planning
transport
design
environment
infrastructure

Document 3.1 – ES Volume 2

APPENDIX 5.6: Air Quality – Odour Assessment Methodology

Wheelabrator Kemsley (K3 Generating Station) and Wheelabrator Kemsley North (WKN) Waste to Energy Facility DCO

September 2019 -Submission Version **PINS ref: EN010083**

Appendix 5.6: Qualitative Odour Impact Assessment Methodology

Risk Assessment Methodology

1. The qualitative risk-ranking assessment of the odour impact of emissions from the proposed development site has been carried out using the method in the IAQM Guidance Appendix 1 (IAQM, 2014b) which provides examples of risk factors for odour source potential, pathway effectiveness and receptor sensitivity (set out in Table C.1).

Table C.1 IAQM Examples of Risk Factors for Odour Source, Pathway and Receptor

Source Odour Potential	Pathway Effectiveness	Receptor
Factors affecting the source odour potential include: • the magnitude of the odour release (taking into account odour-control measures) • how inherently odorous the compounds are • the unpleasantness of the odour	Factors affecting the odour flux to the receptor are: • distance from source to receptor the frequency (%) of winds from the source to receptor (or, qualitatively, the direction of receptors from source with respect to prevailing wind) • the effectiveness of any mitigation/control in reducing flux to the receptor • the effectiveness of dispersion/ dilution in reducing the odour flux to the receptor • topography and terrain	For the sensitivity of people to odour, the IAQM recommends that the air quality practitioner uses professional judgement to identify where on the spectrum between high and low sensitivity a receptor lies, taking into account the following general principles:
Large Source Odour Potential Magnitude - Larger Permitted processes of odorous nature or large STWs; materials usage hundreds of thousands of tonnes/m^3 per year; area sources of thousands of m^2. The compounds involved are very odorous (e.g. mercaptans), having very low Odour Detection Thresholds (ODTs) where known. Unpleasantness - processes classed as "Most offensive" in H4; or (where known) compounds/odours having unpleasant (-2) to very unpleasant (-4) hedonic score. Mitigation/control - open air operation with no containment, reliance solely on good management techniques and best practice.	**Highly Effective Pathway for Odour Flux to Receptor** Distance - receptor is adjacent to the source/site; distance well below any official set-back distances [a]. Direction - high frequency (%) of winds from source to receptor (or, qualitatively, receptors downwind of source with respect to prevailing wind). Effectiveness of dispersion/dilution - open processes with low-level releases, e.g. lagoons, uncovered effluent treatment plant, landfilling of putrescible wastes.	**High Sensitivity Receptor** - surrounding land where: • users` can reasonably expect enjoyment of a high level of amenity; and • the 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 Source Odour Potential Magnitude - smaller Permitted processes	**Moderately Effective Pathway for Odour Flux to Receptor**	**Medium Sensitivity Receptor** - surrounding land where:

Source Odour Potential	Pathway Effectiveness	Receptor
or small Sewage Treatment Works (STWs); materials usage thousands of tonnes/m^3 per year; area sources of hundreds of m^2. The compounds involved are moderately odorous. Unpleasantness – processes classed in H4 as "Moderately offensive"; or (where known) odours having neutral (0) to unpleasant (-2) hedonic score. Mitigation/control – some mitigation measures in place, but significant residual odour remains.	Distance – receptor is local to the source. Where mitigation relies on dispersion/dilution – releases are elevated, but compromised by building effects.	• 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.
Small Source Odour Potential Magnitude – falls below Part B threshold; materials usage hundreds of tonnes/m^3 per year; area sources of tens m^2. The compounds involved are only mildly odorous, having relatively high ODTs where known. Unpleasantness – processes classed as "Less offensive" in H4; or (where known) compounds/odours having neutral (0) to very pleasant (+4) hedonic score. Mitigation/control – effective, tangible mitigation measures in place (e.g. BAT, BPM) leading to little or no residual odour.	**Ineffective Pathway for Odour Flux to Receptor** Distance – receptor is remote from the source; distance exceeds any official set-back distances. Direction – low frequency (%) of winds from source to receptor (or, qualitatively, receptors upwind of source with respect to prevailing wind). Where mitigation relies on dispersion/ dilution – releases are from high level (e.g. stacks, or roof vents > 3 m above ridge height) and are not compromised by surrounding buildings	**Low Sensitivity Receptor** – surrounding land where: • 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, farms, footpaths and roads.

Notes: [a] Minimum setback distances may be defined for some odorous activities

Source

2. The first step of this qualitative assessment is to estimate the odour-generating potential of the site activities, termed the "Source Odour Potential". This takes into account three factors:

   i. The scale (magnitude) of the release from the odour source, taking into account the effectiveness of any odour control or mitigation measures that are already in place. This involves judging the relative size of the release rate after mitigation and taking account of any pattern of release (e.g. intermittency). The assumption has been made, as required by the NPPF, that the pollution-control regimes applying to these sites will operate effectively and that the appropriate BAT standards of odour control will be enforced.

ii. How inherently odorous the emission is. In some cases it may be known whether the release has a low, medium or high odour detection threshold (ODT); this is the concentration at which an odour becomes detectable to the human nose. In most instances the odours released by a source will be a complex mixture of compounds and the detectability will not be known. However, for some industrial processes the odour will be due to one or a small number of known compounds and the detection thresholds will be a good indication of whether the release is highly odorous or mildly odorous.

iii. The relative pleasantness/unpleasantness* of the odour. Lists of relative pleasantness of different substances are given in the Environment Agency guidance H4 Odour Management (Environment Agency, 2011)

3. Using the example risk ranking in Table C.2, the Source Odour Potential can be categorised as small, medium or large.

Table C.2 H4 Offensiveness of Odour Emission Sources

Offensiveness	Odour Emission Sources
Most Offensive	Processes involving decaying animal or fish remains Processes involving septic effluent or sludge Biological landfill odours
Moderately Offensive	Intensive livestock rearing Fat frying (food processing) Sugar beet processing Well aerated green waste composting
Less Offensive	Brewery Confectionary Coffee

Pathway Effectiveness

4. Next, the effectiveness of the pollutant pathway as the transport mechanism for odour through the air to the receptor, versus the dilution/dispersion in the atmosphere, needs to be estimated. Anything that increases dilution and dispersion of the odorous pollutant plume as it travels from source (e.g. processes and plant) to receptor will reduce the concentration at the receptor, and hence reduce exposure. Important factors to consider here are:

i. The distance of sensitive receptors from the odour source.

* This can be measured in the laboratory as the hedonic tone, and when measured by the standard method and expressed on a standard nine-point scale it is termed the hedonic score.

ii. Whether these receptors are downwind (with respect to the predominant prevailing wind direction). Odour episodes often tend to occur during stable atmospheric conditions with low wind speed, which gives poor dispersion and dilution; receptors close to the source in all directions around it can be affected under these conditions. When conditions are not calm, it will be the downwind receptors that are affected. Overall therefore, receptors that are downwind with respect to the prevailing wind direction tend to be at higher risk of odour impact.

iii. The effectiveness of the point of release in promoting good dispersion, e.g. releasing the emissions from a high stack will - all other things being equal - increase the pathway, dilution and dispersion.

iv. The topography and terrain between the source and the receptor. The presence of topographical features such as hills and valleys, or urban terrain features such as buildings can affect air flow and therefore increase, or inhibit dispersion and dilution.

5. Using the example risk ranking in Table C.3, the pollutant pathway from source to receptor can be categorised as ineffective, moderately effective, or highly effective.

Odour Exposure Risk

6. In the third step, the estimates of Source Odour Potential and the Pathway Effectiveness are considered together to predict the risk of odour exposure (impact) at the receptor location, as shown by the example matrix in Table C.3.

Table C.3 Risk of Odour Exposure (Impact) at the Specific Receptor Location

		Source Odour Potential		
		Small	**Medium**	**Large**
Pathway Effectiveness	**Highly effective**	Low Risk	Medium Risk	High Risk
	Moderately effective	Negligible Risk	Low Risk	Medium Risk
	Ineffective	Negligible Risk	Negligible Risk	Low Risk

Assessment of the Effect of Odour Exposure

7. The next step is to estimate the effect of that odour impact on the exposed receptor, taking into account its sensitivity, as shown by the example matrix in Table C.4. The odour effects may range from negligible, through slight adverse and moderate adverse, up to substantial adverse.

Table C.4 Likely Magnitude of Odour Effect at the Specific Receptor Location

Risk of Odour Exposure	Receptor Sensitivity		
	Low	**Medium**	**High**
High	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
Low	Negligible Effect	Negligible Effect	Slight Adverse Effect
Negligible	Negligible Effect	Negligible Effect	Negligible Effect

8. This procedure results in a prediction of the likely odour effect at each sensitive receptor. The next step is to estimate the overall odour effect on the surrounding area, taking into account the different magnitude of effects at different receptors, and the number of receptors that experience these different effects*. This requires the competent and suitably experienced Air Quality Practitioner to apply professional judgement.

9. This procedure results in a prediction of the likely odour effect at each sensitive receptor. The next step is to estimate the overall odour effect on the surrounding area, taking into account the different magnitude of effects at different receptors, and the number of receptors that experience these different effects*. This requires the competent and suitably experienced Air Quality Practitioner to apply professional judgement.

* Unless there is only a small number of local receptors, then a representative selection of receptors will have been used in the assessment. This final stage of considering the overall effect needs to take into account how many receptors these selected ones represent.

* Unless there is only a small number of local receptors, then a representative selection of receptors will have been used in the assessment. This final stage of considering the overall effect needs to take into account how many receptors these selected ones represent.