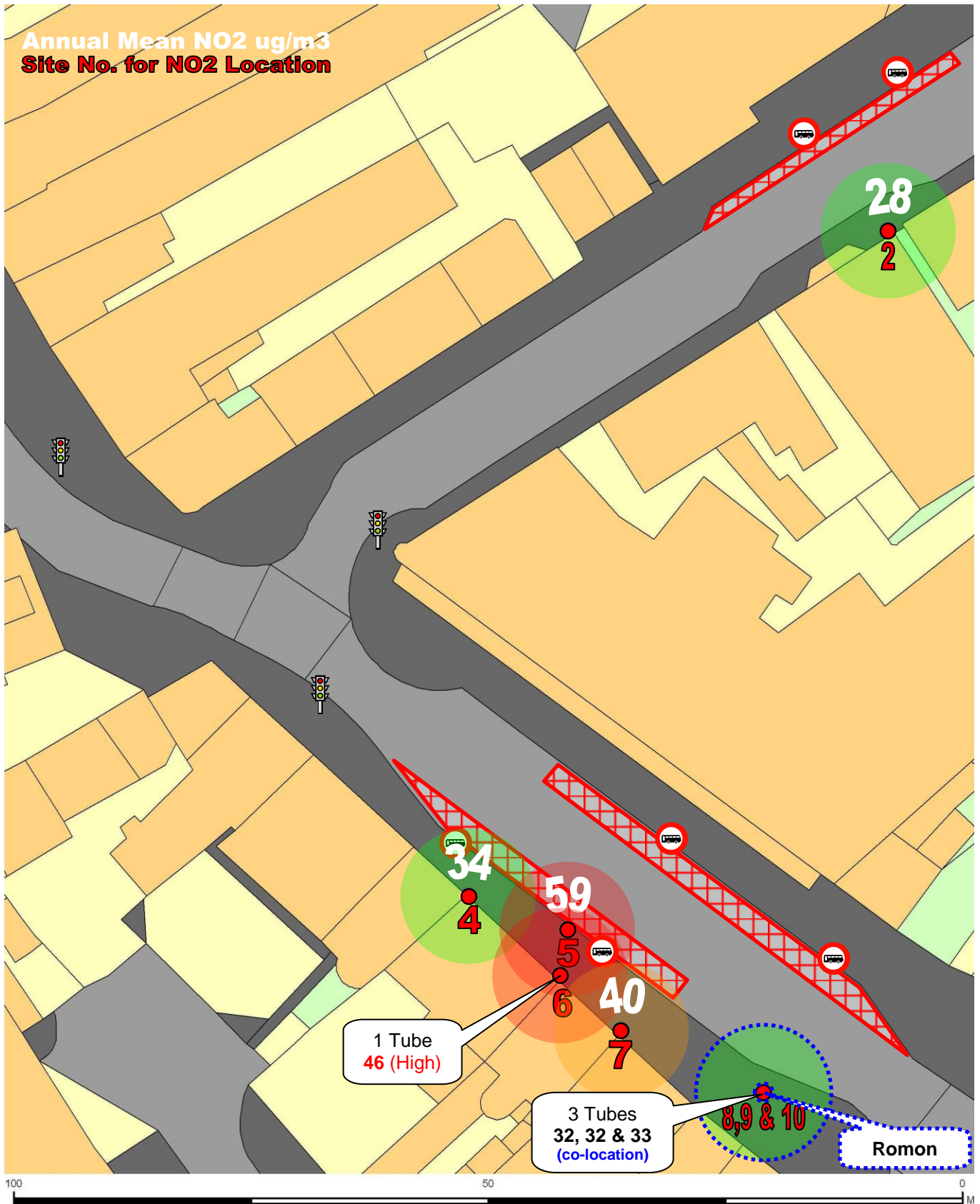
Appendix 11: Irvine, High St (2010) NO<sub>2</sub> µg/m<sup>3</sup>



### Appendix 12: Irvine, High St (2011) NO<sub>2</sub> µg/m<sup>3</sup>

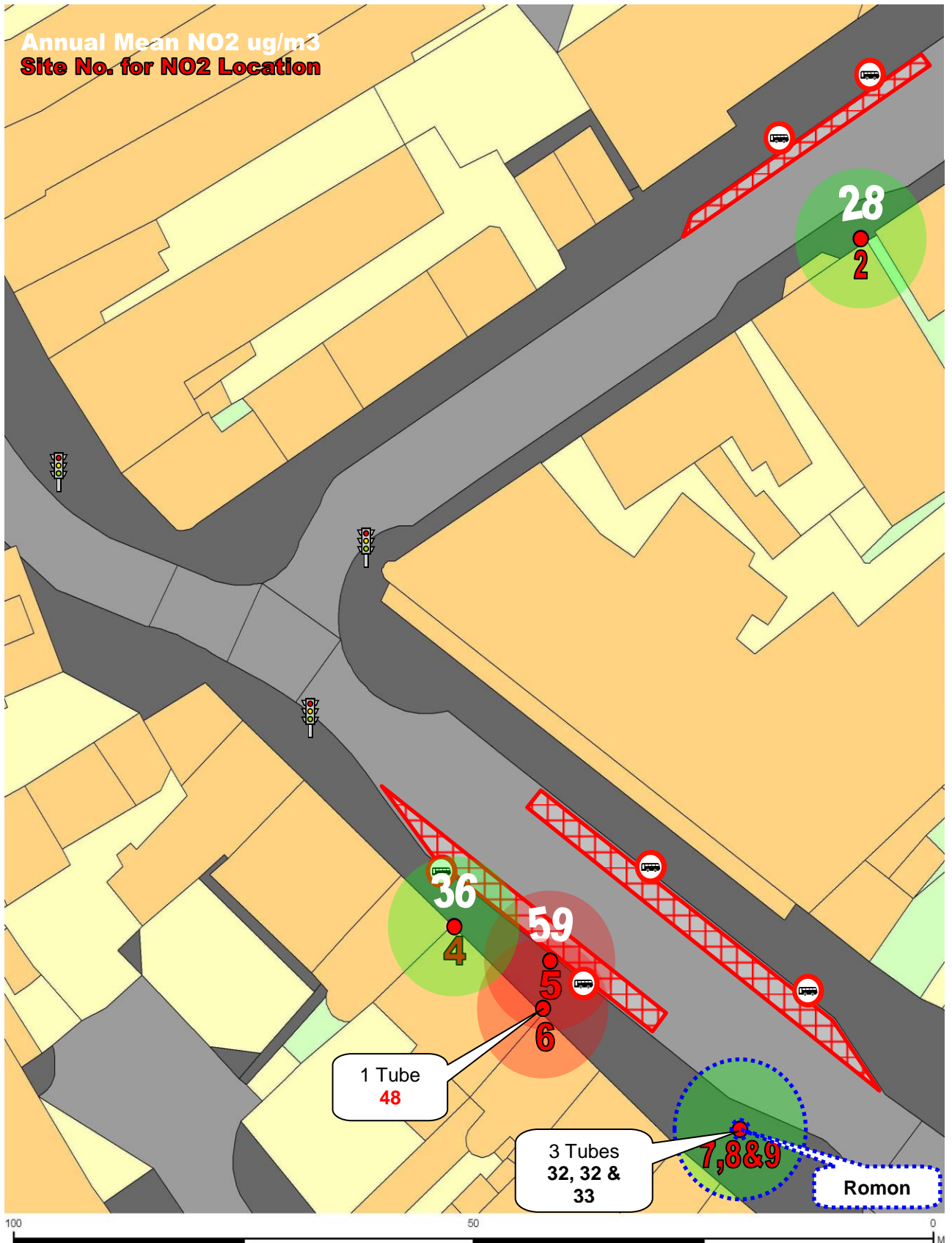


### Appendix 13: Irvine, High St (2012) NO<sub>2</sub> µg/m<sup>3</sup>

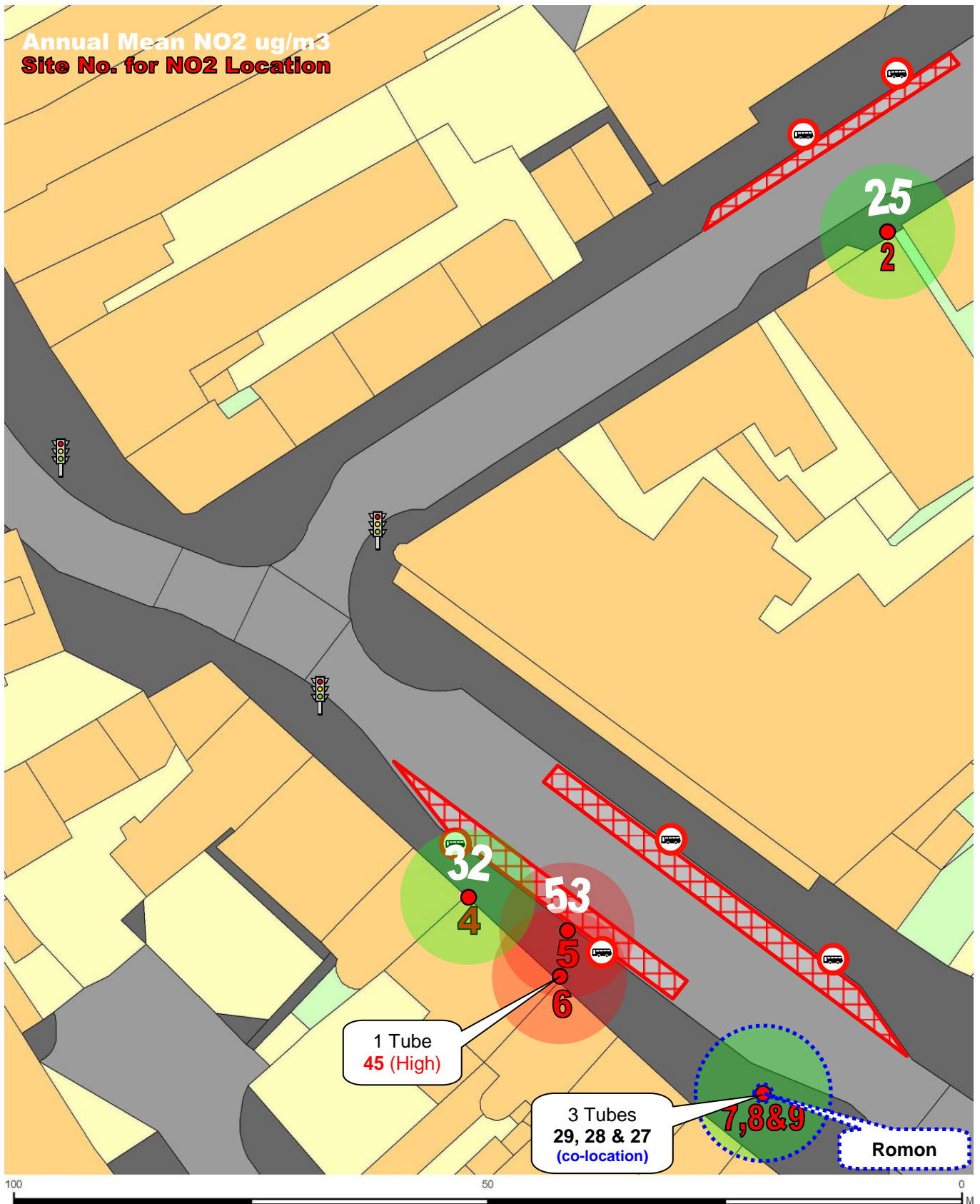




Appendix 14: Irvine, High St (2013) NO<sub>2</sub> µg/m<sup>3</sup>



Appendix 15: Irvine, High St (2014) NO<sub>2</sub> µg/m<sup>3</sup>

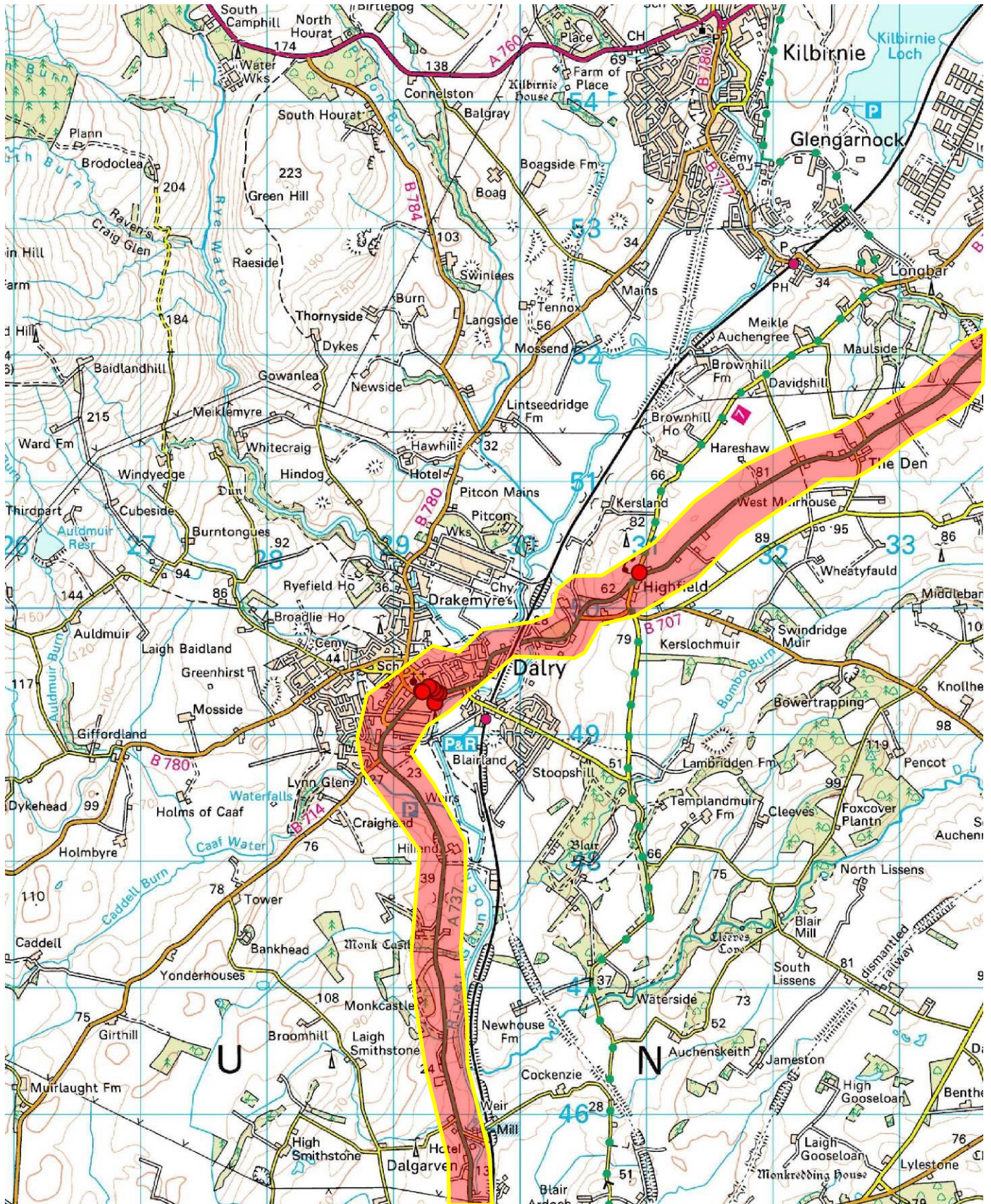


# **Dalry Area**

## **Appendices 16 to 23**



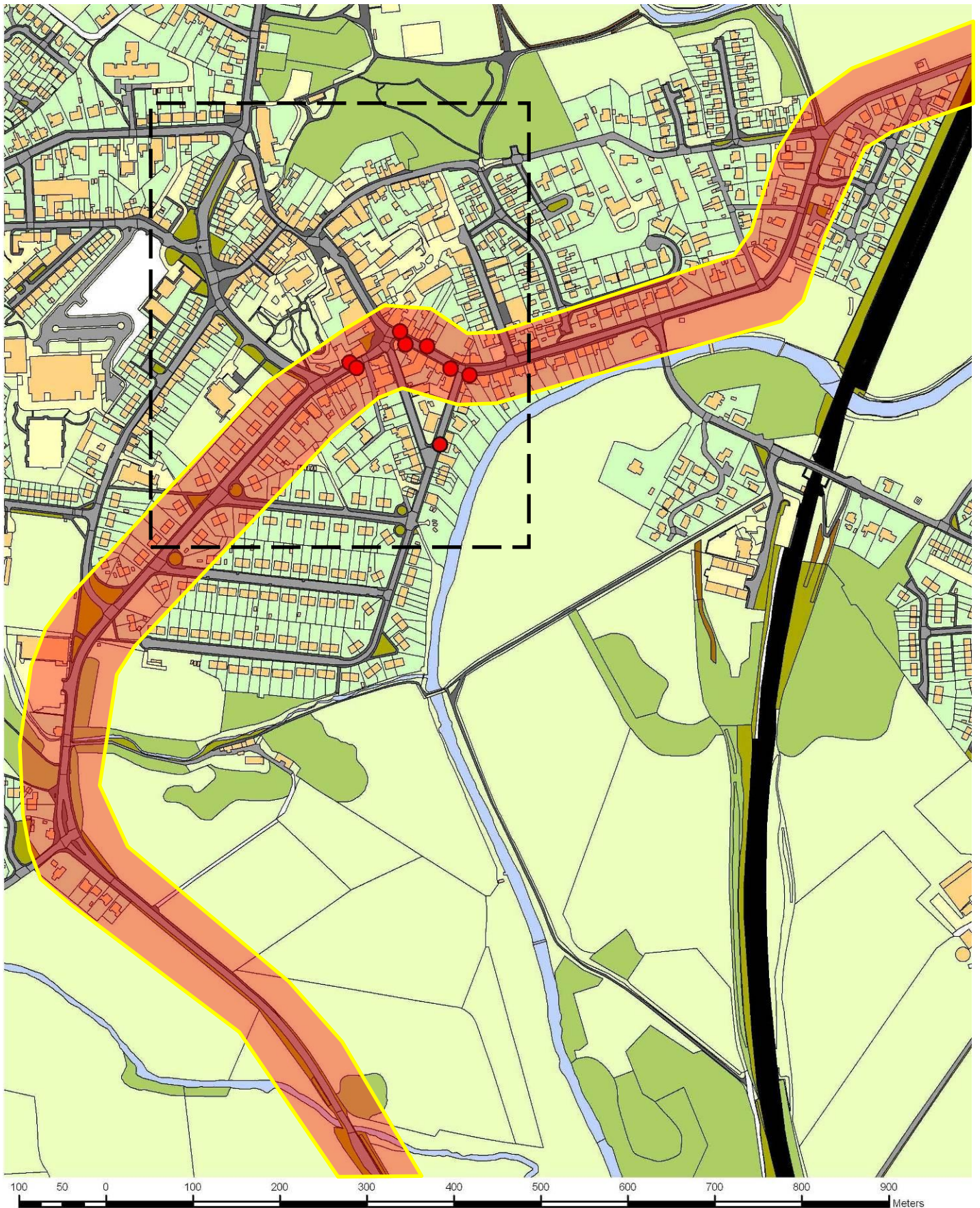
# Appendix 16: Dalry (Ordnance Survey)



-  Irvine - Glasgow corridor
-  NO2 diffusion tubes



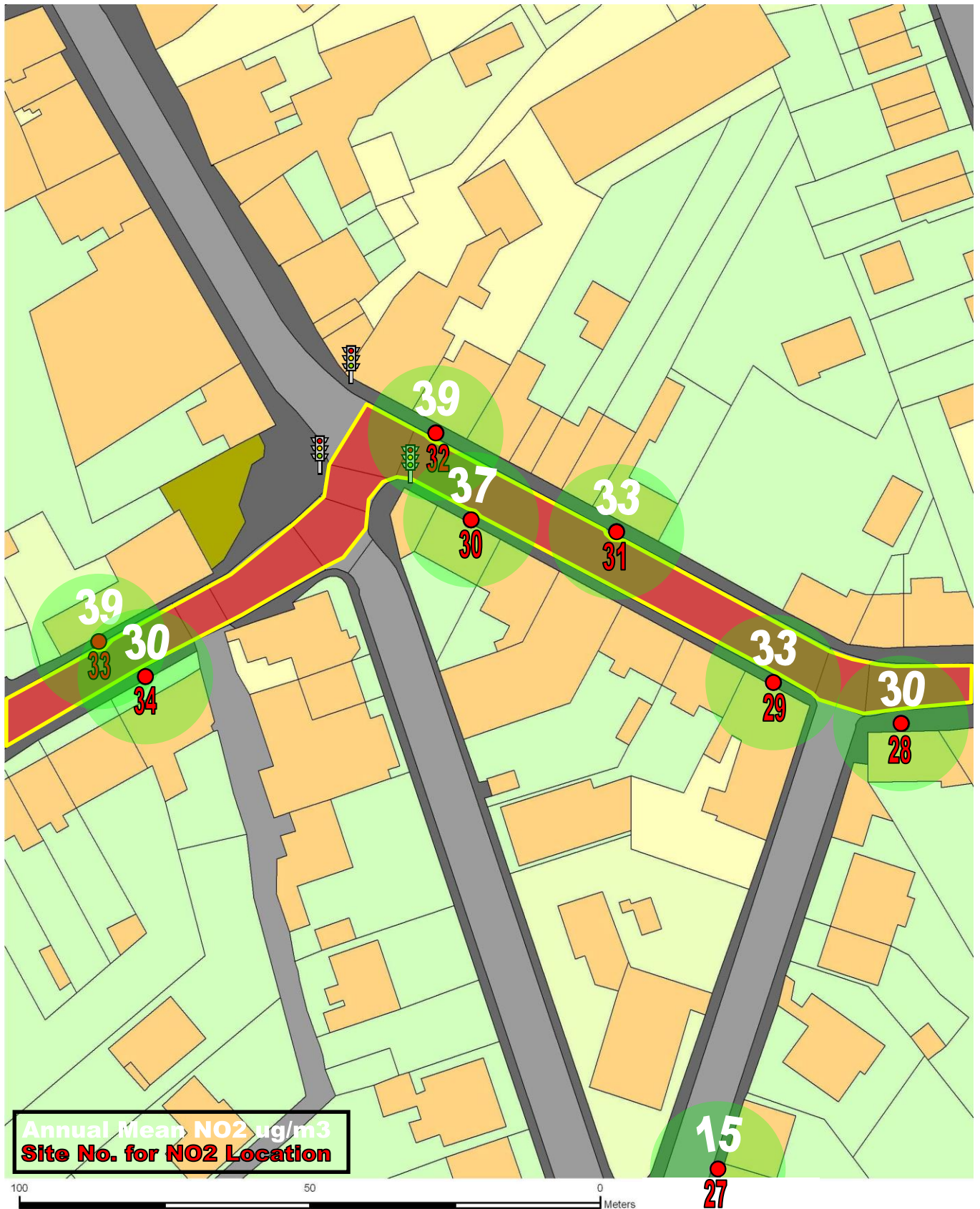
# Appendix 17: Dalry - Town Centre



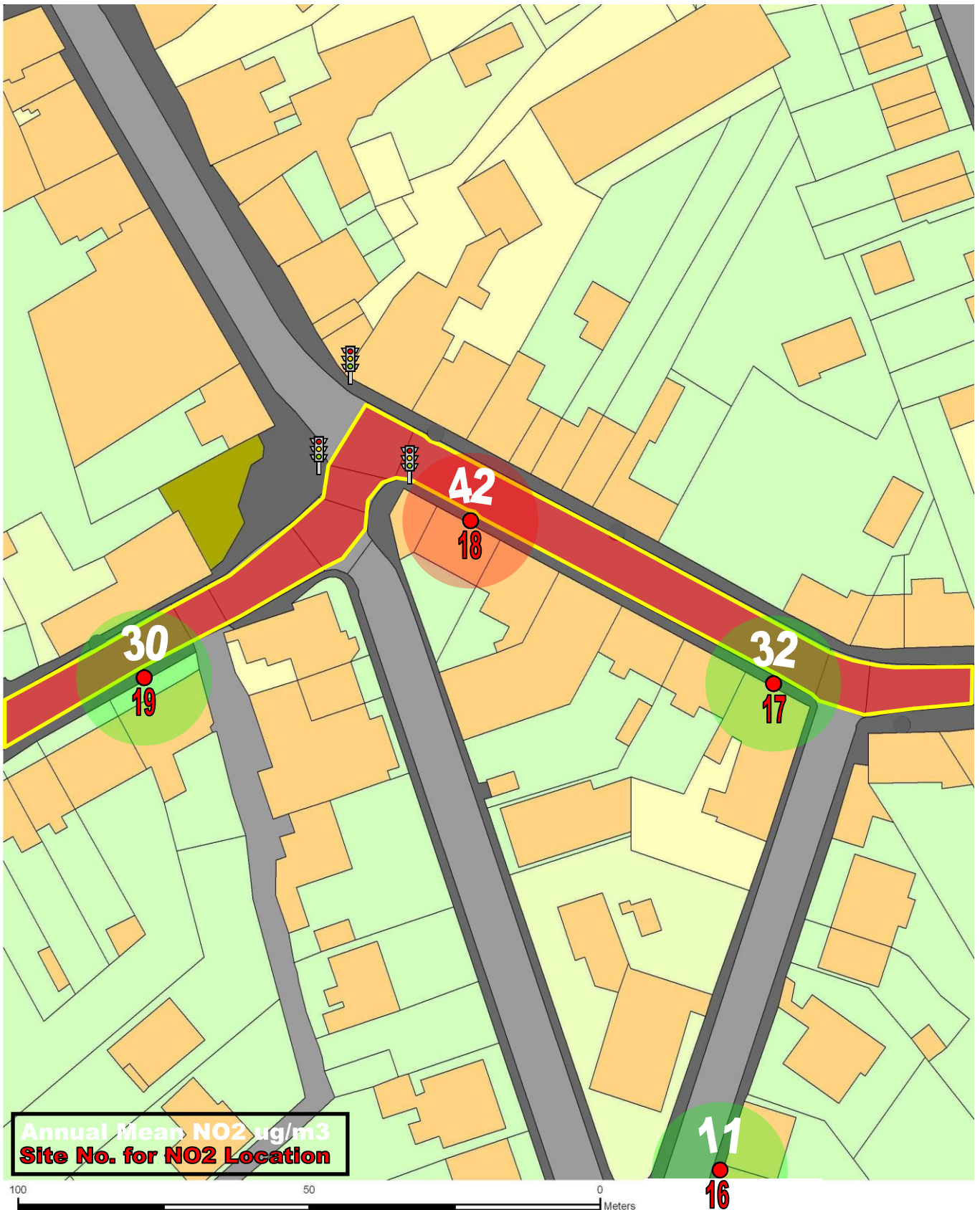
- Irvine - Glasgow corridor
- NO2 diffusion tubes (Including Historic Sites)



Appendix 18: Dalry – Townhead St/New St (2010) NO<sub>2</sub> µg/m<sup>3</sup>

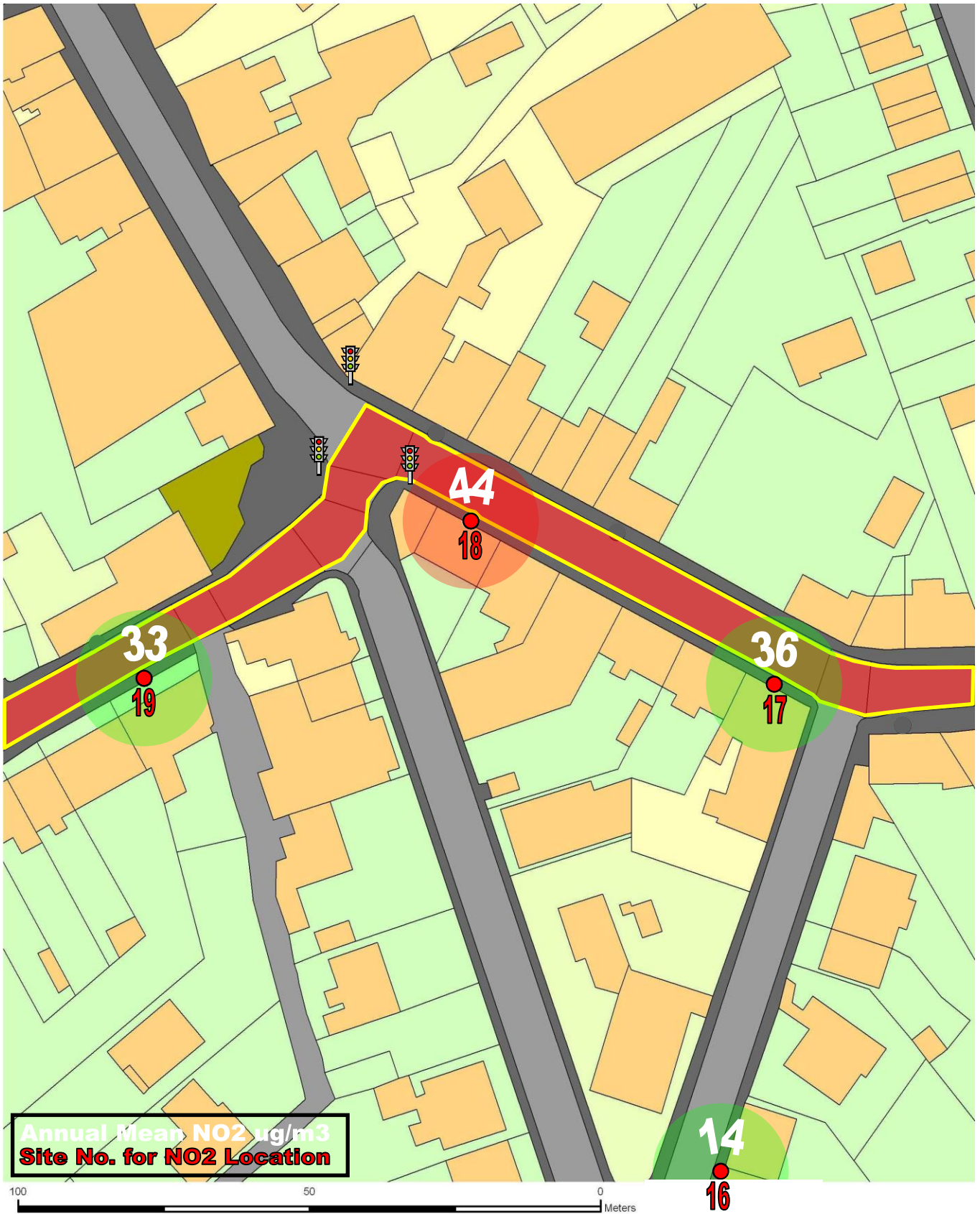


Appendix 19: Dalry – Townhead St/New St (2011) NO<sub>2</sub> µg/m<sup>3</sup>

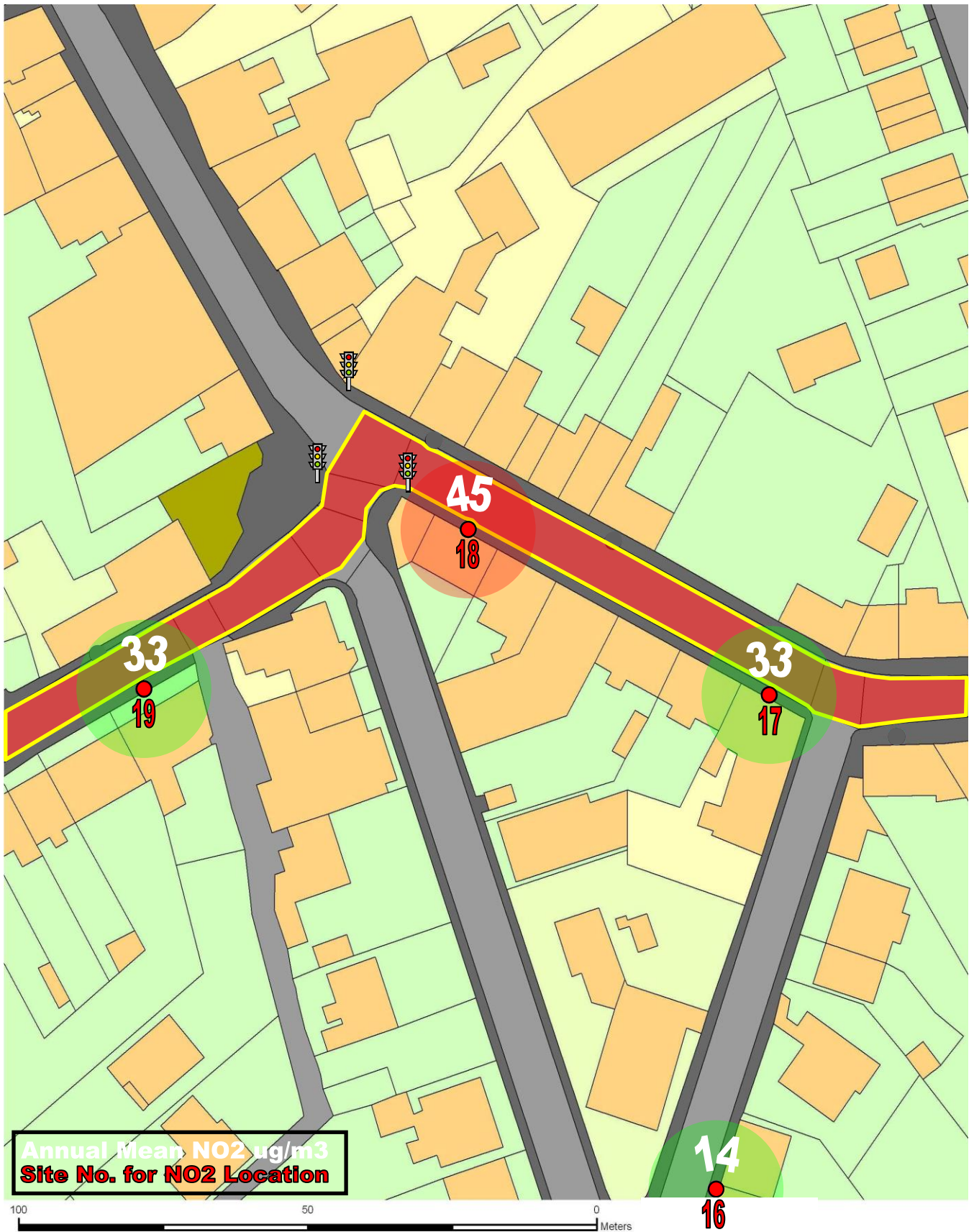




# Appendix 20: Dalry – Townhead St/New St (2012) NO<sub>2</sub> µg/m<sup>3</sup>

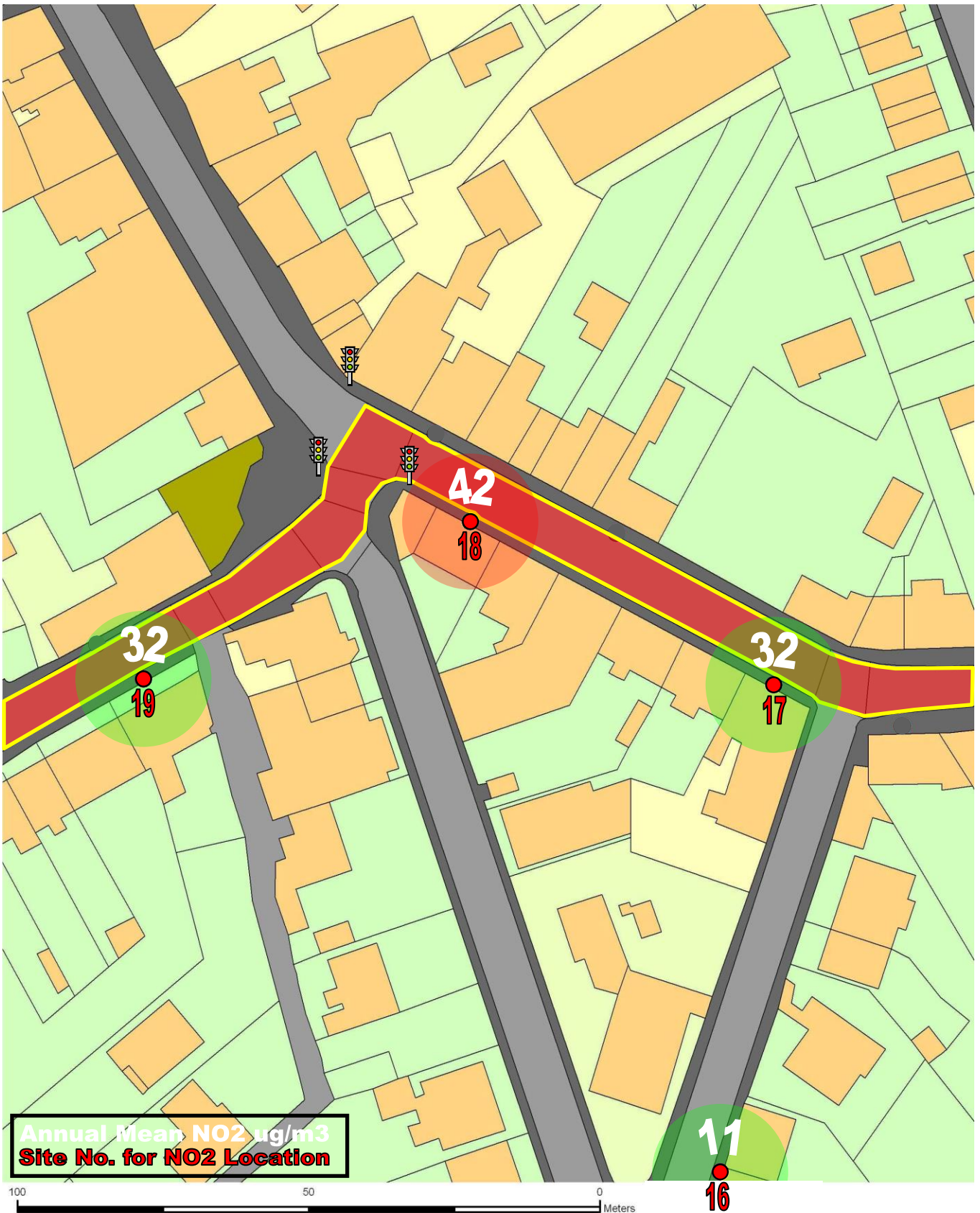


Appendix 23: Dalry – Townhead St/New St (2013) NO<sub>2</sub> µg/m<sup>3</sup>





Appendix 23: Dalry – Townhead St/New St (2014) NO<sub>2</sub> µg/m<sup>3</sup>



This page is left blank intentionally