Air Quality and Land Use Planning SG: Technical Guide.

Dundee City Council

Table of contents

1 Introduction

1.1 Purpose of this technical guide.

The purpose of this guide is to give advice to developers and their consultants and provide technical advice on how Dundee City Council (DCC) will deal with planning applications that have the potential to impact on air quality in the city. It is hoped that the guidance provided here will help to guide the approaches used when carrying out air quality assessments for development management purposes.

Particular attention is given to the methodologies developers are required to use when characterising the potential air quality impacts of their proposals. Therefore the document assumes that a decision has been taken that an air quality assessment is required. The aim is to ensure that all air quality assessment work carried out in support of planning applications is done to common and transparent standards.

This technical guide should be read in conjunction with the Supplementary Guidance "Air Quality and Land Use Planning." The Council expects that developments with the potential to impact on air quality will make use of the SG to determine whether an air quality assessment is required, and if so will take account of the methodological approaches outlined in this technical guide. The Technical Guide has been substantially developed by AEA Technology plc and the contents of the SG is significantly shaped by their advice.

The guidance should enable developers to ensure that they afford air quality the appropriate level of importance when making their planning applications to the Council. It should also facilitate timely communication, evidence generation and eventually decision making.

1.2 National and local policy background

The UK Air Quality Strategy (AQS) was developed by Government in 1997 and has subsequently been revised in 2003 and 2007. This sets out the national policy approach to air quality across the UK. The AQS sets out a series of air quality objectives which Local Authorities must work towards achieving. The UK air quality objectives have derived from legally binding limit values set in EU legislation[1]. An air quality objective is a date by which the relevant Standard should not be exceeded, these dates have now passed for all of the pollutants that DCC has responsibility for. The relevant objectives and standards are provided in Appendix 4.

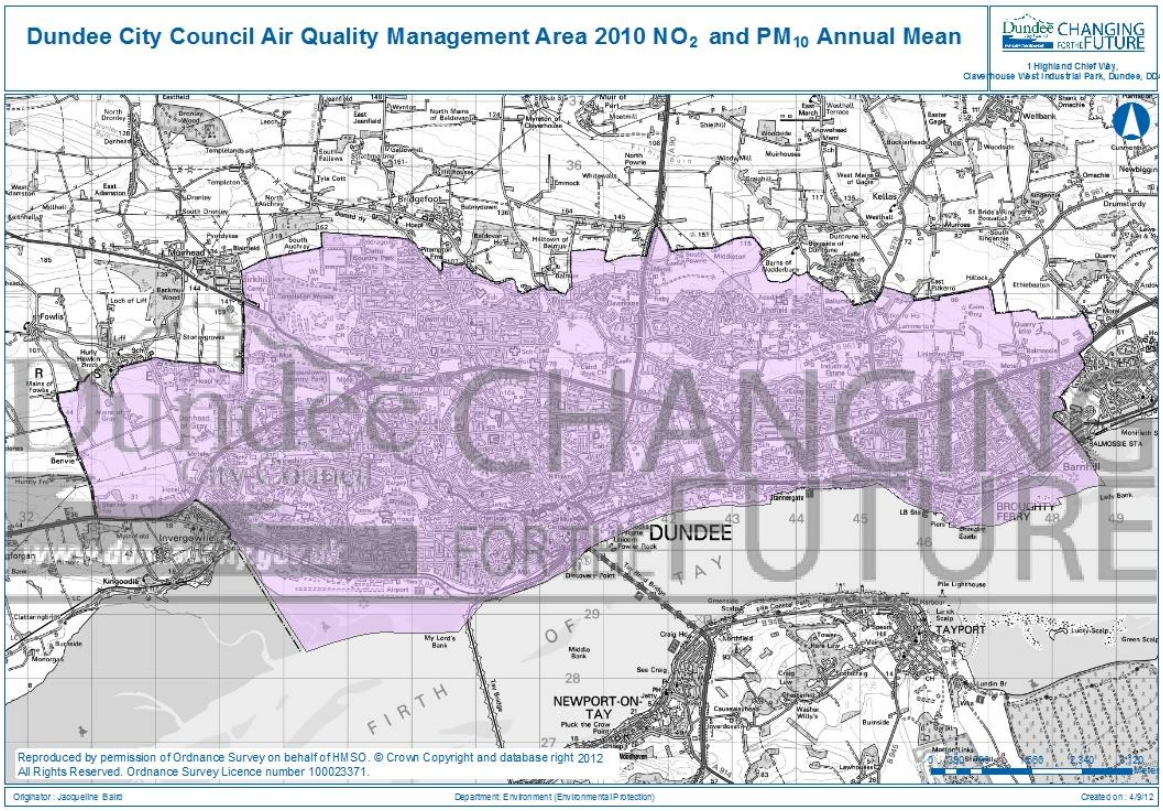
Council obligations in this regard are laid out in the Environment Act 1995 which set out a system called Local Air Quality Management (LAQM). It should be noted that although the objectives are policy targets (the Council are not legally obliged to achieve them) all of the UK objectives are at least as stringent as the European Limit Values for the various pollutants. The Limit Values carry legal standing and have been written into UK law through the various Air Quality Standards Regulations. It is worth noting that Scottish Government has adopted a PM_{10} annual mean objective that is lower than the UK or EU standard. The Scottish PM_{10} standard is written into regulation[2] and therefore carries equivalent weight to the Limit Value based standards.

The LAQM framework requires that Local Authorities who find exceedances of air quality objectives within their geographical area must designate Air Quality Management Areas (AQMAs) and produce an Air Quality Action Plan setting out measures they intend to take to work towards the objectives. DCC has an AQMA in place for both NO_2 and PM_{10} across the whole city and has prepared an Air Quality Action Plan (AQAP) which aims to help address the exceedances in the City.

[1] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe
[2] The Air Quality (Scotland) Amendment Regulations 2002

There are 32 measures within the Action Plan, which have been designed to help improve air quality mainly through efforts to tackle traffic emissions, education and raising awareness. Development of the SG is one of the measures within the Action Plan.

Figure 1: Dundee City Council AQMA boundary



1.3 Planning and LAQM

Although DCC has declared the entire City as an AQMA, not every area of the city suffers poor air quality. Most of the City complies with air quality objectives and exceedances are restricted to known areas within the City centre, and at certain locations along major roads or narrow streets. Declaration of the entire city as an AQMA allows the Council to take a holistic approach to managing air quality in the city, and land use planning is a key aspect of this.

Planning Advice Note- PAN 51 (Revised 2006)

Planning Advice Note 51 (PAN 51)[3] advises on the policies and practices that should be adopted by planning authorities and others involved in planning new developments and redevelopments. It explains the role of the planning system in relation to the LAQM and environmental protection regimes. It is therefore important to establish the potential air quality implications of planning applications in the city. The Scottish Government suggests that development of SG should be considered to facilitate this[4]. This technical guide forms part of that SPG.

Where developments take place in an AQMA, mitigation measures should be considered as standard practice, particularly in cases where the development is new and does not replace an existing use. This is especially important where the development has provision for a large number of parking spaces, significantly increases road traffic activity, and/or has requirements for heating plant.

[3] Scottish Government (2006) Planning Advice Note 51
[4] Scottish Government (2009) Part IV of the Environment Act 1995 Local Air Quality Management Policy Guidance PG(S)(09)

Areas of known poor air quality are summarised in the SG. All of these areas have been subject to investigation by the Council over the years and there is a significant amount of air quality monitoring data which is available in the Council's annual LAQM reports, or in the case of automatic monitoring, from the Scottish Air Quality Database[5].

Whilst these are known areas with poor air quality in the city, there are other areas which do not currently exceed standards but could in future if developments introduce new traffic to already quite busy areas. The Council will seek to ensure that these parts of the city do not exceed air quality standards in future by managing the air quality impacts from new developments in these areas.

1.4 Planning and pollution control

The Council also has to consider the implications for air quality from planning applications which introduce other sources of air pollution in the City, for example large combustion facilities or industrial premises.

PAN 51 explains the relationship between the land use planning and the relevant pollution control systems. If the proposed emissions source is not regulated under Integrated Pollution Prevention and Control (IPPC), or if only some of its emissions are regulated under the Clean Air Act 1993 then the Council will consider adding conditions to the planning permission to address potential impacts on local air quality.

These conditions might require a scheme of monitoring and mitigation, covering planning concerns to be approved by planning authorities before any development went ahead. In these cases DCC will work closely with SEPA. Where conditions are not enough to overcome the planning objection to a development proposal the Council may seek a planning obligation under Section 75 of the Town and Country Planning (Scotland) Act 1997.

Section 75 agreements impose obligations on land which is the subject of approved development proposals e.g. for the developer to fund new community facilities or road improvements. The legislative basis for planning obligations is Section 75 of the Town and Country Planning (Scotland) Act 1997.

[5] http://www.scottishairquality.co.uk/data.php

2 Air quality assessments for planning applications

2.1 Background

Air quality impact assessments are by their nature often quite technical exercises with potential variations in approach. Sometimes these methodological variations can lead to problems where a practitioner uses an approach which does not satisfy the Council. This in turn can lead to delays in making planning decisions where air quality is a consideration. To prevent this as much as practicable in this document DCC outline some preferred approaches to air quality assessment that should guide developers and their consultants when preparing air quality assessments to support planning applications in Dundee. The guidance is based on the Council's knowledge of air pollution in the City gained over many years of working within the LAQM framework and draws on their experiences of dealing with planning and air quality during that time.

Developers should note that DCC may require ambient monitoring to be undertaken to underpin air quality assessments. The developer should consult with the Council in order to determine whether this will be required (the decision should be based on current Council data availability and pertinence to the development site). DCC undertake monitoring at many locations across the city, and it may be that existing monitoring can be used in an air quality assessment, but this should not be assumed under any circumstances.

Where an air quality assessment has been completed by a developer, DCC will make a judgement on this based on a number of factors. If a development is judged to result in a deterioration of air quality, DCC will seek mitigation measures that will allow the development to progress. Similarly, if a development is of sensitive use and located in an area of poor air quality, DCC will require mitigation measures to secure acceptable air quality for new receptors.

The methodologies developed to support the LAQM process in the UK are laid out in LAQM.TG(09)[6] and DCC expect that developers will use methods that are closely aligned with that guidance. Of particular relevance to developers conducting air quality assessments are the sections on ambient monitoring, making emissions estimates and dispersion modelling. Even when applying the methods in LAQM.TG(09) there is room for variation in techniques; where appropriate we set out our preferred approaches in this guidance document.

Appendix 1: Scope of assessment checklist provides the information that DCC require to be agreed prior to an air quality assessment being undertaken. It is hoped that this checklist will reduce the consultation burden between developers or their consultants, and DCC Environment Department Officers (Environment Protection Division).

2.2 Developments that require an air quality assessment

The aim of any air quality impact assessment is to estimate the effect on local air quality arising from a development. Alternatively the focus of the assessment might be to assess existing air quality in an area to estimate exposure at new buildings.

The three main ways a development may have an impact are as follows:

1. The development may itself cause a deterioration in local air quality e.g. from increased traffic flows, or stack emissions e.g. from heating plant;

[6] Defra and the devolved administrations (2009) Local Air Quality Management Technical Guidance LAQM.TG(09)

2. The development is proposed in an area of existing poor air quality (i.e., it could expose future occupiers to unacceptable pollutant concentrations);
3. The demolition/construction phase will have an impact on the local environment (e.g., through fugitive dust and/or exhaust emissions from machinery and vehicles). We would recommend as a minimum that the provisions laid out in the Institute of Air Quality Management (2014) Guidance are followed.

For the largest developments an Environmental Impact Assessment (EIA) could be required under the EIA Regulations[7]. As part of any EIA a detailed study of the effects of a development on air quality would be necessary. Formal Environmental Impact Assessments need to take explicit account of the EU Limit Values; eg the assessment of PM_{10} should be against the limit values in addition to the Scottish objectives. An EIA will introduce the need to assess the impact on $PM_{2.5}$ concentrations, along with those pollutants that affect ecosystems and vegetation where appropriate[8].

In such cases, the approach set out in this guidance note should be followed. Most proposals for large commercial or industrial installations that have the potential to emit pollution (e.g., 'Part A' installations) will also normally require an air quality assessment under the EIA regulations. Small industries, such as 'Part B' installations, may still require an assessment as part of a permit application under the Pollution Prevention and Control (PPC) regime[9], and the same assessment could in principle be used to help determine the impact of the development in terms of air quality for a planning application. If for whatever reason planning permission is being sought in the absence of an assessment having been carried out for a permit application or similar, then DCC will require one to be submitted.

A full EIA will not normally be required for smaller developments but DCC may still require an air quality assessment as part of the planning application. Developers should always check with DCC to determine whether an air quality assessment is required before submitting a planning application.

Where it is clear from the initial specification of the development that it is likely that the development will have a minimal impact on air quality, but an air quality assessment may still be required developers may wish to consider identifying air quality mitigation measures from the start as part of the development, instead of undertaking a full air quality assessment. This course of action is at the discretion of DCC, and so it is important that communication between developers, or their consultants, and the local authority takes place at an early stage of the decision making process.

Developers should always contact DCC to obtain the most up to date monitoring and LAQM assessment reports to inform their work.

DCC will consider the following issues when determining whether an air quality assessment should normally be undertaken:

- The locality and type of development and its proximity to known areas of concern (including consideration of the sensitivity of the development or the sensitivity of existing receptors potentially affected by the new development;
- The duration and scale of the demolition and construction phases;
- The likely increase in traffic volumes compared to existing baseline and any potential to introduce congestion or queuing traffic; or significantly increase road traffic emissions in streets with canyon like topography;
- Where new developments involve major changes in road alignment that reduce the separation distance between road traffic and receptors.
- Industrial, commercial or residential developments with new point source emissions from combustion processes (e.g. boiler plant/biomass combustion/energy production/permitted installations/authorised processes);

[7] The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011
[8] Environmental Protection UK (2010) Development Control: Planning For Air Quality (paragraph 2.10)
[9] The Pollution Prevention and Control (Scotland) Regulations 2000

- Size of the proposed development considering either the residential/commercial floor space or number of units;
- Increase in heavy diesel vehicle (HDV) movements such as for lorry parks, depots, bus stations;
- Waste handling activities
- Whether the development introduces non-threshold pollutants

Current criteria that will be used to help to establish when an air quality assessment is likely to be considered necessary are presented in Box 1. *Note: This list is not exhaustive and other factors may determine that DCC will require an air quality assessment.*

Box 1: Examples of Criteria to help establish when an air quality assessment will be required[10].

- Proposals that will generate or increase traffic congestion where 'congestion' manifests itself as an increase in periods with stop start driving;
- Proposals that will give rise to a significant change in either traffic volumes, typically a change in annual average daily traffic (AADT) or peak traffic flows of greater than ±5% or ±10%, depending on local circumstances (a change of ±5% will be appropriate for traffic flows within an AQMA), or in vehicle speed (typically of more than ±10 kph), or both, usually on a road with more than 10,000 AADT (5,000 if 'narrow and congested');
- Proposals that would significantly alter the traffic composition on local roads, for instance, increase the number of HDVs by say 200 movements or more per day, due to the development of a bus station or an HGV park (professional judgement will be required, taking account of the total vehicle flow as well as the change);
- Proposals that include significant new car parking, which may be taken to be more than 100 spaces outside an AQMA or 50 spaces inside an AQMA. Account should also be taken of car park turnover, i.e. the difference between short-term and long-term parking, which will affect the traffic flows into and out of the car park. This should also include proposals for new coach or lorry parks. These criteria are designed to trigger the requirement for the assessment of traffic on the local roads. It may also be appropriate to assess the emissions from within the car park itself;
- Developments which may significantly affect nitrogen deposition to sensitive habitats;
- Introduction of new exposure close to existing sources of air pollutants, including road traffic, industrial operations, agricultural operations etc;
- Proposals that include biomass boilers or biomass-fuelled CHP plant (there is no established criterion for the size of plant that might require assessment. Reference should be made to Environmental Protection UK's guidance on biomass);
- Consideration should be given to the impacts of centralised boilers or CHP plant burning other fuels (e.g. gas or oil) within or close to an AQMA;
- Proposals that could give rise to potentially significant impacts during construction for nearby sensitive locations, e.g. residential areas, areas with parked cars and commercial operations that may be sensitive to dust;
- Large, long-term construction sites that would generate large HGV flows (>200 movements per day) over a period of a year or more.

2.3 Considerations for air quality assessments

DCC require that developers consider the air quality aspects of their planning applications under one or both of these categories:

- **Existing air quality at the chosen site:** if a development is proposed in an area that is already exceeding AQ limits this could have a detrimental impact upon its future residents;

[10] Environmental Protection UK (2010) Development Control: Planning for Air Quality (2010 update)

- **Air quality impact of the development:** where an air quality impact assessment is required it should clearly indicate the likely change in pollutant concentrations relevant to the air quality objectives. This will most likely be undertaken for NO_2 and PM_{10} (though other pollutants may need to be addressed - See Appendix 4) as these are the pollutants of most concern to DCC arising from the proposed development during both the construction and operational phases. The assessment must calculate the difference in air quality as a result of the proposed development.

There is no single definitive method for conducting air quality impact assessments, but the chosen method must be appropriate for the development. Development proposals may require screening or dispersion models to be applied. Developers must agree the modelling methodology with DCC in advance of the assessment being undertaken. The pro-forma attached to this guidance should be used outlining the approach. If the developer needs to change the modelling methodology this will require agreement with DCC, and any changes should be documented and outlined in the final submission.

The chosen model should:

- Estimate the current air quality profile of the area in question using a method agreed with DCC prior to starting work (note that DCC presume that monitoring will be undertaken, but developers can offer a case against this if they can provide evidence that it is not necessary);
- Estimate emissions of local air pollutants from the development using nationally recognised emissions models or stack emissions data;
- Make predictions in the context of the air quality objectives for NO_2 and PM_{10} (or other pollutants where appropriate) *without* the development in place relative to the year of opening and air quality objectives (EU Limits year 2010 or relevant EU limit years)- the baseline scenario;
- Make predictions in the context of the air quality objectives for NO_2 and PM_{10} (or other pollutants where appropriate) *with* the development in place in the same years;
- The cumulative impact of developments should be considered- consultation with planning officers to agree committed development to be included in the assessment.

2.4 Choosing a model

Generally speaking, the model must be appropriate for the application and should be able to account for the conditions in Dundee. For example when modelling road traffic emissions we expect that the chosen model will be able to account for the presence of street canyons and queuing traffic. For stack emissions modelling we expect that the model will be able to account for issues like downwash arising from site buildings, variable surface roughness and terrain (where a model domain is quite large for example).

Screening models: basic models with limited input parameters which are primarily designed to determine if a more detailed assessment is required. They are unlikely to be applicable where there are significant topographical features or a complex road layout (as is generally the case in Dundee). The Design Manual for Roads and Bridges (DMRB) model is the main road traffic screening method used in the UK. Modelling carried out with a screening model of any kind should still be subject to the same rigorous model verification process. If a developer wishes to use a screening model they should justify this paying particular regard to the model's applicability to the situation in Dundee. Screening models for point sources include ADMS-Screen and AERSCREEN which can be applied to combustion sources or industrial emissions, subject to limitations. Please note the DMRB traffic screening model has generally been found to under predict in Dundee therefore we expect robust model verification where this tool is used.

- ***Local scale dispersion models***: these allow estimation of ambient concentration of air pollutants taking into account a much more detailed treatment of meteorology, emissions and site parameters. Typical examples are ADMS-Roads, ADMS-Urban, the Caline group of

models (available commercially in the Breeze Roads package) and AAQuIRE. The most widely used detailed local scale dispersion models appropriate to point sources are ADMS and AERMOD. The models used for road traffic emissions will invariably require the modelled local contributions to be verified against local monitoring data and if necessary adjusted. The model chosen by the developer should be justified given the situation in Dundee.

Use of dispersion models are appropriate in almost all cases for large developments, or those developments proposed in areas where air quality is approaching or exceeding the relevant standards or objectives. There will be combustion point sources that will also require dispersion modelling. LAQM.TG (09) suggests models that can be used for air quality assessments– DCC require that the chosen model is agreed in advance of conducting the assessment (using the pro-forma).

2.5 Model input data

The assessment should provide a full and transparent account of the modelling undertaken, all assumptions made and input data used in Appendix 1 for every assessment outlining key inputs and assumptions. For road traffic sources the applicant should describe the traffic and emissions data that will be used and its source in the pro forma attached to this Guide (Appendix 1). The pro forma should also describe the emissions data that will be used for stack sources of pollution. DCC may request an audit of the assessment, in which case the developer must provide any extra appropriate data requested. For example developers and their consultants should be aware that DCC may require submission of the model input and/or output log files (the output log file contains key information on the model run which can be useful to DCC).

The Council will be guided by the principle that all reports should include the necessary information such that, if they wished, DCC could re-run the model themselves given the input data/input files provided.

2.5.1 Emissions data

2.5.1.1 Road traffic

For air quality modelling the road traffic data required includes annual average daily traffic flows (AADT), vehicle speeds, and appropriate growth and expansion factors.

All road traffic data used to derive emissions rates should be provided in the submitted report along with its source. Assumptions made with regard to speed and treatment of slowing traffic at junctions should be clearly outlined as these are primary determinants of traffic emissions in an urban setting.

Emission rates should be derived for the roads in question using an emissions model appropriate for use in the UK. This will probably involve either calculating emissions in a standalone tool such as the latest version of the Emissions Factors Toolkit[11] (EfT) or using emissions derived in a dispersion model on input of the relevant traffic parameters (e.g. ADMS-Roads has “built-in” emissions factors).

When using a dispersion model with built in emissions factors care should be taken to ensure the factors are up to date. DCC’s preference is for developers to use the EfT as the Council can re-run the calculations if they wish and the EfT spreadsheet is often updated months in advance of emission factors within proprietary dispersion models being updated.

If other emission data is needed for specific situations, for example to represent queuing or cold starts, the methods outlined in LAQM.TG(09) should be used. In the case of queuing the Council’s preference is to use a methodology that estimates the queuing emissions separately to the main flow, which are then “switched” on and off in the dispersion model using a variable emission file.

[11] http://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html

For road traffic sources the applicant should describe the traffic and emissions data that will be used and its source in the pro forma attached to this guidance (appendix 1).

2.5.1.2 Other emissions

Since the predicted impact at a given location is proportional to the emissions rates input to the model it is important that the emissions factors used are appropriate and based on the best available information.

For point source assessments the developer should outline the source of the emissions data used. This could be derived from plant manufacturer data, or from measurements at other sites for example. If no such data is available the developer may have to use emissions factors from the National Atmospheric Emissions Inventory (NAEI) or other libraries of emissions factors (such as CORINAIR or USEPA AP-42 datasets). Whichever data source is used the report must clearly outline the data source, and the reason for choosing the emissions dataset used. If possible, the developer should discuss the uncertainties in the emission factor- for example the USEPA AP-42 dataset includes a "rating" which indicates the quality of the emission factor.

Manufacturers often present emissions data at "standard conditions", that is for a given temperature, oxygen percentage and moisture content (e.g. in mg/Nm^3). It is important to model the emissions at actual conditions at the point of release (e.g. in mg/m^3) and therefore the emissions will need to be corrected to account for this. The report must include all calculations outlining the corrections made to derive the emissions rates (e.g. mg/s or g/s) used in the model.

For biomass installations we would draw attention to a tool published by Environmental Protection UK (EPUK) which can be used to estimate emissions in the absence of manufacturer's data in the UK[12]. If this tool is used, the outputs of the spreadsheet could be provided in the impact assessment report.

For stack sources the applicant should describe the emissions data that will be used in the pro forma attached to this guidance.

2.5.2 Time-varying emissions

Traffic flows and speeds, and hence emissions, vary throughout the day; if appropriate emissions from vehicles should vary within the model, by time of day and by day of week. Where possible, time-varying traffic movements should be based on local information, for instance from automatic traffic counters. It is recognised that this information is most applicable for assessments looking at short-term objectives. The main air quality issues in Dundee currently relate to the annual mean objectives for NO_2 and PM_{10} and hence variable traffic emissions may not be necessary in all cases.

The additional emissions that arise during traffic congestion should always be properly addressed in the assessment- we would suggest by using a time varying emissions file in a roads dispersion model. This is particularly important where that proposed development is likely to result in increased congestion or increased queue length.

For stack emissions DCC prefer a precautionary approach i.e. that emissions are modelled at the same rate 24 hours per day, 7 days a week. If an assessment carried out in this way predicts exceedances of objectives (with an important contribution from the new source) a more flexible time varying approach may be appropriate but would require to be agreed with the Council.

The applicant should state how they will approach time varying emissions in the pro-forma attached to this guidance.

2.5.3 Transport assessment data

For larger developments it is common to prepare a transport assessment (TA). Where a TA has been prepared, modelled or predicted development traffic flows in the TA should generally be used as the

[12] http://www.environmental-protection.org.uk/assets/library/documents/Unit_Con_and_Screening_Tool.xls

basis for the calculation of 'with development' emissions and subsequent model runs. This should include a robust assessment of existing baseline traffic.

Before an air quality assessment based on a TA is undertaken, DCC require that the TA should be approved by Council traffic planners, in consultation with their air quality officers.

If this does not happen, developers risk undertaking an air quality assessment on the basis of traffic proposals that may subsequently change, risking the assessment becoming obsolete.

Where the proposed development is likely to result in additional congested traffic conditions, the TA will need to provide sufficient information to quantify the times when queuing around junctions is likely to occur.

2.5.4 Treatment of background concentrations

It is the Council's preference that measured background data is used. DCC's urban background data can be used provided the data is relevant to the study area- the Council will provide a list of monitoring locations and advise of data availability at the pre-application stage. DCC undertake background monitoring for NO_2 and PM_{10} but it should not be assumed that the Council hold measured background data that is representative of the whole city.

Where relevant measured background data is not available for a given location it is possible to use the national background mapping in the assessment. Background maps are provided by Scottish Government that estimate concentrations of air pollutants at $1km^2$ resolution for the whole of Scotland[13]. The report should clearly provide the grid co-ordinate of the square used, or if an average value for more than one square is used, derivation of this should be explained. These datasets are also useful in that the relative contribution from sources within Dundee to the background value are provided- therefore double counting can be removed to an extent.

It is important that the background mapped values must not be used to characterise existing baseline air quality (i.e. existing concentrations arising as a result of background plus traffic or other emissions sources), they are not intended for this purpose. Developers must not under any circumstances use a background value, assume it is representative of baseline ambient air quality at their location, and simply add a development contribution to this value.

The applicant should outline their approach to characterising background concentrations on the pro-forma attached to this guidance (appendix 1). It is likely that they will need to consult with DCC prior to making the decision as they will need to check if local background measurements can be used in preference to the background mapped values.

2.5.5 Treatment of terrain and topography

For models that do not cover large spatial areas within Dundee it is not expected that terrain will be included in air quality assessments. This should however be determined on a case by case basis. For large point source application it is more likely that terrain will have to be included due to the typically longer range impacts that can cover areas with different terrain characteristics. Inclusion or exclusion of terrain should be included in a sensitivity analysis if terrain is identified as a factor in the modelling.

Generally speaking if the model domain does not include gradients of more than 10% then terrain can be discounted. In terms of the overall uncertainty in eventual model predictions, it is much more important to have accurate emissions data, followed by representative meteorology.

The applicant should state whether terrain will be included in the model in the pro-forma attached to this guidance providing justification on their decision.

Of more importance in Dundee is the potential presence of street canyons which can greatly reduce the dispersion of emissions in certain areas of the City. DCC prefer that any roads dispersion **model**

[13] http://www.scottishairquality.co.uk/maps.php?n_action=data

used will have the capability to model street canyons. In instances where an alternative road dispersion model cannot model street canyons explicitly, there may be methods available to cope with this. For example when verifying the model it could be appropriate to use different adjustment factors for locations inside canyons than those lying outside of canyons. LAQM.TG(09) provides examples of this approach and DCC would expect a full description of the application of such a method in the submitted report.

The applicant should confirm that the chosen roads model has the capability to model street canyons. If the model does not, an alternative approach must be outlined.

2.5.6 Meteorological data

For traffic based air quality assessments DCC expect that the most recent year of hourly sequential meteorological data available will be used, with the proviso that it should match the most recent year of air quality measurement data and traffic or emissions data used in the assessment i.e. all datasets should encompass the same time period, where possible. A single year of met data is appropriate for traffic based assessments. DCC expect that the report will include a description of the data used, including the amount of missing data in the set and the number of calm hours.

For stack emissions assessments for smaller sources DCC require at least 3 years of hourly sequential meteorological data to be used. The model should be run separately for each year and the worst case i.e. that which provides the most conservative results) should be used throughout the remainder of the assessment. For very large installations requiring EIA type assessment, 5 years of met data should be used. DCC expect that the report will include a description of the data used, including the amount of missing data in the set and the number of calm hours. When multi-year met files are used a full sensitivity analysis should be provided in the report.

DCC, through experience, recommend the use of meteorological data from Leuchars station, subject to sufficient data capture being available. If Leuchars' data is not used then the applicant should justify their choice of data in the pro-forma attached to this guidance.

2.5.7 Other model parameters

DCC should be consulted on other model input parameters. It may be appropriate for some of these parameters to be included in sensitivity analyses when the modelling is carried out. At the outset the applicant should complete the pro-forma outlining the values chosen for the following:

- Surface roughness: to include whether the same value will be applied to the whole model domain, or if a variable file will be used to represent changes in roughness value across a larger model domain. The chosen meteorological site will also have its own surface roughness value which should be provided. DCC would recommend application of a surface roughness value of 0.5-1m for developments on the periphery of the city, and up to 2m for the city centre. These values are based on recommendations from the World Meteorological Organisation[14] and are consistent with model defaults in common dispersion models.
- Limit of Monin-Obukhov length: chosen value should be provided. DCC suggest that a value of at most 30m is appropriate for Dundee- this is consistent with model defaults for large towns and cities in common dispersion modelling tools.
- Treatment of street canyons: if street canyon modelling will be included these should be listed along with estimated dimensions (width and building height) that will be input to the model
- Stack site parameters: the physical characteristics of any stack or stacks and the site buildings should be provided. This should include as a minimum the chosen stack height (or range of

[14] World Meteorological Organisation (2008) Guide to Meteorological Instruments and Methods of Observation p I.5–12

heights), stack width, building co-ordinates and dimensions. A map should be provided to DCC outlining the location of the stack and buildings.

2.6 Characterising baseline air quality

Existing air pollution should be appropriately characterised for the assessment. A clear distinction should be made between "background" air quality and "existing" air quality. Background air quality is that arising from regional sources with a smaller contribution from local sources. Existing air quality is that which is dominated by local sources (for example at roadside locations, or buildings close to busy roads) with a small contribution from regional sources. DCC require the development to be placed in the context of the existing receiving environment- that is, existing air quality. Therefore the baseline can only be robustly characterised by measurements, or in some cases, modelling. It is not appropriate to use background maps to characterise existing air quality in Dundee.

The Council's preference is that baseline monitoring will be carried out to support developments. Applicants should consult with the Council as to whether monitoring should be done to support their assessment. If monitoring is to be carried out, the pollutants, locations, duration and importantly how the data can be used to support model verification/error characterisation should be agreed with the Council. DCC expect that the monitoring strategy will be spatially designed in such a way as to support robust model verification, adjustment and characterisation of error/uncertainty.

2.7 Pollutant-specific issues

If a development is expected to influence existing traffic flows then NO_2 and PM_{10} should normally be modelled, since there are current exceedances of these pollutants in Dundee. Road traffic is the main source of these pollutants in the City. If the development is itself a source of air pollution (say from an industrial process or heating plant), pollutants relevant to the type of development need to be taken into account.

DCC require that the applicant describe in the pro-forma the source specific pollutants that will be included in the air quality assessment.

Applicants should consult the Environmental Health Division for guidance on specific issues related to modelling of Nitrogen Dioxide (NO_2), Fine Particles (PM_{10}), Sulphur Dioxide (SO_2) and other pollutants.

2.8 Model output area

The output results should cover the area likely to be affected by the proposed development. For a development that affects traffic movements, the output should cover the area where traffic movement is significantly affected.

DCC expect that the results produced would normally be presented as detailed contour plots of predicted pollutant concentrations and scale of air quality change. A plot showing predicted concentrations with the development in place and a map of the difference in concentration with and without the development should both be produced. Ideally, the grid spacing for any contour plots should not be more than 5 metres, to ensure robust definition- though for larger models a 10m resolution is appropriate.

As contour plots are not always numerically accurate DCC also require estimation of concentrations at discreet receptor locations, some of which may be at height. In some cases it may be acceptable for the assessment to only predict concentrations at a number of carefully selected receptors. The developer should agree the output area, location and number of receptors in advance with DCC. All receptors should be presented on an appropriately scaled Ordnance Survey map.

In the case of tall buildings or structures, developers may need to consider the vertical as well as the horizontal dispersion of pollutants in terms of model outputs. Developers should consider the surrounding environment of the development. Any high level point sources, such as chimney stacks or ventilation outlets should be identified to ensure that the proposed development does not encroach upon any existing plume dispersion.

2.9 Model Verification

Dispersion modelling by nature produces results that are subject to uncertainty. Therefore DCC require that the performance of the model being used in relation to air quality measurements in a similar environment should be demonstrated. For air quality assessments in Dundee, it should be shown that the model can adequately predict pollution concentrations in a similar urban environment, preferably within the locality where the development is proposed, since model performance may vary from location to location.

Where the model is used to predict statistics relevant to the air quality objectives (such as percentiles), the evidence of model performance should also address this. Evidence of this should either be incorporated into the report, or submitted with it.

Wherever possible, it is preferable to verify the model against measured pollution concentrations using the same input parameters as for the air quality assessment. DCC have a quite detailed monitoring network which can be used for model verification. The approaches to model verification should closely follow the methods in LAQM.TG(09) and evidence should be provided to show the process applied.

DCC require that the approach to model verification is outlined by the applicant on the pro-forma. This should outline the DCC monitoring sites that will be used (if any) and also whether any monitoring will be carried out (with locations) that will be used for verification purposes.

When reporting results it must be clear whether any model adjustment was required to improve agreement with local measurements. The calculations that yield the adjustment factors must be presented in full. In the case of NO_2 assessments for road traffic, the model should be verified based on the predicted NOx contribution from the traffic versus the measured road NOx. Measured road NOx can be estimated using the Defra NOx:NO_2 model whereby a representative NOx background is subtracted from the measured value.

The report should also contain an estimation of model uncertainty where it has been possible to verify the model against several local measurements. Estimation of model error is more difficult for PM_{10} assessments due to the usual scarcity of measurements, therefore we would recommend using NO_2 to characterise model error in most cases. It is recognised that this is not normally possible for non-road sources; these account for potential model error by using conservative modelling assumptions.

The report must characterise the uncertainty in the model using the methods outlined in LAQM.TG(09). The Root Mean Square Error of the model is reasonably straightforward to calculate and gives a good indication of the likely variation in model predictions. DCC requests that this is included in all road emissions assessments, though care should be exercised where there is a scarcity of local measurements. The characterisation of error is an important inclusion in any modelling study and this should guide decisions on monitoring data availability and application at the start of any assessment. At least five monitoring points would be required to robustly verify and estimate error though obviously more locations would be preferable. This should guide developers where monitoring is to be carried out.

3 Determining and Assessing the significance of the predicted impact on air quality

Determining Significance

Applicants should outline their estimation of significance in the submitted report. The methodology for determining significance of air quality impacts in Dundee is the same as that outlined in the EPUK Development Control guidance[15].

The first step is to describe the impact in terms of its magnitude; all proposed developments in Dundee must be described using these indicators. This compares the impact with the change in annual mean concentration in the context of the objective being considered. The appropriate tables which describe how impact magnitude should be calculated are provided below for NO_2 and PM_{10} which will be the focus of most assessments in Dundee. The annual mean objectives for NO_2 and PM_{10} are generally considered to be the most stringent on comparison with the shorter term objectives.

Table 3-1 Impact magnitude for changes in annual mean NO_2

Magnitude of change	Annual mean
Large	**Increase/decreased >4 µg.m^{-3}**
Medium	**Increase/decreased 2-4 µg.m^{-3}**
Small	**Increase/decreased 0.4-2 µg.m^{-3}**
Imperceptible	**Increase/decreased <0.4 µg.m^{-3}**

Table 3-2 Impact magnitude for changes in annual mean PM_{10}

Magnitude of change	Annual mean
Large	**Increase/decreased >1.8 µg.m^{-3}**
Medium	**Increase/decreased 0.9-1.8 µg.m^{-3}**
Small	**Increase/decreased 0.2-0.9 µg.m^{-3}**
Imperceptible	**Increase/decreased <0.2 µg.m^{-3}**

The next step is to use the magnitude of change descriptors to characterise the impact in terms of existing air quality at the development site. For most developments requiring an air quality assessment this should be carried out for NO_2 and PM_{10} concentrations. This requires a good understanding of existing air quality at the site. This is likely to be much more challenging to estimate for PM_{10}.

The significance tables below for NO_2 and PM_{10} should be used, and a significance descriptor should be derived for each separately.

Table 3-3 Air quality impact descriptors for changes to annual mean nitrogen dioxide concentrations at a receptor

[15] Environmental Protection UK (2010) Development Control: Planning For Air Quality

Absolute concentration in relation to objective/limit value	Change in concentration		
	Small	Medium	Large
Increase with scheme			
Above objective/ limit value with scheme (>40 µg.m^{-3})	Slight adverse	Moderate adverse	Substantial adverse
Just below objective/limit value with scheme (36-40 µg.m^{-3})	Slight adverse	Moderate adverse	Moderate adverse
Below objective/limit value with scheme (30-36 µg.m^{-3})	Negligible	Slight adverse	Slight adverse
Well below objective/limit value with scheme (<30 µg.m^{-3})	Negligible	Negligible	Slight adverse
Decrease with scheme			
Above objective/ limit value without scheme (>40 µg.m^{-3})	Slight beneficial	Moderate beneficial	Substantial beneficial
Just below objective/limit value without scheme (36-40 µg.m^{-3})	Slight beneficial	Moderate beneficial	Moderate beneficial
Below objective/limit value without scheme (30-36 µg.m^{-3})	Negligible	Slight beneficial	Slight beneficial
Well below objective/limit value without scheme (<30 µg.m^{-3})	Negligible	Negligible	Slight beneficial
If the impacts in Table 3.1 or 3.2 are imperceptible the outcome of the significance assessment will be "Negligible"			

Table 3-4 Air quality impact descriptors for changes to annual mean PM_{10} concentrations at a receptor

Absolute concentration in relation to objective/limit value	Change in concentration		
	Small	Medium	Large
Increase with scheme			
Above objective/ limit value with scheme (>18 µg.m^{-3})	Slight adverse	Moderate adverse	Substantial adverse
Just below objective/limit value with scheme (16-18 µg.m^{-3})	Slight adverse	Moderate adverse	Moderate adverse
Below objective/limit value with scheme (14-16 µg.m^{-3})	Negligible	Slight adverse	Slight adverse
Well below objective/limit value with scheme (<14 µg.m^{-3})	Negligible	Negligible	Slight adverse
Decrease with scheme			
Above objective/ limit value without scheme (>18 µg.m^{-3})	Slight beneficial	Moderate beneficial	Substantial beneficial
Just below objective/limit value without scheme (16-18 µg.m^{-3})	Slight beneficial	Moderate beneficial	Moderate beneficial

Below objective/limit value without scheme (14-16 µg.m^{-3})	Negligible	Slight beneficial	Slight beneficial
Well below objective/limit value without scheme (<14 µg.m^{-3})	Negligible	Negligible	Slight beneficial
If the impacts in Table 3.1 or 3.2 are imperceptible the outcome of the significance assessment will be "Negligible"			

Assessing Significance.

8.1. When assessing significance the following factors at locations of relevant exposure are likely to be considered.

- Are EU Limits Values for air quality expected to be exceeded on or near to the development site?
- Are National Air Quality Objectives likely to be exceeded on or near the development site?
- How significant is any predicted breach of the objectives?
- Even if the air quality objectives are not expected to be exceeded, how much of an increase in pollution concentrations is predicted to be attributable to the proposed development.
- How many members of the public may be exposed to pollutant concentrations in excess of the objectives?
- The number of receptors (Note i) who experience an increase in exposure to pollutants, particularly non-threshold pollutants?

8.2 It is important that, where appropriate e.g. new residential accommodation; the significance of the following impacts should be described separately:

- The impacts of emissions related to the development on existing receptors in the surrounding area.
- The impacts of emissions from surrounding sources on new exposure being introduced within the proposed development.

8.3 When the results of the assessment are provided to DCC, the Council will make their own judgement of significance based on the data. The method of assessing significance described in the EPUK Development Control: Planning for air quality guidance[16] is the method that Dundee City Council will normally use and is consistent with the approach used in other areas of the UK. The flow chart that will be used to guide DCCs determination is provided in Appendix 2. Following the initial assessment of impact significance, recommendations on additional mitigation measures may be requested from the applicant by the Council. This will require further consultation between the applicant and the Council to establish if specific mitigation measures, or amendments to the development design, can be incorporated to reduce potential air quality impacts.

A summary of the types of outcome that may arise based on the impact significance is presented in Table 5.

Table 5: Recommendations following the assessment of significance.

Impact significance (based on EPUK flow chart)	Recommendation
Highest priority consideration	Require mitigation measures to address "highest priority" impacts. If the impact is not satisfactorily addressed there should be a strong presumption for a recommendation for refusal on air quality grounds

[16] Environmental Protection UK (2010) Development Control: Planning for Air Quality (2010 update).

High priority consideration	Ensure that measures to minimise "high priority" impacts are appropriate in the proposal. Recommend strengthening the measures if appropriate. Consideration may also be given to compensation/offsetting. Depending on the scale of the impacts, taking into account the number of people affected, the absolute levels and the magnitude of the changes, and the suitability of the measures to minimise impacts, it may be appropriate to recommend refusal.
Medium and low priority consideration	It is unlikely that refusal would be recommended, but mitigation measures should be incorporated into the scheme design to ensure that the development conforms to best practice standards, and is "air quality neutral" as far as is reasonably practicable.

4 Mitigation Measures that may be required to reduce the air quality impact.

Demolition and Construction Phase Impact Management

Emissions to air during the construction phase of a development can impact upon local air quality. Impacts from this phase will arise from emissions of fugitive dust and fine particulates; on-site burning of combustible material can also be locally highly polluting and cause annoyance to nearby residents.

There is also potential for plant and vehicles to emit nitrogen oxides (NOx) and PM_{10} during construction. These impacts should be quantified in the air quality assessment. Recently published guidance by the IAQM[17] provides a method for assessing the significance of construction sites on air quality.

Mitigation measures will generally include site management procedures, dust control measures and location of plant in relation to nearby receptors. Proposed mitigation measures should minimise the impact of emissions from construction activities in line with current best practice. Arrangements should be made for the off-site disposal of combustible waste. Information on best practice with respect to the mitigation of construction impacts, within an urban environment where air quality is known to be of concern, is detailed in the 2006 London Councils Guidance[18].

Depending on the scale of the proposed development, the Council may require monitoring of dust or particulates before and during the construction phase of a development.

Operational Phase Impact Management.

Operational phase mitigation measures will depend upon the nature of the development and the associated air quality impacts.

- ***Building Location and design.***

Land use proposals that may introduce relevant human exposure into areas where pollution levels are a concern include residential, child care, school, health care and certain public buildings. To

17 IAQM (2012) Guidance on the assessment of the Impacts of Construction on Air Quality and the Determination of their significance
18 Greater London Authority (GLA) with the London Councils (2006) The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance

prevent unacceptable new human exposure in affected areas design measures to minimise health and pollution impacts on future occupants of buildings should be incorporated and will be considered in the planning process:

- There is a presumption against residential properties being located at ground floor in areas which exceed or are in danger of exceeding air quality objectives. This presumption may be rebutted based on site specific evidence provided by the developer.
- Mitigation measures may be required for developments on first floor level unless demonstrated otherwise by an appropriate model or monitoring.
- More numerous developments (20 units and over) with residential use on first floor level may require an AQ assessment.
- Air Quality is unlikely to be a material consideration for residential use at second floor level and above.
- Developments adjacent to busy streets where the development will be closer to the carriageway or junctions than existing may require an air quality assessment.

Design features which may assist mitigation where air quality is an issue could include:

- Locating building facades further from the roadside.
- Avoiding creating street canyons (locations where pollution does not disperse well) by including gaps between buildings.
- Avoiding balconies close to known locations of poor air quality.
- Habitable rooms should be at opposite side of building to known locations of poor air quality
- Providing whole house mechanical ventilation, taking air from a clean location.

In addition, in all areas, where relevant receptors are to be located in the vicinity of potentially polluting sources e.g. point sources, industry, dust generating sources etc. an air quality assessment may be required.

- ***Combustion Sources, including Renewable Energy Plant and Combined Heat and Power (CHP).***

For combustion point sources in general, the higher the chimney the smaller the impact of pollutants at ground level. However in public health terms abating emissions using appropriate abatement technology based on current understanding of best practice is preferred.

The Local Development Plan promotes the Scottish Government policy on biomass at a scale appropriate to make best use of the available heat. Biomass boilers, however, give rise to higher emissions of NOx and fine particles than conventional gas boilers. This gives rise to air quality concerns in densely populated urban areas and AQMAs, such as Dundee. Scottish Government has outlined its position on biomass combustion in urban settings in a recent letter to Local Authority Chief Executives[19].

Evidence may be required within an air quality assessment that the combustion plant complies with the requirements of the smoke control area; and that the chimney height and pollution abatement systems have been designed and specified appropriately. The chimney height must be such that its emissions are not prejudicial to health or a nuisance, and the change in annual mean nitrogen dioxide and particulate matter concentrations will be negligible. In all cases biomass plant will be expected to mitigate emissions by the installation of effective abatement technology. Further information on biomass combustion is contained in the EPUK Biomass and Air Quality Information for Developers guidance document[20] and the EPUK Biomass and Air Quality Guidance for Scottish Local Authorities[21].

[19] http://www.scottishairquality.co.uk/documents/news/letter.pdf
[20] Environmental Protection UK (2009) Biomass and Air Quality Information for Developers
[21] Environmental Protection UK (2010) Biomass and Air Quality Guidance for Scottish Local Authorities

Applications should also be supported by clear plans for securing sustainable wood fuel supplies for the lifespan of the development and minimising transportation impacts. District Heating Schemes will be supported in preference to schemes involving multiple individually heated buildings.

- ***Transport Related Measures.***

New development that introduces increased road vehicle emissions into an area, or changes in road alignment that reduce the separation distances between road traffic and receptors may have an adverse impact on air quality. Examples of measures to mitigate against this are[22]:

- The development and implementation of Travel Plans
- Car Clubs
- Electric vehicle charging points
- Parking restrictions
- Preferential parking for low emission vehicles.
- Developer contribution to specific traffic management or road schemes

Any proposed mitigation measures that may impact upon parking or traffic management will require to be approved by the Dundee City Council Transport Division.

5 Other Guidance

Demolition and construction phase impact management:

Recently published guidance by the IAQM[23] provides a method for assessing the significance of construction sites on air quality. Information on best practice with respect to the mitigation of construction impacts, within an urban environment where air quality is known to be of concern, is detailed in the 2006 London Councils Guidance[24].

Combustion Sources, including Renewable Energy Plan and Combined Heat and Power (CHP).

Further information on biomass combustion is contained in the EPUK Biomass and Air Quality Information for Developers guidance document[25] and the EPUK Biomass and Air Quality Guidance for Scottish Local Authorities[26].

6 Required content for air quality reports

The report structure should follow accepted best practice. We refer the reader to the EPUK guidance on which these recommendations are based. The report outlining the results of the assessment should contain the following information:

1. **Outline of the development**: the report should describe the development in general terms, providing information such as location, type of development and site layout with supporting maps or drawings. Sources of the relevant source specific pollutants should be described and if appropriate changes in traffic flows should be outlined. The development should be placed in the context of the existing receiving environment in order to understand the sensitivity of the area.

[22] Environmental Protection UK (2010) Development Control: Planning for Air Quality (2010 update)

[23] IAQM (2012) Guidance on the assessment of the Impacts of Construction on Air Quality and the Determination of their significance
[24] Greater London Authority (GLA) with the London Councils (2006) The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance
[25] Environmental Protection UK (2009) Biomass and Air Quality Information for Developers
[26] Environmental Protection UK (2010) Biomass and Air Quality Guidance for Scottish Local Authorities

2. **Relevant policy**: summary of environmental and planning policy instruments relevant to the assessment.
3. **Air quality standards**: the relevant objectives, standards or limit values should be outlined for the pollutants being considered.
4. **Determination of significance**: it is likely that qualitative descriptors will be used to ascribe a level of significance to the results of the air quality assessment. These descriptors should be outlined in the report.
5. **Assessment methodology (traffic)**: a detailed explanation of the assessment methodology should be provided. This should include a thorough explanation of all monitoring and modeling methods, data and assumptions. All items in the attached pro-forma should be included in the discussion of the methodology with justification for choices made where appropriate. Of particular importance are issues such as:
    a. *Description of the source and quality of any traffic data used in the assessment*. Where the results of a Transport Assessment are being used, evidence must be provided in the report that this has been approved by a DCC Transportation officer.
    b. *Characterisation of emission rates must be explained in detail* with a description of the emission factors/tools used.
    c. *Treatment of meteorology*- describe the meteorological data in terms of the year(s), station location (preferably Leuchars), data quality (missing or calm hours), distance from assessment site. Comment should be provided on the location and topography of the met data site to ensure it is representative of the assessment site.
    d. *Treatment of background concentrations*- the choice of background data used should be explained and justified. It is not appropriate to use a background value and simply add a development contribution to estimate total concentrations. The difference between "background" air quality and "existing" air quality at the assessment site / receptors should be explained.
    e. *Assessment year(s)*- it is likely that the baseline year will be the most recent year with monitoring, meteorological, traffic or emissions data sets covering the same period. The future year of assessment should be based on the scheme opening year.
    f. *Other methodological issues*- e.g. conversion method for NOx to NO_2, treatment of street canyons, annualisation of monitoring data, treatment of congestion, receptors at height, other sources in the area
6. **Assessment methodology (point sources)**- the requirements for level of detail in the methodological discussion are similar to road traffic based assessment. For point sources issues of particular importance are:
    a. *Description of the plant* - information should be provided on the type of installation, power rating, fuel type and source, and number of fuel delivery vehicles servicing the site.
    b. *Characterisation of emission rates* - a full description of the source of the emissions estimates must be provided. It is particularly important to outline whether the data is based on measurements, manufacturer's data or emission factors. If manufacturers or other data is used to characterise stack emissions, extracts from test reports or library data should be reproduced in an appendix to the report. The report should also outline the corrections applied to the emissions data e.g. if manufacturers' data is expressed at standard temperature, oxygen and moisture content, but the emissions will be modelled at release conditions. Corrections for these parameters should be reproduced in an appendix in the report.
    c. *Stack and building parameters* - all physical parameters pertaining to the stack (height, width, location) should be provided in a table. Physical parameters of the emissions should also be provided (e.g. efflux velocity and or flow rate/mass flux). Buildings should be outlined and it should be clear whether the effects of building downwash have been included in the modelling.

d. *Treatment of meteorology* - describe the meteorological data in terms of the year(s), station location (preferably Leuchars), data quality (missing or calm hours), distance from assessment site. Comment should be provided on the location and topography of the met data site to ensure it is representative of the assessment site.
e. *Treatment of background concentrations* - the choice of background data used should be explained and justified. It is not appropriate to use a background value and simply add a development contribution to estimate total concentrations. The difference between "background" air quality and "existing" air quality at the assessment site / receptors should be explained.
f. *Assessment year(s)* - it is likely that the baseline year will be the most recent year with monitoring, meteorological, traffic or emissions data sets covering the same period. The future year of assessment should be based on the scheme opening year.

7. ***Other methodological issues*** - e.g. conversion method for NOx to NO_2, annualisation of monitoring data, receptors at height, other sources in the area
8. **Model verification -** required for all traffic based assessments but not normally appropriate for point sources. A full and transparent description of the verification procedure must be provided with graphs or tables showing the results of any regressions analyses carried out and the derivation of any adjustment factors. Methods outlined in LAQM.TG (09) should be followed and referenced.
9. **Receptor locations** - a list of all agreed receptor locations should be provided outlining their location (OS x,y co-ordinates), height and type.
10. **Characterisation of baseline air quality** - it is important to place the development impact in the context of existing sensitivities in the receiving environment. The report should detail all monitoring data used and explain the methods used to capture the data. As indicated above it is not appropriate to use a background value to characterise baseline air quality at development sites in Dundee.
11. **Impact assessment** - the results of any modeling done should be placed in the context of the objectives being considered. For advanced models it is usual to provide dispersion contour plots showing concentrations. If these are provided the symbology used in the maps should be clear and important features should be annotated to enable easy interpretation of the data. Numerical predictions at receptors should always be produced as these are more accurate than inferring concentrations at these locations from a contour plot. The report should clearly compare with and without development scenarios for the opening year.
12. **Construction phase impacts** - impacts from this phase will mainly arise from emissions of fugitive dust/PM_{10} though there is potential for plant and vehicles to emit NOx and PM_{10} during construction. These require to be assessed and this should consider issues like the construction activities, duration and any mitigation measures that will be implemented. Impacts should be characterized by estimating the distance over which these will occur and how many properties might be affected.
13. **Mitigation measures** - where significant impacts are identified in the assessment DCC require that measures to be employed to avoid, reduce and, if possible, offset significant adverse effects on air quality from the development. If impacts are judged to be insignificant, consideration should still be given to application of measures, in line with current best practice. This is especially the case for developments that increase emissions of particulate matter, as there is no safe level for exposure, and all reductions in emissions will be beneficial.
14. **Summary** - a concise summary of the results of the assessment should be provided. This should outline construction phase impacts, operational phase impacts, comparison with objectives, effect on DCC's Air Quality Action Plan, significance of impacts, and mitigation measures that will be employed.

Appendices

Appendix 1: Scope of assessment checklist

Appendix 2: Significance flow chart

Appendix 3: Assessment evaluation criteria

Appendix 4: Scottish Air Quality Objectives

Notes

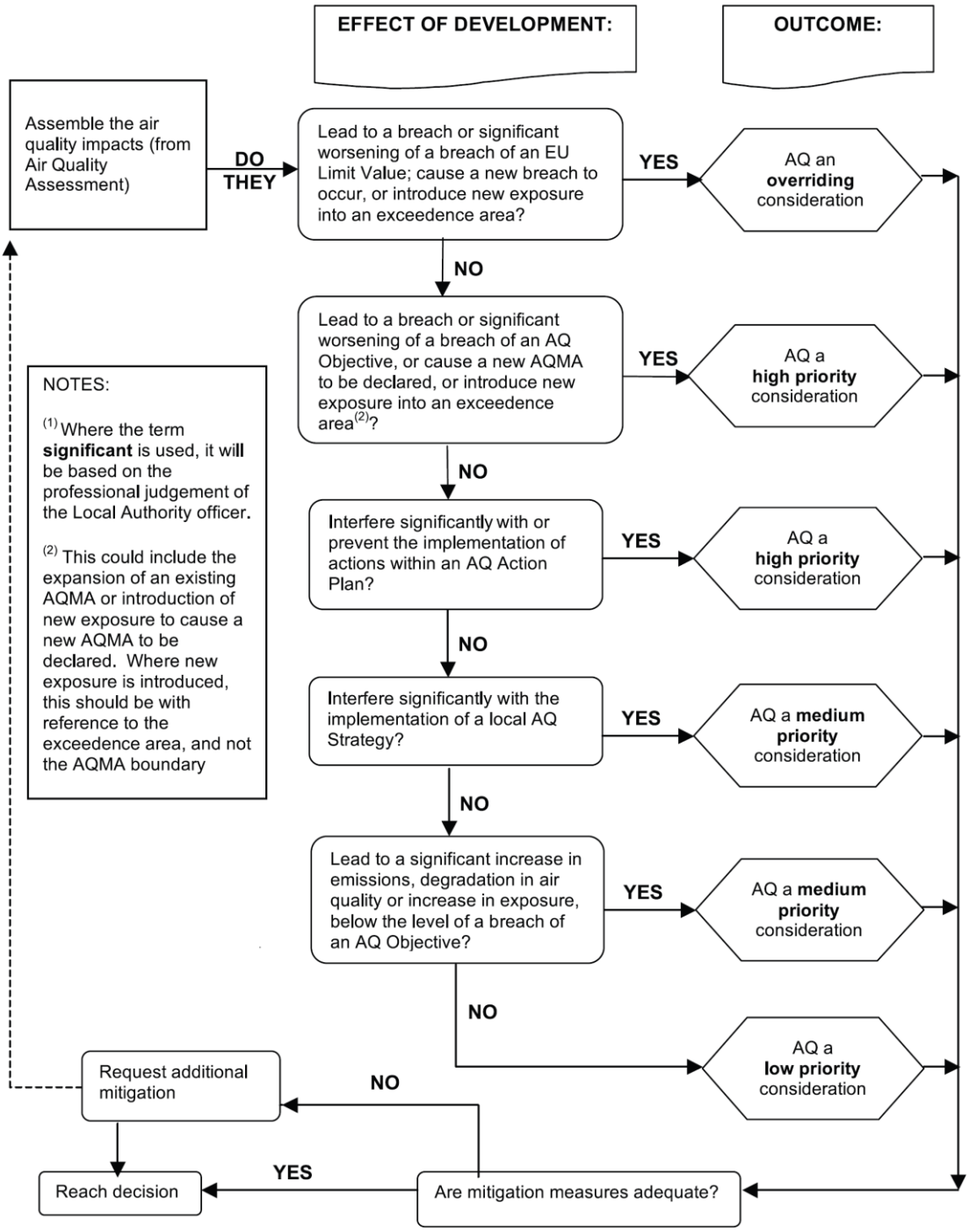
Appendix 1: DCC Scope of assessment checklist

It is hoped that this checklist will clearly indicate what information is required to satisfactorily complete an AQ Assessment and what information needs to be agreed prior to the assessment taking place. This form should be submitted to DCC who will sign off on the method if they are in agreement.

Assessment methods	Comments	DCC sign off (yes/no)
Describe the modelling study outlining the site and relevant sources which will be assessed		
Describe the chosen model outlining the reason for choosing it (screening or detailed, chosen model tool)		
Outline the pollutants that will form the basis of the assessment and which air quality standards will be used		
Describe the approach to assessing cumulative impacts (if appropriate)		
For traffic based assessments describe the baseline and with development traffic data and how you will characterise emission rates. Outline any tools or emissions factors datasets you will apply. Also outline how traffic behaviour will be handled (e.g. congestion). If a Transport Assessment is being used please provide evidence that DCC have accepted it		
For point source assessments describe the site characteristics and physical parameters of any stacks. Describe the approach that will be taken to characterising emissions from the source(s)		
If time-varying emissions will be included please outline the approach (pertinent to both road traffic and point sources)		
Describe how background concentrations will be treated in the assessment outlining the source of the data. Please consult with the Council to check availability of existing background monitoring data pertinent to the site		
Describe how existing air quality will be characterised at the site (please do not assume background values are representative). If monitoring will be carried out please outline the techniques that will be used and the proposed duration of the campaign		

Assessment methods	Comments	DCC sign off (yes/no)
Describe the treatment of terrain- if this will not be included please state the reason		
For traffic assessments, please describe the approach to modelling street canyons in Dundee. If the model cannot include street canyons please outline an alternative approach.		
Describe the meteorological data that will be used and outline the years that will be used, or range of years for point source assessments. Comment on the properties of the measurement site, its distance and applicability to conditions in Dundee, including a wind rose.		
Describe what other model parameters will be used. In particular describe the surface roughness value (fixed or variable), and the limit of Monin-Obukhov length that will applied		
Outline the modelling outputs in terms of receptor locations and heights, and confirm whether dispersion contour plots will be provided and the grid spacing used.		
Describe the model verification approach that will be applied- in particular describe the monitoring locations (DCC or your own) that will be used to verify your model. Confirm that model error will be calculated and that this will inform monitoring requirements at your site		
Describe the approach to characterising impacts from construction and demolition phases of the development		

Appendix 2 DCC significance flow chart[27]



[27] Environmental Protection UK (2010) Development Control: Planning for Air Quality (2010 update)

Appendix 3 Assessment evaluation criteria

Criteria		Y/N?	Comments
Modelling Procedures			
Has an appropriate model been used?			
Has the model been appropriately verified?			
Are the modelling scenarios and projections appropriate?			
Have suitable on and off site receptors been selected, including those which are worst case?			
Adequacy of input data?	Traffic and emissions data?		
	Meteorological data?		
	Background concentrations?		
	NOx/NO_2 relationship?		
	Other relevant input data?		
Adequacy of baseline information?	Monitoring locations described?		
	Relevant exposure considered?		
Adequacy of QA/QC information?	Bias adjustment of NO_2 tubes?		
	Other QA/QC information? (including laboratory records)		
Are appropriate pollutants and/or objectives considered?			
Have correct units been used?			
Do the predicted concentrations and changes in concentrations seem reasonable?			
Have the changes in concentrations been adequately described?			
Are the impacts assessed in relation to appropriate air quality objectives and EU limit values?			
Has the significance of the impacts been described?			
Has consideration been given to impacts on neighbouring local authorities?			
Are the potential impacts described appropriately?	Pollutant sources?		
	Expected changes to traffic volumes, composition, speed etc?		
Have construction phase impacts, including duration, activities to be carried out and properties likely to be affected been adequately described?			
Have the necessary mitigation measures been described?			
Has consideration been given to the likely impacts of the development on the implementation of the AQAP (where one is in place)?			

Appendix 4 Scottish Air Quality Objectives.

Table 4.1 Objectives included in the Air Quality Regulations and subsequent Amendments for the purpose of Local Air Quality Management

Pollutant	Air Quality Objective		
	Concentration	Measured as	To be achieved by
Benzene Authorities in Scotland and Northern Ireland	3.25 µg.m^{-3}	Running annual mean	31st December 2010
1,3 Butadiene	2.25 µg.m^{-3}	Running annual mean	31st December 2003
Carbon Monoxide	10 mg.m^{-3}	Running 8-hr mean	31st December 2003
Lead	0.25 µg.m^{-3}	annual mean	31st December 2008
Nitrogen dioxide	200 µg.m^{-3} not to be exceeded more than 18 times a year	1 hour mean	31st December 2005
	40 µg.m^{-3}	annual mean	31st December 2005
Particles (PM_{10}) (gravimetric) Authorities in Scotland only	50 µg.m^{-3} not to be exceeded more than 7 times a year	24 hour mean	31st December 2010
	18 µg.m^{-3}	annual mean	31st December 2010
Sulphur Dioxide	266 µg.m^{-3} not to be exceeded more than 35 times a year	15 minute mean	31st December 2005
	350µg.m-3 not to be exceeded more than 24 times per year	1 hour mean	31st December 2004
	125 µg.m-3 not to be exceeded more than 3 times a year	24 hour mean	31st December 2004

Note that all objectives above are consistent with European Limit Values, except for the Scottish annual mean PM_{10} objective and the UK 15-minute SO_2 objective. The Scottish PM_{10} objective is more stringent than the Limit Value and there is no 15-minute SO_2 Limit Value.

Table 4.2 Examples of where the Air Quality Objectives should and should not apply. *

Averaging Period	Objectives *should* apply at …	Objectives should *not* generally apply at …
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean and 8-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties**	Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks and railway stations etc. which are not fully enclosed. Any outdoor locations to which the public might reasonably be expected to have access.	Kerbside sites where the public would not be expected to have regular access.
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

* Defra (2009) Local Air Quality Management Technical Guidance LAQM.TG(09); February 2009

** Such locations should represent parts of the garden where relevant public exposure is likely, for example where there are seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

Notes

I Receptors are person/s or ecosystem/s that could potentially be exposed to pollution.