

# Annual Progress Report (APR)



2023 Air Quality Annual Progress Report (APR) for The Highland Council

In fulfilment of Part IV of the Environment Act 1995, as amended by the  
Environment Act 2021

Local Air Quality Management

31<sup>st</sup> August, 2023

Information	The Highland Council Details
Local Authority Officer	<p>Gregor MacCormick Senior EHO</p> <p>Nick Thornton EH Technical Officer</p> <p>Esther MacRae Scientific Officer</p>
Department	Community and Place – Environmental Health
Address	38 Harbour Road, Inverness
Telephone	01349 886603
E-mail	<p><a href="mailto:gregor.maccormick@highland.gov.uk">gregor.maccormick@highland.gov.uk</a></p> <p><a href="mailto:nick.thornton@highland.gov.uk">nick.thornton@highland.gov.uk</a></p> <p><a href="mailto:esther.macrae@highland.gov.uk">esther.macrae@highland.gov.uk</a></p>
Report Reference Number	THCLAQMAPR2023
Date	31 <sup>st</sup> August 2023

# Executive Summary: Air Quality in Our Area

## Air Quality in The Highland Council

Air Quality in The Highland Council area is generally good. The existing air quality issues relate to nitrogen dioxide pollution in Inverness City Centre. The Council monitors air quality through existing automatic network stations and with passive sampling methods to identify areas where air quality might be poor. The planning process is also used to ensure appropriate siting of development with the potential to pollute, and new sensitive receptors.

An Air Quality Management Area (AQMA) was declared in 2014 for nitrogen dioxide covering a small area around the junction between Queensgate and Academy Street where there is relevant exposure in the form of flats in upper stories.

The Council has worked with partners, including SEPA, HITRANS, NHS Highland, Inverness BID to prepare an Action Plan to improve the Air Quality within the AQMA. Although a final draft of the action plan was completed in 2016, the plan was not formally published. The Highland Council is currently consulting on an update to the action plan

which will be finalised and published in 2024.

**Figure 1 Rose Street Bus Gateway**



Since 2016 there has been a general trend of reduction in nitrogen dioxide levels within the AQMA. However, the abnormal traffic conditions experienced throughout 2020 and 2021 as a result of the COVID19 response have meant that it has not been possible to properly quantify what improvement may have resulted from some of the initiatives that have completed in the

last two years. For example: the completion of the Rose Street Bus Gateway. Monitoring results reported in this document for the 2022 monitoring year however suggest that the improvement in air quality within the AQMA is not a short-term variation but a longer-term trend.

The electrification of the bus fleet within Inverness took place at the end of 2022 and the effect that has had on pollutant levels within the AQMA will be discovered when the 2023 data set becomes available.

## **Actions to Improve Air Quality**

*Actions identified cover six broad areas:*

- ***Action 1 – Promote smarter travel choices,***
- ***Action 2 – Actively promote low emission vehicles and supporting infrastructure,***
- ***Action 3 – Use the planning system to ensure that air quality is fully considered for new development,***
- ***Action 4 – Traffic management to reduce emissions within the AQMA,***
- ***Action 5 – Communication to inform the public about health impacts of air pollution and how they can change behaviour to reduce emissions and reduce exposure,***
- ***Action 6 – Continue to monitor and assess air quality in line with government guidance for LAQM.***

## **Local Priorities and Challenges**

The Highland Council will be working with partners to progress measures included in the action plan and the Action Points identified above.

## **Current Council Initiatives**

The Highland Council is working to develop a Low Carbon Travel and Transport Hub, including City Centre EV charging, and an active travel hub giving access to active travel information, cycle hire, a bike workshop and outreach programmes adjacent to the bus and train stations. The proposal will also develop EV and active travel satellite hubs at other locations in the city.

**Figure 2 Schools Project**



Following the success of the Air Quality Education Project carried out in 2022 The Highland Council is again working with a further ten primary schools to promote air quality issues, through the use of portable air quality monitors alongside the educational work.

The Highland Council is planning a redesign of the streetscape of Academy Street within Inverness City Centre looking at improving access for sustainable transport.

## How to Get Involved

Information on air quality within the Highlands can be obtained at [The Highland Council Pollution web pages](#)

## Table of Contents

<b>Executive Summary: Air Quality in Our Area .....</b>	<b>i</b>
Air Quality in The Highland Council .....	i
<b>Actions to Improve Air Quality .....</b>	<b>ii</b>
<b>Local Priorities and Challenges .....</b>	<b>ii</b>
<b>Current Council Initiatives .....</b>	<b>ii</b>
<b>How to Get Involved.....</b>	<b>iii</b>
<b>1 Local Air Quality Management .....</b>	<b>1</b>
<b>2 Actions to Improve Air Quality .....</b>	<b>2</b>
2.1 Air Quality Management Areas .....	2
2.2 Cleaner Air for Scotland 2 .....	2
2.2.1 Placemaking – Plans and Policies .....	3
2.2.2 Transport – Low Emission Zones.....	3
2.3 Implementation of Air Quality Action Plan(s) and/or measures to address air quality.....	4
<b>3 Air Quality Monitoring Data and Comparison with Air Quality Objectives.....</b>	<b>18</b>
3.1 Summary of Monitoring Undertaken .....	18
3.1.1 Automatic Monitoring Sites.....	18
3.1.2 Non-Automatic Monitoring Sites .....	18
3.1.3 Other Monitoring Activities .....	18
3.2 Individual Pollutants .....	19
3.2.1 Nitrogen Dioxide (NO <sub>2</sub> ).....	19
3.2.2 Particulate Matter (PM <sub>10</sub> ) .....	21
3.2.3 Particulate Matter (PM <sub>2.5</sub> ) .....	22
3.2.4 Sulphur Dioxide (SO <sub>2</sub> ) .....	22
3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene .....	22
<b>4 New Local Developments.....</b>	<b>23</b>
4.1 Road Traffic Sources .....	23
4.2 Other Transport Sources .....	23
4.3 Industrial Sources .....	23

4.4 Commercial and Domestic Sources .....	23
4.5 New Developments with Fugitive or Uncontrolled Sources .....	23
<b>5 Planning Applications.....</b>	<b>24</b>
<b>6 Conclusions and Proposed Actions .....</b>	<b>25</b>
6.1 Conclusions from New Monitoring Data .....	25
6.2 Conclusions relating to New Local Developments .....	25
6.3 Proposed Actions .....	25
<b>Appendix A: Monitoring Results .....</b>	<b>26</b>
<b>Appendix B: Full Monthly Diffusion Tube Results for 2022 .....</b>	<b>47</b>
<b>Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC .....</b>	<b>50</b>
New or Changed Sources Identified Within The Highland Council During 2022 .....	50
Additional Air Quality Works Undertaken by The Highland Council During 2022.....	50
QA/QC of Diffusion Tube Monitoring .....	56
Diffusion Tube Annualisation.....	57
Diffusion Tube Bias Adjustment Factors .....	57
NO <sub>2</sub> Fall-off with Distance from the Road .....	58
QA/QC of Automatic Monitoring.....	58
PM <sub>10</sub> and PM <sub>2.5</sub> Monitoring Adjustment.....	58
Automatic Monitoring Annualisation .....	59
NO <sub>2</sub> Fall-off with Distance from the Road .....	59
<b>Glossary of Terms.....</b>	<b>62</b>
<b>References .....</b>	<b>63</b>

## List of Tables

Table 1.1 – Summary of Air Quality Objectives in Scotland .....	1
Table 2.1 – Declared Air Quality Management Areas.....	2
Table 2.2 – Progress on Measures to Improve Air Quality .....	6
Table A.1 – Details of Automatic Monitoring Sites .....	26
Table A.2 – Details of Non-Automatic Monitoring Sites .....	27
Table A.3 – Annual Mean NO <sub>2</sub> Monitoring Results (µg/m <sup>3</sup> ).....	34
Table A.4 – 1-Hour Mean NO <sub>2</sub> Monitoring Results, Number of 1-Hour Means > 200µg/m <sup>3</sup> .....	37
Table A.5 – Annual Mean PM <sub>10</sub> Monitoring Results (µg/m <sup>3</sup> ) .....	38
Table A.6 – 24-Hour Mean PM <sub>10</sub> Monitoring Results, Number of PM <sub>10</sub> 24-Hour Means > 50µg/m <sup>3</sup> .....	39
Table A.7 – Annual Mean PM <sub>2.5</sub> Monitoring Results (µg/m <sup>3</sup> ).....	40
Table B.1 – NO <sub>2</sub> 2022 Monthly Diffusion Tube Results (µg/m <sup>3</sup> ).....	47
Table C.1 – Bias Adjustment Factor .....	58
Table C.2 – Annualisation Summary (concentrations presented in µg/m <sup>3</sup> ) .....	60
Table C.3 – Local Bias Adjustment Calculations .....	61

## List of Figures

Figure 1 Rose Street Bus Gateway .....	i
Figure 2 Schools Project.....	iii
Figure 5 Map of Automatic Monitoring Sites in Highland.....	40
Figure 6 Map of Automatic Monitoring Sites in Inverness .....	41
Figure 7 Map of non-automatic Monitoring Sites in Inverness .....	42
Figure 8 Map of non-automatic Monitoring Sites in Inverness AQMA .....	43
Figure 9 Map of non-automatic Monitoring Sites in Dingwall .....	44
Figure 10 Map of non-automatic Monitoring Sites in Nairn .....	45
Figure 11 Map of non-automatic monitoring sites and AURN site in Fort William .....	46



# 1 Local Air Quality Management

This report provides an overview of air quality in The Highland Council during 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), 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 an exceedance is considered likely the local authority must 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. This Annual Progress Report (APR) summarises the work being undertaken by The Highland Council to improve air quality and any progress that has been made.

**Table 1.1 – Summary of Air Quality Objectives in Scotland**

Pollutant	Air Quality Objective Concentration	Air Quality Objective Measured as	Date to be Achieved by
Nitrogen dioxide (NO <sub>2</sub> )	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
Nitrogen dioxide (NO <sub>2</sub> )	40 µg/m <sup>3</sup>	Annual mean	31.12.2005
Particulate Matter (PM <sub>10</sub> )	50 µg/m <sup>3</sup> , not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
Particulate Matter (PM <sub>10</sub> )	18 µg/m <sup>3</sup>	Annual mean	31.12.2010
Particulate Matter (PM <sub>2.5</sub> )	10 µg/m <sup>3</sup>	Annual mean	31.12.2021
Sulphur dioxide (SO <sub>2</sub> )	350 µg/m <sup>3</sup> , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
Sulphur dioxide (SO <sub>2</sub> )	125 µg/m <sup>3</sup> , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
Sulphur dioxide (SO <sub>2</sub> )	266 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005
Benzene	3.25 µg/m <sup>3</sup>	Running annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m <sup>3</sup>	Running annual mean	31.12.2003
Carbon Monoxide	10.0 mg/m <sup>3</sup>	Running 8-Hour mean	31.12.2003

## 2 Actions to Improve Air Quality

### 2.1 Air Quality Management Areas

Air Quality Management Areas (AQMA) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare publish and implement an Air Quality Action Plan (AQAP) within the shortest possible time and no later than 12 months of the date of AQMA Designation Order. The AQAP must set out measures the local authority intends to put in place in pursuit of the objectives within the shortest possible time. Measures should be provided with milestones and a final date for completion. The action plan itself should have a timescale for completion and for revocation of the AQMA. Where measures to reduce air pollution may require a longer timescale an action plan shall be reviewed and republished within five years of initial publication and then five-yearly thereafter.

A summary of AQMA declared by The Highland Council can be found in Table 2.1. Further information related to declared or revoked AQMA, including maps of AQMA boundaries are available online at [https://uk-air.defra.gov.uk/aqma/local-authorities?la\\_id=374](https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=374).

**Table 2.1 – Declared Air Quality Management Areas**

<b>AQMA Name</b>	<b>Pollutants and Air Quality Objectives</b>	<b>City / Town</b>	<b>Description</b>	<b>Action Plan</b>
Inverness City Centre AQMA	NO <sub>2</sub> annual mean	Inverness	An area encompassing a number of properties at the junction of Queensgate, Academy Street and Strothers Lane	<a href="#"><u>Action Plan for Inverness City Centre AQMA (Draft)</u></a>

### 2.2 Cleaner Air for Scotland 2

[Cleaner Air for Scotland 2 – Towards a Better Place for Everyone \(CAFS2\)](#) is Scotland's second air quality strategy. CAFS2 sets out how the Scottish Government and its partner organisations propose to further reduce air pollution to protect human health and fulfil Scotland's legal responsibilities over the period 2021 – 2026. CAFS2 was published in July

2021 and replaces [Cleaner Air for Scotland – The Road to a Healthier Future \(CAFS\)](#), which was published in 2015. CAFS2 aims to achieve the ambitious vision for Scotland "to have the best air quality in Europe". A series of actions across a range of policy areas are outlined, a summary of which is available on the Scottish Government's website.

Progress by The Highland Council against relevant actions for which local authorities are the lead delivery bodies within this strategy is demonstrated below.

### **2.2.1 Placemaking – Plans and Policies**

Local authorities with support from the Scottish Government will assess how effectively air quality is embedded in plans, policies, City Deals and other initiatives, and more generally in cross departmental working, identifying and addressing evidence, skills, awareness and operational gaps.

The Highland Council has submitted the Inner Moray Firth Proposed Local Development Plan 2 to Scottish Ministers on 24 March 2023. The examination of the plan is ongoing. This document includes the Inverness City Centre Development Brief which has a stated vision, outcome and approach to development to "make it convenient and attractive to access city centre destinations on foot or by bicycle or public transport, improving air quality where required". It also supports delivery of the Council's Draft Air Quality Management Plan.

### **2.2.2 Transport – Low Emission Zones**

Local authorities working with Transport Scotland and SEPA will look at opportunities to promote zero-carbon city centres within the existing LEZs structure.

The Highland Council has no Low Emission Zones established within the Local Authority area. The Highland Council is currently revising its Local Transport Strategy, and has recently published an Inverness Active Travel Masterplan in partnership with The Highlands and Islands Strategic Transport Partnership (HITRANS). The purpose of this plan is to help establish a network for walking, cycling and access to public transport.

Funding has been secured through 'Places for Everyone' for the redesign of Academy Street, Inverness, with the aim of making it a more attractive and healthier place for people. A key feature of the scheme is a reduction in private vehicles to less than 2,000 a day achieved by changing how private vehicles enter and exit Academy Street.

A consultation portal is available to allow the public to learn more about the project, view and comment on the design, and update on progress. The consultation portal can be accessed here: <https://academystreetproposals.commonplace.is/>

The Inverness Active Travel Masterplan can be accessed here: [Inverness Active Travel Masterplan](#)

## **2.3 Implementation of Air Quality Action Plan(s) and/or measures to address air quality**

In order to ensure that local authorities implement the measures within an action plan by the timescales stated within that plan, the Scottish Government expects authorities to submit updates on progress through the APR process. The Highland Council has taken forward a number of measures within the action plan during the current reporting year of 2022 in pursuit of improving local air quality and meeting the air quality objectives within the shortest possible time. Details of all measures completed, in progress or planned are set out in Table 2.2. More detail on these measures can be found in the draft air quality Action Plan relating to the AQMA.

Key completed measures for this reporting year are:

- The implementation by Stagecoach of fleet changeover from diesel to EV of all Inverness city centre bus routes in December 2022. This encompassed 25 EV buses that directly pass through the AQMA multiple times daily.
- Raigmore Estate Active Travel link opened in March 2022 for accessing Inverness Campus and Retail Park from Raigmore Estate by a traffic free “Golden Bridge” over the A9, linking to other active travel routes within the city centre.

The Highland Council expects the following measures to be completed over the course of the next reporting year:

- Finalised Design Proposals to be agreed for Academy Street redesign, and commencement of tendering process.
- City Centre Traffic Light Priority upgrades at twenty key traffic light junctions in the city centre which allows buses to have priority at traffic lights depending on real time bus tracker information to cut delays.

- Raigmore Bus Gate linking Raigmore Hospital to Raigmore housing estate, cutting bus delays and congestion at the entrance of the hospital and onto the B9006.

The Highland Council has identified the following new measure since the last reporting year:

- 20mph Speed Limit Programme rollout within the whole of Inverness and most towns and villages across Highland on a temporary 18 month basis. This will encourage uptake of active travel as an alternative to private vehicle use by reducing the perception of road danger.

The Highland Council is currently consulting on finalising its Inverness AQMA Air Quality Action Plan, which may result in significant changes to the layout of the following table which reports on the draft AQMA Action Plan. This will be reported on in the 2024 APR.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
1	Train Station Cycle Parking	Alternatives to private vehicle use	n/a	Unknown	Unknown	Unknown	Improved cycle parking was provided to a minor extent previously. Transport Scotland have included Inverness Station for consideration of redevelopment to enhance operational functionality and improved integration within locality as part of an integrated transport interchange. A Master-planning Steering Group met in Jan 2021.	No timescale on proposals which will be dependent on funding allocation, planning requirements and public consultation.
2	Low Carbon Transport and Travel (LCTT) Hub	Promoting low emission transport	Unknown	Ongoing	Low Carbon Travel and Transport Challenge Fund, Round 2 award	Unknown	A revised proposal has been approved and includes EV charging hub at Rose Street Car Park (11 EV chargers) plus various EV and Active Travel satellite hubs throughout the city.	EV charge points for Highland Council vehicles were installed, however public EV charge points are still to be installed.

3	Active Travel	Promoting travel alternatives	Multiple projects have various completion dates	Ongoing	Various including TS/Sustrans	Completion of projects	<p>Multiple initiatives including <a href="#">Raigmore Active Travel Link</a> (officially opened March 2022), Milburn Road; <a href="#">Riverside Way</a> (technical designs near completion and funding in place) and route between Cradlehall Business Park and the campus. Funding has been secured for a signalised crossing for non-motorised users at Raigmore Interchange. Detailed plans are in preparation. <a href="#">Active Travel map</a> for Inverness.</p> <p>HC revised Travel and Subsistence Policy promotes active travel through new travel hierarchy. NHS Active Travel Policy in place. e-bike hire scheme within Inverness City Centre to continue and expand. Docking points at the train station, UHI campus and</p>	
---	---------------	-------------------------------	---	---------	-------------------------------	------------------------	---	--

Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
							key destinations. <a href="https://www.hi-bike.co.uk/">https://www.hi-bike.co.uk/</a>	
4	Pedestrian Friendly Academy Street	Transport planning and infrastructure	2025	Design proposals ongoing	Sustrans	Agreement of Designs (expected 2023) Tendering of scheme (expected 2024) Delivery of scheme	Spaces for people funding widened footpaths along both sides of Academy St as Covid-19 response. These measures to be retained until a permanent scheme is delivered ~2025. Consultation on new scheme underway: <a href="https://academystreetproposals.commonplace.is/">https://academystreetproposals.commonplace.is/</a>	
5	Cycling Strategy	Promoting travel alternatives	unknown	unknown	n/a	Unknown	Active Travel Masterplans including <a href="#">Inverness Active Travel Masterplan</a> issued October 2021 to support the Inner Moray Firth Local Development Plan 2 which has been submitted to Scottish Ministers. The Highland Council is currently revising its Local Transport Strategy.	The Highland Council is currently creating an Active Travel Strategy, which will include strategies for cycling, so a separate Cycling Strategy is not required.



Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
6	School Engagement	Promoting Travel Alternatives	Ongoing	Ongoing	Scottish Government grant funding for anti-idling promotion campaign	Completion of Air Quality Awareness Raising Project and other project trials	Six Primary Schools were involved with a project which delivered educational packages and the use of low cost air quality monitors. Funding for a further 10 schools in <a href="#">2023</a> is secured. A <a href="#">School Street Zone</a> pilot is underway at an Inverness Primary, with a further three locations commencing in 2023. The Council runs <a href="#">Go For It</a> incentive project with rewards for active travel. All Highland Council takes part in the <a href="#">Eco Schools</a> award scheme which include a focus on sustainable travel to/from school	
7	Car and Lift Sharing	Alternatives to private vehicle use	Ongoing	Ongoing	n/a	Ongoing	The Highland Council Launched its own Liftshare platform in 2018: <a href="https://liftshare.com/uk/community/hitravel">https://liftshare.com/uk/community/hitravel</a>	

Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
8	Low emission buses	Promoting low emission transport	2022	Largely completed	n/a	Fleet changeover from diesel to EV	Stagecoach new fleet of <a href="#">25 electric buses</a> for Inverness city centre routes from December 2022 replacing diesel fleet. A driverless EV bus operates between UHI campus and a nearby retail park. <a href="https://hitrans.org.uk/News/Story/1278">https://hitrans.org.uk/News/Story/1278</a>	Long distance buses are still diesel.
9	Limits on Euro Standards of Buses	Promoting low emission transport	n/a	Superseded by introduction of EV buses	n/a	Unknown	Largely superseded by introduction of EV buses on Inverness City Centre routes	
10	Electric Vehicle Charge Points	Promoting low emission transport	Ongoing	Ongoing	EV Infrastructure Fund Pathfinder Project. FASTER project has £250K from TS (not all within Highland Council area)	Completion of further EV infrastructure	The Highland Council currently host over <a href="#">90 EV charge points</a> , with more planned for the future. Additional charge points for the west coast region are due to be installed by Autumn 2023 via <a href="#">FASTER</a> programme.	

Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
11	Lower Emission Council Fleet	Vehicle fleet efficiency	2025 (light fleet) 2030 (LGV)	Ongoing	Unknown	Fleet changeover	<p>The Highland Council, in collaboration with Enterprise Car Club, now operate a fleet of 80+ shared asset car club vehicles, the majority being plug-in hybrids or EV. Currently the Council operates 55 electric vehicles and 48 hybrid vehicles, which represents 14% of the light commercial fleet. There are 26 EV charge points scheduled for installation at Council depots which are dedicated for fleet use. The Council has committed to a <a href="#">Greening Fleet Action Plan</a> with target dates for decarbonising the fleet. Currently e-cargo bikes are being trialled for Council business use.</p>	

Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
12	Reduce Taxi Emissions	Promoting low emission transport	Unknown	Unknown	Unknown	Rapid EV charge point for taxi use adjacent to AQMA complete	A rapid EV charge point exclusive for taxi use has been installed to encourage taxi EV uptake.	Taxi licencing does not record engine type, therefore difficult to track taxi fleet changeover.
13	Investigate parking Charge differentiation for LEVs	Promoting low emission transport	Complete	Complete	n/a	n/a	Investigation complete, there is no parking charge for EV whilst charging. <a href="#">Tariffs</a> for charging are displayed in car parks.	
14	Ecostars	Promoting low emission transport	Unknown	Unknown	n/a	n/a	The Ecostars project was not implemented by Highland Council.	
15	Identify relevant planning applications	Policy guidance and development control	Ongoing	Ongoing	n/a	n/a	This work is ongoing as part of the development control process. GIS is used to ensure development influencing AQMA is identified	
16	Air quality impact assessment of development	Policy guidance and development control	Ongoing	Ongoing	n/a	n/a	This work is ongoing as part of the development control process as needed.	

Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
17	Air Quality Mitigation in the development Planning Process	Policy guidance and development control	Ongoing	Ongoing	n/a	n/a	This work is ongoing as part of the development control process as needed.	
18	Encouraging travel plans	Policy guidance and development control	Ongoing	Ongoing	n/a	n/a	Policy in place - requirement for development projects of >10 dwellings; or >500m <sup>2</sup> commercial/industrial area	
19	Encourage Electric vehicle infrastructure	Policy guidance and development control	Ongoing	Ongoing	n/a	n/a	The Highland Council has published <a href="#">Planning Guidance for EV Infrastructure</a> to be incorporated into new residential developments. This measure is tied in with measures 10 above.	
20	Providing Sustainable Transport Information	Policy guidance and development control	Ongoing	Ongoing	n/a	n/a	Provision of sustainable transport information for residents of new developments is required for major developments as <a href="#">planning policy</a> .	

Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
21	Traffic management on Academy Street	Traffic Management	Ongoing	Ongoing	n/a	n/a	The Council uses SCOOT traffic signal software to optimise travel on Academy St. This is ongoing.	
22	Microsimulation modelling	Traffic Management	Ongoing	Ongoing	n/a	n/a	This measure is included within the overall redesign of Academy St (measure 4). The street geometry of Academy St will be altered.	

Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
23	Bus Movements Review	Transport Planning and Infrastructure	Ongoing	Ongoing	<u>Bus Partnership Fund</u> (TS), £2.1 million for 6 Inverness projects with potential for further funding following STAG appraisals.	Implementation of schemes and approval of STAG appraisals	<ol style="list-style-type: none"> <li>1. Raigmore Bus Gate linking hospital with Raigmore estate – construction underway.</li> <li>2. Rose Street enforcement camera to deter unauthorised use of Foundry Way bus link – complete.</li> <li>3. City Centre Traffic Light Priority to allow bus priority dependent on real time info - upgrades ongoing.</li> <li>4. Connecting Inverness STAG appraisal – submitted to TS for review.</li> <li>5. B9006 Bus Priority STAG appraisal to enhance bus journey time and reliability – public engagement complete, report under preparation.</li> <li>6. Millburn Corridor Bus Priority and Active Travel STAG Appraisal which will tie into Academy St redesign - public engagement complete, report under preparation.</li> </ol>	

Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
24	Completion of Phase 1 West Link	Transport Planning and Infrastructure	2018	Complete	n/a	Completion of project	Work completed and new link opened in 2018. The swing bridge over the canal was complete in 2021.	
25	Investigate Shortening Delivery Hours	Freight and delivery management	Unknown	Unknown	Unknown	Unknown	This measure has not been taken forward.	Funding and/or staff not identified to review measure.
26	Investigate Refuse Collection Vehicle Delivery times	Freight and delivery management	Unknown	Unknown	Unknown	Unknown	This measure has not been taken forward.	Funding and/or staff not identified to review measure.
27	Communicate with residents	Public Information	2016 and ongoing	Ongoing	n/a	Residents sent information on AQMA and other public information campaigns	Residents were informed of declaration of AQMA. Other public campaigns include <a href="#">Clean Air Day</a>	
28	Improve Bus Information Provision	Public Information	Ongoing	Ongoing	n/a	Real time bus information	Real time bus information display provision upgraded and extended. <a href="#">GO-HI app</a> launched with access to integrated transport options. Ongoing maintenance of displays will continue.	



Measure No.	Measure	Category	Expected/ Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
29	Active Travel Campaigns	Promoting travel alternatives	Ongoing	Ongoing	n/a	n/a	Various campaigns held throughout 2022 including <a href="#">Sustainable Travel Day</a> . Highland Council has a Bikeability Coordinator who supports delivery of <a href="#">cycle training in schools</a> .	
30	Signposting to Car parks and other destinations	Transport Planning and Infrastructure	Unknown	Unknown	Unknown	Unknown	It is anticipated that city centre signposting will be reconfigured as part of the Academy St changes.	
31	Improve communication within the council	Policy Guidance and Development Control	2021	Complete	n/a	Workshop/Conference on Climate Change	A <a href="#">Climate Change Committee</a> has been established by Highland Council to provide advice and guidance on environmental sustainability, and protect environmental assets, including air.	
32	20mph Speed Limit Programme	Traffic Management	2023	Ongoing	TS providing funding as part of an 18month pilot	Implementation of 20mph speed limits in whole of Inverness and other Highland towns/ villages	<a href="#">20mph</a> signage and communication campaigns are ongoing. A Temporary Road Traffic Regulation Order in place for 18 months from 31/07/23.	

## **3 Air Quality Monitoring Data and Comparison with Air Quality Objectives**

### **3.1 Summary of Monitoring Undertaken**

#### **3.1.1 Automatic Monitoring Sites**

This section sets out what monitoring has taken place and how local concentrations of the main air pollutants compare with the objectives.

The Highland Council undertook automatic (continuous) monitoring at 2 sites during 2022. There are also 3 sites operated on behalf of DEFRA as part of the AURN. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at [The Scottish Government Air Quality in Scotland](#)

Maps showing the location of the monitoring sites are provided in Appendix A. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

#### **3.1.2 Non-Automatic Monitoring Sites**

The Highland Council undertook non-automatic (passive diffusion tubes) monitoring of NO<sub>2</sub> at 63 sites during 2022. This includes 30 locations for passive diffusion tube monitoring for a duration of three months only undertaken as part of a schools education program. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix A. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

#### **3.1.3 Other Monitoring Activities**

The Highland Council undertook monitoring with low-cost sensors during 2022. Seven 'Earthsense Zephyr' units measured oxides of Nitrogen and fine particles. The sensors were

deployed around primary schools to support an educational project within the schools. The data was used, alongside some diffusion tube monitoring to demonstrate monitoring methods to pupils. Details of the project and the monitoring undertaken are included in the appendices.

## 3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for annualisation and bias. Further details on adjustments are provided in Appendix C.

### 3.2.1 Nitrogen Dioxide (NO<sub>2</sub>)

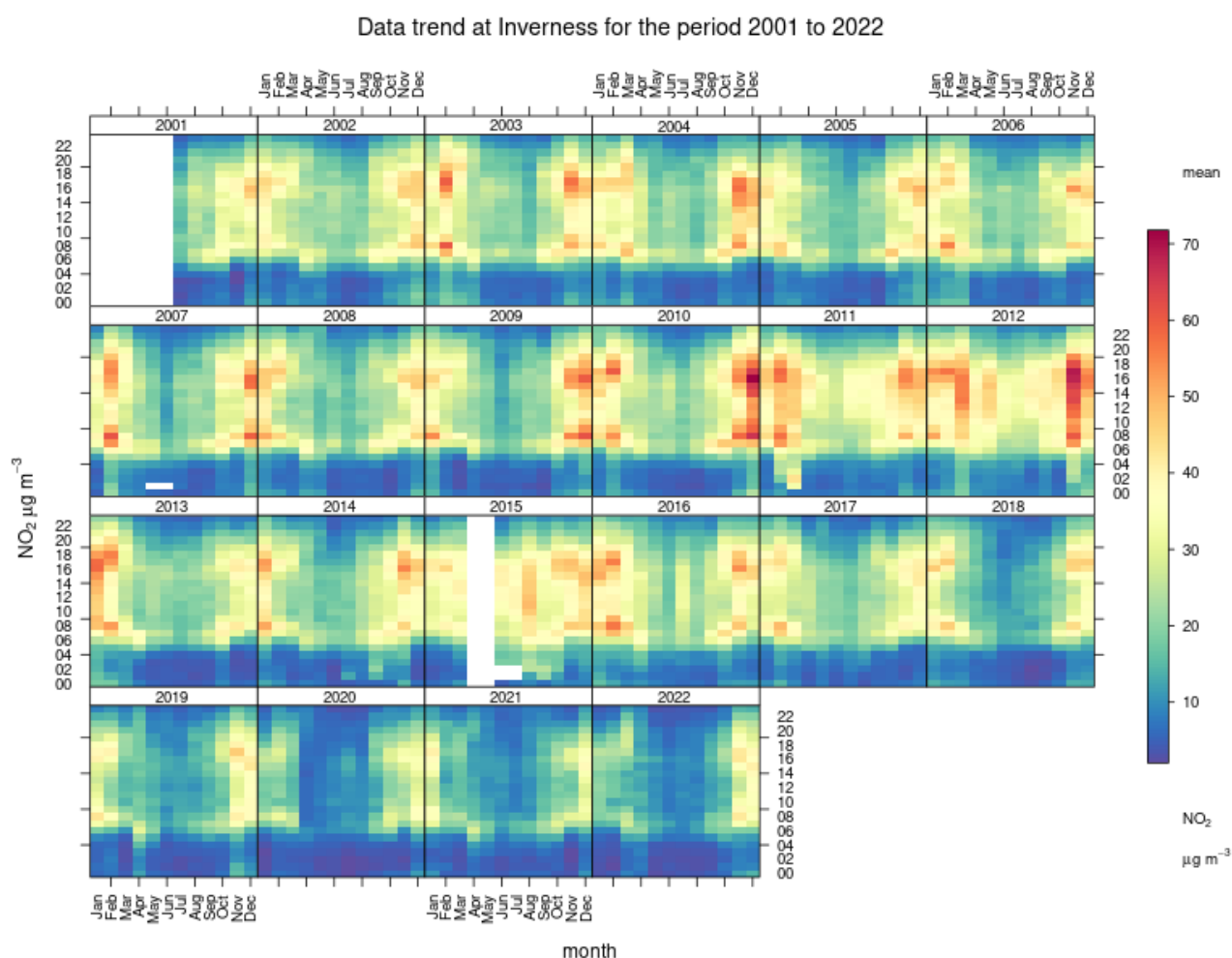
Table A.3 in Appendix A compares the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations for the past five years with the air quality objective of 40 µg/m<sup>3</sup>.

For diffusion tubes, the full 2022 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO<sub>2</sub> hourly mean concentrations for the past five years with the air quality objective of 200µg/m<sup>3</sup>, not to be exceeded more than 18 times per year.

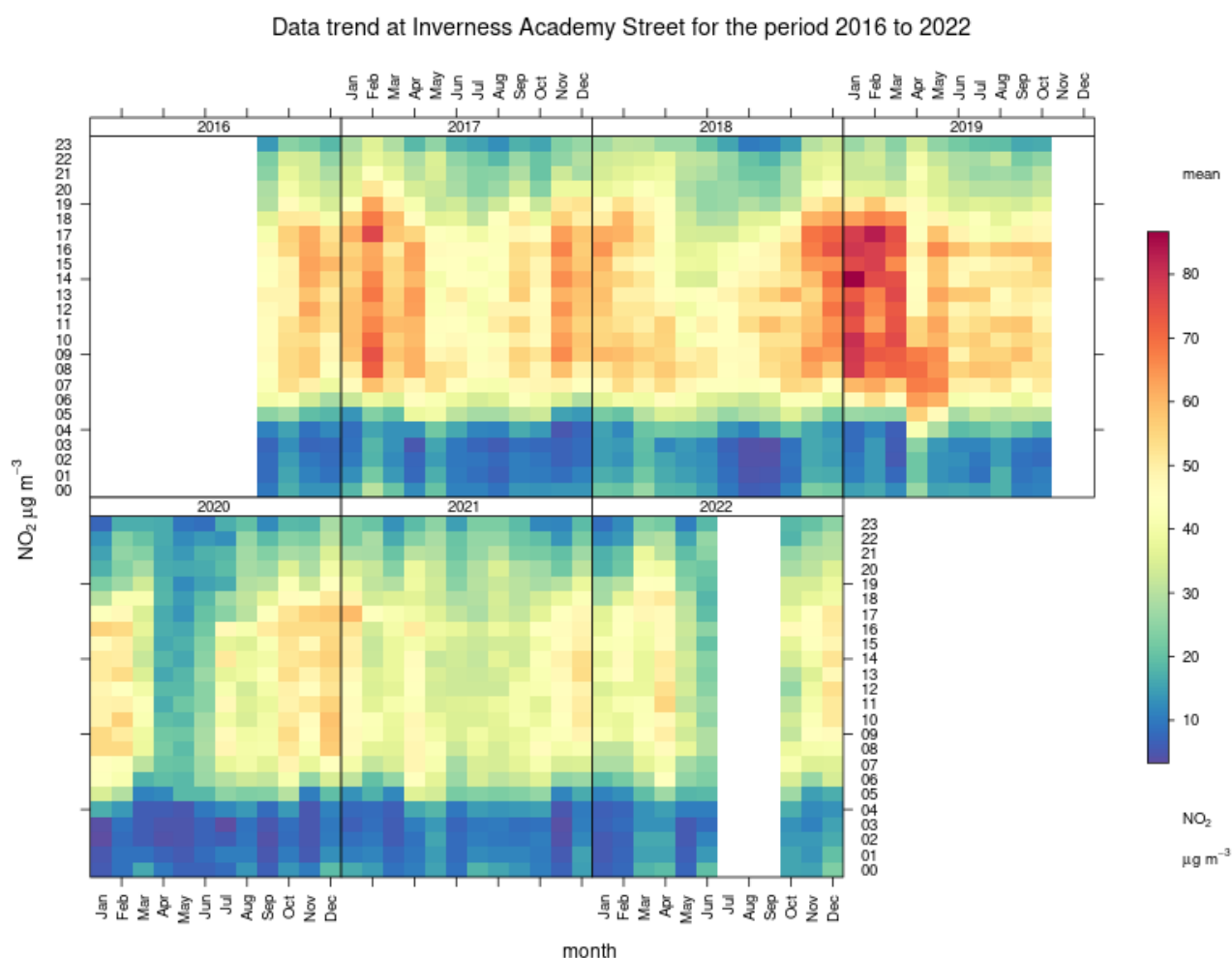
There were no exceedances of any of the air quality objectives at any of the sites where monitoring was undertaken in The Highland Council area withn 2022.

Figure 3 below is a graphical representation of the long term trend at Telford Street AURN. The steady increase in mean nitrogen dioxide concentration from 2001 until 2012 is demonstrated. Between 2012 and 2016 there is little change year on year. From 2017 onward the trend is reducing.

**Figure 3 Data trend at Inverness AURN**

Automatic monitoring within the AQMA only began in 2016. Figure 4 below is a graphical representation of the trend in mean nitrogen dioxide concentration measured by the automatic monitor on Quensgate within the AQMA. Mean concentration is trending level from 2016 to 2018. Over the winter of 2018/19 there was a significant increase in mean NO<sub>2</sub> concentration.

Nitrogen Dioxide concentrations saw a significant reduction at all sites in 2020 largely due to impact of the restrictions on movement during the COVID19 response. Although most formal restrictions had ended by mid 2021 concentration of the pollutant remained low, relative to pre-COVID levels. This trend continued in to 2022 when the annual mean nitrogen dioxide concentration within the AQMA was less than 30µg/m<sup>3</sup>. At the AURN site on Telford Street in Inverness the annual mean nitrogen dioxide concentration was 13µg/m<sup>3</sup>.

**Figure 4 Trend at Inverness Queensgate SAQN site with the AQMA**

### 3.2.2 Particulate Matter (PM<sub>10</sub>)

Table A.5 in Appendix A compares the ratified and adjusted monitored PM<sub>10</sub> annual mean concentrations for the past five years with the air quality objective of 18µg/m<sup>3</sup>.

Table A.6 in Appendix A compares the ratified continuous monitored PM<sub>10</sub> daily mean concentrations for the past five years with the air quality objective of 50µg/m<sup>3</sup>, not to be exceeded more than seven times per year.

There were no exceedances of any of the air quality objectives within The Highland Council area in 2022.

### **3.2.3 Particulate Matter (PM<sub>2.5</sub>)**

Table A.7 in Appendix A compares the ratified and adjusted monitored PM<sub>2.5</sub> annual mean concentrations for the past five years with the air quality objective of 10µg/m<sup>3</sup>.

There were no exceedances of any of the air quality objectives within The Highland Council area in 2022.

### **3.2.4 Sulphur Dioxide (SO<sub>2</sub>)**

No monitoring for SO<sub>2</sub> was undertaken in The Highland Council area in 2022.

### **3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene**

No monitoring for Carbon Monoxide, Lead or 1,3-Butadiene was undertaken in The Highland Council area in 2022.

## **4 New Local Developments**

### **4.1 Road Traffic Sources**

There are no new road traffic sources identified in Highland in 2022.

### **4.2 Other Transport Sources**

The port of Nigg opened an additional facility, the East Quay in July 2022, increasing the port's deep water quayside facility. There is not considered to be a significant impact on air quality from the quay, details of the development are in Appendix C.

### **4.3 Industrial Sources**

There are no new Industrial installations, or significantly changed existing installations, major fuel storage depots storing petrol, petrol stations or poultry farms identified in Highland in 2022.

### **4.4 Commercial and Domestic Sources**

Three new biomass combustion plants were granted planning consent in 2022. Details of the developments are in Appendix C. They were screened for air quality impact and were not found to be significant.

### **4.5 New Developments with Fugitive or Uncontrolled Sources**

There were no new potential sources of fugitive or uncontrolled particulate matter identified in 2022.

## 5 Planning Applications

There are no major planning applications currently under consideration which will have a significant impact on air quality within Highland.

There is one planning application for a hard rock quarry extension for 30years at Park Quarry in Nairn which is under consideration (Planning Application 21/05886/FUL). However, the EIA report submitted to support the application does not consider that there will be a significant reduction in air quality should the application be approved.

The following two projects are currently obtaining pre-planning consents and investigations which will lead to Planning Applications in the future, both of which will include EIA air impact assessments.

The A9/A82 Longman Junction Improvement commissioned by Transport Scotland will create a grade separated junction to replace the existing at capacity Longman Road/A9 roundabout. The EIA Scoping report submitted to support Planning Application 19/05561/SCOP sets out how the impacts to air quality will be assessed.

SSE Renewables are planning a major new pumped hydro scheme at Coire Glas which will include A82 junction works, temporary access road, new bridge and storage compounds. The EIA Scoping report submitted to support Planning Application 22/00233/SCOP sets out how the impacts to air quality will be assessed.



## **6 Conclusions and Proposed Actions**

### **6.1 Conclusions from New Monitoring Data**

No exceedances of an AQS Objective have been identified at relevant locations either within or out with and AQMA. Monitoring results within the Inverness City Centre AQMA have been below the air quality objective in 2020, 2021 and 2022. 2020, and to an extent 2021, will have been affected by the COVID 19 response, however the continuing reduced concentrations of nitrogen dioxide within the AQMA in 2022 suggest that this an ongoing trend and not a short term deviation. Once the 2023 data is confirmed the Highland Council will move to seek revocation of the AQMA.

### **6.2 Conclusions relating to New Local Developments**

There were no new developments that were considered likely to have a significant detrimental effect upon air quality.

### **6.3 Proposed Actions**

The Highland Council intends the following actions with regard to air quality in the future:

- Continue to monitor air quality
- Finalise and publish an Air Quality Action Plan for the Inverness City Centre AQMA
- Continue to work with partners to seek actions that will improve air quality in the AQMA and in Highland more generally.

## Appendix A: Monitoring Results

**Table A.1 – Details of Automatic Monitoring Sites**

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Inlet Height (m)
INV02	Inverness	Roadside	265709	845670	NO <sub>2</sub> ; PM <sub>10</sub> ; PM <sub>2.5</sub>	N	Chemiluminescent (2018 onwards) Daily Gravimetric PM (until 2017)	2.5	4	3
FW	Fort William	Suburban	210857	774431	NO <sub>2</sub> ; Ozone	N	Chemiluminescent	77	47	2.5
SV	Strath Vaich	Rural	234831	875029	Ozone	N	Chemiluminescent	717	n/a	3
INV03	Inverness Academy Street	Roadside	266650	845446	NO <sub>2</sub>	Inverness City Centre	Chemiluminescent	0	4	1.3
INV04	Inverness Academy Street First Floor	Roadside	266650	845446	NO <sub>2</sub>	Inverness City Centre	Chemiluminescent	0	4	5

**Notes:**

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube co-located with a Continuous Analyser?	Tube Height (m)
IV1	Inverness - Union Street	Roadside	266681	845361	NO <sub>2</sub>	No	0.0	3.0	No	3.5
IV2E	Inverness - Academy Street E	Roadside	266610	845487	NO <sub>2</sub>	No	0.0	2.0	No	2.0
IV2F	Inverness - Academy Street F	Roadside	266629	845473	NO <sub>2</sub>	No	0.0	2.0	No	2.0
IV2G	Inverness - Academy Street G	Roadside	266704	845413	NO <sub>2</sub>	No	0.0	2.0	No	2.5
IV3A	Inverness - Queensgate A	Roadside	266650	845428	NO <sub>2</sub>	Yes	0.0	3.0	No	2.5
IV3C	Inverness - Queensgate C	Roadside	266609	845404	NO <sub>2</sub>	No	0.0	3.0	No	2.5
IV3H, IV3K, IV3L	Inverness - Queensgate L	Roadside	266650	845446	NO <sub>2</sub>	Yes	0.0	4.0	Yes	1.5
IV4A, IV4B, IV4C	Inverness AURN C	Roadside	265710	845672	NO <sub>2</sub>	No	0.0	4.0	Yes	3.0
IV6A	Inverness - Church Street A	Roadside	266586	845337	NO <sub>2</sub>	No	0.0	1.0	No	3.0
IV6B	Inverness - Church Street B	Roadside	266513	845476	NO <sub>2</sub>	No	2.0	1.0	No	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube co-located with a Continuous Analyser?	Tube Height (m)
IV8	Inverness - Margaret Street	Roadside	266654	845532	NO <sub>2</sub>	No	0.0	1.0	No	2.0
IV9A	Inverness AQMA A	Kerbside	266657	845447	NO <sub>2</sub>	Yes	4.0	0.5	No	2.0
IV9B	Inverness AQMA B	Kerbside	266666	845441	NO <sub>2</sub>	Yes	4.0	0.5	No	2.0
IV9C	Inverness AQMA C	Roadside	266677	845451	NO <sub>2</sub>	Yes	0.0	2.0	No	2.5
IV9D	Inverness AQMA D	Kerbside	266659	845467	NO <sub>2</sub>	Yes	2.0	0.5	No	2.0
IV11	Inverness - George Street	Roadside	266565	845743	NO <sub>2</sub>	No	10.0	0.0	No	2.5
NIA	Nairn-Bridge Street	Roadside	288660	856563	NO <sub>2</sub>	no	2.0	2.0	No	2.0
N1B	Nairn - Boath Terrace	Roadside	288688	856543	NO <sub>2</sub>	no	4.0	3.0	No	2.5
N2A	Nairn - Asher's Court	Roadside	288559	856629	NO <sub>2</sub>	no	0.0	2.6	No	2.5
N2B	Nairn - St Ninians Road	Roadside	288503	856659	NO <sub>2</sub>	no	0.0	1.8	No	2.5
RC1	Dingwall - Wyvis Terrace	Roadside	254429	858970	NO <sub>2</sub>	no	10.0	1.0	No	2.0
RC2	Dingwall - Station Road	Roadside	255199	858189	NO <sub>2</sub>	no	0.0	1.5	No	2.5
RC3	Dingwall - Kintail Place	Urban Background	255113	859863	NO <sub>2</sub>	no	0.0	2.0	No	2.5
RC4	Dingwall - Burns Crescent	Urban Background	254419	859287	NO <sub>2</sub>	no	0.0	1.0	No	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube co-located with a Continuous Analyser?	Tube Height (m)
RC5	Dingwall - Burn Place	Roadside	254536	858789	NO <sub>2</sub>	no	0.0	2.0	No	3.0
FW1A	Fort William 1A	Roadside	211342	774369	NO <sub>2</sub>	No	5.0	1.0	No	2.5
FW1B	Fort William 1B	Roadside	211355	774386	NO <sub>2</sub>	No	0.0	6.0	No	2.5
FW1C	Fort William 1C	Roadside	211148	774294	NO <sub>2</sub>	No	6.0	2.0	No	2.5
FW1D	Fort William 1D	Roadside	210818	774188	NO <sub>2</sub>	No	10.0	2.0	No	2.5
DAL1	Dalneigh Primary School 1	Urban Background	265299	845056	NO <sub>2</sub>	No	0.0	2.0	No	3.0
DAL2	Dalneigh Primary School 2	Urban Background	265237	845063	NO <sub>2</sub>	No	0.0	2.0	No	3.0
DAL3	Dalneigh Primary School 3	Urban Background	265261	844909	NO <sub>2</sub>	No	0.0	2.0	No	3.0
DAL4	Dalneigh Primary School 4	Urban Background	265333	844901	NO <sub>2</sub>	No	0.0	2.0	No	3.0
BE1	Bishop Eden Primary School 1	Urban Background	266255	845330	NO <sub>2</sub>	No	0.0	1.5	No	3.0
BE2	Bishop Eden Primary School 2	Urban Background	266261	845339	NO <sub>2</sub>	No	0.0	1.5	No	3.0
BE3	Bishop Eden Primary School 3	Urban Background	266230	845348	NO <sub>2</sub>	No	0.0	1.5	No	3.0
BE4	Bishop Eden Primary School 4	Urban Background	266217	845357	NO <sub>2</sub>	No	0.0	1.5	No	3.0

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube co-located with a Continuous Analyser?	Tube Height (m)
CR1	Crown Primary School 1	Roadside	267179	845224	NO <sub>2</sub>	No	0.0	1.5	No	3.0
CR2	Crown Primary School 2	Roadside	267080	845188	NO <sub>2</sub>	No	0.0	1.5	No	3.0
CR3	Crown Primary School 3	Roadside	267107	845141	NO <sub>2</sub>	No	0.0	1.5	No	3.0
CR4	Crown Primary School 4	Roadside	267088	845129	NO <sub>2</sub>	No	0.0	1.5	No	3.0
CR5	Crown Primary School 5	Roadside	267103	845108	NO <sub>2</sub>	No	0.0	1.5	No	3.0
CR6	Crown Primary School 6	Roadside	267116	845085	NO <sub>2</sub>	No	0.0	1.5	No	3.0
HM1	Holm Primary School 1	Suburban	265644	842313	NO <sub>2</sub>	No	0.0	1.5	No	3.0
HM2	Holm Primary School 2	Suburban	265626	842326	NO <sub>2</sub>	No	0.0	1.5	No	3.0
HM3	Holm Primary School 3	Suburban	265601	842342	NO <sub>2</sub>	No	0.0	1.5	No	3.0
HM4	Holm Primary School 4	Suburban	265577	842354	NO <sub>2</sub>	No	0.0	1.5	No	3.0
HM5	Holm Primary School 5	Suburban	265511	842475	NO <sub>2</sub>	No	0.0	1.5	No	3.0

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube co-located with a Continuous Analyser?	Tube Height (m)
KH1	Kirkhill Primary School 1	Suburban	255488	845586	NO <sub>2</sub>	No	0.0	1.5	No	3.0
KH2	Kirkhill Primary School 2	Suburban	255512	845606	NO <sub>2</sub>	No	0.0	1.5	No	3.0
KH3	Kirkhill Primary School 3	Suburban	255544	845612	NO <sub>2</sub>	No	0.0	1.5	No	3.0
KH4	Kirkhill Primary School 4	Suburban	255570	845630	NO <sub>2</sub>	No	0.0	1.5	No	3.0
KH5	Kirkhill Primary School 5	Suburban	255573	845453	NO <sub>2</sub>	No	0.0	1.5	No	3.0
KH6	Kirkhill Primary School 6	Suburban	255594	845652	NO <sub>2</sub>	No	0.0	1.5	No	3.0
PL1	Pennyland Primary School 1	Suburban	310859	968464	NO <sub>2</sub>	No	0.0	1.5	No	3.0
PL2	Pennyland Primary School 2	Suburban	310871	968430	NO <sub>2</sub>	No	0.0	1.5	No	3.0
PL3	Pennyland Primary School 3	Suburban	310854	968403	NO <sub>2</sub>	No	0.0	1.5	No	3.0
PL4	Pennyland Primary School 4	Suburban	310763	968362	NO <sub>2</sub>	No	0.0	1.5	No	3.0
PL5	Pennyland Primary School 5	Suburban	310671	968452	NO <sub>2</sub>	No	0.0	1.5	No	3.0

**Notes:**

- (1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).
- (2) N/A if not applicable.



Table A.3 – Annual Mean NO<sub>2</sub> Monitoring Results (µg/m<sup>3</sup>)

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
INV02	Roadside	Automatic	95	95	18	16	12.7	14	13
INV03	Roadside	Automatic	57	57	38	<b>43</b>	28.2	29	29
INV04	Roadside	Automatic	40	40	-	31	22.6	29.6	23
FW	Suburban	Automatic	98	98	9	8	5.3	6	7
IV1	Roadside	Diffusion Tube	92.3	92.3	19.0	25.0	14.9	-	19.9
IV2E	Roadside	Diffusion Tube	100	100.0	35.0	34.0	21.3	30.1	27.8
IV2F	Roadside	Diffusion Tube	59.6	59.6	36.0	38.0	22.0	26.5	26.7
IV2G	Roadside	Diffusion Tube	100	100.0	35.0	37.0	22.1	29.6	27.6
IV3A	Roadside	Diffusion Tube	100	100.0	35.0	38.0	22.2	28.7	25.8
IV3C	Roadside	Diffusion Tube	100	100.0	31.0	33.0	18.8	24.3	22.2
IV3H, IV3K, IV3L	Roadside	Diffusion Tube (collocated triplicate)	100	100.0	38.0	<b>41.0</b>	28.4	25.1	23.4
IV4A, IV4B, IV4C	Roadside	Diffusion Tube (collocated triplicate)	100	100.0	17.0	17.0	13.3	14.7	14.6
IV6A	Roadside	Diffusion Tube	90.4	90.4	23.0	27.0	15.9	19.6	16.8
IV6B	Roadside	Diffusion Tube	82.7	82.7	21.0	18.0	11.2	14.3	12.7
IV8	Roadside	Diffusion Tube	100	100.0	21.0	22.0	13.3	17.6	15.7
IV9A	Kerbside	Diffusion Tube	92.3	92.3	<b>42.0</b>	<b>45.0</b>	27.1	33.7	31.0
IV9B	Kerbside	Diffusion Tube	100	100.0	34.0	38.0	21.5	27.8	25.6
IV9C	Roadside	Diffusion Tube	100	100.0	39.0	<b>40.0</b>	22.9	33.7	28.0
IV9D	Kerbside	Diffusion Tube	100	100.0	33.0	34.0	18.9	25.7	23.7
IV11	Roadside	Diffusion Tube	90.4	90.4	-	18.0	11.6	14.2	13.7
NIA	Roadside	Diffusion Tube	100	100.0	-	18.0	11.8	14.0	13.1
N1B	Roadside	Diffusion Tube	100	100.0	-	19.0	15.6	17.2	17.7
N2A	Roadside	Diffusion Tube	100	100.0	-	25.0	20.4	20.1	21.1
N2B	Roadside	Diffusion Tube	100	100.0	-	33.0	28.1	27.9	28.5
RC1	Roadside	Diffusion Tube	100	100.0	21.0	20.0	14.6	14.0	11.9
RC2	Roadside	Diffusion Tube	94.2	94.2	30.0	30.0	20.9	19.2	20.3
RC3	Urban Background	Diffusion Tube	100	100.0	8.0	8.0	5.9	5.3	5.1
RC4	Urban Background	Diffusion Tube	100	100.0	11.0	9.0	7.0	6.6	6.6

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
RC5	Roadside	Diffusion Tube	80.8	80.8	-	-	-	11.2	9.4
FW1A	Roadside	Diffusion Tube	100	100.0	21.0	21.0	13.9	16.4	16.2
FW1B	Roadside	Diffusion Tube	90.1	90.1	19.0	18.0	12.4	14.5	13.7
FW1C	Roadside	Diffusion Tube	100	100.0	21.0	19.0	14.1	16.1	15.6
FW1D	Roadside	Diffusion Tube	100	100.0	24.0	22.0	13.9	16.6	16.0
DAL1	Urban Background	Diffusion Tube	66.6	17.6	-	-	-	-	-
DAL2	Urban Background	Diffusion Tube	33.3	10.2	-	-	-	-	-
DAL3	Urban Background	Diffusion Tube	66.6	17.6	-	-	-	-	-
DAL4	Urban Background	Diffusion Tube	100	27.7	-	-	-	-	7.1
BE1	Urban Background	Diffusion Tube	100	23.1	-	-	-	-	10.3
BE2	Urban Background	Diffusion Tube	100	23.1	-	-	-	-	10.9
BE3	Urban Background	Diffusion Tube	100	23.1	-	-	-	-	9.1
BE4	Urban Background	Diffusion Tube	100	23.1	-	-	-	-	10.0
CR1	Roadside	Diffusion Tube	100	23.1	-	-	-	-	11.6
CR2	Roadside	Diffusion Tube	100	23.1	-	-	-	-	11.2
CR3	Roadside	Diffusion Tube	100	23.1	-	-	-	-	9.7
CR4	Roadside	Diffusion Tube	100	23.1	-	-	-	-	10.7
CR5	Roadside	Diffusion Tube	100	23.1	-	-	-	-	11.7
CR6	Roadside	Diffusion Tube	100	23.1	-	-	-	-	11.8
HM1	Suburban	Diffusion Tube	100	23.1	-	-	-	-	5.4
HM2	Suburban	Diffusion Tube	100	23.1	-	-	-	-	5.2
HM3	Suburban	Diffusion Tube	100	23.1	-	-	-	-	5.2
HM4	Suburban	Diffusion Tube	100	23.1	-	-	-	-	4.3
HM5	Suburban	Diffusion Tube	100	23.1	-	-	-	-	4.9
KH1	Suburban	Diffusion Tube	33	6.9	-	-	-	-	-
KH2	Suburban	Diffusion Tube	66	14.6	-	-	-	-	-
KH3	Suburban	Diffusion Tube	66	14.6	-	-	-	-	-
KH4	Suburban	Diffusion Tube	100	22.3	-	-	-	-	-

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
KH5	Suburban	Diffusion Tube	100	22.3	-	-	-	-	-
KH6	Suburban	Diffusion Tube	100	22.3	-	-	-	-	-
PL1	Suburban	Diffusion Tube	100	23.6	-	-	-	-	3.1
PL2	Suburban	Diffusion Tube	66	15.1	-	-	-	-	-
PL3	Suburban	Diffusion Tube	100	23.6	-	-	-	-	3.2
PL4	Suburban	Diffusion Tube	100	23.6	-	-	-	-	3.0
PL5	Suburban	Diffusion Tube	100	23.6	-	-	-	-	3.0

**Notes:**

Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in bold.

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG(22) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

**Table A.4 – 1-Hour Mean NO<sub>2</sub> Monitoring Results, Number of 1-Hour Means > 200µg/m<sup>3</sup>**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
INV02	Roadside	Automatic	95	95	0	0	0	0	0
INV03	Roadside	Automatic	57	57	0	0(143.7)	0	0	0(102)
INV04	Roadside	Automatic	40	40	-	0(95.1)	0	0(95.9)	0(89)
FW	Suburban	Automatic	98	98	0	0	0	0	0

**Notes:**

Exceedances of the NO<sub>2</sub> 1-hour mean objective (200 µg/m<sup>3</sup> not to be exceeded more than 18 times/year) are shown in bold.

If the period of valid data is less than 85%, the 99.8<sup>th</sup> percentile of 1-hour means is provided in brackets.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

**Table A.5 – Annual Mean PM<sub>10</sub> Monitoring Results (µg/m<sup>3</sup>)**

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
INV02	Roadside	99	99	9	9	8	9	9

**Notes:**

Exceedances of the PM<sub>10</sub> annual mean objective of 18µg/m<sup>3</sup> are shown in bold.

All means have been “annualised” as per LAQM.TG(22), valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

**Table A.6 – 24-Hour Mean PM<sub>10</sub> Monitoring Results, Number of PM<sub>10</sub> 24-Hour Means > 50µg/m<sup>3</sup>**

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
INV02	Roadside	99	99	0	0	0	0	0

**Notes:**

Exceedances of the PM<sub>10</sub> 24-hour mean objective (50µg/m<sup>3</sup> not to be exceeded more than seven times/year) are shown in bold.

If the period of valid data is less than 85%, the 98.1st percentile of 24-hour means is provided in brackets.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

**Table A.7 – Annual Mean PM<sub>2.5</sub> Monitoring Results (µg/m<sup>3</sup>)**

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
INV02	Roadside	99	99	6	5	4	5	5

**Notes:**

Exceedances of the PM<sub>2.5</sub> annual mean objective of 10µg/m<sup>3</sup> are shown in bold.

All means have been “annualised” as per LAQM.TG(22), valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

## Maps of Monitoring locations

Figure 3 Map of Automatic Monitoring Sites in Highland

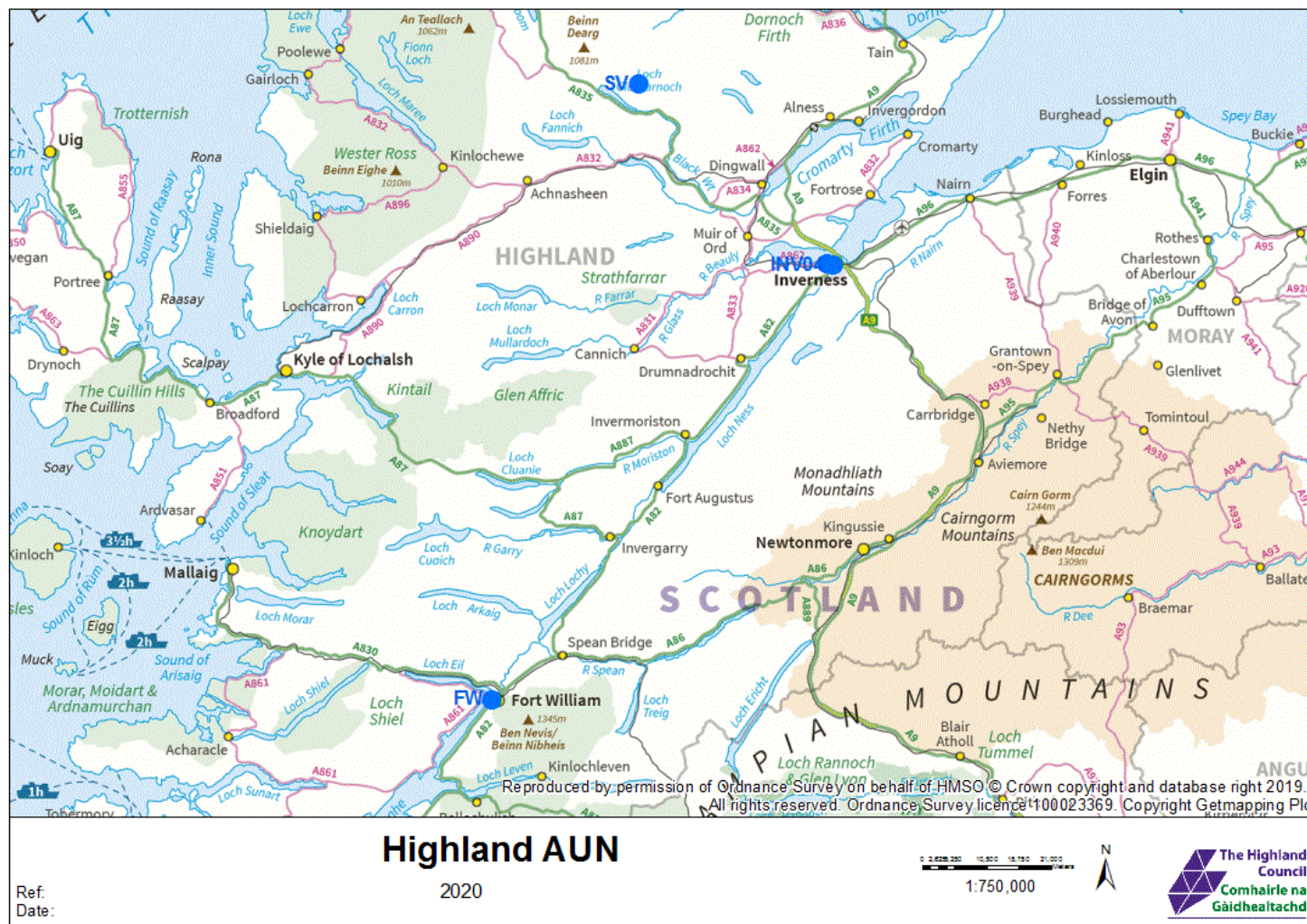




Figure 4 Map of Automatic Monitoring Sites in Inverness

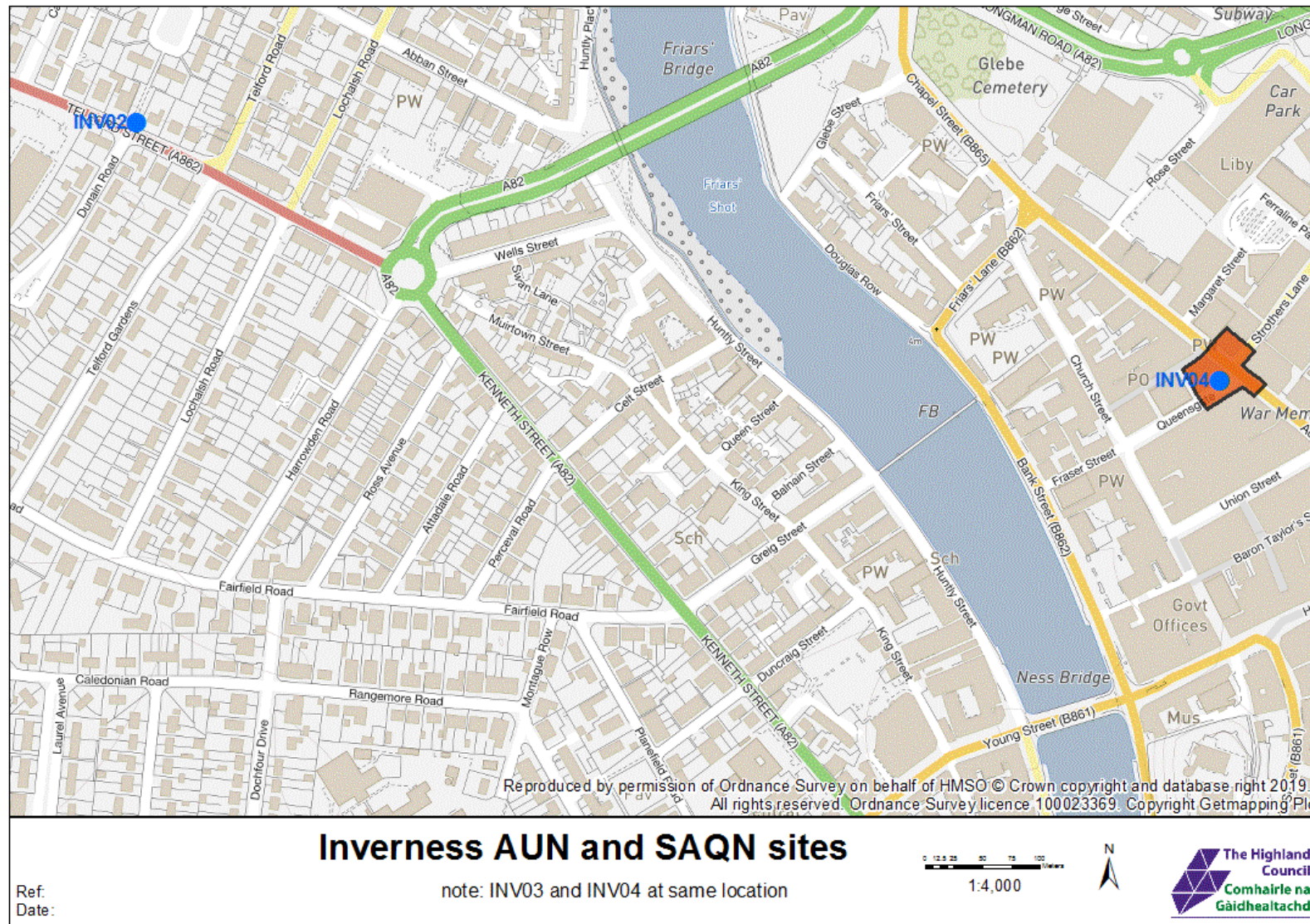




Figure 5 Map of non-automatic Monitoring Sites in Inverness

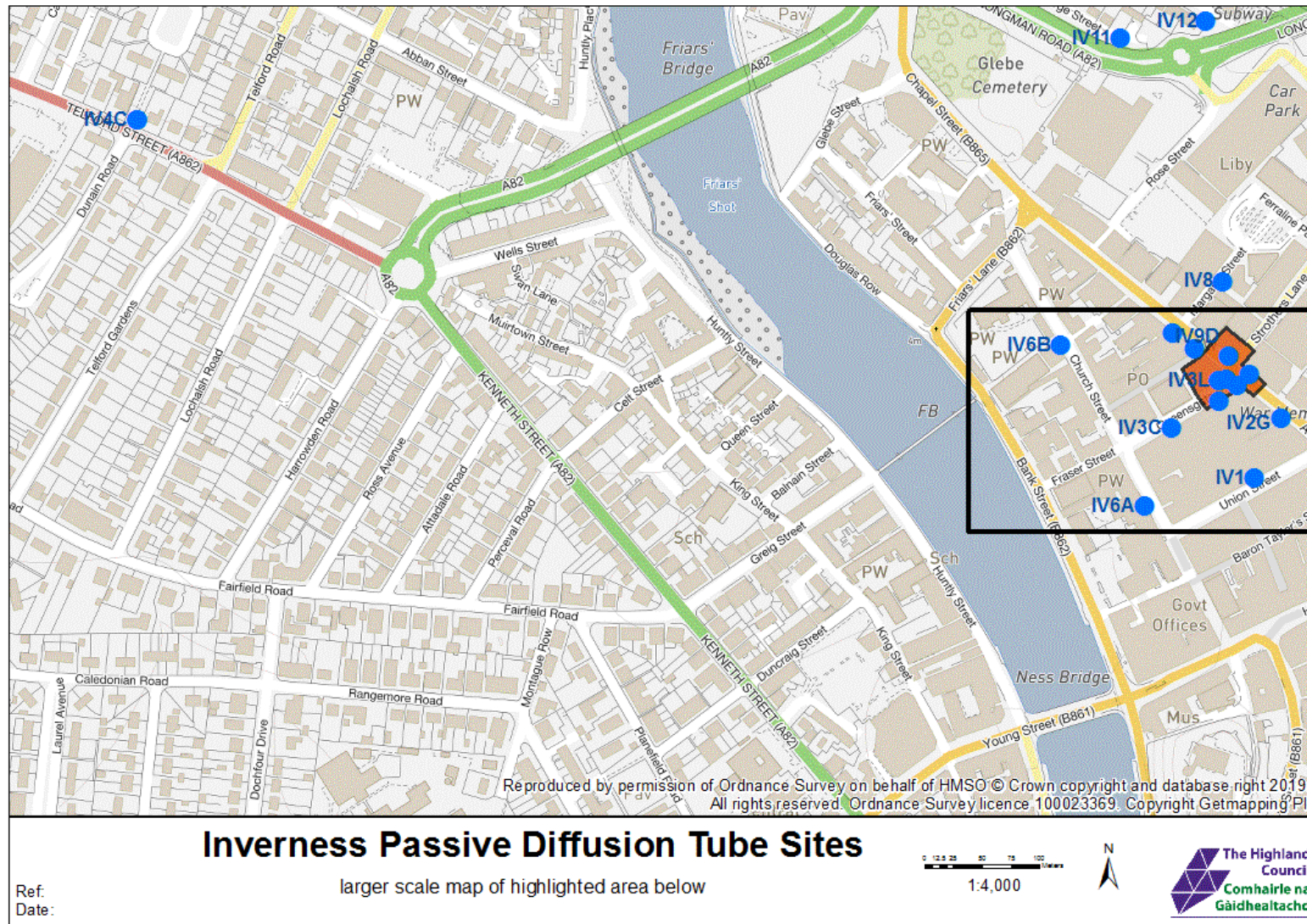




Figure 6 Map of non-automatic Monitoring Sites in Inverness AQMA

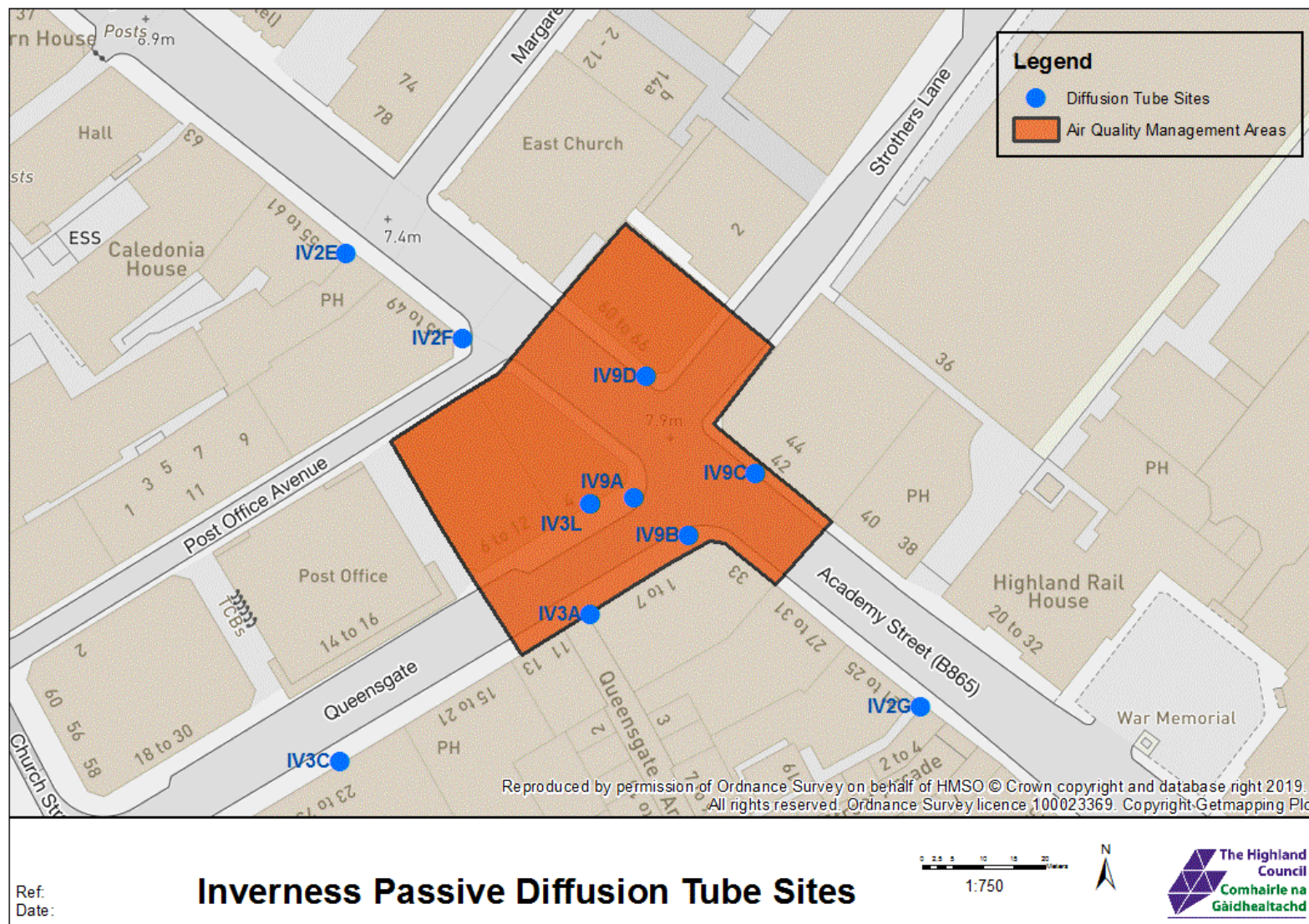




Figure 7 Map of non-automatic Monitoring Sites in Dingwall

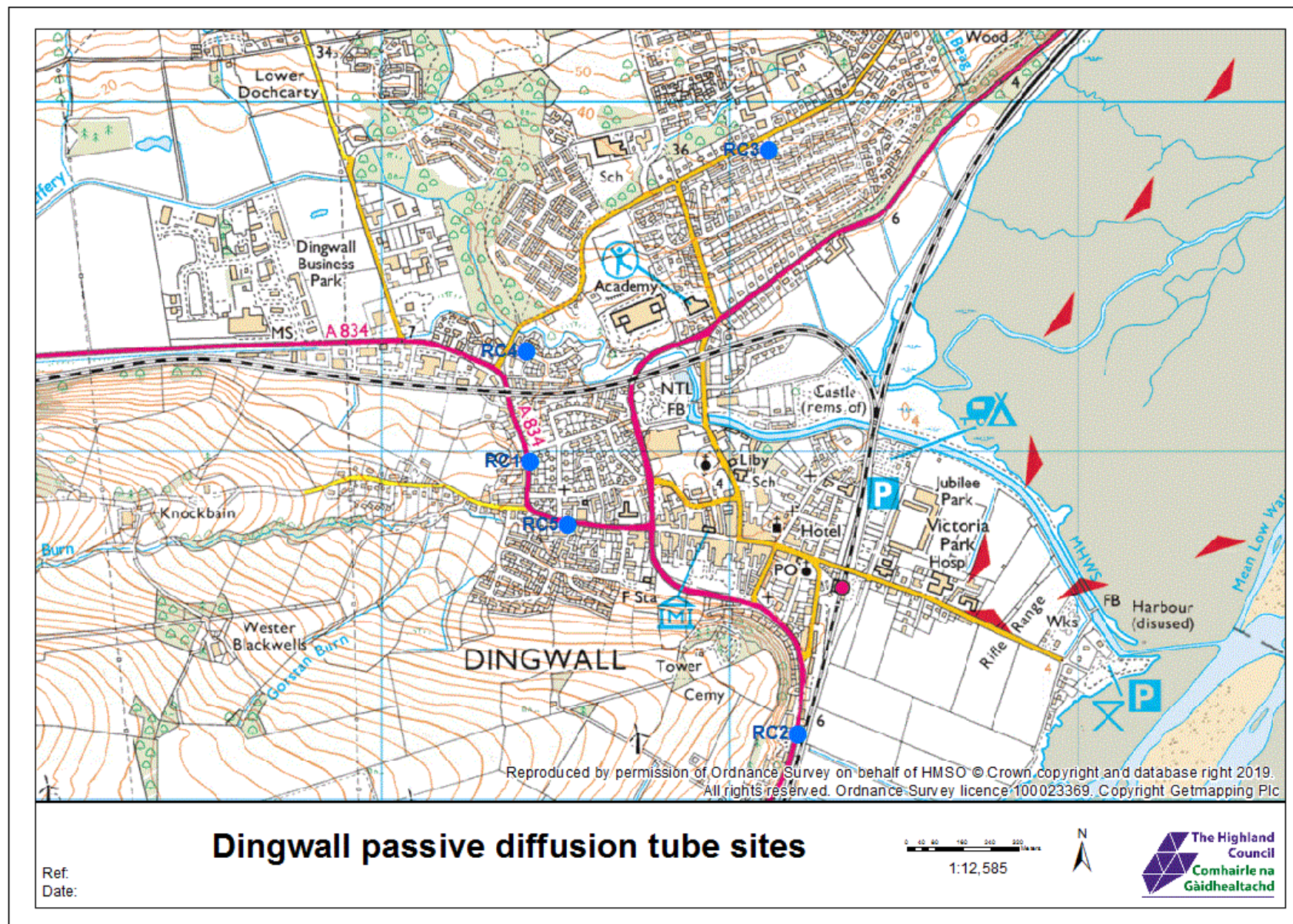




Figure 8 Map of non-automatic Monitoring Sites in Nairn

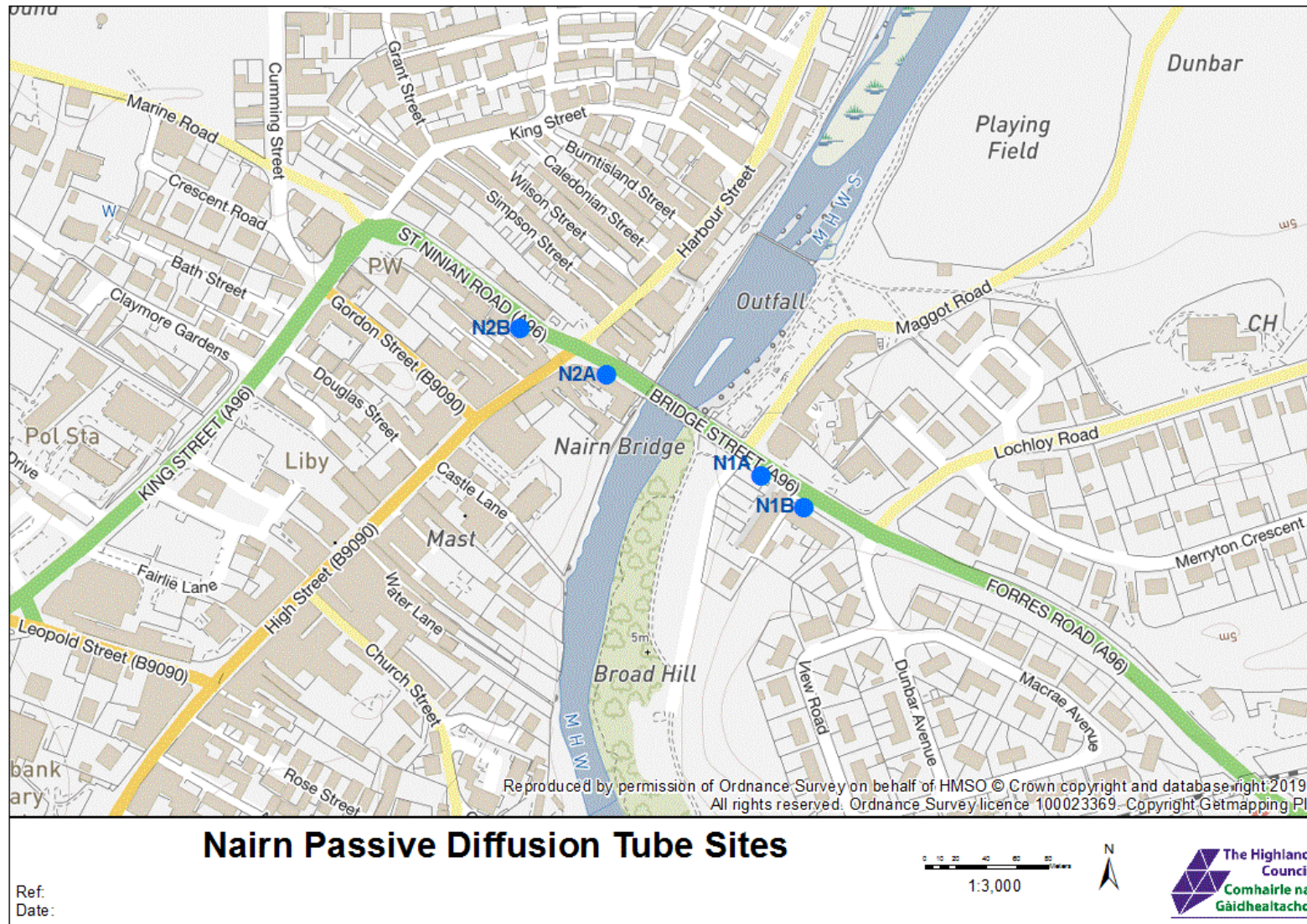
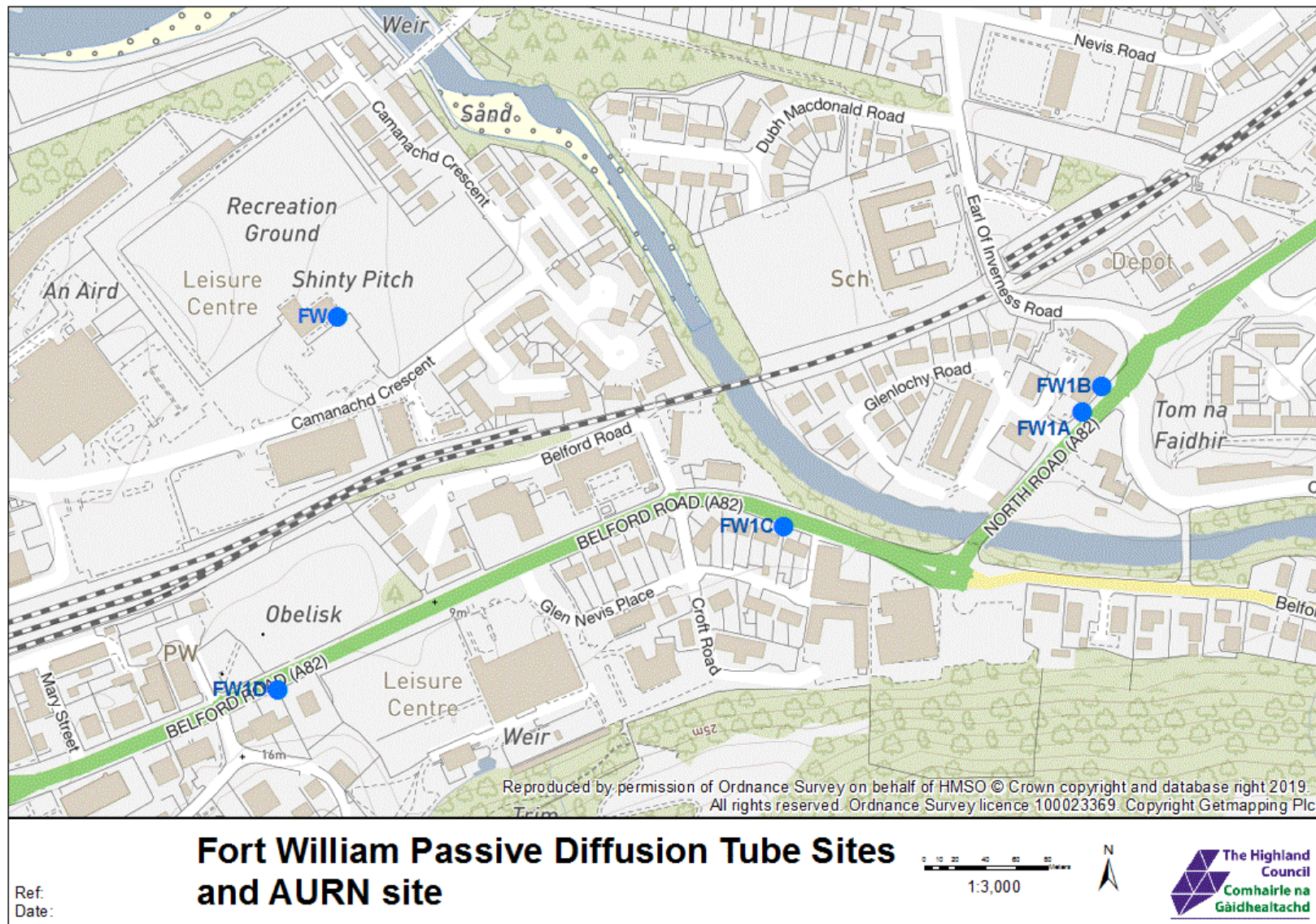




Figure 9 Map of non-automatic monitoring sites and AURN site in Fort William



## Appendix B: Full Monthly Diffusion Tube Results for 2022

**Table B.1 – NO<sub>2</sub> 2022 Monthly Diffusion Tube Results (µg/m<sup>3</sup>)**

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted <sup>(1)</sup>
IV1		13.2	20.9	67.6	18.0	11.4	13.8	18.5	22.6	17.8	25.4	25.3	23.9	19.9
IV2E	30.9	33.1	35.7	36.2	30.3	26.8	27.9	30.1	33.8	31.9	40.7	42.2	33.5	27.8
IV2F	30.6	31.6	38.3		24.6		27.3		36.0	28.4			30.5	27.0
IV2G	30.2	30.6	34.4	40.7	31.3	27.2	29.0	30.1	37.0	28.8	39.3	38.9	33.3	27.6
IV3A	30.2	29.0	34.5	36.6	26.4	24.4	24.9	27.5	33.5	28.8	36.1	38.8	31.0	25.8
IV3C	24.4	23.4	30.2	35.4	24.0	20.1	20.2	23.4	26.7	24.7	35.5	31.2	26.8	22.2
IV3H	27.7	30.3	28.4	30.6	25.3	21.8	24.1	23.7	31.1	24.0	34.4	32.5	28.2*	23.4
IV3K	27.6	29.0	29.3	33.4	25.0	21.6	25.7	25.0	30.6	24.4	33.3	30.3		
IV3L	28.5	30.0	30.6	31.7	26.0	21.6	24.1	24.7	31.1	25.8	35.2	32.1		
IV4A	20.4	18.6	20.9	14.6	11.5	10.6	10.8	11.2	16.0	18.0	27.4	28.5	17.6*	14.6
IV4B	21.1	20.2	21.0	15.6	12.5	11.2	11.3	11.7	15.8	18.0	28.0	27.3		
IV4C	21.3	16.2	21.2	14.8	12.0	10.8	11.0	11.3	15.7	18.1	29.2	28.6		
IV6A	11.6	17.1	23.2	28.2	17.4	13.6	15.1	18.5	24.3	20.0	31.7		20.2	16.8
IV6B	11.9	12.2			13.3	9.7	10.8	12.3	22.6	16.1	21.9	21.2	15.4	12.7
IV8	15.8	19.4	20.3	23.4	15.9	12.4	13.3	15.3	19.8	17.3	25.2	26.8	18.9	15.7
IV9A	41.4	37.4	40.0	40.3	33.5	33.6	32.9	33.1	37.7	36.3		43.1	37.3	31.0
IV9B	33.8	29.2	28.8	35.4	27.6	24.4	26.8	27.7	34.7	27.9	38.4	34.8	30.9	25.6
IV9C	29.5	25.6	33.6	43.5	33.0	24.9	27.0	31.5	42.4	28.5	40.9	41.6	33.8	28.0
IV9D	19.7	23.7	30.3	41.8	24.4	18.6	23.0	27.4	31.1	25.3	36.5	36.1	28.5	23.7
IV11	16.2	16.7	22.1	18.4	11.8	10.0	11.0	11.2	17.2	16.6	30.4		16.5	13.7
NIA	11.6	11.3	22.7	19.2	12.0	10.1	11.8	13.2	18.5	15.3	24.0	18.9	15.8	13.1
N1B	23.9	22.2	25.9	21.5	15.9	14.7	14.6	16.5	21.3	21.5	30.3	28.1	21.4	17.7
N2A	31.9	31.8	38.6	22.6	19.8	10.9	19.3	22.7	22.3	23.8	31.8	29.1	25.4	21.1
N2B	36.3	38.3	38.4	33.3	27.1	28.2	29.8	30.3	35.5	31.4	41.1	42.6	34.3	28.5
RC1	20.9	18.4	20.8	15.3	12.0	11.4	9.0	11.9	7.9	9.1	11.3	24.5	14.4	11.9
RC2	26.3	26.3	27.1	25.4	20.4		15.9	21.2	22.1	24.9	26.3	33.4	24.4	20.3

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted <sup>(1)</sup>
RC3	8.1	6.7	7.8	5.6	3.3	2.9	2.7	3.8	4.4	7.3	9.2	11.6	6.2	5.1
RC4	9.8	8.3	9.8	6.2	4.1	8.1	3.8	4.9	2.5	9.8	12.6	16.1	8.0	6.6
RC5	13.2	12.3	16.6		9.6	17.3	7.5	9.7	8.3	9.7	12.5		11.3	9.4
FW1A	14.8	19.2	21.2	20.7	18.3	10.4	13.5	17.9	20.5	23.3	26.0	25.4	19.3	16.2
FW1B	12.6	18.3		17.0	16.0	11.5	14.5	15.3	17.4	16.7	21.5	19.1	16.3	13.7
FW1C	13.0	16.7	19.4	20.2	18.5	13.1	16.1	18.7	20.2	20.0	22.8	24.4	18.6	15.6
FW1D	17.3	19.1	21.0	21.7	19.2	14.0	17.6	17.8	19.0	18.9	21.5	21.8	19.1	16.0
DAL1									6.2		10.9		-	-
DAL2										4.8			-	-
DAL3									6.5		11.9		-	-
DAL4									6.6	5.3	11.4		7.6	7.1
BE1									10.0	11.4	15.0		12.1	10.3
BE2									9.4	11.5	17.5		12.8	10.9
BE3									9.5	10.7	12.0		10.7	9.1
BE4									9.1	10.6	15.6		11.8	10.0
CR1									11.5	12.9	16.6		13.7	11.6
CR2									10.5	11.0	17.9		13.1	11.2
CR3									9.3	10.4	14.4		11.3	9.7
CR4									11.1	12.2	14.4		12.6	10.7
CR5									10.8	12.2	18.1		13.7	11.7
CR6									10.8	12.3	18.4		13.8	11.8
HM1									4.3	5.7	9.5		6.5	5.4
HM2									4.2	5.5	9.2		6.3	5.2
HM3									4.3	5.5	9.2		6.3	5.2
HM4									4.3	3.0	8.4		5.2	4.3
HM5									4.1	5.6	8.1		5.9	4.9
KH1									3.6				-	-
KH2									3.4	4.4			-	-
KH3									3.1		6.8		-	-
KH4									3.4	3.9	6.7		-	-
KH5									2.6	3.3	6.1		-	-
KH6									2.9	3.8	6.7		-	-
PL1									2.5	4.0	5.5		4.0	3.1
PL2									2.7		6.2		-	-
PL3									2.2	3.8	6.4		4.2	3.2



Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted <sup>(1)</sup>
PL4									2.1	3.4	5.9		3.9	3.0
PL5									2.5	3.4	5.8		3.9	3.0

**Notes:** See Appendix C for details on bias adjustment

## **Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC**

### **New or Changed Sources Identified Within The Highland Council During 2022**

The following new sources were identified in 2022:

East Quay, Nigg opened in July 2022, increasing Nigg port's deep water quayside facility. However, the EIA supporting the planning application did not propose any mitigations for air quality (planning reference 19/02777/FUL).

25kW biomass boiler, Land 105M North of Achnahannet, Spean Bridge (planning reference 22/04162/FUL)

100kW biomass boiler, The Doune, Rothiemurchus (planning reference 22/03084/FUL)

500kW biomass boiler, Ben Wyvis Hotel, Strathpeffer (planning reference 22/02159/FUL)

The biomass developments were screened using the methods described in LAQM.TG22 and found to be not significant in terms of impacts upon air quality.

### **Additional Air Quality Works Undertaken by The Highland Council During 2022**

Funding provided by the Scottish Government in May 2022 allowed the Highland Council to carry out an air quality awareness raising project at six Highland primary schools in 2022.

The monitoring included a combination of five NO<sub>2</sub> passive diffusion tubes at each school changed monthly over a three month period, and live Earthsense 'Zephyr' monitoring of multiple parameters over a few weeks at each site.

The monitoring locations were selected to use current street furniture in closest proximity to school drop off zones or known idling zones.

The diffusion tube monitoring results were adjusted where possible to annual average (AA) and none of the schools exceeded the Scottish Government Air Quality (AA) standard for NO<sub>2</sub>. The data from the zephyr's indicated raw data peaks coinciding with drop off and pick up times (9am/3pm).

The awareness raising element was undertaken through delivery of a project talk to pupils (Second Stage) in all six schools, delivery of monitoring data worksheets, and an end of project mini-report which we encouraged to be shared with pupils, staff or parents via school newsletters.

The aim for 2023/24 is to repeat the project at Highland Council's ten priority Urban Primary Schools by proximity to A and B roads to raise further awareness, and to undertake further monitoring data capture.

#### 2022/23 Schools Project

Primary Name	School Role	LAQM (TG22) Site Type	Easting	Northing
Bishop Eden (Inverness City)	39	Background Urban	266212	845340
Crown (Inverness City)	278	Background Urban	267137	845129
Dalneigh (Inverness City)	239	Background Urban	265315	845013
Holm (Inverness City)	271	Suburban	265556	842367
Kirkhill (Inverness-shire)	152	Suburban	255595	845595
Pennyland (Caithness)	211	Suburban	310826	968436



BISHOP EDEN PRIMARY

CROWN PRIMARY



DALNEIGH PRIMARY

HOLM PRIMARY



KIRKHILL PRIMARY

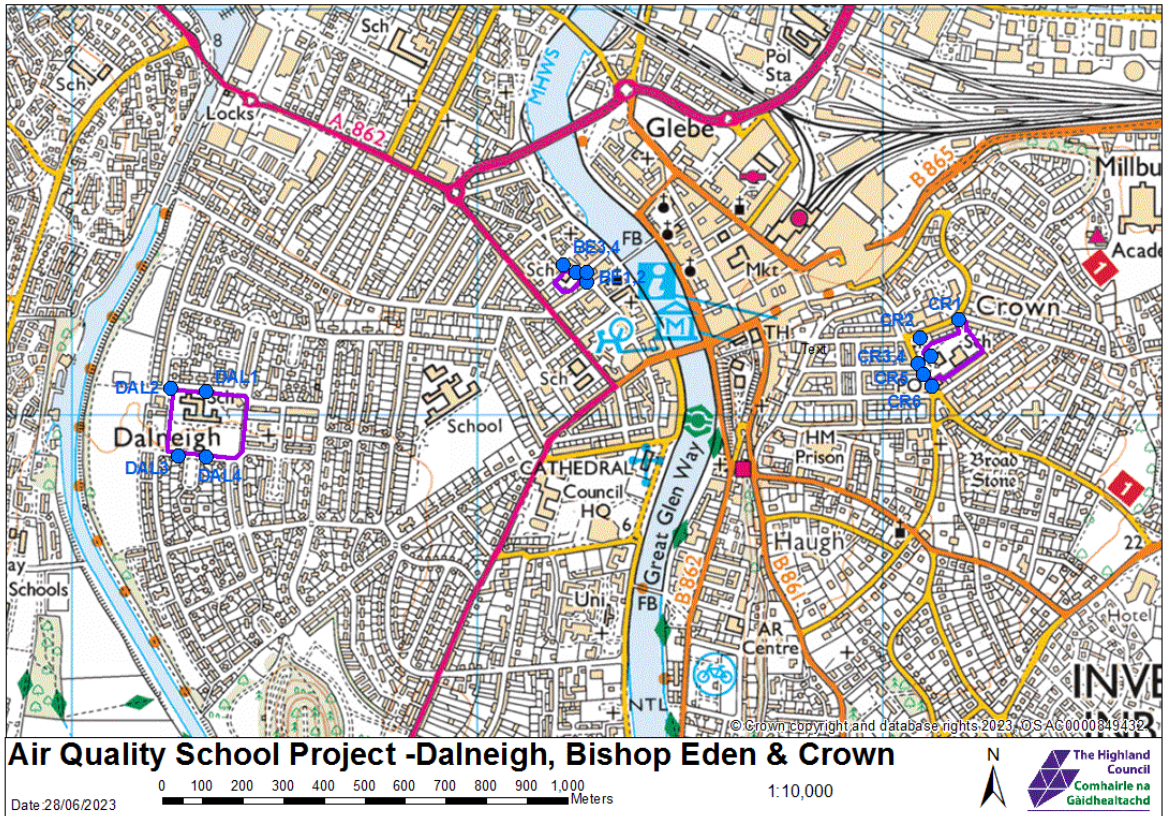


PENNYLAND PRIMARY

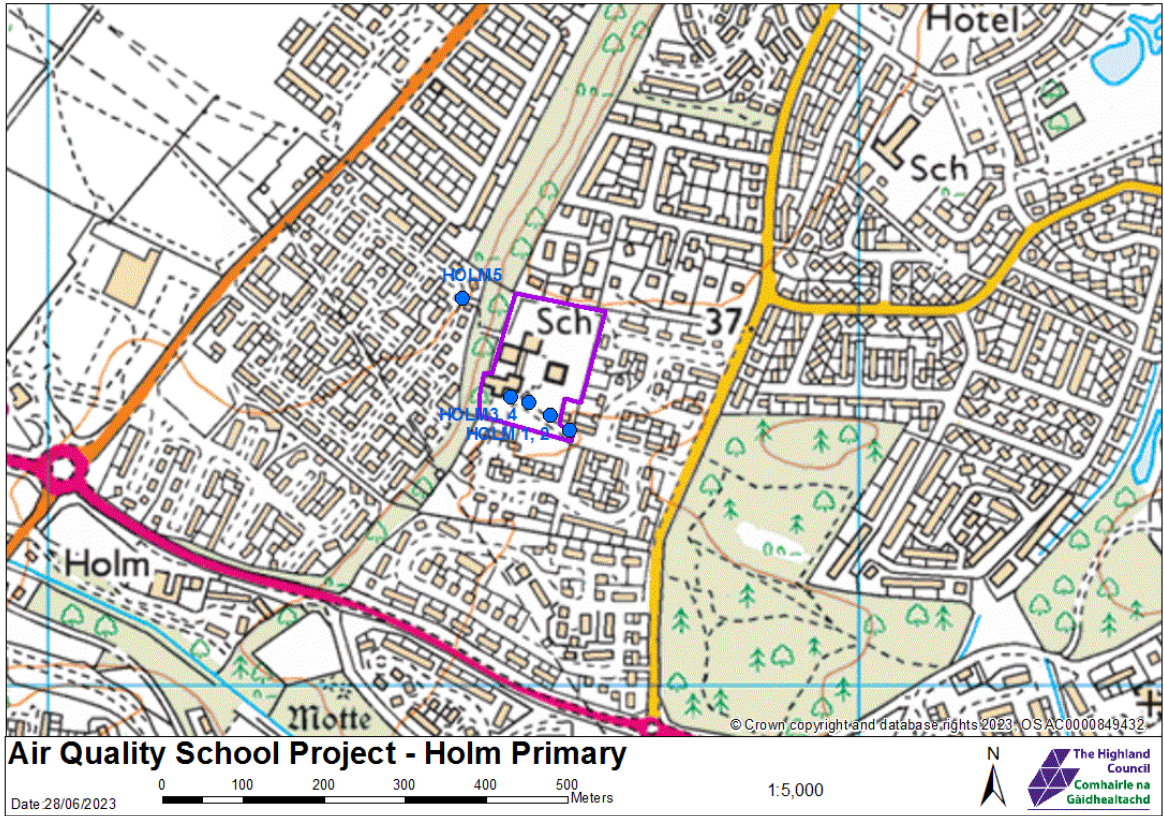




BISHOP EDEN, DALNEIGH AND CROWN PRIMARYS

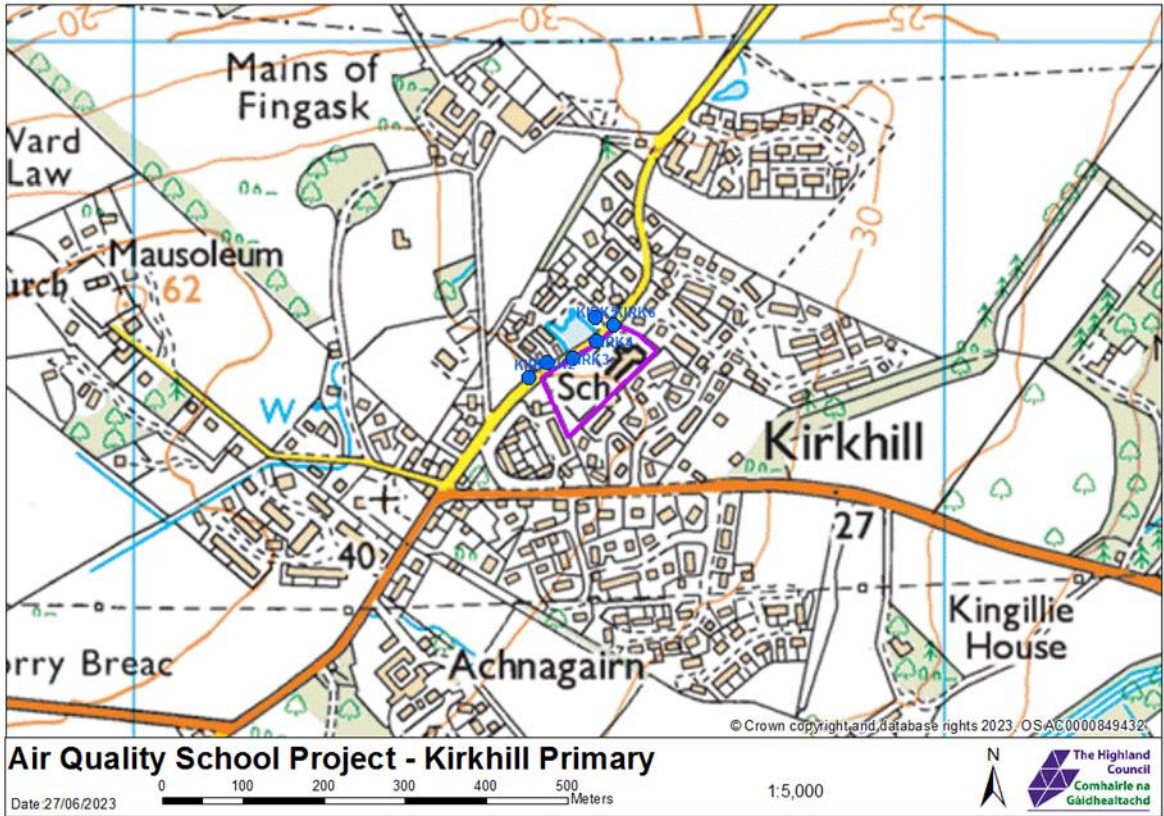


HOLM PRIMARY

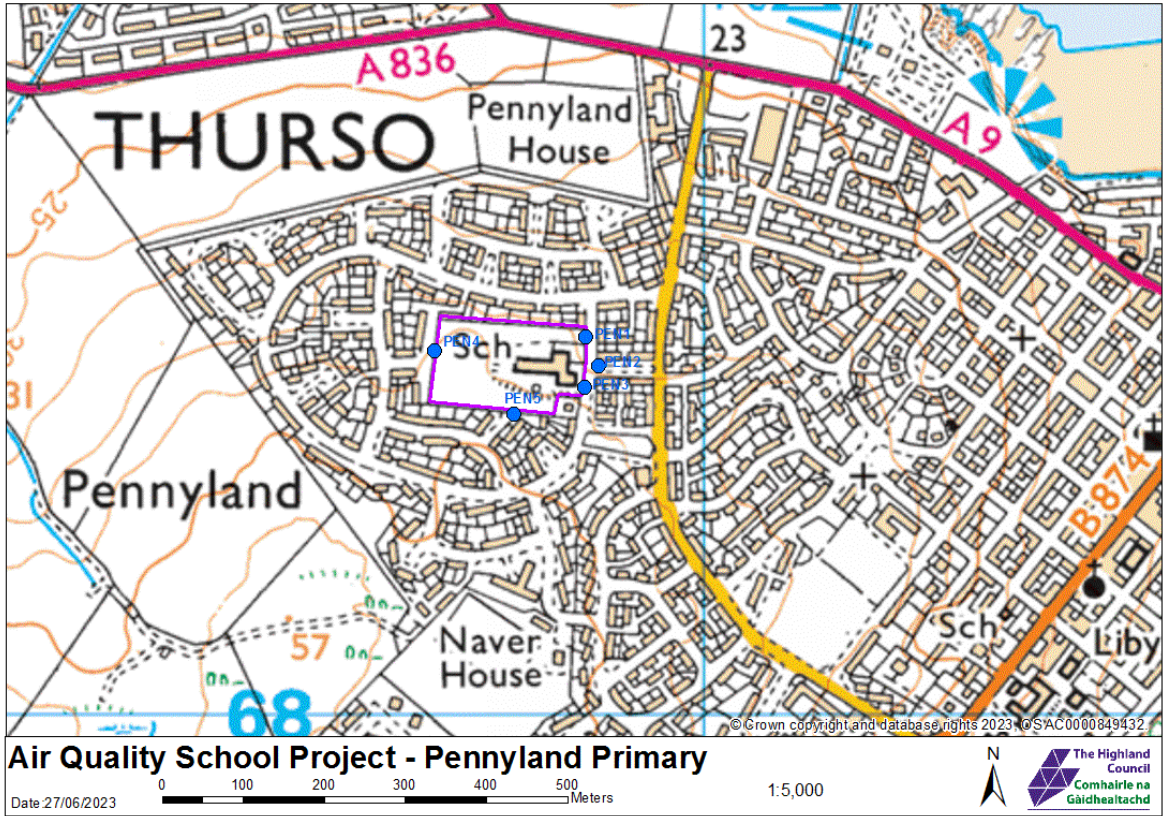




KIRK HILL PRIMARY



PENNYLAND PRIMARY



## QA/QC of Diffusion Tube Monitoring

Diffusion tubes used in the surveys reported in this document were supplied by Gradko International Ltd. The method of preparation is 20% TEA in water. Analysis of the NO<sub>2</sub> diffusion tubes is carried out using ion chromatography techniques in accordance with Gradko International Ltd U.K.A.S. accredited (ISO/IEC 17025) internal laboratory procedure GLM 7, which is a recommended UV spectrophotometric method.

Reporting of the NO<sub>2</sub> analysis results is sent to electronically to each authority in PDF format or if requested EXCEL format. The report is issued within 10 working days from receipt of the exposed diffusion tubes to the Gradko Laboratory.

**Quality Assurance:** The laboratory has a fully documented Quality Management System, which has been assessed and accredited by U.K.A.S. (Accreditation No. 2187). A copy of the Quality Manual Contents Index is available on request.

**Quality Control Procedures:** All tube components are maintained in a high state of cleanliness. New absorbent is prepared by the Laboratory and checked for levels of nitrogen dioxide.

The diffusion tubes are prepared in a dedicated clean laboratory and stored under refrigerated conditions to maintain stability. A sample of each batch of tubes prepared is checked by the analyst for blank levels. If the tubes are stored for more than one week, a further sample is taken and checked for any increases in blank levels. If the levels reach a pre-determined value, the batch of tubes is discarded.

Analytical Quality Control Procedures are implemented by the use of internal standards checks using certified standards from two different sources, and the use of external proficiency schemes such as AIR/PT Scheme.

AIR is an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combined two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme. The most up to date rounds available are rounds 49 to 50, which cover the up to June 2022, details of which can be found at:

[https://laqm.defra.gov.uk/wp-content/uploads/2022/07/LAQM-NO2-Performance-data\\_Up-to-June-2022\\_V2.1.pdf](https://laqm.defra.gov.uk/wp-content/uploads/2022/07/LAQM-NO2-Performance-data_Up-to-June-2022_V2.1.pdf)



100% of submissions in both rounds were satisfactory.

### **Tube Exposure Procedure**

The Highland Council exposes diffusion tubes according to the method described in “Passive Diffusion Air Monitors – Instruction Manual for Exposure and Location” by Gradko International Ltd. Guidance is also found in “Diffusion Tubes for Ambient NO<sub>2</sub> Monitoring: Practical Guidance” by AEA for DEFRA. Tubes are exposed to the DEFRA calendar <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/diffusion-tube-monitoring-calendar/>

### **Diffusion Tube Annualisation**

The diffusion tube sites identified in Table C.2 were annualised using the Diffusion Tube Processing Tool v3.0.

### **Diffusion Tube Bias Adjustment Factors**

The Highland Council have applied a national bias adjustment factor of 0.83 to the 2022 monitoring data. A summary of bias adjustment factors used by The Highland Council over the past five years is presented in Table C.1.

Two local co-location studies were undertaken by The Highland Council in 2022, at the AURN site INV02, a roadside site on Telford Street in Inverness, and the SAQN site INV03, a roadside site on Queensgate within the Inverness City Centre AQMA. The two sites returned bias adjustment factors of 0.77 and 1.02 respectively. A combined bias adjustment factor of 0.87 was calculated using the Diffusion Tube Data Processing Tool v.3.0.

INV03 had poor overall data capture in 2022 (57%) reducing the confidence in that result. The national factor was therefore chosen for the bias adjustment of the 2022 data set.

The national factor was obtained from the bias adjustment spreadsheet version 03/23 and was derived from 27 studies.

**Table C.1 – Bias Adjustment Factor**

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	National	03/23	0.83
2021	Local	-	0.82
2020	Local and National	09/21	0.7 local and 0.81 national
2019	Local and National		0.86 local and 0.93 national
2018	Local and National		0.89 local and 0.93 national

**NO<sub>2</sub> Fall-off with Distance from the Road**

No diffusion tube NO<sub>2</sub> monitoring locations within The Highland Council required distance correction during 2022.

**QA/QC of Automatic Monitoring**

The AURN sites in Highland are operated for DEFRA by Bureau Veritas with QA/QC provided by Ricardo E and E. Local site operator is The Highland Council for all sites.

INV03 and INV04 are operated by The Highland Council as part of the Scottish Air Quality Database (SAQD). QA/QC and data management for the SAQD is provided by Ricardo E and E.

Sites are subject to six monthly audit and service visits. LSO calibration visits are carried out fortnightly for all sites other than Fort William and Strath Vaich, which are four weekly and quarterly.

All data reported in this document is ratified.

Live and historical data is available at <http://www.scottishairquality.scot/data/>

**PM<sub>10</sub> and PM<sub>2.5</sub> Monitoring Adjustment**

The type of PM<sub>10</sub>/PM<sub>2.5</sub> monitor(s) utilised within The Highland Council do not require the application of a correction factor.

### **Automatic Monitoring Annualisation**

INV02 and INV03 required annualisation in 2022. Detail of the annualisation process is included in Table C.2.

### **NO<sub>2</sub> Fall-off with Distance from the Road**

No automatic NO<sub>2</sub> monitoring locations within The Highland Council required distance correction during 2022.

Table C.2 – Annualisation Summary (concentrations presented in  $\mu\text{g}/\text{m}^3$ )

Site ID	Annualisation Factor Site 1 Fort William	Annualisation Factor Site 2 Aberdeen Errol Park	Annualisation Factor Site 3 Edinburgh St Leonards	Annualisation Factor Site 4 Glasgow Townhead	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
INV03	0.9855	1.0351	0.9916		1.0041	28.9	28.8	
INV04	0.9957	1.0133	1.1020		1.0370	24.3	23.4	
	Aberdeen Errol Park	Edinburgh St Leonards	Glasgow Anderston					
IV2F	1.0135	1.0464	1.1223	1.0796	1.0654	30.5	32.5	
BE1	0.9930	1.1394	0.9474		1.0266	12.1	12.4	
BE2	0.9930	1.1394	0.9474		1.0266	12.8	13.2	
BE3	0.9930	1.1394	0.9474		1.0266	10.7	11.0	
BE4	0.9930	1.1394	0.9474		1.0266	11.8	12.1	
CR1	0.9930	1.1394	0.9474		1.0266	13.7	14.0	
CR2	0.9930	1.1394	0.9474		1.0266	13.1	13.5	
CR3	0.9930	1.1394	0.9474		1.0266	11.3	11.6	
CR4	0.9930	1.1394	0.9474		1.0266	12.6	12.9	
CR5	0.9930	1.1394	0.9474		1.0266	13.7	14.1	
CR6	0.9930	1.1394	0.9474		1.0266	13.8	14.2	
DAL4	1.0844	1.3057	1.0167		1.1356	7.6	8.6	
	Edinburgh Currie	Fort William	Peebles					
HM1	0.9745	0.9364	1.0829		0.9979	6.5	6.5	
HM2	0.9745	0.9364	1.0829		0.9979	6.3	6.3	
HM3	0.9745	0.9364	1.0829		0.9979	6.3	6.3	
HM4	0.9745	0.9364	1.0829		0.9979	5.2	5.2	
HM5	0.9745	0.9364	1.0829		0.9979	5.9	5.9	
PL1	0.9108	0.8756	0.9743		0.9203	4.0	3.7	
PL3	0.9108	0.8756	0.9743		0.9203	4.2	3.9	
PL4	0.9108	0.8756	0.9743		0.9203	3.9	3.6	
PL5	0.9108	0.8756	0.9743		0.9203	3.9	3.6	

Table C.3 – Local Bias Adjustment Calculations

	Local Bias Adjustment Input 1	Local Bias Adjustment Input 2	Local Bias Adjustment Input 3	Local Bias Adjustment Input 4	Local Bias Adjustment Input 5
Periods used to calculate bias	6	12			
Bias Factor A	1.02 (0.87 - 1.25)	0.77(0.7 - 0.85)			
Bias Factor B	-2% (-20% - 15%)	31%(18% - 43%)			
Diffusion Tube Mean ( $\mu\text{g}/\text{m}^3$ )	28	17.6			
Mean CV (Precision)	2.4%	3.0%			
Automatic Mean ( $\mu\text{g}/\text{m}^3$ )	28.7	13.4			
Data Capture	99%	95%			
Adjusted Tube Mean ( $\mu\text{g}/\text{m}^3$ )	29(24 - 35)	14 (12 - 15)			

## Notes:

Co-location study 1 has poor overall data capture. The national bias adjustment factor of 0.83 has been used to bias adjust the 2022 diffusion tube results.

The combined local bias adjustment factor of 0.87 has therefore not been used to bias adjust the 2022 diffusion tube results.

## Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
APR	Air quality Annual Progress Report
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
PM <sub>10</sub>	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO <sub>2</sub>	Sulphur Dioxide

## References

1. DEFRA in partnership with the devolved administrations, **The Air Quality Strategy for England, Scotland, Wales and Northern Ireland**, March 2011.
2. **The Air Quality (Scotland) Regulations 2000**
3. **The Air Quality (Scotland) (Amendment) Regulations 2002**
4. **The Air Quality (Scotland) (Amendment) Regulations 2016**
5. DEFRA in partnership with the devolved administrations, **Local Air Quality Management Technical Guidance LAQM.TG(09)**, 2009
6. DEFRA in Partnership with the devolved administrations, **Local Air Quality Management Technical Guidance LAQM.TG(16)**, 2016
7. DEFRA in partnership with the devolved administrations, **Local Air Quality Management Policy Guidance LAQM.PG(S)(16)**, 2016
8. The Scottish Government, **Cleaner Air For Scotland: the road to a healthier future**, November 2015
9. The Highland Council, **Air Quality in The Highlands – First Stage Review and Assessment** 1998.
10. The Highland Council, **Addendum to Air Quality in the Highlands**, 2001.
11. The Highland Council, **Updating and Screening Assessment**, 2003
12. The Highland Council, **Progress Report**, 2005
13. The Highland Council, **Detailed Assessment Report**, 2005
14. The Highland Council, **Updating and Screening Assessment**, 2006.
15. The Highland Council, **Progress Report** 2007.

16. The Highland Council, **Progress Report** 2008.
17. The Highland Council, **Updating and screening Assessment**, 2009
18. The Highland Council, **Progress Report** 2010.
19. The Highland Council, **Progress Report** 2011
20. The Highland Council, **Updating and screening Assessment**, 2012
21. The Highland Council, **Progress Report** 2013
22. The Highland Council, **Progress Report** 2014
23. The Highland Council, **Updating and Screening Assessment**, 2015
24. Air Quality Consultants on behalf of The Highland Council, **Detailed Assessment of Air Quality in Inverness** May 2014
25. The Highland Council, **Annual Progress Report** 2016
26. The Highland Council, **Action Plan for Inverness City Centre AQMA (Draft)** 2016
27. The Highland Council, **Annual progress Report** 2017
28. The Highland Council, **Annual Progress Report** 2018
29. The Highland Council, **Annual Progress Report** 2019
30. The Highland Council, **Annual Progress Report** 2020
31. The Highland Council, **Annual Progress Report** 2021
32. The Highland Council, **Annual progress Report** 2022
33. NETCEN, **Air Quality Monitoring: Highland**, 2005
34. **Environment Act 1995**
35. **Clean Air Act 1993**
36. <http://www.scottishairquality.scot/data>
37. <http://www.scottishairquality.scot/laqm>



38. AEA Energy and Environment on behalf of the Scottish Government, **Measurement and Modelling of Fine Particulate Emissions (PM10 and PM2.5) from Wood Burning Biomass Boilers**, 2008
39. Ricardo AEA , **QA/QC Report for the Automatic Urban and Rural Network, Oct-Dec 2014 and Annual Review 2014**, June 2015.
40. Gradko (International) Ltd, **Passive Diffusion Tube Monitors – Instruction manual for Exposure and Location**.
41. AEA Energy and Environment, **Technical Guidance – Screening Assessment for Biomass Boilers**, 2008
42. Air Quality Consultants, **Nitrogen dioxide Concentrations and Distance from Roads**, 2008
43. <http://www.uwe.ac.uk/aqm/review/>
44. AEA Energy and Environment for DEFRA and the devolved administrations, **Diffusion Tubes for Ambient NO2 Monitoring – Practical Guidance for Laboratories and Users**, 2008
45. LGC for BV/NPL on behalf of DEFRA and the devolved administrations, **Summary of Laboratory Performance in AIR NO2 Proficiency Testing Scheme**  
[https://laqm.defra.gov.uk/wp-content/uploads/2022/07/LAQM-NO2-Performance-data\\_Up-to-June-2022\\_V2.1.pdf](https://laqm.defra.gov.uk/wp-content/uploads/2022/07/LAQM-NO2-Performance-data_Up-to-June-2022_V2.1.pdf)