ODOUR CONSTRAINTS ASSESSMENT – MORETON IN MARSH AND NORTHLEACH WASTEWATER TREATMENT WORKS

Review of Local Plan Sites

Prepared for: Cotswold District Council

SLR Ref: 410.04798.00003
Version No: FINAL v1
July 2017

BASIS OF REPORT

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

Executive Summary

Cotswold District Council is seeking to identify appropriate land-use allocations in the district over the plan period 2011 – 2031 as part of a review of the Submission Draft Local Plan. Five parcels of land were identified through the Water Cycle Study as being within 400m of an operational wastewater treatment works (WwTW) whereby a corresponding Odour Constraints Assessment should be provided to determine appropriate land-use allocations.

SLR has undertaken an Odour Constraints Assessment of identified sources of odour from the Moreton in Marsh WwTW and the Northleach WwTW, to inform appropriate land-use allocations as part of the Cotswold District Council Local Plan Review.

Odour impacts from the Moreton in Marsh WwTW and the Northleach WwTW has been quantified by dispersion modelling, with a precautionary approach and model inputs applied as part robust assessment.

A series of isopleth contour plots is presented in Appendix 01, which graphically illustrates predicted odour impacts from the operation of the Moreton in Marsh WwTW and the Northleach WwTW, based upon the assessment inputs. These contour plots illustrate locations where WwTW related odour is predicted to be in excess of the applied industry recognised odour impact criteria (i.e. within the shaded contour area) whereby it would not be appropriate to allocated for corresponding land-use classes. Conversely, for those locations were odour is not predicted to be in excess of the applied industry recognised odour impact criterion (i.e. outside of the shaded contour area), these locations are deemed to be appropriate to safeguard the amenity of the development from WwTW related odour impacts.

On the basis of this Odour Constraints Assessment and the inputs applied, the land-use allocations proposed by CDC are considered appropriate, as follows:

- Moreton in Marsh
    - M_12A – suitable for residential uses;
    - MOR_E6 – suitable for employment uses; and
    - MOR_E11 – suitable for employment uses.
- Northleach:
    - N_14B – suitable for residential uses; and
    - N_14B (Northleach) – suitable for residential uses.

The predicted effect is ‘not significant’ on any of the identified sites, based upon the above considered use classes, in accordance with the applied Institute of Air Quality Management ‘*Guidance on the assessment of odour for planning*’.

It is noted that the results of this assessment are a high level overview to inform appropriate land-use allocations. It is considered that Thames Water would require site-specific odour assessments to support individual planning application for each site when they are taken forward, to assess updated potential constraints from WwTW operational odour.

1.0 Introduction

SLR Consulting Limited (SLR) has been commissioned by Cotswold District Council (CDC) to undertake a detailed Odour Constraints Assessment of the Moreton in Marsh Wastewater Treatment Works (WwTW), and the Northleach WwTW.

This Odour Constraints Assessment is provided to support a review of the CDC Local Plan and inform appropriate land use allocations for sites in close proximity to the Moreton in Marsh WwTW, and the Northleach WwTW. Both WwTW are operated by Thames Water. CDC's Water Cycle Study evidence base recommends that Odour Constraints Assessments be undertaken for each of the proposed sites to inform whether the sites would be appropriate for allocation as either employment / residential uses. This fee proposal is to provide the Odour Constraints Assessment.

1.1 Context

CDC are seeking to identify appropriate land-use allocations in the district over the plan period 2011 – 2031, of which five parcels of land identified through the Water Cycle Study, as being within 400m of an operational WwTW whereby a corresponding Odour Constraints Assessment should be provided to determine appropriate land-use allocations.

The following sites have been identified:

- Moreton in Marsh: M_12A – Land at Evenlode Road, Moreton allocated for 68 dwellings;
- Moreton in Marsh: MOR_E6 – part of Fire Services College B, Moreton allocated for B1 employment uses;
- Moreton in Marsh: MOR_E11 – Land at Evenlode Road, Moreton allocated for B8 employment uses;
- Northleach: N_14B – Land adjoining East End and Nostle Road, Northleach allocated for 17 dwellings; and
- 'Land at Bassett Road' site, which has planning permission for 40 dwellings.

The above identified sites would introduce receptor exposure in closer proximity to the Moreton in Marsh WwTW, and the Northleach WwTW than existing receptor locations. Therefore, this Odour Constraints Assessment is provided in order to:

- ascertain whether odour issues may be expected on the identified sites;
- provide a quantification of potential odour impact of the WwTW;
- identify appropriate land-uses based upon the predicted odour impact, considering a range of potential receptor sensitivities.

1.2 Report Structure

The remainder of this report is structured as follows:

- section 2 presents an overview of the relevant legislation, policy and guidance;
- section 3 presents an overview of the site setting and background;
- section 4 details the assessment methodology;
- section 5 presents the quantification of odour emissions;
- section 6 presents the dispersion model input data and parameters;

- section 7 presents the assessment of odour constraints and review of local plan sites; and
- section 8 provides assessment discussion and concludes the study.

1.3 Documents Consulted

The following documents were consulted during the undertaking of this assessment:

- Horizontal Guidance H4: Odour Management – How to comply with your Environmental Permit, Environment Agency, 2011;
- National Planning Policy Framework (NPPF), 2012;
- National Planning Practice Guidance (NPPG) (2016);
- Code of Practice on Odour Nuisance from Sewage Treatment Works, DEFRA, 2006;
- Odour Control in Wastewater Treatment – A Technical Reference Document 01/WW13/3, UK Water Industry Research (UKWIR), 2001;
- Environmental Protection Act, 1990;
- Assessment of Community Response to Odorous Emissions, R&D Technical Report P4-095/TR, Environment Agency, 2002;
- IAQM Odour Guidance for Planning (2014);
- Environmental Permitting (England and Wales) Regulations, 2010; and
- Odour Guidance for Local Authorities, DEFRA, March 2010.

2.0 Relevant Policy, Legislation and Guidance

2.1 Planning Policy

2.1.1 National Policy

The National Planning Policy Framework (NPPF) was formally adopted on 27th March 2012 and describes the policy context in relation to pollutants, including atmospheric pollution:

Para 109 *The planning system should contribute to and enhance the natural and local environment by*

[...] preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of land, air, water or noise pollution or land instability."

"Para 120 *To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner."*

"Para 122: *In doing so, local planning authorities should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume that these regimes will operate effectively."*

Where pollution is defined as:

"Annex 2: Glossary *Anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light."*

The policies within the NPPF in relation to air pollution are considered within this Odour Assessment.

The accompanying National Planning Practice Guidance (NPPG), provides guiding principles on how planning can take account of the impact of new development on air quality, and includes the following in regard to odour:

"*Odour and dust can also be a planning concern, for example, because of the effect on local amenity.*"

"When deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality."

"Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific. The scope and content of supporting information is therefore best discussed and agreed between the local planning authority and applicant before it is commissioned."

The guidance within the NPPG specifically relating to odour has been considered as part of this Odour Assessment.

2.1.2 Local Policy

CDC adopted the current Local Plan 2001 – 2011 in April 2006. CDC is currently preparing a new Local Plan to cover the period 2011 – 2031. This Local Plan consultation draft relates to the whole District and provides a strategy for delivering growth for Cotswold District up to 2031. The Submission Draft Local Plan document provides the vision, objectives, strategic policies, development management policies and site specific allocations for delivering new homes, jobs, services, facilities and infrastructure. However, to date this plan has yet to be adopted.

The Secretary of State issued a Direction on 19th January 2009 which indefinitely saved a number of policies contained within the Local Plan 2001 – 2011, until such time that relevant and appropriate Development Plan Documents are produced as part of a new Local Plan within the Local Development Framework (LDF) in line with the Planning and Compulsory Purchases Act (2004).

The following saved policy is contained within the Local Plan 2001 – 2011 relating to odour:

> *"POLICY 5: POLLUTION AND SAFETY HAZARDS*
>
> *1. Permission will not be given for development that:*
>
> *(a) would result in an unacceptable risk to public health or safety, the environment, general amenity or existing land uses because of its location or due to the potential pollution of air, water, land or sky;*
>
> *(b) is likely to cause significant noise nuisance, unacceptable light levels and spillage, vibration, dust or smell, particularly if this is likely to harm an existing business or other neighbouring land use; or*
>
> *(c) lies within a protected area around sewage treatment works or similar installations.*
>
> *2. The Council will seek, through conditions on planning permissions or legal agreements, to control the construction and operation of any development to minimise levels of pollution, of whatever type, and risk to :*
>
> *(a) public health or safety;*
>
> *(b) the environment;*
>
> *(c) general amenity; or*
>
> *(d) existing land uses."*

The above saved policy contained within the Local Plan 2001 – 2011 is addressed within this assessment.

2.2 Odour Nuisance Regulation

The main requirements with respect to odour control from industrial or trade premises that are not permitted under the Environmental Permitting (England and Wales) Regulations (2016), and subsequent amendments, is that provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

> *'any dust steam, smell or other effluvia arising on industrial trade or business premises and being prejudicial to health or a nuisance.'*

Enforcement of the Act, in regard to nuisance, is under the jurisdiction of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the Local Authority (LA) is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an abatement notice under Part III of the Environmental Protection Act (1990). Enforcement can insist that there be no malodour beyond the boundary of the works. A defence is to show that the process to which the

nuisance has been attributed and its operation are being controlled according to Best Practicable Means (BPM).

2.3 Water Companies' Obligations in respect to Odour Control at WwTWs

The DEFRA Code of Practice (COP)[1] states that:

> *'[...] sewage treatment operators have the responsibility to put in place measures to control or abate odour problems from their plant using "Best Practicable Means.'*

The guidance is also intended to provide an aid to Environmental Services in assessing the seriousness of an odour nuisance and to enable the Environmental Health Officer (EHO) to decide on what measures are in place to deal with such an issue and also take a view on whether Best Practicable Measures (BPM) have been taken.

Whilst voluntary, the COP applies to all operating facilities and makes no distinction between older works and recently built works. Simple routine operational changes made to mitigate odour are considered as 'Baseline Measures' in the COP whilst process modifications and installation of appropriate odour control equipment (Enhanced Measures) will offer additional benefits in odour reduction, containment and control.

The main philosophy behind the COP is that sewage treatment works operators should use appropriate means to prevent odour nuisance, and to abate odour emissions with the aim of ensuring that risk of nuisance is minimised. This is described as a specific stepwise procedure and is referred to as the Good Practice Approach.

Some odour control measures should be put in place by the sewage treatment works operator as a matter of course in order to reduce the risk of nuisance occurring in the first place. These are essentially preventative measures and should be thought of as minimum day-to-day operating standards as part of good management practice and to meet their statutory obligations. Examples of such an approach would be planned and routine maintenance of plant and equipment and (where possible) locating or re-locating sources of odour as far as is practicable from the site boundary and sensitive receptors.

The COP additionally considers the issue of development in close proximity to sewage works (termed 'encroachment'). The guidance states that local planning authorities need to carefully consider the proximity and location of existing sources of odour, such as sewage works, when considering plans to allocate new development.

2.4 Assessment of Predicted Odour Impact

There are neither European or United Kingdom (UK) specific regulatory standards for the assessment of the impact of odours. However, it may be reasonably argued that complaints are likely to occur when odours become detectable and recognisable. The longer the odour detection persists for an individual, the greater the level of complaints may be expected, particularly if the odours are unpleasant.

The potential for odorous compounds to cause nuisance is dependent upon a wide range of factors, including:

- the rate of emission of the compound(s);
- the duration and frequency of exposure;
- the time of the day that this emission occurs;
- the prevailing meteorology;

[1] DEFRA (2006) Code of Practice on Odour Nuisance from Sewage Treatment Works.

- the sensitivity of the 'receptors' to the emission, i.e. whether the odorous compound is more likely to cause nuisance, such as the sick or elderly, who may be more sensitive;
- the odour detection capacity of individuals to the various compound(s); and
- the individual perception of the odour, (i.e. whether the odour is regarded as unpleasant). This is greatly subjective, and may vary significantly from individual to individual. For example, some individuals may consider some odours as pleasant, such as petrol, paint and creosote.

2.4.1 IAQM – Odour Assessment for Planning Guidance

The Institute of Air Quality Management (IAQM) '*Odour assessment for planning guidance*'[2] summarises the typical requirements and approaches for undertaking an odour assessment for planning applications to determine the potential amenity impacts.

To facilitate the assessment of the significance of predicted odour exposure on amenity, the guidance defines receptor sensitivity and proposes 'odour effect descriptors' which combine the relative sensitivity of the receptors, the nature (or offensiveness) of the odour with quantitative predicted odour exposure levels.

The IAQM receptor sensitivity types are summarised in Table 2-1.

Table 2-1
IAQM Odour Receptor Sensitivity

Receptor Sensitivity	Example Land-uses
High sensitivity receptors	Surrounding land where: • users can reasonably expect enjoyment of a high level of amenity; and • people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools/education and tourist/cultural
Medium sensitivity receptors	Surrounding land where: • users would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or • people wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples may include places of work, commercial/retail premises and playing/recreation fields
Low sensitivity receptors	Surrounding land where:

[2] IAQM Guidance on the assessment of odour for planning. IAQM 2014.

Receptor Sensitivity	Example Land-uses
	• the enjoyment of amenity would not reasonably be expected; or • there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial use, farms, footpaths and roads

The IAQM then presents a matrix for 'most offensive' odour types which has been expanded to include both 'moderately offensive' and 'less offensive' odours as summarised in Table 2-2. It is noted that impacts descriptors apply equally to cases where there are increases and decreases in odour exposure as a result of a development. Therefore the terms 'adverse' and 'beneficial' should be applied to the descriptors as appropriate.

Table 2-2
Odour Effect Descriptors (based on IAQM approach)

Predicted Odour Exposure $C_{98,1\text{-hour}}$ ou^E/m^3			Receptor Sensitivity		
Less offensive	Moderately offensive	Most offensive	Low	Medium	High
>20	>15	>10	Moderate	Substantial	Substantial
15-20	10-15	5-10	Moderate	Moderate	Substantial
10-15	5-10	3-5	Slight	Moderate	Moderate
5-10	3-5	1.5-3	Negligible	Slight	Moderate
3-5	1.5-3	0.5-1.5	Negligible	Negligible	Slight
<3	<1.5	<0.5	Negligible	Negligible	Negligible

2.4.2 Chartered Institute for Water and Environmental Management

The Chartered Institute for Water and Environmental Management (CIWEM) released a Policy Position Statement regarding odour in February 2011. In consideration of an appropriate assessment criterion to determine potential odour impacts, CIWEM stated that:

> *'Given the differing odour impact criteria available, the selection of the most appropriate criterion should be determined by the objective of the assessment (whether this be against a standard of avoidance of nuisance or 'significant pollution') and the nature of the odour under assessment.*
>
> *It is, therefore, the view of CIWEM that these and other odour impact criteria should be regarded as indicative guidelines and cannot be applied as over-arching statutory numerical standards. CIWEM considers that the following framework is the most reliable that can be defined on the basis of the limited research undertaken in the UK at the time of writing:*
>
> - *$C_{98,\ 1\text{-hour}}$ >10ou_E/m^3 – complaints are highly likely and odour exposure at these levels represents an actionable nuisance;*

- *$C_{98, 1\text{-hour}}$ >5ouE/m^3, – complaints may occur and depending on the sensitivity of the locality and nature of the odour this level may constitute a nuisance; and*
- *$C_{98, 1\text{-hour}}$ <3ou$_E$/m^3, – complaints are unlikely to occur and exposure below this level are unlikely to constitute significant pollution or significant detriment to amenity unless the locality is highly sensitive or the odour highly unpleasant in nature.'*

2.4.3 Planning Precedent Decision

A planning inspectorate's decision on a public inquiry in 1993 for an application for a residential development adjacent to a Northumbrian Water Ltd operated WwTW sited at Newbiggin-by-the-Sea, Northumberland[3] addressed the issue of what constituted an appropriate exposure limit at a sensitive receptor. The presiding inspector concluded that:

> *"Whilst a particularly sensitive person could detect an emission level as low as 2ou/m^3, it seems to be that adoption of a level of 5ou/m^3 for the appeal site is both reasonable and cautious."*

As a result of this case, an impact criteria of 5.0ou$_E$/m^3 as a 98th percentile of 1-hour average concentrations has been frequently quoted and accepted and is applied as being sufficient to prevent nuisance for a number of industry sectors. This impact criteria has more recently been applied within the context of odour assessment from WwTW related odour adjacent to existing and proposed residential receptors[4,5,6].

2.4.4 Assessment of Community Response to Odorous Emissions

Environment Agency (EA) Research and Development Technical Report P4-095/TR was released in 2002. This report provides a scientific background to assist in identifying defensible numerical limits for regulating exposure to odours in the UK, and identify further supporting research work as required to underpin such limits.

This report recognises that the $C_{98, 1\text{-hour}}$ < 5 ou$_E$/m^3 exposure level (refer to Section 4.1 for description of notation) is currently applied in the UK with the legal objective of avoiding nuisance.

The EA R&D document recognises that not all aspects of wastewater treatment have the potential to generate odour which is likely to be offensive and, thus, has the potential to generate complaints.

It is considered, within the context of this Odour Constraints Assessment that raw sewage (the inlet screens and balance tank) and raw sludge (sludge storage tanks), sources which are present at both of the Moreton in Marsh WwTW and Northleach WwTW, would be considered to have a relatively high annoyance potential. However, it is noted that these sources are covered and emissions to atmosphere abated via odour control in order to reduce the potential for odour impacts and annoyance. Secondary treatment stages, such as the Activated Sludge Plant (ASP) present at the Moreton in Marsh WwTW and the percolating filters present at the Northleach WwTW, would be considered as having a low annoyance potential.

However, in order to undertake a worst-case assessment, this Odour Constraints Assessment has considered odour generated by all aspects of treatment at the Moreton in Marsh WwTW and Northleach WwTW with an open / point source to atmosphere to assess all odorous potential.

---

[3] Department of the Environment (15th July 1993) Appeal by Northumbrian Water Ltd: Land Adjacent to Spital Burn, Newbiggin-by-the-sea, Northumberland. Case ref: APP/F2930/A/92 206240.

[4] Planning Inspectorate – Appeal Reference: APP/P0240/A/09/2110667.

[5] Planning Inspectorate – Appeal Reference: APP/E3525/A/11/2145235.

[6] High Court of Justice - [2011] EWHC 3253 (TCC).

2.4.5 UKWIR – Odour Control in Wastewater Treatment

In 1999, UK Water Industry Research (UKWIR) commissioned a study into wastewater treatment odour control. In 2001, Technical Reference Document 01/WW/13/3 '*Odour Control in Wastewater Treatment*' was published. This document consists of two parts. Part 1 outlines the principles of odour formation, measurement and management. Part 2 describes in detail the practical methods available to control odours in wastewater treatment. Importantly, Table 5.1 of this document provides emission rate estimates from wastewater and sludge treatment processes; these emission rate estimates have been considered in this assessment.

UKWIR Technical Reference Document 01/WW/13/3 is relevant to this assessment as it provides specific odour emission data against which the values used in this assessment may be compared.

The UKWIR document includes the most in-depth published study in the UK of the correlation between of modelled odour impacts and human response (dose-effect). This was based on a review of the correlation between reported odour complaints and modelled odour impacts in relation to 9 wastewater treatment works in the UK with on-going odour complaints.

The findings of this research indicated the following:

- at modelled exposures of below $C_{98,1\text{-hour}}$ $5ou_E/m^3$, complaints are relatively rare, at only 3% of the total registered;
- at modelled exposures between $C_{98,1\text{-hour}}$ $5ou_E/m^3$ and $C_{98,1\text{-hour}}$ $10ou_E/m^3$, a significant proportion of total registered complaints occur; 38% of the total; and
- the majority of complaints occur in areas of modelled exposure greater than $C_{98,1\text{-hour}}$ $10ou_E/m^3$; 59% of the total.

2.4.6 EA's H4 Odour Management Guidance

The EA's H4 Guidance[7] proposes installation-specific exposure criteria (benchmarks) on the basis that not all odours are equally offensive, and not all receptors are equally sensitive.

The H4 Guidance proposes the following benchmarks levels for the assessment and indication of unacceptable odour pollution:

- $1.5ou_E/m^3$ (as a 98th percentile of 1-hour average concentrations) for the most offensive odours;
- $3ou_E/m^3$ (as a 98th percentile of 1-hour average concentrations) for moderately offensive odours; and
- $6ou_E/m^3$ (as a 98th percentile of 1-hour average concentrations) for less offensive odours.

The H4 Guidance refers to the application of the $1.5ou_E/m^3$ criterion against the most offensive odorous sources, such as those processes involving septic effluent or sludge. It is considered that only the sludge treatment process at the Moreton in Marsh WwTW and Northleach WwTW would be comparable to this assessment criterion. However, it is understood that the neither sludge treatment processes undertaken at the Moreton in Marsh WwTW and Northleach WwTW are covered by the Environmental Permitting Regulations.

It is noted that Water UK, in their consultation response to the EA on the draft Environmental Permitting Regulations H4: Odour Management[8], stated that an odour assessment criteria of $5ou_E/m^3$ as a 98^{th} percentile of 1-hour average concentrations was a more realistic target for the assessment of odour at the nearest receptor.

---

[7] Horizontal Guidance H4: Odour Management – How to comply with your Environmental Permit, Environment Agency, 2011.
[8] Environment Agency Technical Guidance Note: H4 Odour Management Consultation, Water UK Response, 2009.

3.0 Site Setting and Background

3.1 Site Location – Moreton in Marsh

The Moreton in Marsh WwTW is located to the south of A44 London Road, and accessed via the Cotswold Business Village, at approximate National Grid Reference (NGR) x421720, y231990. There are existing commercial / industrial units (comprising the Cotswold Business Village) located approximately 80m north-west of the Moreton in Marsh WwTW, and existing residential dwellings (Evenlode Gardens, and Lysander Way) located approximately 250m and 400m west and north of the Moreton in Marsh WwTW, respectively.

Reference should be made to Figure 3-1 for an illustration of the Moreton in Marsh Local Plan review sites relative to the Moreton in Marsh WwTW. Shapefiles of the relevant sites from the Local Plan review were provided by CDC.

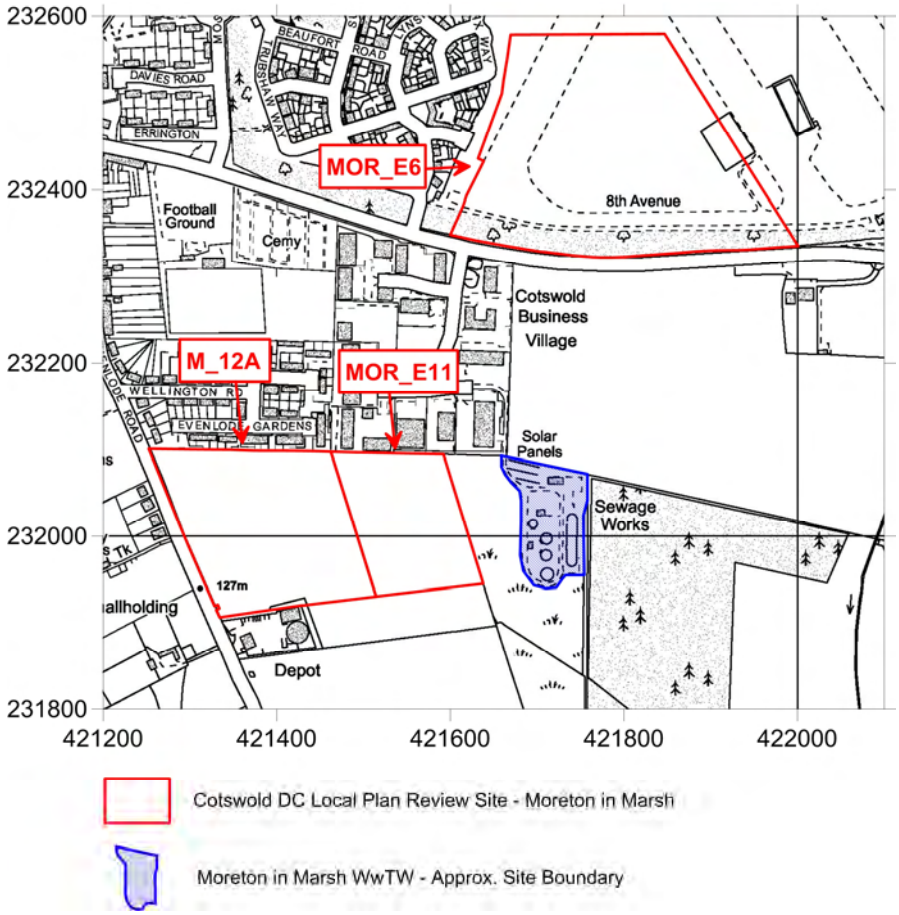

Figure 3-1
Moreton in Marsh Local Plan Sites Relative to WwTW

Discussion with CDC[9] provided the following information on each of the Local Plan review sites and the currently proposed land use class:

[9] E-mail communication between James Brain, Forward Planning Manager at Cotswold District Council, and SLR Consulting Ltd, dated 29th March 2017.

- M_12A – Land at Evenlode Road, Moreton allocated for 68 dwellings;
- MOR_E6 – part of Fire Services College B, Moreton allocated for B1 employment uses; and
- MOR_E11 – Land at Evenlode Road, Moreton allocated for B8 employment uses.

3.2 Site Location – Northleach

The Northleach WwTW is located to the south of East End Road at approximate National Grid Reference (NGR) x412310, y21250. There are existing residential dwellings (Bassett Road) located approximately 315m west of the Northleach WwTW. A consented residential development (Land at Bassett Road) for 40 dwellings (CDC planning application reference: 14/04274/OUT) is located approximately 190m west of the Northleach WwTW.

Reference should be made to Figure 3-2 for an illustration of the Northleach Local Plan review site relative to the Northleach WwTW. Shapefiles of the relevant sites from the Local Plan review were provided by CDC.

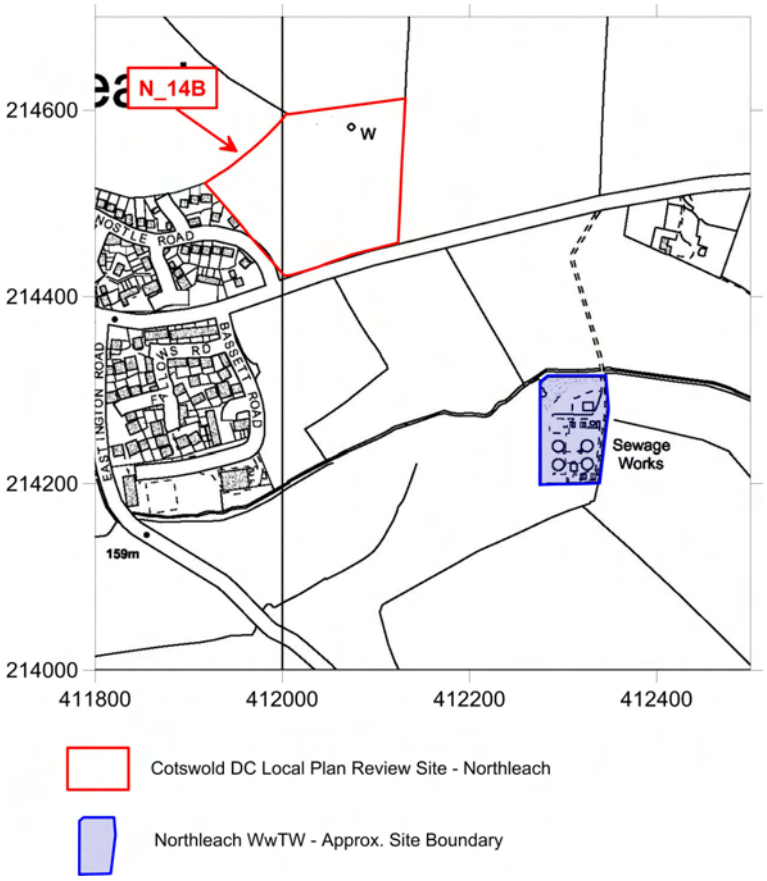

Figure 3-2
Northleach Local Plan Sites Relative to WwTW

Discussion with CDC[10] provided the following information on the Local Plan review site and the currently proposed land use class:

- N_14B – Land adjoining East End and Nostle Road, Northleach allocated for 17 dwellings.

[10] E-mail communication between James Brain, Forward Planning Manager at Cotswold District Council, and SLR Consulting Ltd, dated 29th March 2017.

3.3 Existing Complaints – Established Baseline: Morton-in-Marsh WwTW

Freedom of Information (FoI) requests were made to CDC to determine the location of any existing complaints regarding odour attributed to the Moreton in Marsh WwTW over the proceeding 5-years (since April 2012).

This FoI request[11] identified that 7 odour complaints have been received by CDC, as follows:

- 2013: January (1 complaint) March (3 complaints) April (1 complaint);
- 2014: February (1 complaint); and
- 2017: (April) (1 complaint on behalf of 4 residences).

The FoI return noted that these complaints were received from the areas of GL56 0LY and GL56 0JH (located to the west of the WwTW).

However, it is also noted that these odour complaints were not substantiated[12] by CDC Regulatory Services Pollution Team, if any enforcement action was served upon Thames Water, or if the period of elevated odour generation which resulted in the complaint was as a result of WwTW malfunction or non-standard operation, for example.

Reference should be made to Appendix 03 for a copy of this FoI return.

3.4 Existing Complaints – Established Baseline: Northleach WwTW

FoI requests were made to CDC to determine the location of any existing complaints regarding odour attributed to the Northleach WwTW over the proceeding 5-years (since April 2012).

This FoI request[13] identified that no odour complaints have been received by CDC over the requested period.

Reference should be made to Appendix 03 for a copy of this FoI return.

---

[11] CDC Freedom of Information request, reference: 17227, dated 22nd May 2017.

[12] Local Authorities have a duty of care to investigate odour complaints from relevant commercial sites under the requirements of the Environmental Protection Act (1990). Following receipt of a complaint, Local Authorities will undertake their own investigations as part of the review of odour to determine if it can be substantiated (i.e. the Local Authority is satisfied that the odour complaint is genuine and a statutory nuisance exists) and thus requires enforcement under the Act.

[13] CDC Freedom of Information request, reference: 17226, dated 22nd May 2017.

4.0 Assessment Methodology

4.1 Basis for Odour Quantification

The assessment of an odour impact may be undertaken with two differing approaches, by the use of indicator determinands, or total odour. Both approaches are discussed below. In the case where an emission is dominated by one particular odorous gas (such as hydrogen sulphide (H_2S) commonly used in the case of wastewater treatment), the use of an indicator determinand may allow simple validation of an assessment through monitoring at source and receptor. The relationship between concentration of this determinand and odour impact is often difficult to derive for all sources[14].

A more appropriate approach in the case of complex gas mixture (or a site with multiple sources of differing nature) is that of total odour. Total odour is measured using the concept of the European Odour Unit (ou_E), as defined in British Standard EN 13725(2003). This approach allows impact assessment of any odorous gas as it is independent of chemical constituents and centres instead on human response or detection threshold of the gas in question.

As the odour unit is a Standard Unit in the same way as gram or milligram, the notation used in odour assessment will follow the conventions of any mass emission unit as follows:

- concentration: ou_E/m^3;
- emission: ou_E/s; and
- specific emission (emission per unit area): $ou_E/m^2/s$.

Like air quality standards for individual pollutants, exposure to odour is given in terms of a percentile of averages over the course of a year. The exposure criteria accepted in the UK at present is given in terms of (concentration) European Odour Units as a 98th percentile (C_{98}) of hourly averages. This allows 2% of the year when the impact may be above the limit criterion (175 hours). The notation for impact is therefore:

$$C_{98,\ 1\text{-hour}}\ X\ ou_E/m^3$$

For the purposes of this assessment the approach using European Odour Units has been adopted as the most appropriate method.

4.2 Detailed Dispersion Modelling

In order to consider potential odour impacts within the vicinity of the Moreton in Marsh WwTW and the Northleach WwTW, a quantitative assessment using the AERMOD dispersion model[15] was undertaken. AERMOD is a regulatory model approved for the United States Environmental Protection Agency (US EPA) and is used extensively for odour impact assessment in the UK.

The detailed dispersion modelling has been used to predict the ground level concentration of odour and has been undertaken in accordance with the relevant EA guidance[16]. In accordance with the EA best practice methodology for dispersion modelling assessment, 5-years of hourly sequential consecutive meteorological data were used. Modelled odour concentrations are presented for each individual year in order to present

[14] Van Harreveld, A.P & Stoaling, M (2002) Chemicals as odour predictors: what causes the odour deficit? Presented at 'Odours, what a nuisance' – Regulation and Quantification of Environmental Odour. CIWEM, 2002.
[15] Software used: Lakes AERMOD View, version 9.3.0.
[16] Environment Agency – Air dispersion modelling report requirements (for detailed air dispersion modelling), Air Quality Modelling and Assessment Unit.

inter-year variability. Further, it is noted that this reporting of modelling results from individual meteorological years is as per the requirements of the IAQM Guidance, for the determination of maximum modelled results, as a worst-case assessment. Additionally, an average of the 5-years of meteorological data is used to present average conditions. Reference should be made to Section 6.5 for further information on the utilised meteorological datasets.

4.3 Acceptability of Predicted Odour Impacts

As detailed in Section 2.4.1, receptor exposure and sensitivity to potential odour varies dependent upon the land-use of the site, based on the expectation of uses of the land for a high degree and level of amenity and the duration of time spent at the given location.

On this basis, this Odour Constraints Assessment has considered the following criterion range for the determination of odour impacts from the standard operation of the Moreton in Marsh WwTW and Northleach WwTW to quantify an appropriate stand-off distance for the protection of amenity for any future development at the adjacent CDC Local Plan review sites:

- High sensitive receptor – considered suitable for any development, including residential: an impact criterion of $C_{98,\ 1\text{-hour}}$ <3 ou_E/m^3;
- Medium sensitive receptor – considered suitable for places of work, commercial/retail premises and playing/recreation fields: and impact criterion of $C_{98,\ 1\text{-hour}}$ >3 ou_E/m^3 but $C_{98,\ 1\text{-hour}}$ <5 ou_E/m^3; and
- Low sensitive receptor – considered suitable for non-sensitive uses where exposure would be only transient, e.g. industrial use, farms, footpaths, car-parks and roads: an impact criteria of $C_{98,\ 1\text{-hour}}$ >5 ou_E/m^3.

The above impact criteria are in accordance with the recommendation of the CIWEM, guidance by the IAQM and the planning inspectorate's decision from several planning appeals.

4.3.1 Model Uncertainty and Limitations

This assessment has incorporated a number of precautionary assumptions based upon SLR's understanding and knowledge of WwTW typical operations, as described in the following subsections, which would result in an overestimation of the emissions and predicted ground level concentrations from the standard, consented operation of the Moreton in Marsh WwTW and Northleach WwTW. Therefore actual predicted ground level concentrations may be expected to be lower than this and in some instances significantly lower.

Some factors cannot be included within the dispersion modelling exercise, including non-standard infrequent abnormal operations such as non-consented discharges to sewer and unabated air displaced during tanker filling from the sludge storage tanks. During these periods, it is expected that the generation of odour would be elevated for a short period of time, but considering the likely frequency and duration of such operations from the site (limited to circa.1-hour per-fortnight, total of 26-hours per-year) these would not significantly compromise the amenity of the development. It is noted that during instances of sludge tank emptying, it is best practice / Best Available Technique (BAT) for tankers to operate by displacement and/or utilise the odour control treatment associated with the sludge storage / treatment tanks, to prevent unabated emission of odour to atmosphere.

4.3.2 IAQM – Quantification of Predicted Significance

The magnitude of the predicted odour effect (i.e. impact significance) has been determined based upon the matrix and descriptors presented within the IAQM odour guidance, as presented within Section 2.4.1. For the purposes of this Odour Constraints Assessment, odours have been considered to be of 'moderate offensiveness' to determine the resulting impact.

5.0 Quantification of Odour Emissions

5.1 Potential Sources of Odour – WwTW

The generation of odour from sewage is primarily associated with the release of odorous Volatile Organic Compounds (VOCs) that are generated as a result of the anaerobic breakdown of organic matter by micro-organisms. The objective of the treatment process is to remove solid organic matter responsible for generation of odours and other contaminants from the wastewater so that it can be returned back into the environment. Since the main source of odour and VOCs is the solid organic matter, the most intense and offensive odours tend to be generated from the operations involving the handling and treatment of raw sewage, or sludge extracted from the raw sewage. The treatment units that rely on aerobic processes and are at secondary or tertiary stages of the works typically pose a lesser risk of generating offensive odours.

It is recognised within Odour Guidance for Local Authorities that not all parts of a process are likely to be the cause of significant odours. The potential for odours are greater for some parts of the WwTW treatment process than for others. Those elements of the WwTW that deal with sludges have a far greater propensity for creating malodours than elements such as, for example, secondary aerated treatment stages where any odour is likely to be inoffensive. This accords to the findings of R&D document P4-095/TR[17] and Water UK's consultation response to DEFRA on the CoP for odour control at WwTW[18]. The UKWIR document further states for Final Settlement that "*in this stage, effluent and waste sludges should be well oxidised and should not cause odour problems unless there are operational problems*".

On this basis the stages of treatment that would typically pose a risk of generating more offensive odours at the Moreton in Marsh WwTW and Northleach WwTW are as follows:

- Moreton-in-Marsh WwTW:
  - inlet works;
  - PST; and
  - sludge storage tanks.
- Northleach WwTW:
  - inlet works;
  - PST; and
  - sludge storage tanks.

However, in order to present a worst-case scenario of potential odour impacts resulting from the standard operation of the Moreton in Marsh WwTW and Northleach WwTW, all odorous sources (moderate and more offensive) have been considered within the context of this Odour Constraints Assessment.

[17] Environment Agency (2002) Assessment of Community Response to Odorous Emissions, R&D Technical Report P4-095/TR.

[18] Water UK response to the consultation on the Code of Practice on Odour Nuisance from Sewage Treatment Works and the Accompanying Local Authority Guide, accessed from: http://www.water.org.uk/home/policy/statements-and-responses/comment-draft-code-of-prcatice/water-uk-response-to-odour-cop-and-lag-4--apr-05.doc.

5.2 Moreton in Marsh WwTW Process Overview

The Moreton in Marsh WwTW appears to be a predominantly combined system conveying both foul sewage flows and surface water by gravity to the plant for treatment. The catchment flows are predominantly from residential areas, with some light industrial and commercial inputs.

Details of treatment stages of the Moreton in Marsh WwTW were not made available by Thames Water. Relevant sources and treatment stages were identified from reference to aerial photography. This review determined that there were 5No. individual sources of potential odour present at the Moreton in Marsh WwTW. These are considered to be:

- Inlet works – high potential malodour production;
- Primary settlement tanks (PST) – high potential malodour production;
- ASP - low potential malodour production;
- Final settle tanks (FST) – low potential malodour production; and
- Sludge tank – high potential malodour production.

It is noted that the storm tank appears to be covered, with all process internal foul air being discharged to atmosphere via a dedicated odour control unit (OCU). Based upon SLR's experience, an effectively operating OCU can operate at a removal efficiency of between 95 – 99.5%. Therefore, an assumed 95% operating efficiencies of the OCUs has been applied as a precautionary approach.

It is not known whether the ASP has an associated anoxic zone, where return activated sludge (RAS) is introduced into the ASP. However, an area to the north of the ASP has been separately digitised as the anoxic zone, as presented in Figure 5-1. The corresponding emission rate has been modelled at double that of the ASP, based upon SLR's experience in odour monitoring and emission calculation at WwTW from ASP sources.

5.3 Northleach WwTW Process Overview

The Northleach WwTW appears to be a predominantly combined system conveying both foul sewage flows and surface water by gravity to the plant for treatment. The catchment flows are predominantly from residential areas, with some light industrial and commercial inputs.

Details of treatment stages of the Northleach WwTW were not made available by Thames Water. Relevant sources and treatment stages were identified from reference to aerial photography. This review determined that there were 6No. individual sources of potential odour present at the Moreton in Marsh WwTW. These are considered to be:

- Inlet works – high potential malodour production;
- Primary settlement tanks (PST) – high potential malodour production;
- Percolating filters - low potential malodour production;
- Final settle tanks (FST) / humus tanks – low potential malodour production;
- Sludge tank – high potential malodour production; and
- Storm tanks – medium potential malodour production.

SLR's experience of WwTW operations is that percolating filters are often operated in series to allow for periods of manual cleaning and maintenance and increased effluent treatment requirement during peak inflow periods. However, to reflect a worst-case scenario of potential standard operational odour from the Northleach WwTW, it has been assumed that all four of the percolating filters are operated concurrently.

Consultation with the Met Office website determined that the closest long-term meteorological station monitoring 30-year average climatic conditions to the Northleach WwTW site is located at Little Rissington[19]. Data downloaded for the period 1981 – 2010 illustrates that the months of October – February, inclusive, experienced the highest overall volumes of rainfall (approximately 40% of the year). Therefore, to represent the discontinuous use of the storm-tanks at the Northleach WwTW, an approximate use of 40% has been applied to the assessment to be representative of approximate site operations across a standard year. A monthly profile factor was applied to the emission release corresponding to an operation covering October – February and a converse 'zero' emission for all other months. The PST derived emission rate was applied to the storm tank source group, as this is considered to be a representative emission rate during the period of storm surge inflow and reduced odorous potential associated with the operation of the storm tank. Further, it is assumed that when the storm tanks are operational, tanks will be full to their maximum potential volume capacity to represent the worst-case potential emission.

5.4 Derivation of Source Term

Emission rate data was not provided by Thames Water for either the Moreton in Marsh WwTW or Northleach WwTW, and each of the relevant treatment stages. Therefore, the source term and corresponding emission rates for each remaining treatment stage were derived from the following sources:

- *Published Emission Rates*: Emission rates determined from published literature sources including the UKWIR document[20]; and
- *Surrogate Plant Emission Rates*: Odour monitoring of a similar plant in operation from WwTW previously sampled by SLR, to determine surrogate emission rates for input into the Odour Constraints Assessment.

Where emission rates were sourced from previous WwTW odour monitoring undertaken by SLR, only those WwTW which were of a comparable population equivalent, treatment stage and catchment area were selected. Where emission rates have been calculated from a period of dynamic olfactometry following odour monitoring undertaken by SLR, these have been calculated in accordance with British Standard BS EN 13725 (2003).

5.4.1 Moreton in Marsh WwTW – Modelled Sources and Emission Rates

Reference should be made to Table 5-1 and Table 5-2 for details of modelled area sources and point sources, respectively, considered for the Moreton in Marsh WwTW. Emission parameters for the OCU have been calculated based upon SLR's experience of similar OCUs on sludge tanks.

Table 5-1
Modelled Process Conditions – Moreton in Marsh WwTW: Area Sources

Source	Applied Emission Rate ($ou_E/m_2/s$)
Inlet works [(A)]	6.2
PST [(A)]	1.9

[19] http://www.metoffice.gov.uk/public/weather/climate/gcnz12zfm - accessed June 2017.
[20] Odour Control in Wastewater Treatment – A Technical Reference Document 01/WW13/3, UK Water Industry Research (UKWIR), 2001.

Source	Applied Emission Rate ($ou_E/m_2/s$)
ASP – aerobic (including distribution chamber) (A)	4.0
ASP – anoxic (B)	8.0
FST (A)	0.7

Notes:
(A) Emission rate identified from UKWIR 01/WW/13/3 technical reference document, for source of 'typical' odour potential.
(B) Double the emission rate of the ASP aerobic source term has been applied, to reflect the elevated emission from an anoxic zone.

Table 5-2
Modelled Process Conditions – Moreton in Marsh WwTW: Point Sources

Parameter	Unit	Sludge Tank OCU
Location (NGR)	Easting (X)	421697.47
	Northing (Y)	232034.47
Stack Height	Meters (m)	3
Stack Diameter	m	0.18
Efflux Velocity	m/s	3.65
Volumetric Flow Rate	m^3/s	0.093
Discharge Temperature (A)	°C	Ambient
Emission Rate (B) (C)	ou_E/s	4,638.76

Notes:
(A) Stack temperature was modelled as 'ambient' to process the corresponding temperature of the utilised meteorological file.
(B) Emission rate for the OCUs were calculated based upon a removal efficiency of 95%, as a worst-case.
(C) Emission rate identified from UKWIR 01/WW/13/3 technical reference document, for source of 'typical' odour potential.

Reference should be made to Figure 3-1 for an illustration of the modelled sources of the Moreton in Marsh WwTW.

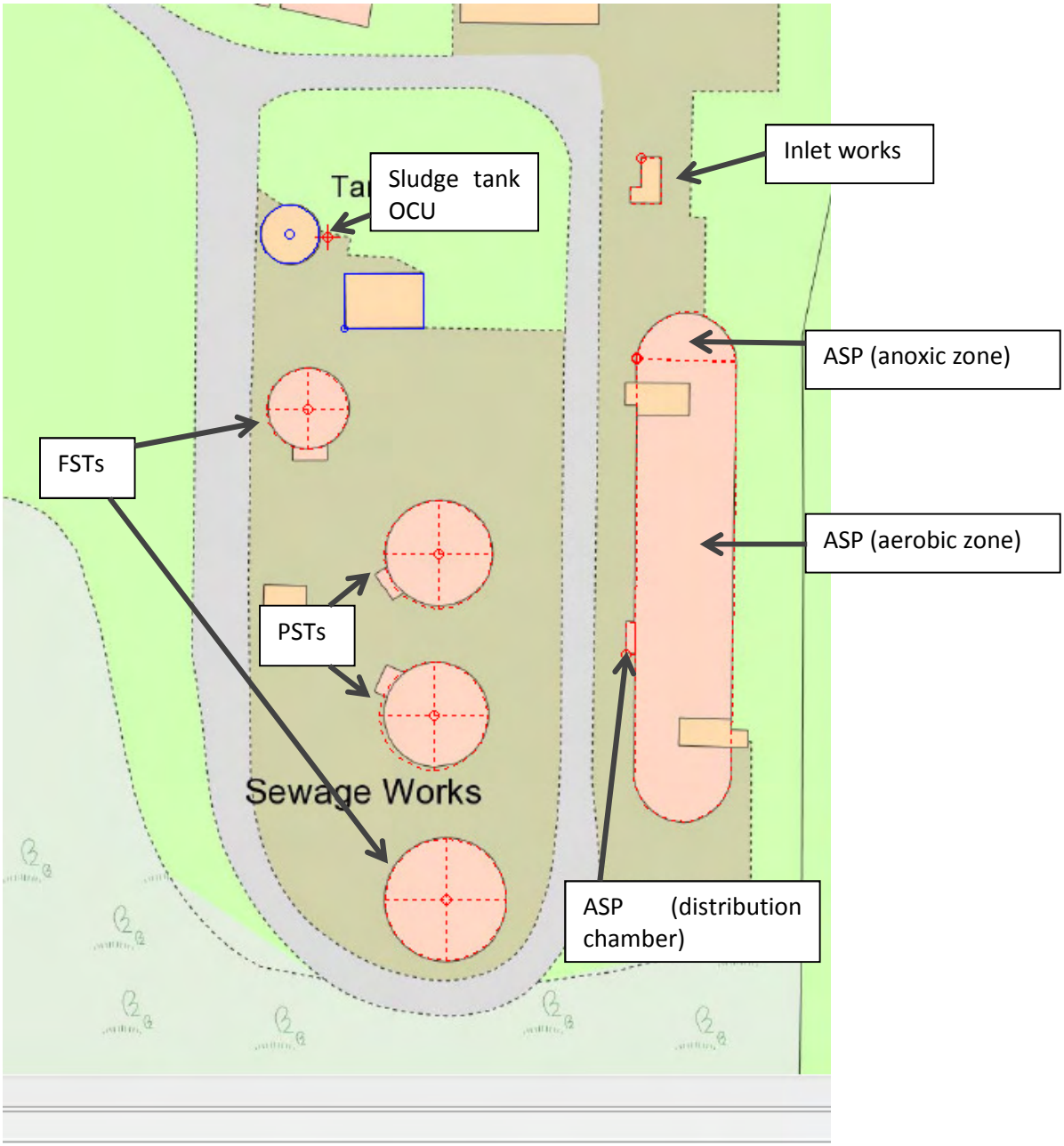

Figure 5-1
Moreton in Marsh WwTW – Modelled Sources

5.4.2 Northleach WwTW – Modelled Sources and Emission Rates

Reference should be made to Table 5-3 for details of modelled area sources considered for the Northleach WwTW.

Table 5-3
Modelled Process Conditions – Northleach WwTW: Area Sources

Source	Applied Emission Rate ($ou_E/m^2/s$)
Inlet works (including PST distribution) (A)	6.2
PST (including percolating filter distribution) (A)	1.9
Percolating filter (B)	1.56
FST / humus tanks (A)	1.7
Storm tanks (A)	1.9
Sludge tank (C)	710

Notes:

(A) Emission rate identified from UKWIR 01/WW/13/3 technical reference document, for source of 'typical' odour potential.

(B) Emission rate sourced from the Bolton on Dearne WwTW odour monitoring undertaken on 2nd August 2012 by SLR Consulting Ltd, based upon the calculated 'maximum' odour concentration from triplicate of odour bag samples. The Bolton on Dearne WwTW is predominantly a combined system conveying both foul sewage flows and surface water by gravity to the plant for treatment, with a population equivalent (PE)of approximately 12,000. The catchment flows are predominantly from residential areas, with some light industrial and commercial inputs. No existing odour complaints were identified from the WwTW.

(C) Modelled as per the 'PST' emission rate source term.

Reference should be made to Figure 3-1 for an illustration of the modelled sources of the Northleach WwTW.

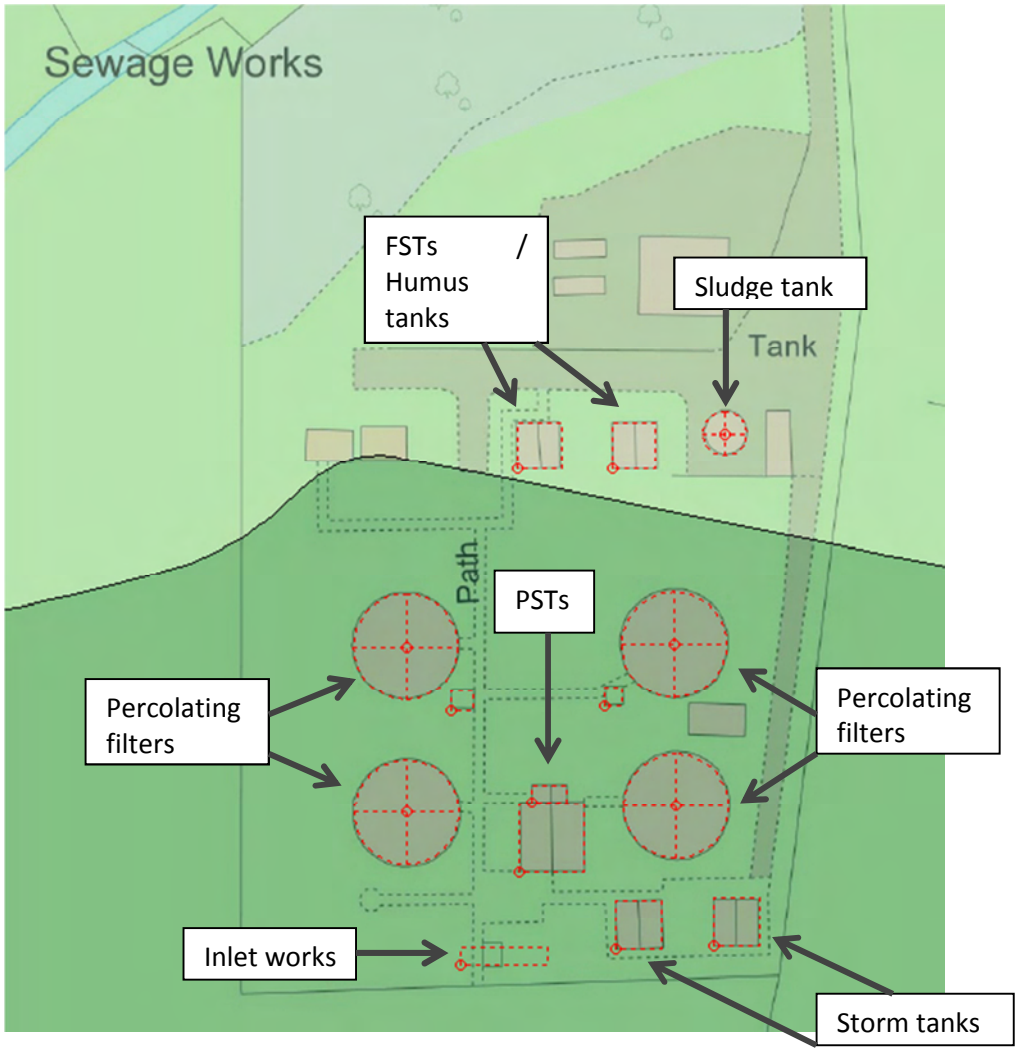

Figure 5-2
Northleach WwTW – Modelled Sources

5.4.3 Overall Site Odour Emission

The overall site emission and the contribution of each source group to this, is presented in Table 5-4 and Table 5-5 for the Moreton in Marsh WwTw and Northleach WwTW, respectively.

Table 5-4
Overall Odour Emission Rate – Moreton in Marsh WwTW

Source	Total Odour Emission Rate (ou_E/s)	Percentage of Site Total (%)
Inlet works	90.52	1.09
PST	489.06	5.88
ASP, both anoxic and aerobic zones (including distribution chamber)	2,929.2	35.24

Source	Total Odour Emission Rate (ou_E/s)	Percentage of Site Total (%)
FST	164.71	1.98
Sludge tank OCU	4,638.76	55.81
TOTAL	8,312.25	100.00

Table 5-5
Overall Odour Emission Rate – Northleach WwTW

Source	Total Odour Emission Rate (ou_E/s)	Percentage of Site Total (%)
Inlet works (including PST distribution)	174.22	1.15
PST (including percolating filter distribution)	133.76	0.88
Percolating filter	705.74	4.66
FST / humus tanks	90.1	0.60
Storm tanks	110.58	0.73
Sludge tank	1,3916	91.97
TOTAL	15130.4	100.00

6.0 Model Input Data

6.1 Modelling Scenarios

The scenario considered within this assessment are detailed within Table 6-1.

Table 6-1
Odour Constraints Assessment – Modelling Scenarios

Assessment Criterion	Modelling Criterion Applied
1-hour mean not to exceed more than 2% of the time (175 hours)	98th percentile of 1-hour means

6.2 Model Assumptions

The treatment sources of the standard operation of the Moreton in Marsh WwTW and the Northleach WwTW were assumed to be in operation 24-hours per day, 365-days per year in order to result in a worst-case determination of potential odour impacts.

6.3 Assessment Area – Moreton in Marsh WwTW

The potential impact of the Moreton in Marsh WwTW was assessed over an area of 1.0km radius from the centre at NGR: x421715, y232050. The receptor grid spacing resolution used was 20m.

Furthermore, an additional Cartesian grid was modelled over the M_12A, MOR_E11 and MOR_E6 sites corresponding to those sites being considered as part of the Local Plan review within the town of Moreton in Marsh, to determine potential constraints from WwTW operational odour. A grid resolution of 10m was applied over each site.

6.4 Assessment Area – Northleach WwTW

The potential impact of the Northleach WwTW was assessed over an area of 1.0km radius from the centre at NGR: x412310, y214245. The receptor grid spacing resolution used was 20m.

Furthermore, an additional Cartesian grid was modelled over the N_14B site corresponding to that site being considered as part of the Local Plan review within the town of Northleach, to determine potential constraints from WwTW operational odour. A grid resolution of 10m was applied over the site.

6.5 Meteorological Data

The most important meteorological parameters governing the atmospheric dispersion of pollutants are as follows:

- wind direction: determines the broad direction of dispersion;
- wind speed: will affect ground level emissions by determining the initial dilution of pollutants emitted; and
- atmospheric stability: is a measure of the turbulence, particularly of vertical motions.

Atmospheric Dispersion Modelling (ADM) Ltd was consulted in order to determine the most appropriate meteorological dataset to utilise within the Odour Constraints Assessment. Meteorological data was sourced

from Little Rissington observation station located at NGR: x421924, y218760, approximately 13.25km south of the Moreton-in-Marsh WwTW and approximately 10.5km north north-east of the Moreton-in-Marsh WwTW.

Five consecutive years of hourly-sequential observation data from this location, covering the period 2012 – 2016, inclusive, were obtained. The wind-roses of the meteorological data are provided in Appendix 02. The wind-rose indicates that the prevailing wind direction at the Little Rissington observation station is from south-western sectors with a frequent north-western component.

Table 6-2 presents statistics on the meteorological dataset illustrating the number of calm hours and the number of missing hours recorded within the 5-year period. Data capture, in terms of the percentage of calm hours and missing hours recorded are less than 10% and therefore, within acceptable limits.

Table 6-2
Little Rissington 2012 – 2016 Meteorological Data Statistics

Year	Calm Hours (%)	Wind Speeds <1.54 m/s (%)	Missing Hours (%)
2012	0.39	4.23	0.00
2013	0.31	4.41	0.26
2014	0.46	3.71	1.47
2015	0.27	3.38	2.13
2016	0.18	4.88	4.59

In accordance with guidance from the IAQM, modelling results from each individual considered meteorological year is presented. In addition, an average of the odour concentrations modelled with the application of the 2012 – 2016 meteorological data has been presented; this prevents results being skewed by infrequent meteorological conditions that would give a false indication of average conditions.

The meteorological data for Little Rissington observing station was obtained from the data supplier and converted to the required surface and profile formats for use in AERMOD using AERMET Pro. Details specific to the exact site location were used for the conversion, such as latitude, longitude and surface characteristics in accordance with the latest guidance[21].

Given the contrasting arable agricultural land, woodland and urban setting and nature of the surface features surrounding the Little Rissington observing station, the surface roughness factors were split into approximate four segments to reflect the differing land use characteristics surrounding the site. The applied values are shown in Table 6-3.

[21] AERMOD Implementation guide. AERMOD implementation workgroup, USEPA. Last revised March 19, 2009.

Table 6-3
Meteorological Data Preparation – Applied Surface Characteristics: Little Rissington

Zone (Start and End Sectors)	Land Use Type	Albedo	Bowen	Surface Roughness
0 – 90	Cultivated land	0.28	0.75	0.0725
90 – 180	Deciduous forest	0.215	0.875	0.9
180 – 225	Cultivated land	0.28	0.75	0.0725
225 – 0	Urban	0.2075	1.625	1.0

6.6 Terrain Data

The model for each site was run with OS 1:50,000 scale digital height contour data at 50m horizontal intervals. Data was processed by the AERMAP function within AERMOD to calculate terrain heights and interpolate data to calculate terrain heights for sources and receptors.

6.7 Building Downwash

Building downwash occurs when turbulence, induced by nearby structures, causes pollutants emitted from an elevated source to be displaced and dispersed rapidly towards the ground, resulting in elevated ground level concentrations.

The integrated Building Profile Input Programme (BPIP) module within AERMOD was used to assess the potential impact of building downwash upon predicted dispersion characteristics. Building and significant structures (such as sludge tanks and amenity / control buildings, etc.) height and dimensions were sourced from aerial photography and SLR's experience of similar structures present at WwTW. All structures present on-site are to be input to the BPIP Building Downwash pre-processor.

Building downwash should always be considered for buildings that have a maximum height equivalent to at least 40% of the emission height, and are located within a distance of five times the lesser of the height or maximum projected width of the building. Buildings and structures to be entered into the dispersion modelling assessment are presented within Table 6-4 for the Moreton in Marsh WwTW.

However, dispersion models are not capable of processing the influence of building upon area source emission releases, such as those emission sources which constitute the Northleach WwTW. Therefore, building downwash has not been considered further within the context of this modelling.

Table 6-4
Buildings and Structures Modelling – Moreton in Marsh WwTW

Structure ID	NGR (m)		Height (m)	Radius (m)	Length (m)	Width (m)
	X	Y				
Sludge tank	421692.88	232034.83	4.5	3.5	-	-
Sludge building	421699.45	232023.58	3	-	9.5	6.6

7.0 Assessment of Odour Constraints – Local Plan Review

7.1 Dispersion Modelling Results – Moreton in Marsh WwTW

Modelled dispersion of odours (as a 98th percentile of 1-hour mean concentrations) from the standard operation of the Moreton in Marsh WwTW presented within Appendix 01 illustrating:

- Figure AQ1-1 Moreton in Marsh WwTW modelled odour concentrations, 2012 meteorology;
- Figure AQ1-2 Moreton in Marsh WwTW modelled odour concentrations, 2013 meteorology;
- Figure AQ1-3 Moreton in Marsh WwTW modelled odour concentrations, 2014 meteorology;
- Figure AQ1-4 Moreton in Marsh WwTW modelled odour concentrations, 2015 meteorology;
- Figure AQ1-5 Moreton in Marsh WwTW modelled odour concentrations, 2016 meteorology; and
- Figure AQ1-6 Moreton in Marsh WwTW modelled odour concentrations, average of 2012 – 2016 meteorology.

Table 7-1 presents maximum modelled odour concentrations for the considered scenario and from each modelled meteorological year, including an average of the 5-year period. It is noted that these odour concentrations are the maximum modelled concentrations predicted anywhere on the assessment grid relating to the considered Local Plan review sites within Moreton in Marsh. Any exceedences of the applied odour exposure benchmark of $C_{98,\ 1\text{-hour}}$ 3.0ou_E/m^3 are displayed in bold text.

Table 7-1
Moreton in Marsh WwTW – Maximum Modelled Odour Concentrations on Local Plan Review Sites

Meteorological Year	Maximum Modelled Odour Concentration (ou_E/m^3) (A)		
	Site MOR_E6	Site MOR_E11	Site M_12A
2012	0.87	**4.30**	1.11
2013	0.70	**5.19**	1.07
2014	0.70	**4.49**	1.05
2015	0.61	**3.97**	0.82
2016	0.65	**4.20**	1.04
Average of 2012 – 2016	0.69	**4.43**	1.02

Notes:
(A) Modelled impact as a 98th percentile of 1-hour average odour concentrations.

7.1.1 Recommendations for Local Plan Review

In making recommendations for review of the Local Plan sites as part of informing appropriate land-use allocations, the following have been considered:

- Figure AQ1-1 which presents those predicted odour concentrations arising from the standard operation of the Moreton in Marsh WwTW based upon the application of 2012 meteorological data (i.e. that which results in the maximum predicted odour exposure at the MOR_E6 and M_12A Local Plan review sites); and

- Figure AQ1-2 which presents those predicted odour concentrations arising from the standard operation of the Moreton in Marsh WwTW based upon the application of 2013 meteorological data (i.e. that which results in the maximum predicted odour exposure at the MOR_E11 Local Plan review site).

The MOR_E6, MOR_E11 and M_12A Local Plan review sites are to be considered for either residential or business (B2 / B8) use classes. Reference should be made to Section 3.1 for details of which site is currently being considered for which use class. Based upon the differing land-use classes and applicable receptor sensitivity, and considering the IAQM odour receptor sensitivity presented within Table 2-1, the following applied odour exposure benchmark criteria has been applied as part of this assessment:

- $C_{98,1\text{-hour}}$ 3.0ou_E/m^3 for potential residential uses classes (of 'high' receptor sensitivity); and
- $C_{98,1\text{-hour}}$ 5.0ou_E/m^3 for potential residential uses classes (of 'medium' receptor sensitivity).

Therefore, it is considered that the adoption of the following would represent a precautionary basis for the Local Plan review:

Site MOR_E6

- areas outside the applied odour exposure benchmark criterion of $C_{98,\ 1\text{-hour}}$ <3 ou_E/m^3 considered suitable for any development, including residential.

In accordance with the IAQM guidance, the magnitude of the predicted odour effect for the differing land uses is as follows:

- Slight adverse for locations of potential residential development (high sensitivity) where the predicted odour exposure is between $C_{98,\ 1\text{-hour}}$ 0.5ou_E/m^3 and $C_{98,\ 1\text{-hour}}$ 3.0ou_E/m^3;
- Negligible for locations of potential residential development (high sensitivity) where the predicted odour exposure is less than $C_{98,\ 1\text{-hour}}$ 0.5ou_E/m^3;
- Negligible for locations of potential places of work, commercial/retail premises and playing/recreation fields (medium sensitivity) at all predicted odour concentrations; and
- Negligible for locations of industrial use, farms, footpaths and roads (low sensitivity) at all predicted odour concentrations.

The predicted effect is 'not significant' at all considered locations on the MOR_E6 Local Plan review site within Moreton in Marsh, in accordance with the IAQM guidance.

Site MOR_E11

- areas outside the applied odour exposure benchmark criterion of $C_{98,\ 1\text{-hour}}$ <3 ou_E/m^3 considered suitable for any development, including residential;
- areas where exposure is predicted to be $C_{98,\ 1\text{-hour}}$ >3 ou_E/m^3 but $C_{98,\ 1\text{-hour}}$ <5 ou_E/m^3 considered suitable for less sensitive uses (places of work, commercial/retail premises and playing/recreation fields) – i.e. the small area to the south west; and
- areas where exposure is predicted to be $C_{98,\ 1\text{-hour}}$ >5 ou_E/m^3 representing areas suitable for non-sensitive uses where exposure would be only transient, e.g. green space (e.g. industrial use, farms, footpaths and roads), i.e. a few meters close to the SW boundary.

In accordance with the IAQM guidance, the magnitude of the predicted odour effect for the differing land uses is as follows:

- Slight adverse for locations of potential residential development (high sensitivity) where the predicted odour exposure is between $C_{98,\ 1\text{-hour}}$ 0.5ou_E/m^3 and $C_{98,\ 1\text{-hour}}$ 3.0ou_E/m^3;
- Negligible for locations of potential residential development (high sensitivity) where the predicted odour exposure is less than $C_{98,\ 1\text{-hour}}$ 0.5ou_E/m^3;
- Negligible for locations of potential places of work, commercial/retail premises and playing/recreation fields (medium sensitivity) at all predicted odour concentrations; and
- Negligible for locations of industrial use, farms, footpaths and roads (low sensitivity) at all predicted odour concentrations.

Information provided by CDC indicates that site MOR_E11 is currently to be considered for a potential B8 employment use allocation[22]. Based upon the IAQM odour receptor sensitivity presented within Table 2-1, this proposed land-use has been considered to be of 'medium' sensitivity for the purposes of determining the predicted impact and therefore the impact is negligible across the entire site, as illustrated in Drawing AQ1-13.

Providing that the above recommendations are followed for the allocation of appropriate land-uses, the predicted effect is 'not significant' at all considered locations on the MOR_E11 Local Plan review site within Moreton in Marsh, in accordance with the IAQM guidance.

Site M_12A

- areas outside the applied odour exposure benchmark criterion of $C_{98,\ 1\text{-hour}}$ <3 ou_E/m^3 considered suitable for any development, including residential.

In accordance with the IAQM guidance, the magnitude of the predicted odour effect for the differing land uses is as follows:

- Slight adverse for locations of potential residential development (high sensitivity) where the predicted odour exposure is between $C_{98,\ 1\text{-hour}}$ 0.5ou_E/m^3 and $C_{98,\ 1\text{-hour}}$ 3.0ou_E/m^3;
- Negligible for locations of potential residential development (high sensitivity) where the predicted odour exposure is less than $C_{98,\ 1\text{-hour}}$ 0.5ou_E/m^3;
- Negligible for locations of potential places of work, commercial/retail premises and playing/recreation fields (medium sensitivity) at all predicted odour concentrations; and
- Negligible for locations of industrial use, farms, footpaths and roads (low sensitivity) at all predicted odour concentrations.

The predicted effect is 'not significant' at all considered locations on the MOR_E6 Local Plan review site within Moreton in Marsh, in accordance with the IAQM guidance.

7.2 Dispersion Modelling Results – Northleach WwTW

Modelled dispersion of odours (as a 98th percentile of 1-hour mean concentrations) from the standard operation of the Northleach WwTW presented within Appendix 01 illustrating:

- Figure AQ1-7 Northleach WwTW modelled odour concentrations, 2012 meteorology;
- Figure AQ1-8 Northleach WwTW modelled odour concentrations, 2013 meteorology;

[22] E-mail communication between James Brain, Forward Planning Manager at Cotswold District Council, and SLR Consulting Ltd, dated 29th March 2017.

- Figure AQ1-9 Northleach WwTW modelled odour concentrations, 2014 meteorology;
- Figure AQ1-10 Northleach WwTW modelled odour concentrations, 2015 meteorology;
- Figure AQ1-11 Northleach WwTW modelled odour concentrations, 2016 meteorology; and
- Figure AQ1-12 Northleach WwTW modelled odour concentrations, average of 2012 – 2016 meteorology.

Table 7-2 presents maximum modelled odour concentrations for the considered scenario and from each modelled meteorological year, including an average of the 5-year period. It is noted that these odour concentrations are the maximum modelled concentrations predicted anywhere on the assessment grid relating to the considered Local Plan review sites within Northleach.

Table 7-2
Northleach WwTW – Maximum Modelled Odour Concentrations on Local Plan Review Sites

Meteorological Year	Maximum Modelled Odour Concentration (ou_E/m^3) (A)
	N_14B
2012	0.27
2013	0.27
2014	0.22
2015	0.26
2016	0.33
Average of 2012 – 2016	0.27

Notes:
(A) Modelled impact as a 98th percentile of 1-hour average odour concentrations.

7.2.1 Recommendations for Local Plan Review

In making recommendations for review of the Local Plan sites as part of informing appropriate land-use allocations, the following have been considered:

- Figure AQ1-11 which presents those predicted odour concentrations arising from the standard operation of the Northleach WwTW based upon the application of 2016 meteorological data (i.e. that which results in the maximum predicted odour exposure at the N_14B Local Plan review site).

Therefore, it is considered that the adoption of the following would represent a precautionary basis for the Local Plan review:

Site N_14B

- areas outside the applied odour exposure benchmark criterion of $C_{98,\ 1\text{-hour}}$ <3 ou_E/m^3 considered suitable for any development, including residential – this constitutes the entire site.

In accordance with the IAQM guidance, the magnitude of the predicted odour effect for the differing land uses is as follows:

- Slight adverse for locations of potential residential development (high sensitivity) where the predicted odour exposure is between $C_{98,\ 1\text{-hour}}$ 0.5ou$_E$/m^3 and $C_{98,\ 1\text{-hour}}$ 3.0ou$_E$/m^3;
- Negligible for locations of potential residential development (high sensitivity) where the predicted odour exposure is less than $C_{98,\ 1\text{-hour}}$ 0.5ou$_E$/m^3;
- Negligible for locations of potential places of work, commercial/retail premises and playing/recreation fields (medium sensitivity) at all predicted odour concentrations; and
- Negligible for locations of industrial use, farms, footpaths and roads (low sensitivity) at all predicted odour concentrations.

The predicted effect is 'not significant' at all considered locations on the N_14B Local Plan review site within Northleach, in accordance with the IAQM guidance.

8.0 Discussion and Conclusion

SLR has undertaken an Odour Constraints Assessment of identified sources of odour from the Moreton in Marsh WwTW and Northleach WwTW.

Odour impact from the Moreton in Marsh WwTW and the Northleach WwTW has been quantified by dispersion modelling, with a precautionary approach and model inputs applied as part robust assessment.

Dispersion modelling of odour from the standard operation of the Moreton in Marsh WwTW and the Northleach WwTW has been compared against the following odour impact criterion:

- $C_{98,1\text{-hour}}$ 3.0ou_E/m^3 for potential residential use classes (of 'high' receptor sensitivity, such as residential uses); and
- $C_{98,1\text{-hour}}$ 5.0ou_E/m^3 for potential employment use classes (of 'medium' receptor sensitivity, such as employment uses).

Locations which exceed these criterion would not be appropriate for development to safeguard the amenity of the development from WwTW related odour impacts. The use of the $C_{98,\ 1\text{-hour}}$ 3.0ou_E/m^3 assessment criterion accords with

- the recommendations of the CIWEM; and
- Planning Inspector Appeal judgements at a number of development sites where residential encroachment to existing WwTWs were proposed.

On the basis of this Odour Constraints Assessment and the inputs applied, the land-use allocations proposed by CDC are considered appropriate, as follows:

- Moreton in Marsh
  - M_12A – suitable for residential uses;
  - MOR_E6 – suitable for employment uses; and
  - MOR_E11 – suitable for employment uses.
- Northleach:
  - N_14B – suitable for residential uses; and
  - N_14B (Northleach) – suitable for residential uses.

The predicted effect is 'not significant' on any of the identified sites, based upon the above considered use classes, in accordance with the stated IAQM guidance.

It is noted that the results of this assessment are a high level overview to inform appropriate land-use allocations. It is considered highly likely that Thames Water would require specific odour assessments to support individual planning application for each site when they are taken forward, to assess updated potential constraints from WwTW operational odour.

As such, it is considered that odour does not represent a material constraint to the development proposals, which conform to the principles of National Planning Policy Framework.

APPENDIX 01

Figures – Modelled Odour Contours and Impact Descriptors

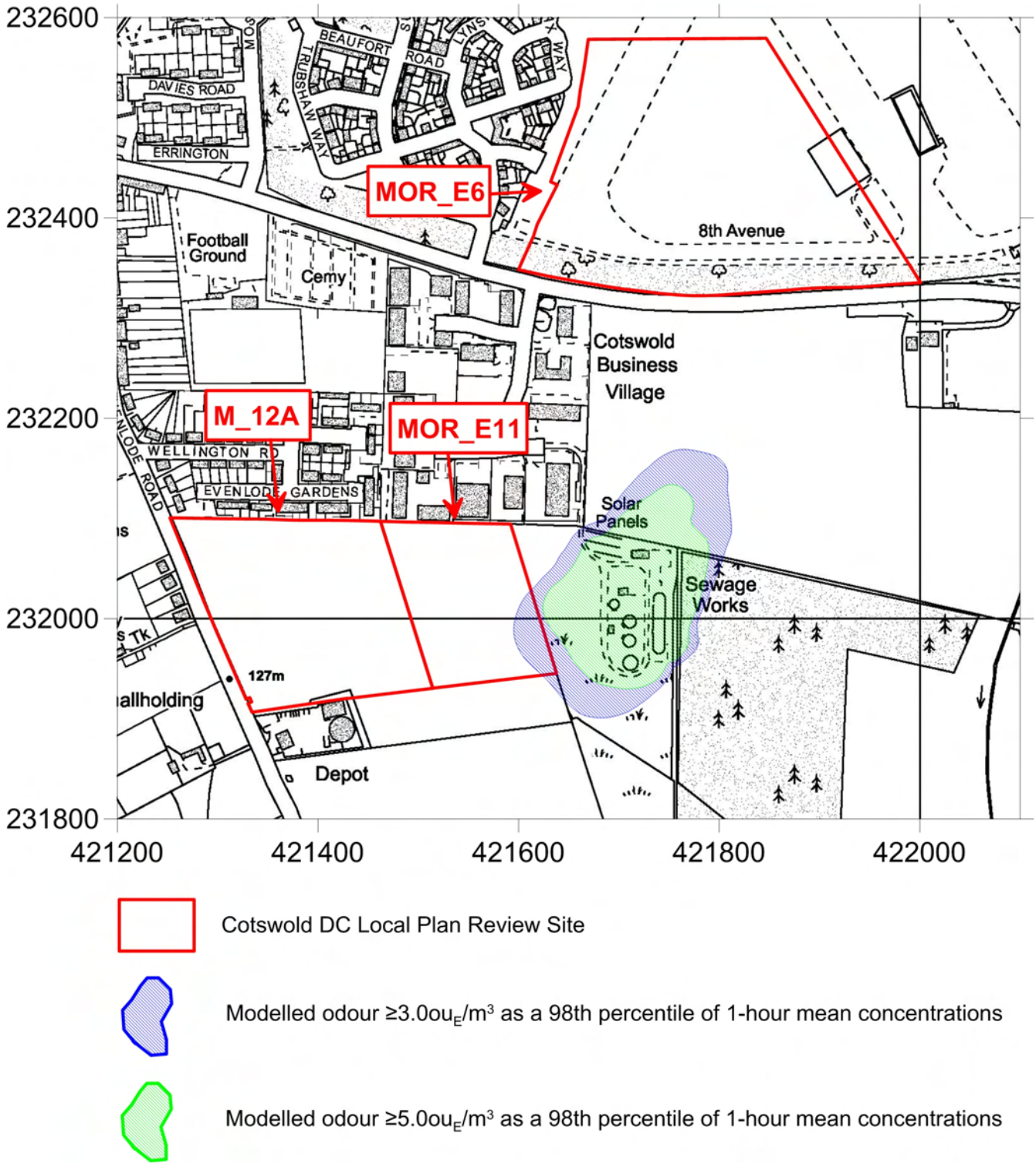

Figure AQ1-1
Moreton in Marsh WwTW – Modelled $C_{98\ 1\text{-hour}}$ Odour Impact: 2012 Meteorological Data

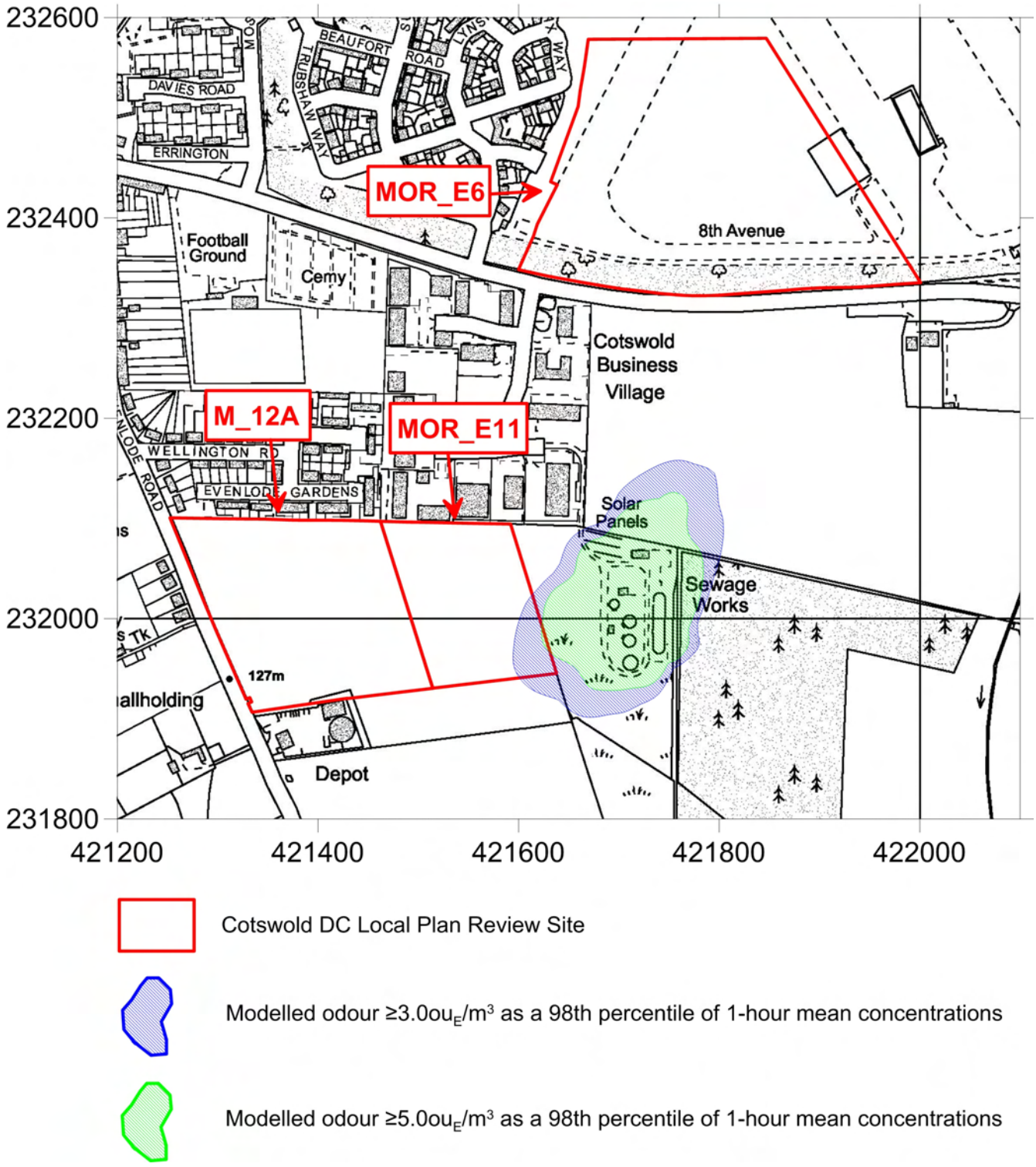

Figure AQ1-2
Moreton in Marsh WwTW – Modelled $C_{98\ 1\text{-hour}}$ Odour Impact: 2013 Meteorological Data

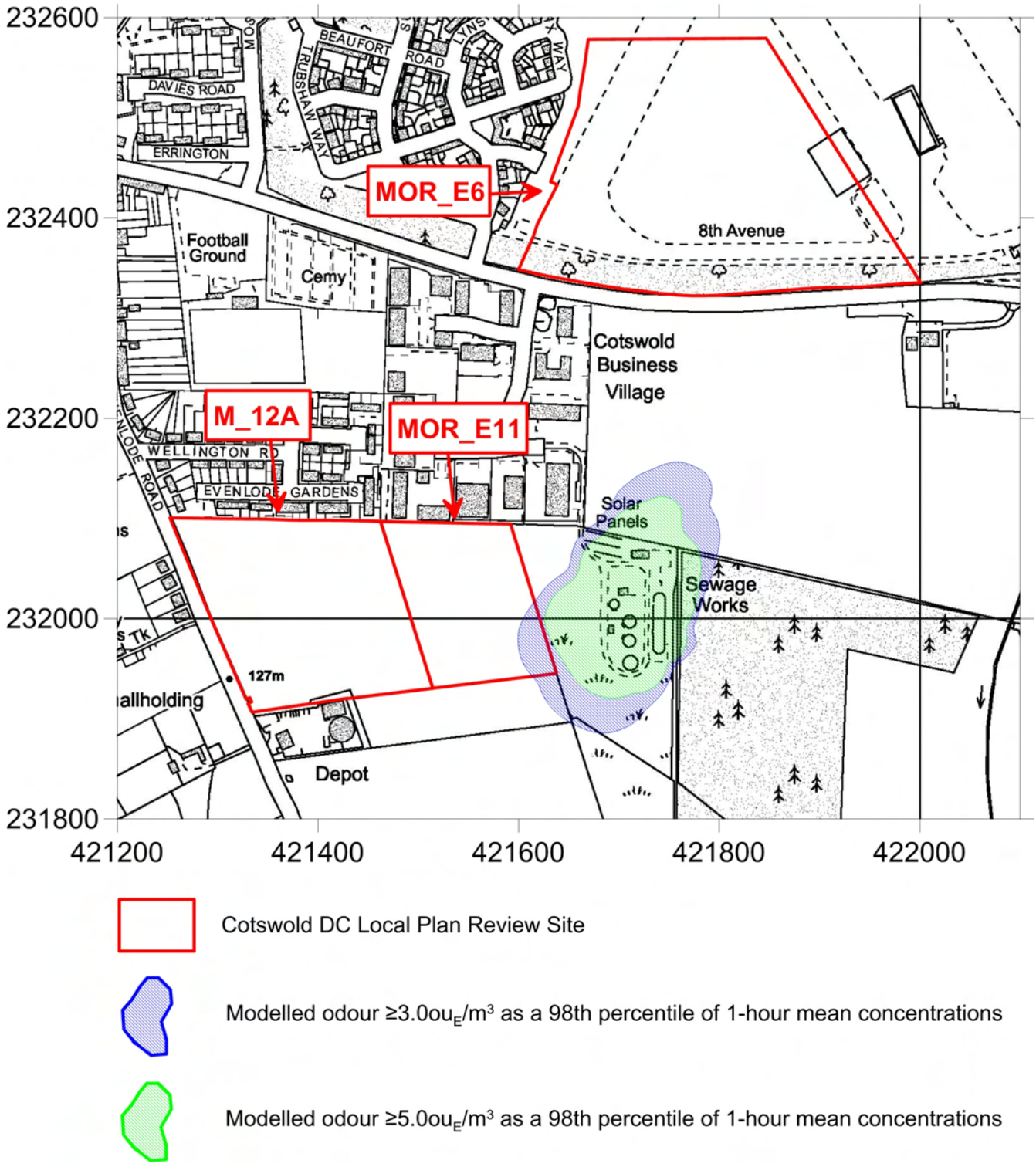

Figure AQ1-3
Moreton in Marsh WwTW – Modelled $C_{98\ 1\text{-hour}}$ Odour Impact: 2014 Meteorological Data

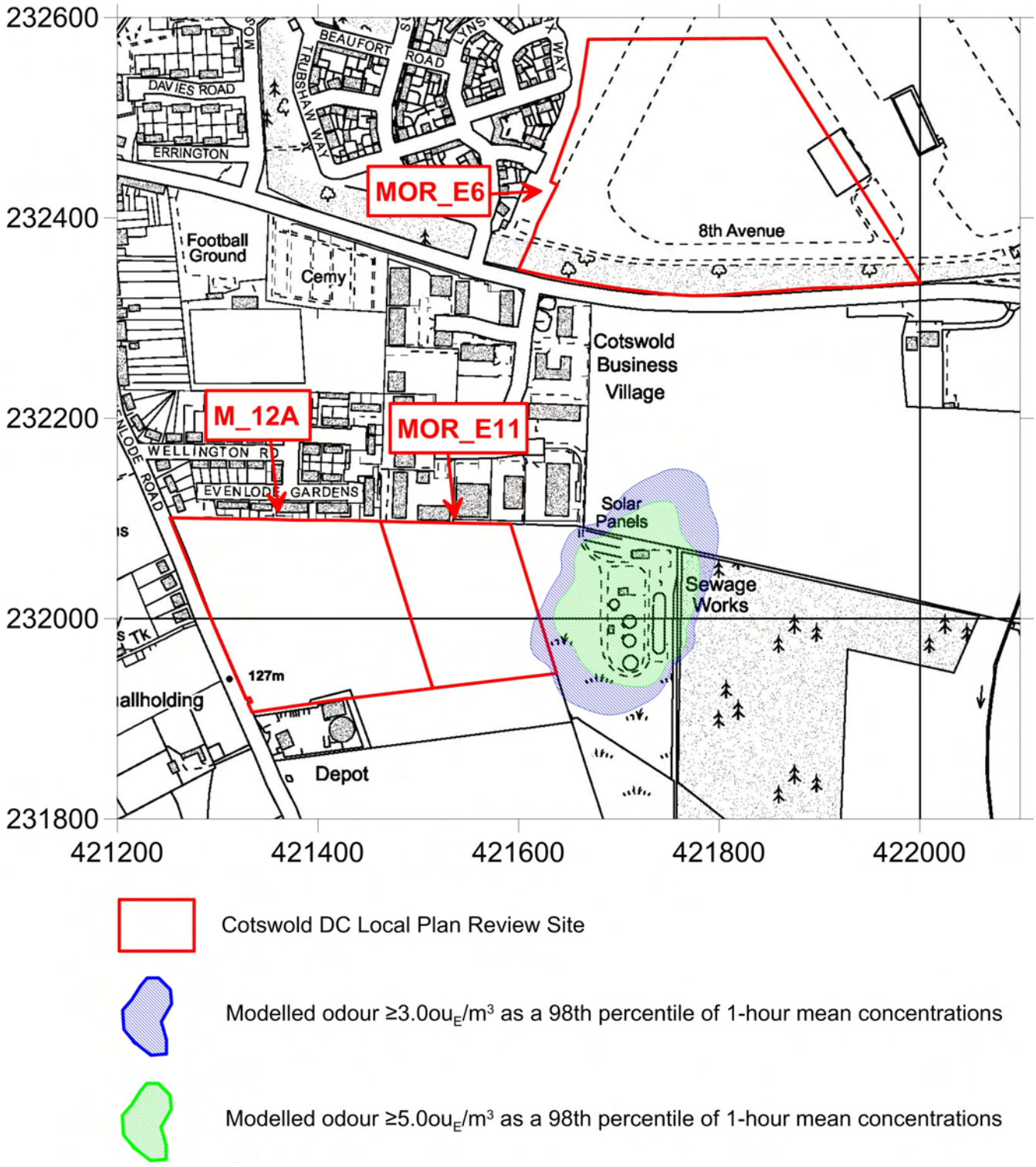

Figure AQ1-4
Moreton in Marsh WwTW – Modelled $C_{98\ 1\text{-hour}}$ Odour Impact: 2015 Meteorological Data

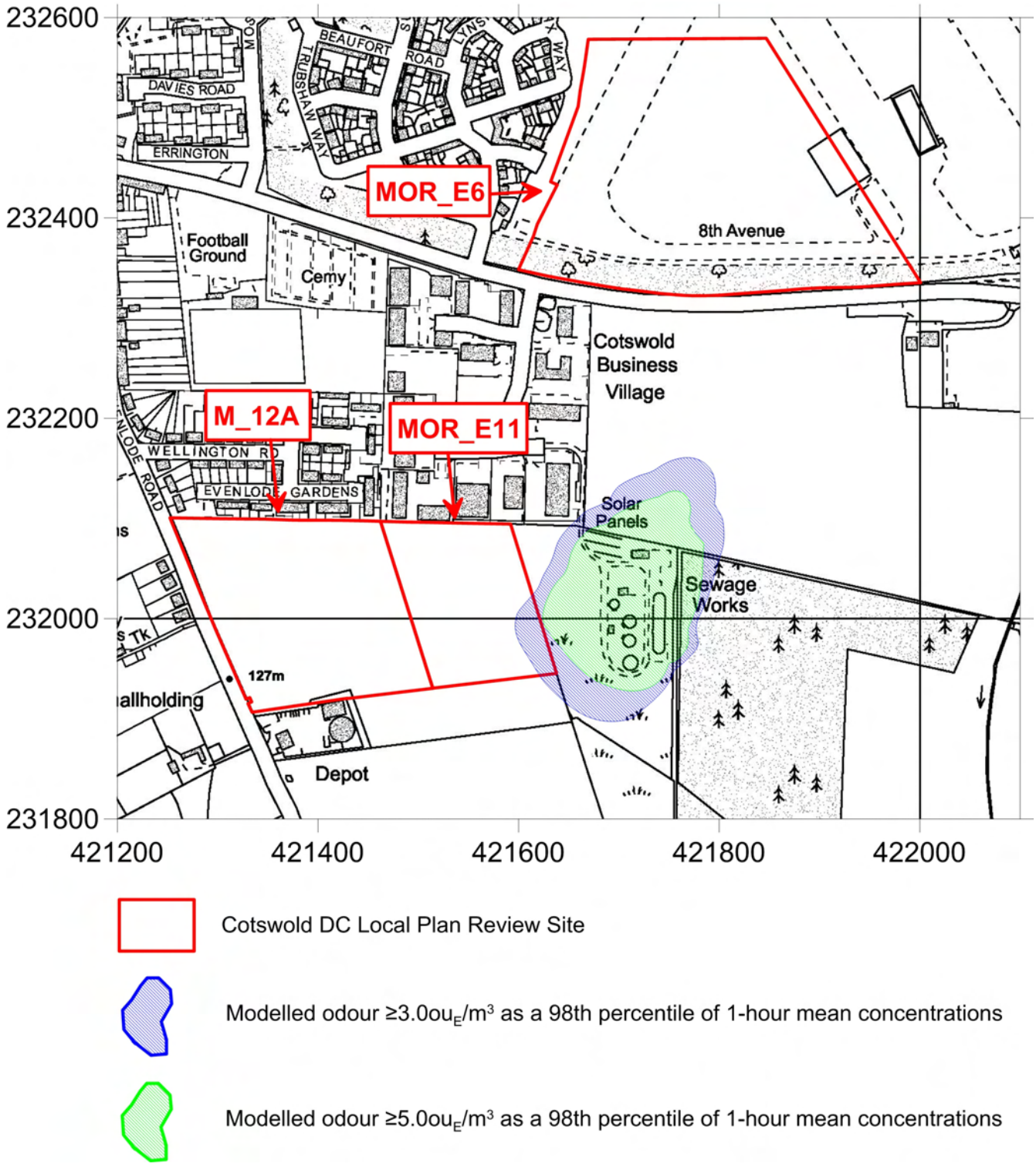

Figure AQ1-5
Moreton in Marsh WwTW – Modelled $C_{98\ 1\text{-hour}}$ Odour Impact: 2016 Meteorological Data

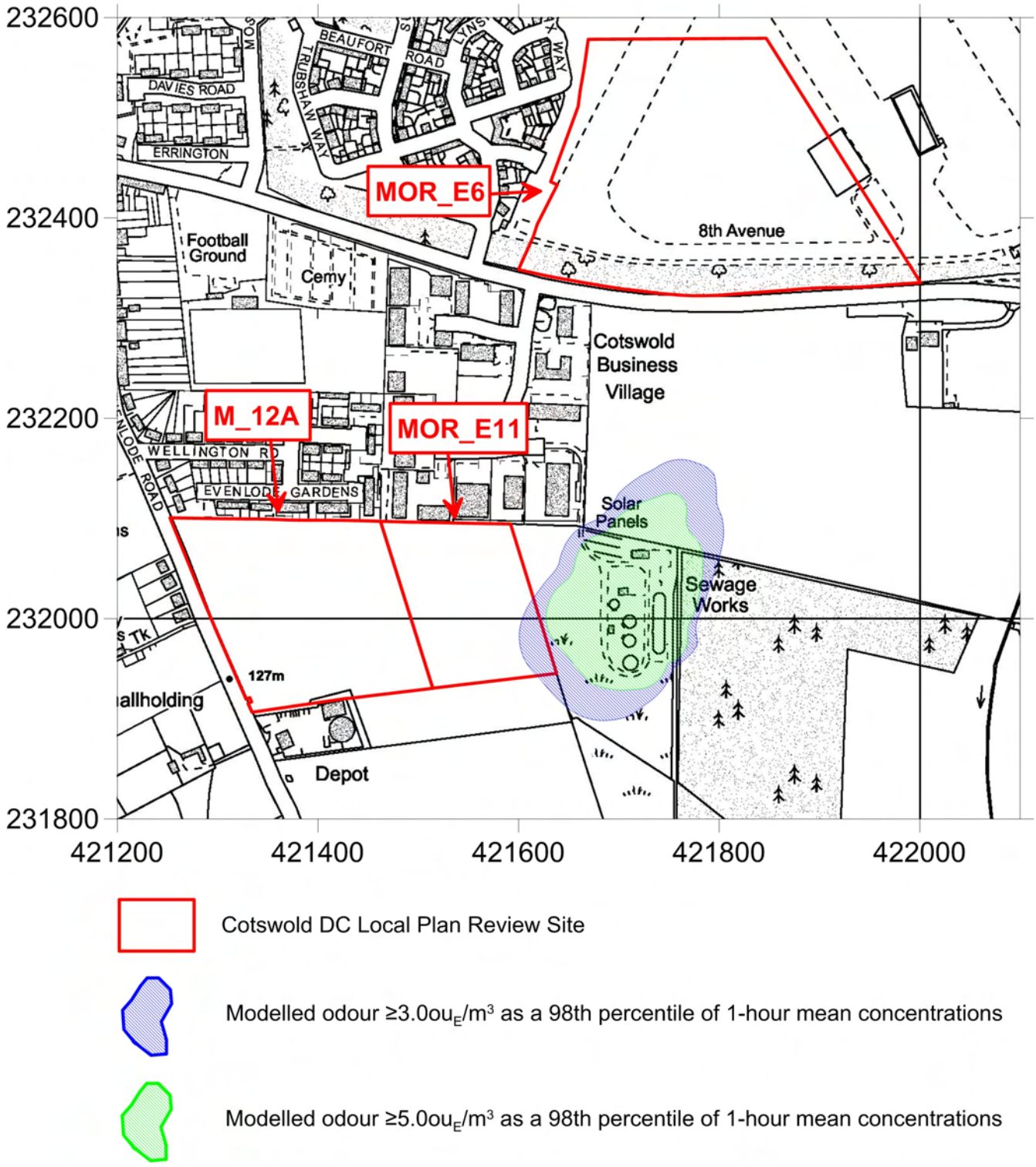

Figure AQ1-6
Moreton in Marsh WwTW – Modelled $C_{98\ 1\text{-}hour}$ Odour Impact: Average of 2012 – 2016 Meteorological Data

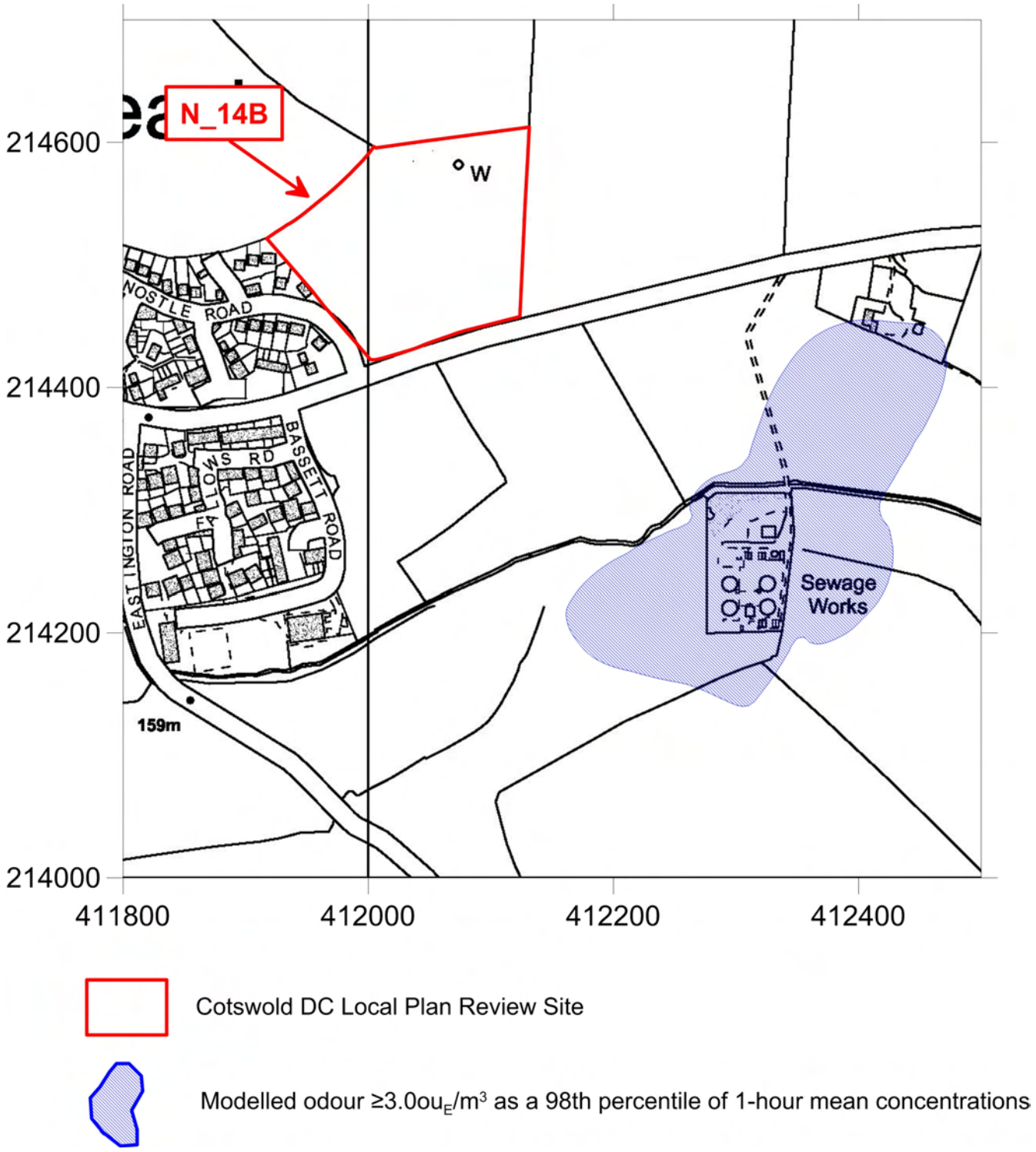

Figure AQ1-7
Northleach WwTW – Modelled $C_{98\ 1\text{-hour}}$ Odour Impact: 2012 Meteorological Data

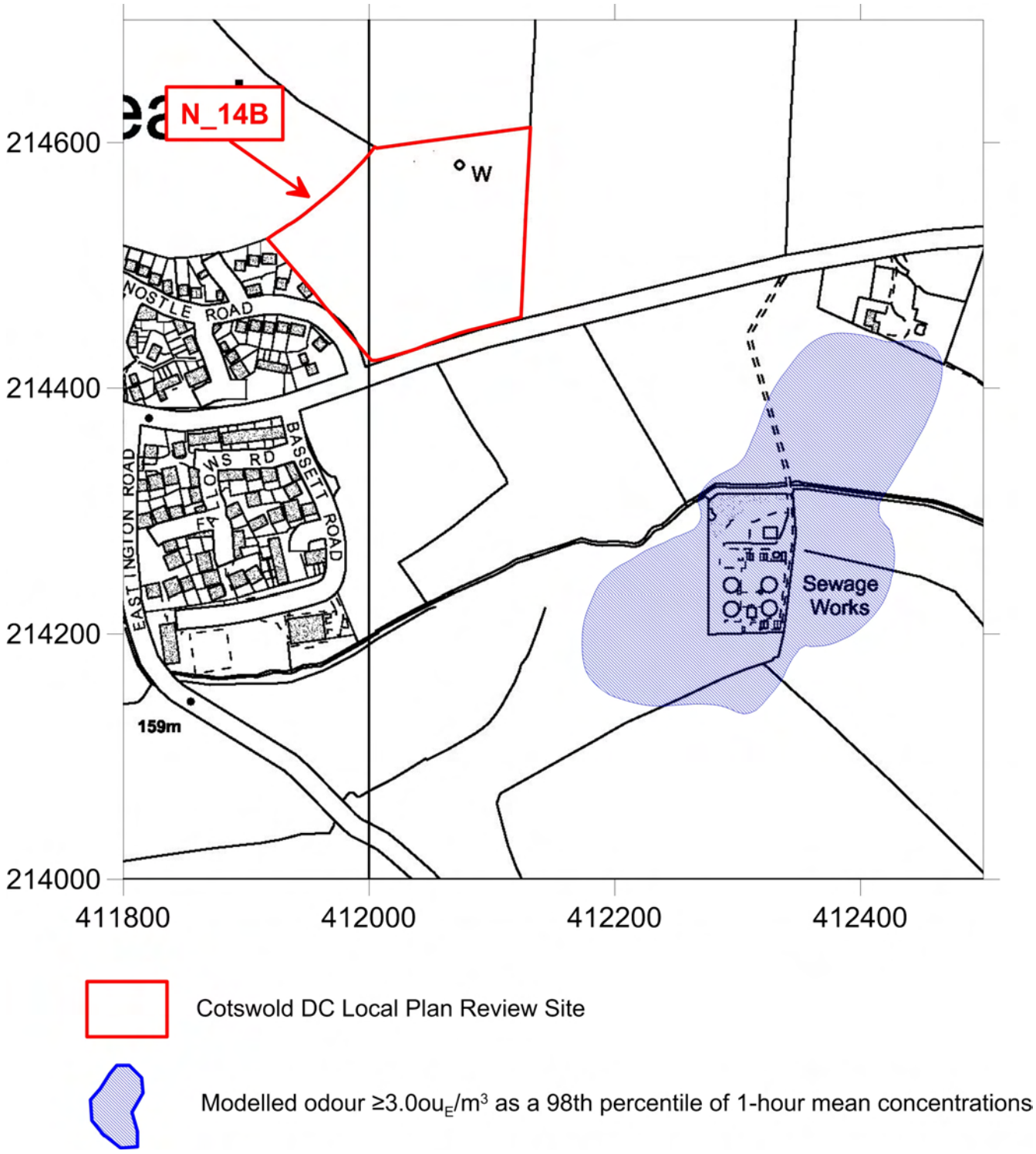

Figure AQ1-8
Northleach WwTW – Modelled $C_{98\ 1\text{-hour}}$ Odour Impact: 2013 Meteorological Data

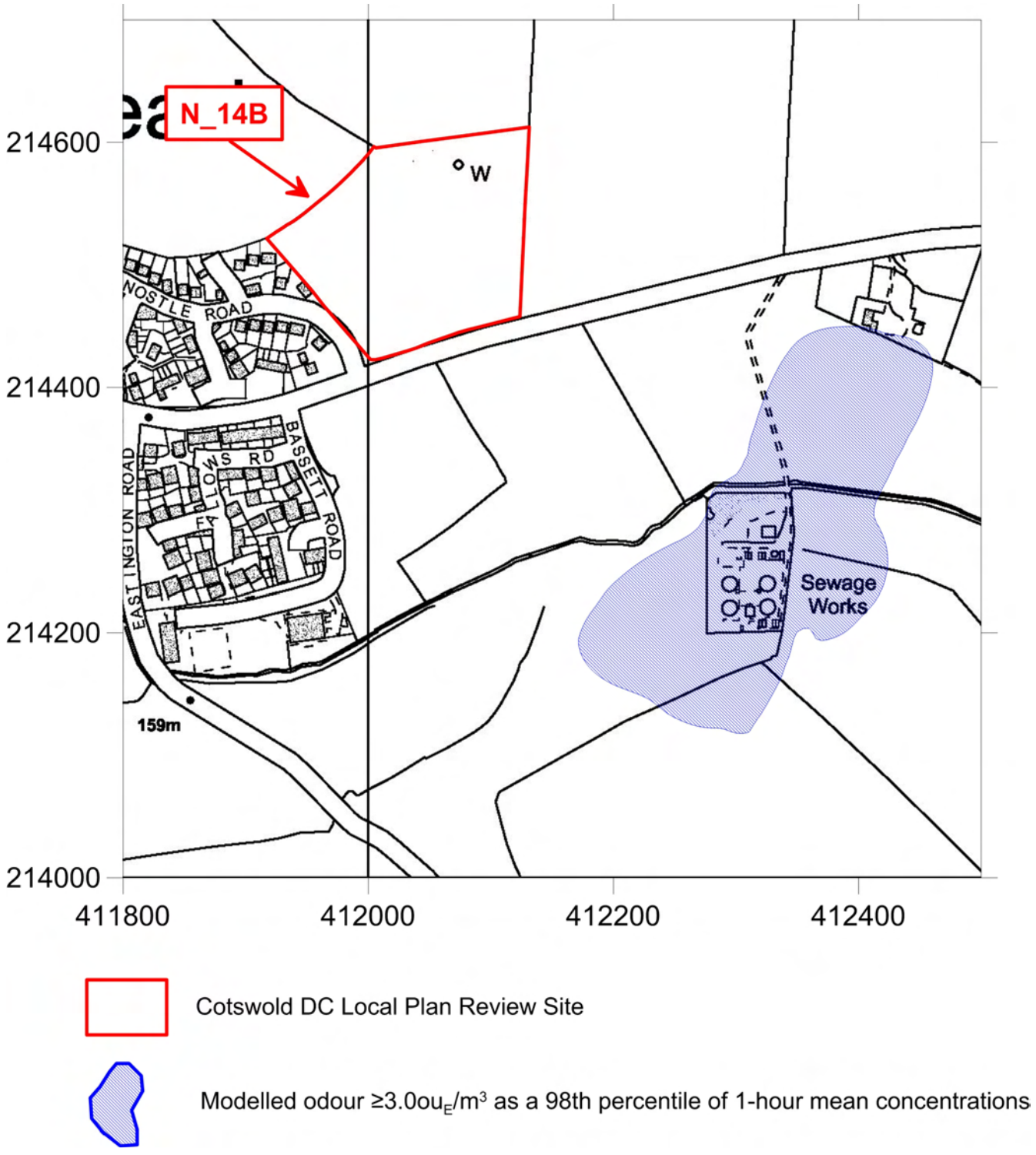

Figure AQ1-9
Northleach WwTW – Modelled $C_{98\ 1\text{-hour}}$ Odour Impact: 2014 Meteorological Data

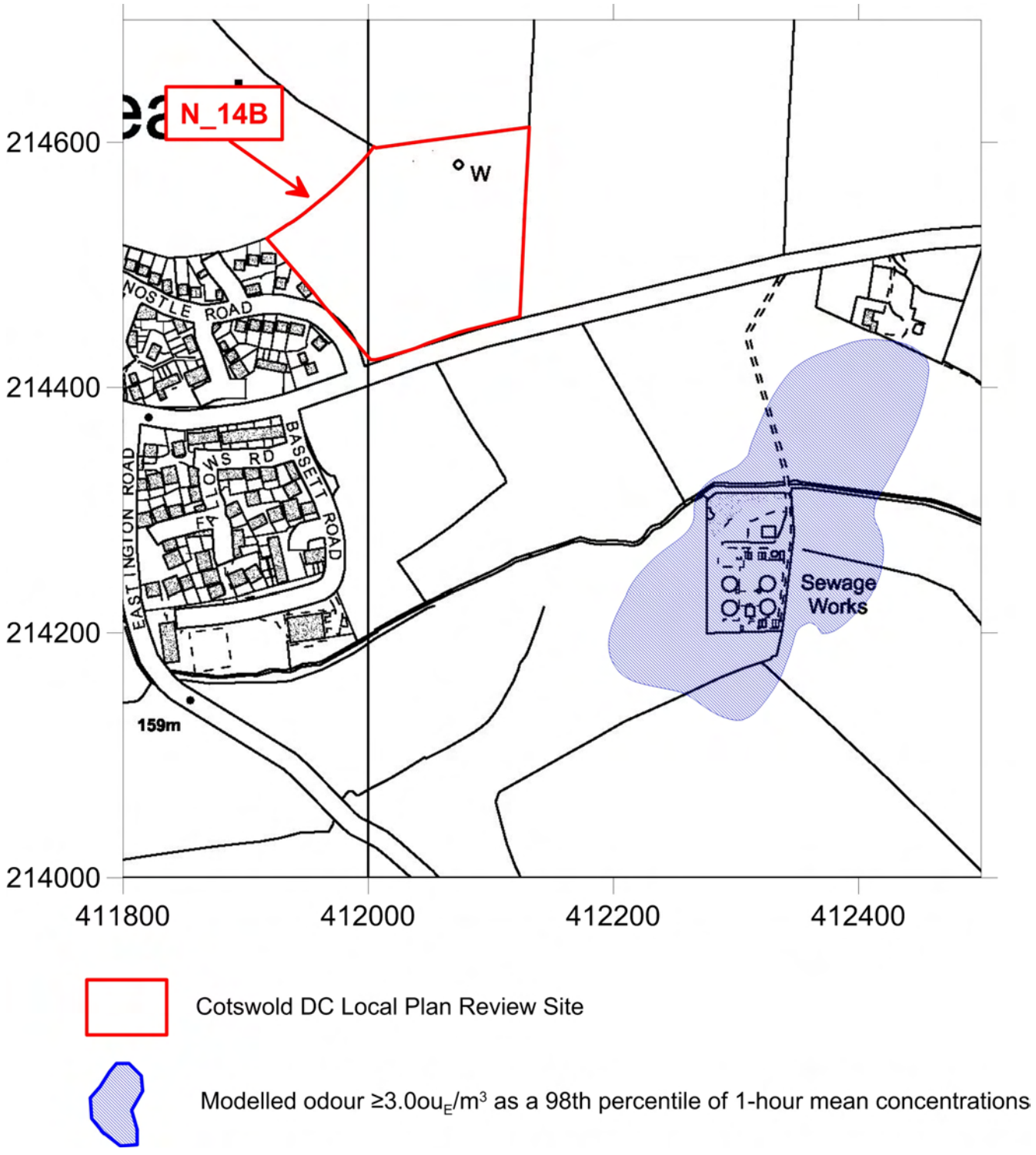

Figure AQ1-10
Northleach WwTW – Modelled $C_{98\ 1\text{-hour}}$ Odour Impact: 2015 Meteorological Data

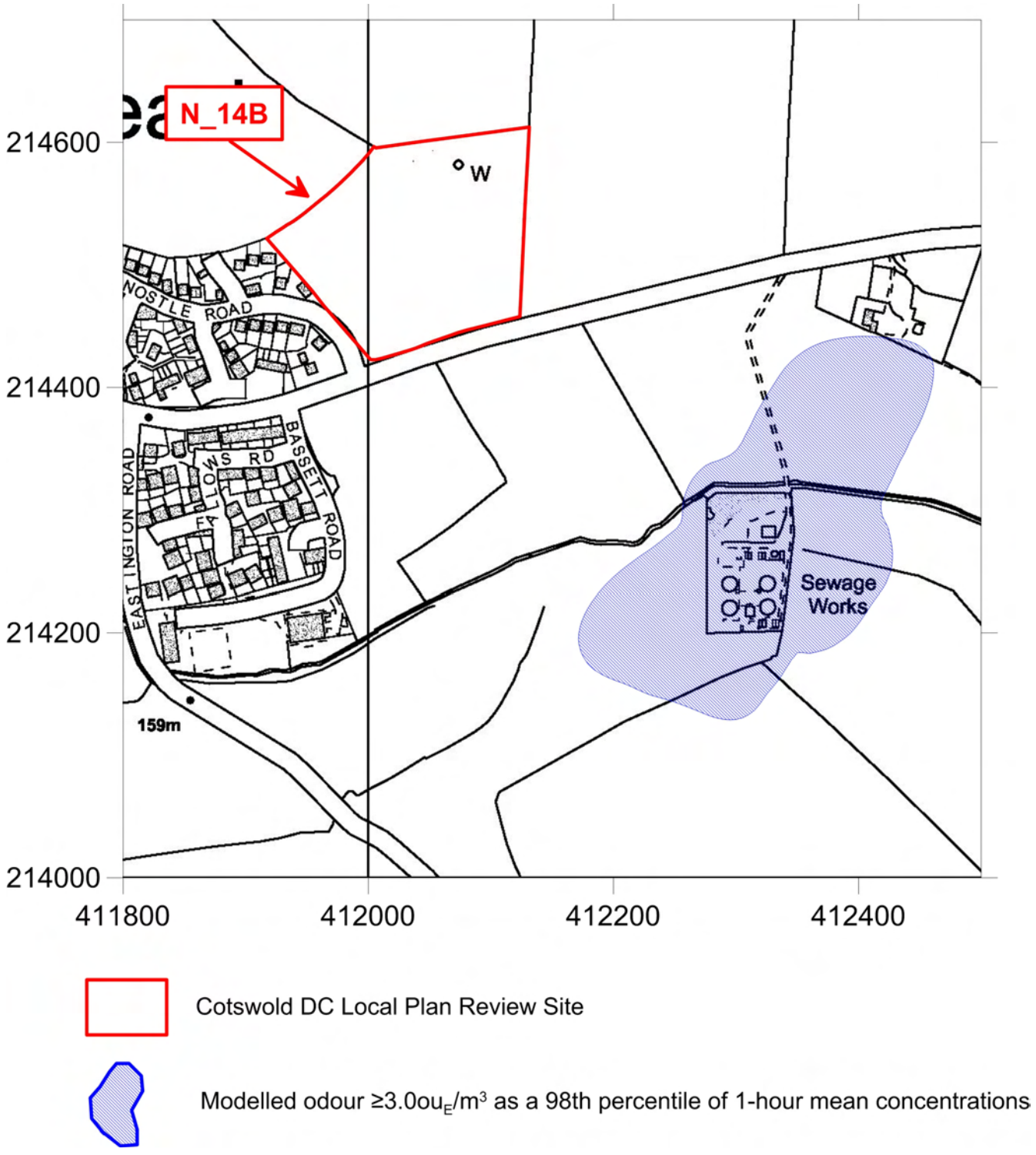

Figure AQ1-11
Northleach WwTW – Modelled $C_{98\ 1\text{-hour}}$ Odour Impact: 2016 Meteorological Data

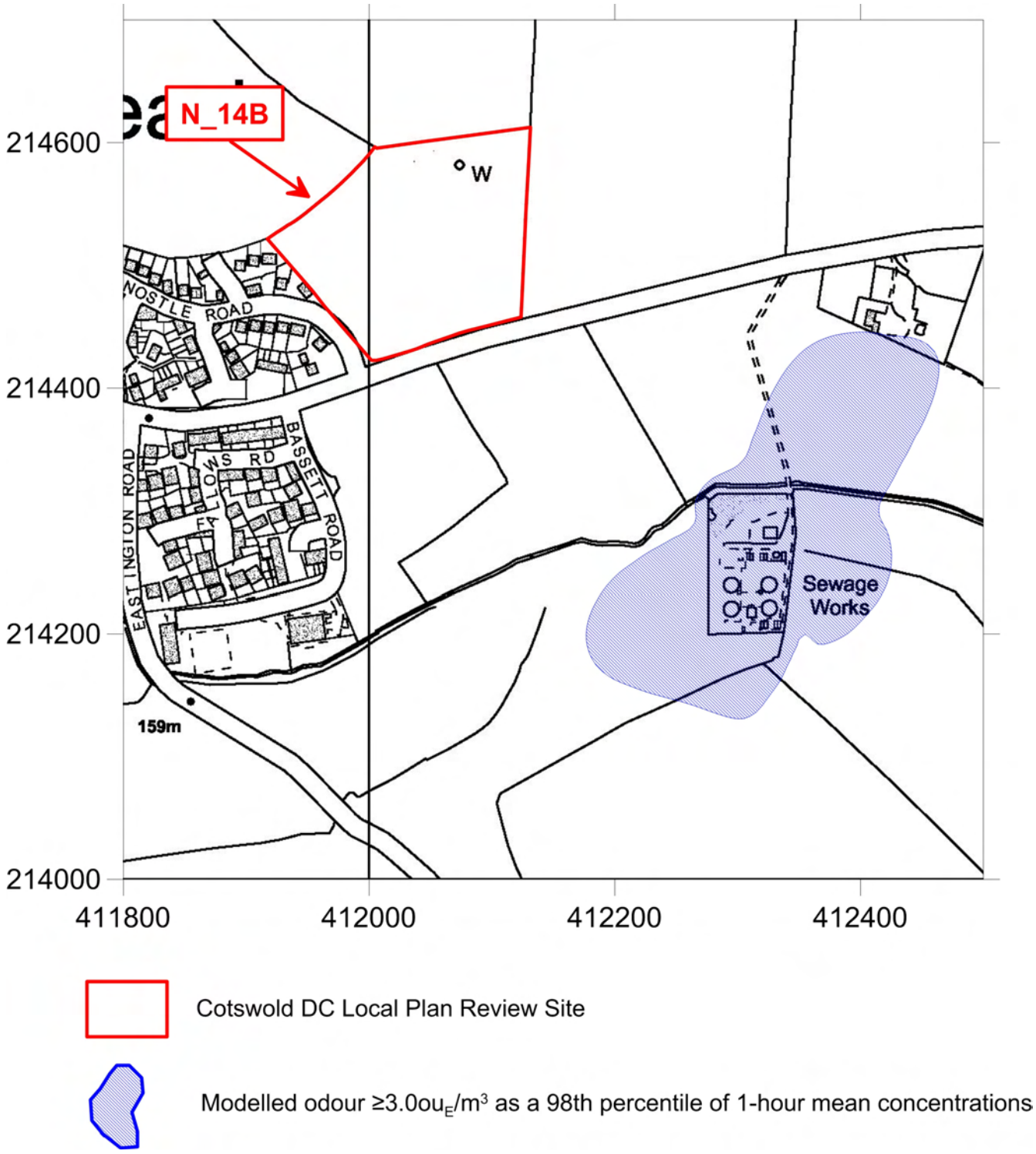

Figure AQ1-12
Northleach WwTW – Modelled $C_{98\ 1\text{-hour}}$ Odour Impact: Average of 2012 – 2016 Meteorological Data

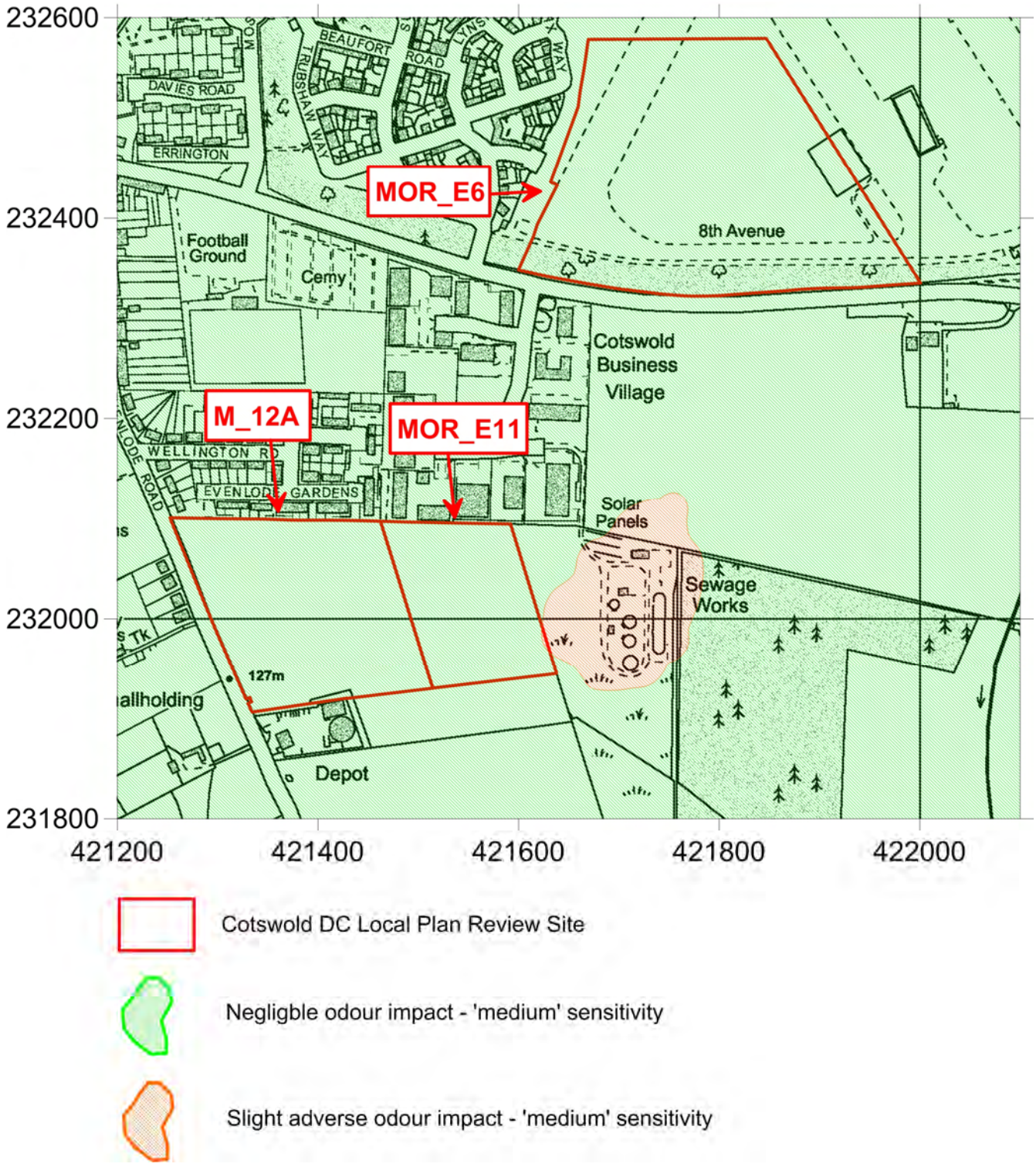

Figure AQ1-12
Moreton in Marsh WwTW – Modelled Odour Impact Descriptors: 'Medium' Sensitivity, 2013 Meteorological Data

APPENDIX 02

Wind Roses

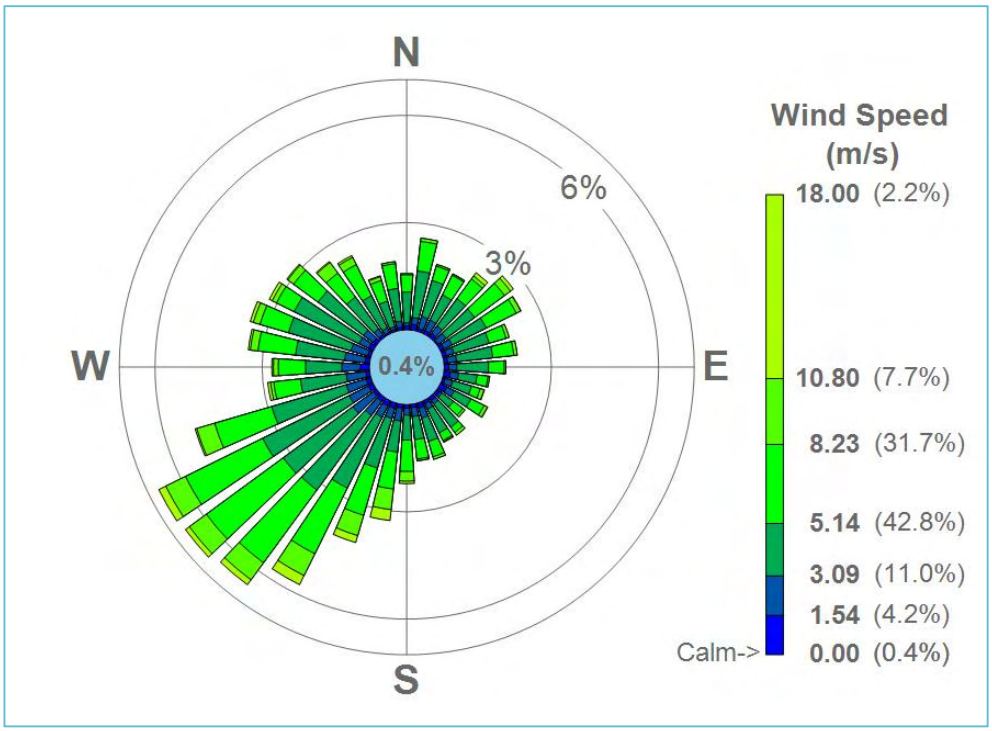

Figure AQ2-1
Little Rissington Wind Rose 2012

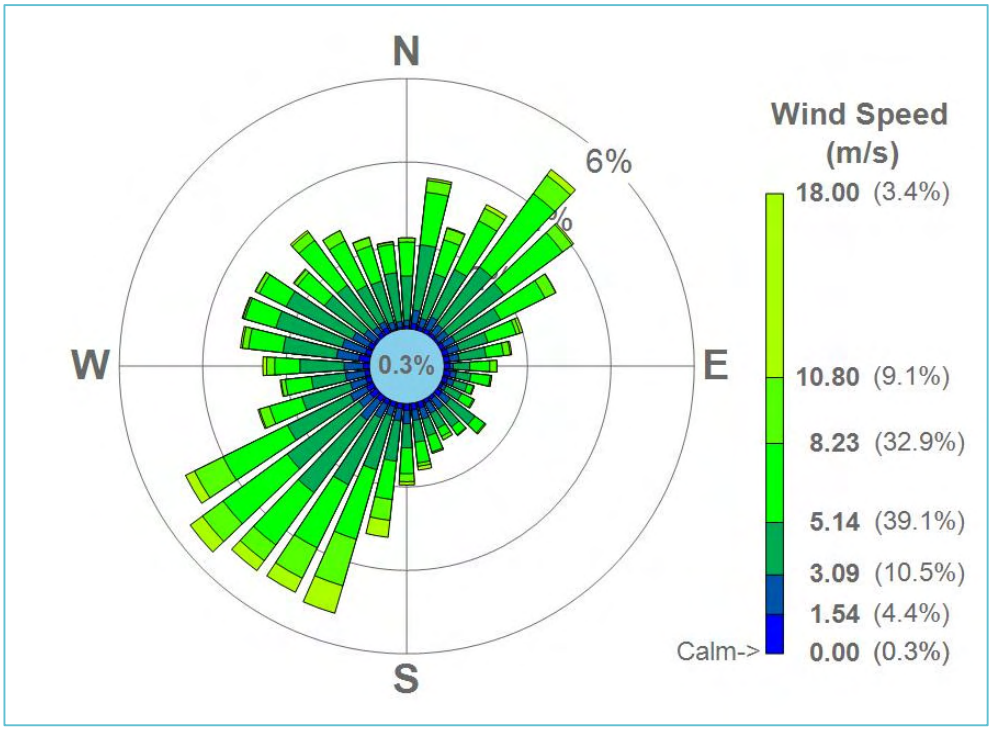

Figure AQ2-1
Little Rissington Wind Rose 2013

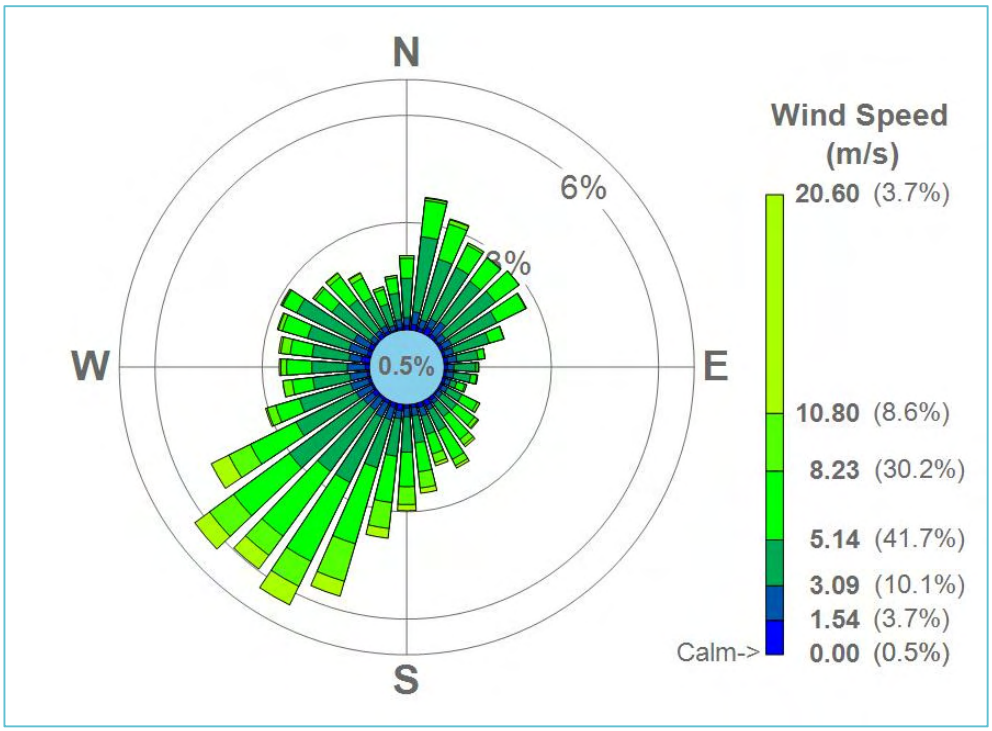

Figure AQ2-1
Little Rissington Wind Rose 2014

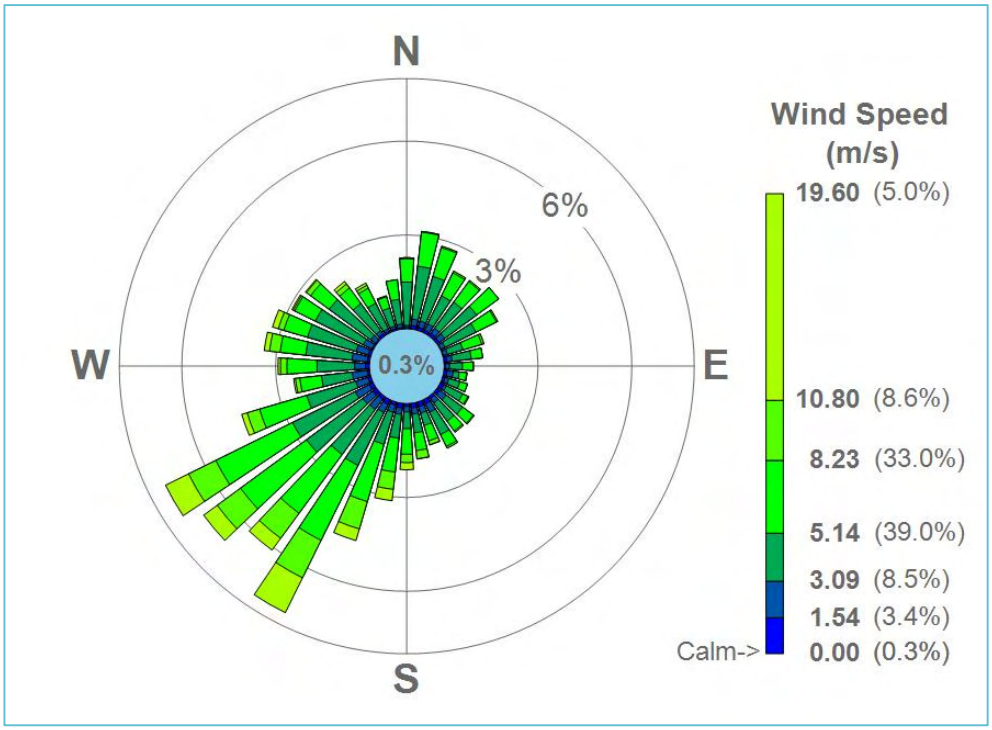

Figure AQ2-1
Little Rissington Wind Rose 2015

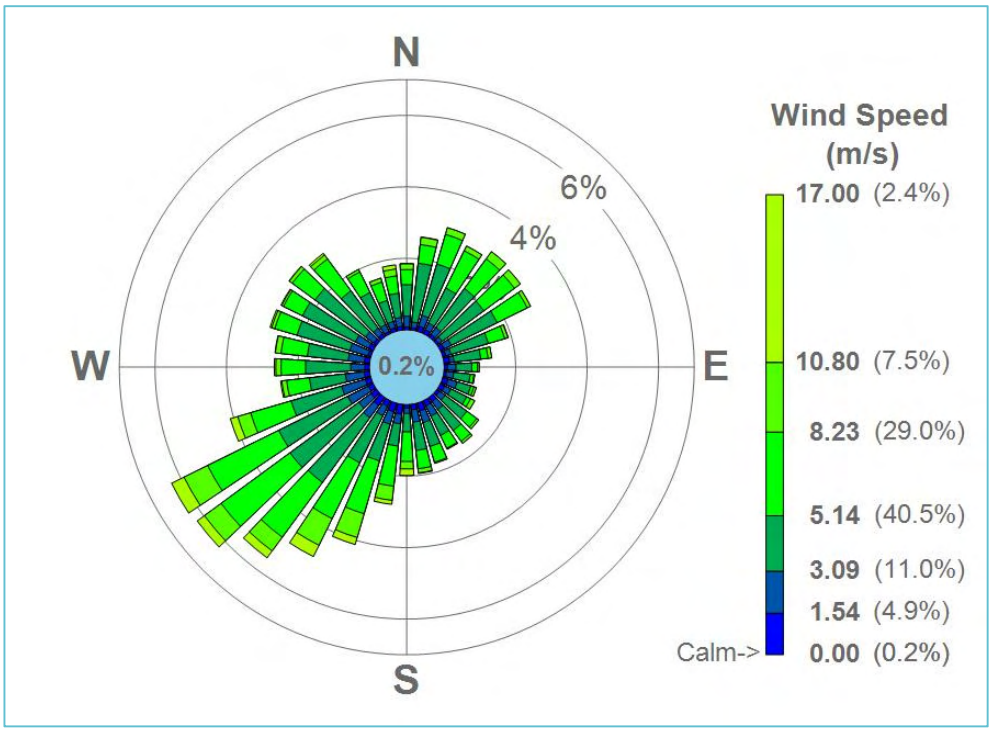

Figure AQ2-1
Little Rissington Wind Rose 2016

APPENDIX 03

Freedom of Information Responses

Graeme Blacklock

From: ERS <ers@2020partnership.uk>
Sent: 22 May 2017 13:50
To: Graeme Blacklock
Cc: 'FOI'
Subject: FOI 17226

Dear Mr Blacklock

With regards to your below FOI request, reference FOI 17226, Cotswold District Council have not received any complaints in relation to the Wastewater Treatment Works in Northleach.

If you are unhappy with the service you have received in relation to your request and wish to make a complaint you should write to The Monitoring Officer, Cotswold District Council, Trinity Road, Cirencester, Gloucestershire GL7 1PX.

If you are not content with the outcome of your complaint, you may apply directly to the Information Commissioner (ICO) for a decision. Generally, the ICO cannot make a decision unless you have exhausted the complaints procedure provided by the Council. The ICO can be contacted at: The Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire SK9 5AF.

Kind Regards,

Nicky Butler
Technical Officer – Business Support

✉ ers@2020partnership.uk Twitter: @ERSLive

☎ West Oxfordshire District Council (01993) 861000
☎ Cotswold District Council (01285) 623000
☎ Forest of Dean District Council (01594) 810000

partnership 2020
Environmental & Regulatory Services

Environmental and Regulatory Services
Protecting Health, Supporting Growth
Pollution I Food & Safety I Private Sector Housing I Licensing I Building Control
Working on behalf of Cotswold District Council, Forest of Dean District Council, West Oxfordshire District Council

From: Cotswold DC
Sent: 27 April 2017 11:07
To: Cotswold DC
Subject: General enquiry form. Freedom of Information Request (SERVICE EMAIL). - Cotswold District Council Reference: CDC_000000146186

Cotswold District Council

Your receipt - General enquiry:
CDC_000000146186
Visit the Cotswold District Council website.

Freedom of Information Request

F.A.O: Cotswold Environmental Health / Pollution Department – Freedom on Information Request

Good morning

I am writing to request information under the Freedom of Information Act 2000 for any odour complaints which have been received from the local community surrounding the Northleach wastewater treatment works (WwTW), located off High Street / East End Place. The WwTW is operated by Thames Water.

I am specifically looking for any odour complaints which have been received in the last 5-years (since April 2012), which have been attributed to the operation of the Northleach WwTW and have subsequently been substantiated by Cotswold Environmental Health / Pollution team. If any odour complaints have been received, can you please detail the location and nature of these complaints. Whilst I appreciate that the exact location of the complaints may be confidential under the terms of the Freedom of Information act, if you are able to provide information on the general area (i.e. to the east / south / west of the WwTW) that would be very helpful.

For ease of reference, the approximate post code for the Northleach WwTW is GL54 3QJ and the National Grid Reference (NGR) is 412339, 214302.

Many thanks in advance for your response.

Kind regards,
Graeme

Contact details submitted

Name	Mr Graeme Blacklock
Address	SLR Consulting Ltd,Quay West,Trafford Wharf Road,Manchester,Greater Manchester,M17 1HH
Email	gblacklock@slrconsulting.com
Phone	0161 872 7564

Thank you for submitting this form. You will hear back from us if we need further information.

Graeme Blacklock

From: ERS <ers@2020partnership.uk>
Sent: 22 May 2017 14:18
To: Graeme Blacklock
Cc: 'FOI'
Subject: FOI 17227

Dear Mr Blacklock

With regards to your below FOI request, reference FOI 17227, please see the following response:

The following odour complaints have been received in relation to the Wastewater Treatment works in Moreton-in-Marsh:

2013 January(1) March(3) April(1)
2014 February(1)
2017 (April)(1 on behalf of 4 residences)

These complaints were received from the areas of GL56 0LY and GL56 0JH.

If you are unhappy with the service you have received in relation to your request and wish to make a complaint you should write to The Monitoring Officer, Cotswold District Council, Trinity Road, Cirencester, Gloucestershire GL7 1PX.

If you are not content with the outcome of your complaint, you may apply directly to the Information Commissioner (ICO) for a decision. Generally, the ICO cannot make a decision unless you have exhausted the complaints procedure provided by the Council. The ICO can be contacted at: The Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire SK9 5AF.

Kind Regards,

Nicky Butler
Technical Officer – Business Support

✉ ers@2020partnership.uk Twitter: @ERSLive

☎ West Oxfordshire District Council (01993) 861000
☎ Cotswold District Council (01285) 623000
☎ Forest of Dean District Council (01594) 810000

partnership 2020 Environmental & Regulatory Services

Environmental and Regulatory Services

Protecting Health, Supporting Growth

Pollution I Food & Safety I Private Sector Housing I Licensing I Building Control

Working on behalf of Cotswold District Council, Forest of Dean District Council, West Oxfordshire District Council

From: Cotswold DC
Sent: 27 April 2017 11:12

To: Cotswold DC
Subject: General enquiry form. Freedom of Information Request (SERVICE EMAIL). - Cotswold District Council Reference: CDC_000000146187

Cotswold District Council

Your receipt - General enquiry:
CDC_000000146187
Visit the Cotswold District Council website.

Freedom of Information Request
F.A.O: Cotswold Environmental Health / Pollution Department – Freedom on Information Request

Good morning

I am writing to request information under the Freedom of Information Act 2000 for any odour complaints which have been received from the local community surrounding the Moreton-in-Marsh wastewater treatment works (WwTW), located off the A44 London Road. The WwTW is operated by Thames Water.

I am specifically looking for any odour complaints which have been received in the last 5-years (since April 2012), which have been attributed to the operation of the Moreton-in-Marsh WwTW and have subsequently been substantiated by Cotswold Environmental Health / Pollution team. If any odour complaints have been received, can you please detail the location and nature of these complaints. Whilst I appreciate that the exact location of the complaints may be confidential under the terms of the Freedom of Information act, if you are able to provide information on the general area (i.e. to the east / south / west of the WwTW) that would be very helpful.

For ease of reference, the approximate post code for the Moreton-in-Marsh WwTW is GL56 0PS and the National Grid Reference (NGR) is 421550, 232120.

Many thanks in advance for your response.

Kind regards,
Graeme

Contact details submitted

Name	Mr Graeme Blacklock
Address	SLR Consulting Ltd,Quay West,Trafford Wharf Road,Manchester,Greater Manchester,M17 1HH
Email	gblacklock@slrconsulting.com
Phone	01618727564

Thank you for submitting this form. You will hear back from us if we need further information.

EUROPEAN OFFICES

United Kingdom

AYLESBURY
T: +44 (0)1844 337380

BELFAST
T: +44 (0)28 9073 2493

BRADFORD-ON-AVON
T: +44 (0)1225 309400

BRISTOL
T: +44 (0)117 906 4280

CAMBRIDGE
T: + 44 (0)1223 813805

CARDIFF
T: +44 (0)29 2049 1010

CHELMSFORD
T: +44 (0)1245 392170

EDINBURGH
T: +44 (0)131 335 6830

EXETER
T: + 44 (0)1392 490152

GLASGOW
T: +44 (0)141 353 5037

GUILDFORD
T: +44 (0)1483 889800

LEEDS
T: +44 (0)113 258 0650

LONDON
T: +44 (0)203 691 5810

MAIDSTONE
T: +44 (0)1622 609242

MANCHESTER
T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE
T: +44 (0)191 261 1966

NOTTINGHAM
T: +44 (0)115 964 7280

SHEFFIELD
T: +44 (0)114 245 5153

SHREWSBURY
T: +44 (0)1743 23 9250

STAFFORD
T: +44 (0)1785 241755

STIRLING
T: +44 (0)1786 239900

WORCESTER
T: +44 (0)1905 751310

Ireland

DUBLIN
T: + 353 (0)1 296 4667

France

GRENOBLE
T: +33 (0)4 76 70 93 41