5 Air Quality

Introduction

5.1 This chapter examines the potential effect of the proposed Jersey Future Hospital and Westaway (together known as Jersey Future Hospital (JFH)) on local air quality. It outlines relevant air quality management policy and legislation, describes the existing air quality conditions in the vicinity of the proposed JFH and the potential air quality impacts associated with its construction and operation. Potential changes to air quality in combination with existing air quality have been compared to appropriate air quality standards to determine their significance. Mitigation measures are also proposed where relevant which would be implemented to reduce the effect of the proposed JFH on air quality, as far as practicable.

5.2 The proposed JFH involves the demolition of existing buildings (hospital and private properties), the construction of new hospital buildings and the extension of Patriotic Street car park.

5.3 The ambient air pollutants of concern in the context of this assessment are nitrogen dioxide (NO_2), total deposited dust (construction phase only), fine particles (PM_{10}) and very fine particles ($PM_{2.5}$).

Review of Proposed Development

5.4 The proposed JFH has the potential to impact local air quality during demolition, construction and operation.

5.5 During demolition and construction, existing buildings will be demolished and new buildings constructed whilst Jersey General Hospital remains operational. Given the increased sensitivity to air pollution of the users of the hospital as well as the highly sensitive equipment used in a hospital, particular care needs to be taken to minimise the generation and spread of dust during construction.

5.6 Non Road Mobile Machinery (NRMM) such as machinery and equipment and construction vehicles travelling to and from the site on the local road network also have the potential to affect local air quality.

5.7 During construction the existing oil-fired boiler plant which provides heat and energy to Jersey General Hospital will be decommissioned prior to the proposed JFH being fully operational. Decommissioning will happen during the initial demolition scheduled to take place in Phase 1A. It is proposed that electrical energy will be used to provide heat and power for the hospital before the oil-firedboiler plant is decommissioned. It is expected that from the time that decommissioning starts, mains electrical power will be used for power and heating of the main hospital site.

5.8 During the operational phase, the proposed JFH has the potential to affect local air quality as a result of traffic travelling to and from the site as well as the extension of the Patriotic Street car park. Stand-by diesel generators are also required as part of the proposed JFH which have the potential to impact local air quality.

Legislation, policy context and guidance

5.9 As stated in the Jersey Air Quality Strategy (JAQS)[1], Jersey has obligations under a number of international conventions, known as multi-lateral environmental agreements (MEAs) to control and report on a range of potential pollutants. The current air quality limit values and objectives for the Island of Jersey are derived from WHO, European and UK objectives and limit values.

5.10 The original legislation for those air quality limit values and objectives relevant to this assessment is described below.

Legislation

5.11 In May 2008 the European Commission Directive 2008/50/EC on ambient air quality and cleaner air for Europe came into force for all Member States. Although Jersey is not a Member State, this legislation has been used to determine the air quality standards used in this assessment. This Directive consolidates earlier directives (except the 4th Daughter Directive, which will be brought into the new Directive at a later date), providing EU limit values for specified pollutants and provides a new regulatory framework for $PM_{2.5}$. The European Directive was transposed into UK legislation in the Air Quality Standards 2010. SoJ have agreed to meet the EU limits.

Air quality objectives and limit values

5.12 Air quality limit values and objectives are quality standards for clean air. Some pollutants have standards expressed as annual average (long-term) concentrations due to the chronic way in which they affect health or the natural environment, (i.e. effects occur after a prolonged period of exposure to elevated concentrations). Others have standards expressed as 24-hour, 1-hour or 15-minute average (short-term) concentrations due to the acute way in which they affect health or the natural environment (i.e. after a relatively short period of exposure). Where a pollutant has a short-term average (e.g. NO_2, 1 hour) standard, there are often a number of these periods that can exceed the numerical standard per year. For example, for NO_2, 18 hours a year can exceed the threshold (200 µg/m^3) and for compliance the 19th highest value needs to be at or below 200 µg/m^3 (this 19th value corresponds to the 99.79th percentile of hourly means in a year). Some pollutants have standards expressed in terms of both long-term and short-term concentrations. Table 5.1 sets out these EU air quality limit values and national air quality objectives for the pollutants relevant to this study (NO_2 and particulate matter).

5.13 The JAQS also set out limit values/objectives for Toluene (in line with WHO guidelines) and Benzene (in line with the EU and UK limit values/objectives). These have not been included in Table 5.1 as the sources considered in this assessment do not generate significant emissions of these pollutants and are therefore not relevant for this assessment.

[1] States of Jersey, Jersey Air Quality Strategy and Action Plan

Table 5.1: Air quality standards

Pollutant	Averaging Period	Limit Value/Objective
Nitrogen Dioxide (NO_2)	Annual mean	40µg/m^3
	1-hour mean	200µg/m^3 not to be exceeded more than 18 times a year (99.79th percentile)
Particulate Matter (PM_{10})	Annual mean	40µg/m^3
	24-hour mean	50µg/m^3 not to be exceeded more than 35 times a year (90.41st percentile)
Particulate Matter ($PM_{2.5}$)	Annual mean	25µg/m^3

Policy context

Jersey Air Quality Strategy (JAQS)

5.14 The Jersey air quality strategy states that:

"Everyone in Jersey should have access to outdoor air without significant risk to their health and that there should be minimal impacts from air pollutants on the environment of Jersey or our neighbours, as evidenced by reporting according to international reporting standards."

5.15 Section 4A of the JAQS relates to transportation emissions in Jersey, this states that a Sustainable Transport Policy was adopted by the State of Jersey (SoJ) in 2010. This provides recommendations to increase the proportion of vehicles with lower emissions and to introduce emissions testing to ensure that the existing fleet is maintained appropriately.

5.16 Section 4D of the JAQS relates to emissions from other sources of pollution on Jersey, which includes from construction sites and new developments. The strategy states that:

"There is the potential to make it a condition of planning approval for construction companies to undertake monitoring before, during and after to assess impact. Good practice guidance is available to the construction sector to support them in meeting these requirements".

5.17 It also states in relation to emissions from new developments:

"The planning system provides a mechanism for ensuring potential air quality impacts from proposed developments are considered and, where appropriate, requirements for monitoring and reporting can be made a planning condition…. There is a requirement for Work Place Travel Plans to be developed and submitted for large development (over 2,500m2)".

5.18 Policy 9: Raising awareness of air quality issues aims to do this by:

"Supporting the implementation of best practice in relation to air quality management from new development proposals through the EIA and SEA processes, including requirement for workplace travel plans, in order to manage emissions from other sources, including construction and new development, using air quality limit values as specified in the JAQS."

Revised 2011 Island plan, 2014

5.19 The Island Plan has a number of policies that are designed to improve air quality in Jersey and identifies the importance of air quality in health and wellbeing of people and the local environment. It also highlights the role that planning can have in alleviating the effects of human activities that lead to the degradation of air quality.

5.20 Policy SP6 is a policy focussed on reducing dependence on cars, states that:

"A proposal must demonstrate that…it does not give rise to an unacceptable deterioration in air quality."

5.21 Objective NR1 states that it is an objective:

"To reduce or avoid significant adverse impacts on air quality in association with new developments."

5.22 Policy NR 3 states that:

"Development that would have a significantly adverse effect on air quality, taking into account the cumulative impact of other proposed or existing sources of air pollution in the area, will not be permitted when it would breach key targets identified in association with the emergent Air Quality Strategy, or when it is considered that it would cause harm to the health, safety and amenity of users of the site or the surrounding area or put at risk the quality of the environment. Such developments may be permitted, however, where the potential pollution problems can be overcome or contained to within acceptable limits by agreement on suitable mitigating measures, to the satisfaction of the Minister for Planning and Environment. Any required mitigation measures and monitoring requirements before, during and following development will be secured by means of planning conditions or planning obligations, as appropriate."

5.23 The Island Plan also acknowledges that concerns over air quality may change in the future and that future policy reviews must accommodate this.

Relevant guidance

5.24 There is no specific guidance relating to air quality assessment methodology produced by the State of Jersey, therefore this assessment has been undertaken following relevant guidance produced for use across the UK. Relevant documents are listed below:

- Institute of Air Quality Management (IAQM) (2016) Guidance on the Assessment of dust from demolition and construction;

- Environmental Protection UK and Institute of Air Quality Management (2015) Land-Use Planning & Development Control: Planning for Air Quality;
- Defra (2016) Part IV of the Environment Act 1995: Local Air Quality Management: Policy Guidance, LAQM.TG16; and
- Defra (2016) Part IV of the Environment Act 1995: Local Air Quality Management: Technical Guidance, LAQM.TG16.

Consultation

5.25 Consultation was carried out with SoJ in March 2018 to agree the approach to the air quality assessment. The points raised and the responses are shown in **Table 5.2**.

5.26 No further consultation was undertaken for the air quality assessment, other than with the SoJ, as these are the body representative for air quality on the Island.

Table 5.2: Consultation and Response

Consultation comment	Response
Careful consideration should be given to the choice of Non Road Mobile Machinery, construction vehicles to be used and the construction methods / programming. It is recommended that a further assessment is carried out to identify potential harm and mitigation measures for these to ensure that they do not have a detrimental impact on air quality or create significant levels of noise.	The contractor has only just been appointed and is not in a position to specify the type or number of NRMM to be used at this time. Therefore, potential impacts associated with NRMM have been identified as part of this assessment and a recommendation for further assessment at an appropriate design stage has been included.
It is recommended that roadside particulates and Nitrogen Dioxide are measured at adjacent sensitive locations throughout the development and that consideration is given to the means of keeping traffic moving so as to reduce congestion and stationary traffic.	A recommendation for monitoring to be undertaken during the development has been included in paragraph 5.130. A traffic management plan will be produced as part of the CEMP to manage construction traffic.
A further assessment should be made to identify the potential effects of the oil-fired combustion system once the exact nature of the system and parameters of the flues has been finalised, to ensure there are no detrimental effects on the local air quality. Consideration should also be given to potential odours from flues etc. throughout the development.	The revised design proposals no longer use oil-fired combustion plant and therefore no assessment to consider emissions from such sources is required. The revised proposals include an all-electric solution for both proposed JFH and Westaway and therefore no local emissions are expected. Stand-by diesel generators will be included as part of the proposal these have been discussed as part of the assessment.
An assessment would need to be conducted to see what effect a roof/cover over part of the road would have on air quality.	This query arose as a result of a design recommendation included in the wind engineering assessment undertaken as part of the previous planning application. It is understood that the proposals for covered areas are for roads which will be accessible by refuse, service and emergency vehicles only. The traffic flows for these sections of road are expected to be low (<60 movements per day) and therefore an assessment of emissions within the covered areas has been screened out as any effect would considered to be negligible.

Methodology

Overview

5.27 The overall approach to the air quality assessment comprises:

- A review of the existing air quality conditions at and in the vicinity of the proposed JFH site;
- An assessment of the potential changes in air quality arising from the construction and operation of the proposed JFH;
- Formulation of mitigation measures, where necessary, to ensure any adverse effects on air quality are minimised; and
- Cumulative effects of the proposed JFH and other planned development in the area.

Methodology for establishing existing conditions and baseline for assessment

5.28 Existing ambient air quality refers to the concentration of relevant substances that are already present in the environment. These are present from various sources, such as industrial processes, commercial and domestic activities, traffic and natural sources.

5.29 A desk-based review was undertaken using the following data sources to determine the existing air quality in the study area:

- SoJ local air quality monitoring data and reports[2]; and
- SoJ website[3].

5.30 The review identified the main sources of air pollution within a 1km radius of the proposed JFH and local air quality monitoring data for recent years. The most recent monitoring data available is from 2016.

5.31 Sensitive receptors are defined as those properties/schools/hospitals that are likely to experience a change in pollutant concentrations and/or dust nuisance due to the construction and operation of the proposed JFH.

Assessment methodology

Construction dust effects

5.32 The effects from demolition and construction have been assessed using the qualitative approach described in the latest guidance[4] by the Institute of Air Quality Management (IAQM).

[2] Ricardo, Air Quality Monitoring in Jersey 2016, Report for the States of Jersey, June 2017
[3] States of Jersey air quality website: https://www.gov.je/Environment/ProtectingEnvironment/Pages/default.aspx Accessed: 19/03/2018
[4] Institute of Air Quality Management (2016); Guidance on the assessment of dust from demolition and construction

5.33 An 'impact' is described as a change in pollutant concentrations or dust deposition, while an 'effect' is described as the consequence of an impact. The main impacts that may arise during demolition and construction of the proposed development are:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes;
- Elevated PM_{10} and $PM_{2.5}$[5] concentrations as a result of dust-generating activities on and off site; and
- An increase in NO_2, $PM_{2.5}$ and PM_{10} concentrations due to exhaust emissions from non road mobile machinery and vehicles accessing the site.

5.34 The IAQM guidance considers the potential for dust emissions from activities such as demolition of existing structures, earthworks, construction of new structures and trackout. Earthworks refer to the processes of soil stripping, ground levelling, excavation and land capping, while trackout is the transport of dust and dirt from the site onto the public road network where it may be deposited and then re-suspended by vehicles using the network. This arises when vehicles leave the site with dust materials, which may then spill onto the road, or when they travel over muddy ground on site and then transfer dust and dirt onto the road network.

5.35 For each of these dust-generating activities, the guidance considers three separate effects: annoyance due to dust soiling; harm to ecological receptors; and the risk of health effects due to a significant increase in PM_{10} exposure. The receptors can be human or ecological and are chosen based on their sensitivity to dust soiling and PM_{10} exposure.

5.36 The methodology takes into account the scale to which the above effects are likely to be generated (classed as small, medium or large), the existing PM_{10} concentrations and the distance to the closest receptor, in order to determine the sensitivity of the area. This is then taken into consideration when deriving the overall risk for the site. Suitable mitigation measures are also proposed to reduce the risk of the site.

5.37 There are five steps in the assessment process described in the IAQM guidance. These are summarised in Figure 5.1 and a further description is provided in the following paragraphs.

[5] The guidance does not explicitly consider $PM_{2.5}$ concentrations but $PM_{2.5}$ is a major constituent of PM_{10}.

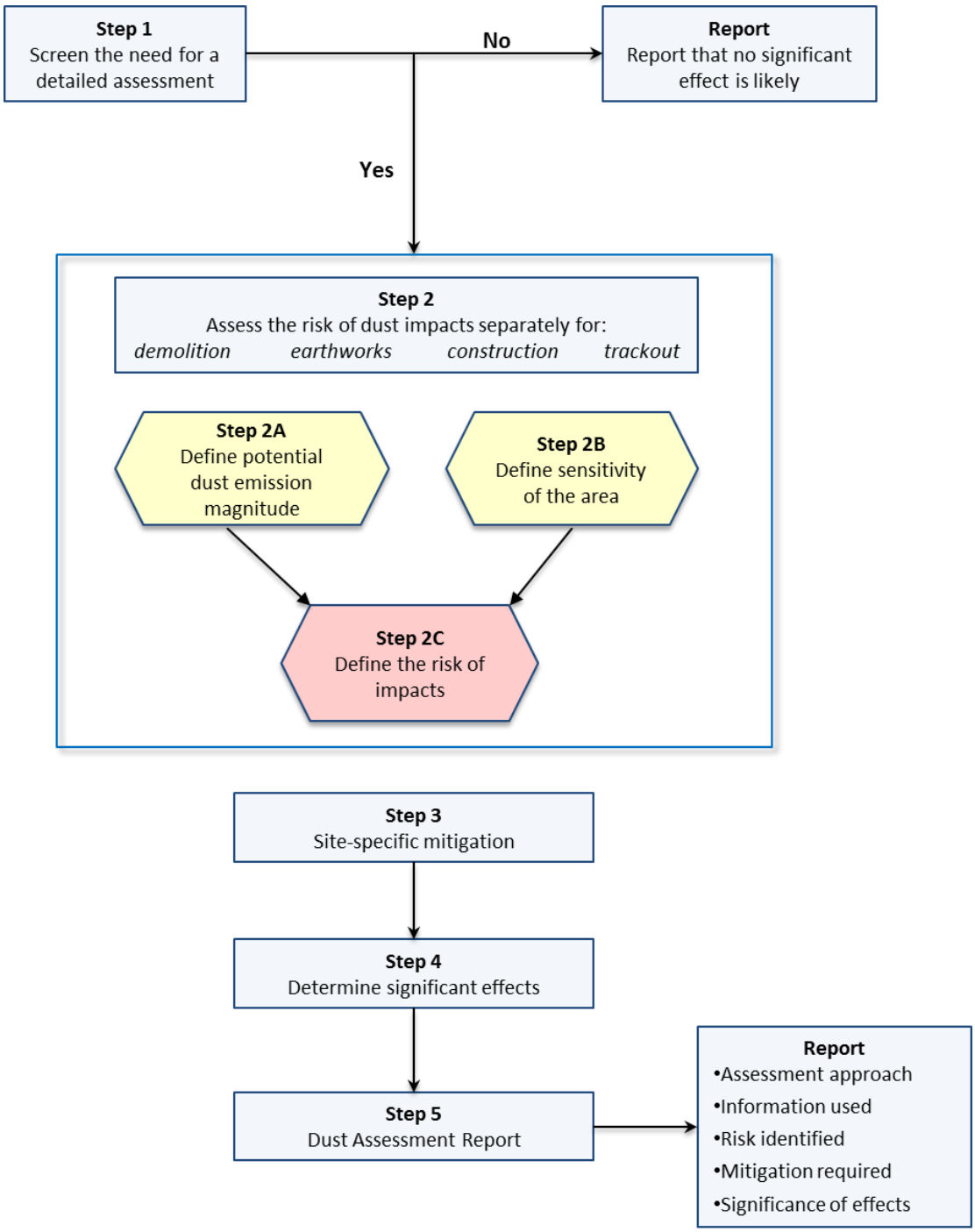

Figure 5.1: IAQM Dust Assessment Methodology

Step 1: Need for assessment

5.38 The first step is the initial screening for the need for a detailed assessment. According to the IAQM guidance, an assessment is required where there are sensitive receptors within 350m of the site boundary (for ecological receptors that is 50m) and/or within 50m of the route(s) used by the construction vehicles on the public highway and up to 500m from the site entrance(s).

Step 2: Assess the risk of dust impacts

5.39 This step is split into three sections as follows:

- 2A. Define the potential dust emission magnitude;
- 2B. define the sensitivity of the area; and
- Define the risk of impacts.

5.40 Each of the dust-generating activities is given a dust emission magnitude depending on the scale and nature of the works (step 2A) based on the criteria shown in Table B.1 (Appendix B-1).

5.41 The sensitivity of the surrounding area is then determined (step 2B) for each dust effect from the above dust-generating activities, based on the proximity and number of receptors, their sensitivity to dust, the existing PM_{10} concentrations and any other site-specific factors. Tables B.2 to A.4 (Appendix B-1) show the criteria for defining the sensitivity of the area to different dust effects.

5.42 The overall risk of the impacts for each activity is then determined (step 2C) prior to the application of any mitigation measures (Table B.5, Appendix B-1) and an overall risk for the site is derived.

Step 3: Determine the site-specific mitigation

5.43 Once each of the activities is assigned a risk rating, appropriate mitigation measures are identified. Where the risk is negligible, no mitigation measures beyond those required by legislation are necessary.

Step 4: Determine any significant residual effects

5.44 Once the risk of dust impacts has been determined and the appropriate dust mitigation measures identified, the final step is to determine whether there are any residual significant effects. The IAQM guidance notes that it is anticipated that with the implementation of effective site-specific mitigation measures, the environmental effect will not be significant in most cases.

Step 5: Prepare a dust assessment report

5.45 The last step of the assessment is the preparation of a Dust Assessment Report. This forms part of this chapter and is included in paragraphs 5.96 to 5.103.

Construction traffic emissions

5.46 The proposed JFH has the potential to impact existing air quality as a result of road traffic exhaust emissions, such as NO_2, PM_{10} and $PM_{2.5}$, associated with additional vehicles travelling to and from the site during the construction phase. The construction phase will also result in a redistribution of local traffic across the network due to road closures. Construction is planned to be completed in two phases in order to maintain hospital operations. Work will begin at both the hospital sites and Westaway in Phase 1A. Westaway will be operational by Phase 1B. To accommodate the different phases the construction traffic scenario has also been considered in two phases to account for different road closures and traffic flows expected during the different construction phases. The assessed construction traffic phases are Phase 1A and Phase 1B. A screening assessment was

undertaken for all phases using the criteria contained in the EPUK/IAQM land-use planning guidance document[6] to determine the need for an air quality assessment based upon changes to traffic as a result of the construction of the proposed JFH.

5.47 The EPUK/IAQM guidance document states the following criteria to help establish when an air quality assessment is likely to be considered necessary:

- A change of Light Duty Vehicle flows of more than 500 Annual Average Daily Traffic (AADT) movements; and
- A change of Heavy Duty Vehicle flows of more than 100 AADT movements.

5.48 Should the traffic data meet either of the above screening criteria, potential impacts at sensitive receptor locations should be assessed by calculating the predicted change in NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of the construction of the proposed JFH.

5.49 Both Phase 1A and Phase 1B results in changes in traffic which exceed these criteria on certain roads due to road closures and diversions transferring vehicles onto other roads. Therefore, an assessment of air quality impacts as a result of construction traffic has been undertaken using dispersion modelling. The dispersion modelling methodology is outlined in the sections below.

5.50 Phase 2 was not assessed as there are no road closures or diversions causing large changes in vehicles movements on roads local to the development and therefore did not meet the EPUK/IAQM criteria for inclusion in an air quality assessment.

Construction traffic modelling scenarios

5.51 Traffic data was provided by the Arup transport planning team for each discreet traffic phase of the construction of the development. The assessed scenarios are:

- 2016 Baseline scenario (12 deck MSCP);
- 2025 Do Minimum – future assessment year without the proposed JFH (12 deck MSCP);
- 2025 Construction Phase 1A (12 deck MSCP); and
- 2025 Construction Phase 1B (13 deck MSCP).

5.52 The traffic data provided for future assessment years includes general growth in traffic as well as traffic flows associated with committed development in the area.

5.53 The data was provided as 24-hour Annual Average Daily Traffic (AADT) with the percentage of HDVs. At junctions traffic speeds were slowed to 20kph as recommended in LAQM.TG16. Traffic data used for the roads assessed is provided in Appendix D-1. Traffic speeds were also provided. For the majority of roads this was the posted speed limit of 30mph (48kph), but fora number of roads recorded traffic speeds were used and these are highlighted in Appendix D-1.

[6] Moorcroft and Barrowcliffe *et al*. (2017) Land-use Planning & Development Control: Planning for Air Quality. Institute of Air Quality Management v1.1, London.

5.54 Emission rates have been calculated using the Defra Emissions Factor Toolkit (EFT) v8.0.17.

5.55 Vehicle emissions and background air quality are predicted to improve over time due to the introduction of cleaner vehicles into the UK vehicle fleet. However, there is uncertainty as to how successful the implementation of stricter controls of vehicle emissions will be particularly in Jersey where cars are kept for longer and therefore the fleet turnover is slower. To account for this uncertainty, vehicle emissions and future background concentrations for the future assessment years have been held at baseline levels. This is considered to be a representative worst case scenario.

Car park emissions

5.56 In addition to traffic travelling on the surrounding local road network, the effects of emissions from the existing and proposed changes to Multi-Storey Car Park (MSCP) at Patriotic Street have been assessed. The scenarios for the MSCP are set out below:

- 2016 Baseline scenario (12 deck MSCP);
- 2025 Do Minimum (12 deck MSCP);
- 2025 Construction Phase 1A (12 deck MSCP); and
- 2025 Construction Phase 1B (13 deck MSCP).

5.57 The car park emissions were included as a volume source in the model in addition to the road sources. Car park emissions comprise two sources of emissions:

- Hot exhaust emissions: these emissions were calculated using the number of vehicles travelling in and out of the car park and the estimated average distance travelled inside the car park[8]; and
- Cold start emissions: these were calculated using the cold start car park figures in the National Atmospheric Emissions Inventory[9].

5.58 The predicted car park vehicle movements for each scenario assessed are shown in **Table 5.3**.

5.59 Emission rates for each scenario were calculated using the formula in Equ**ation 1**. The equation is taken from the CERC note 54: Modelling Car Parks[10].

Table 5.3: Car Park Movements (AADT)

Assessment Scenario (AADT)		
Baseline/DM	**Construction Phase 1A**	**Construction Phase 1B**
6,782	6,872	6,545

[7] Defra Emission Factor Toolkit v8.0.1 (http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html) accessed March 2018
[8] It should be noted that hot soak emission factors are important for emissions of Volatile Organic Compounds (VOCs) which are not of a pollutant of concern.
[9] National Atmospheric Emissions Inventory. www.naei.org.uk
[10] CERC, 2004. Modelling Car Parks

Equation 1: Emission Rate for Multi-Storey Car Parks

$$Emission\ rate\ (g\ m^{-3}s^{-1}) = \frac{(EF\ x\ D\ x\ M) + (HS \times {}^{M}/_{2}) \times (CS \times {}^{M}/_{2})}{60 \times 60 \times 24 \times CP}$$

Where:

EF = Emission factor (g/km)
D = Average distance travelled (km)
HS = Hot soak emission factor (g/trip)
CS = Cold start emission factor (g/trip)
M = Vehicle movements (per day)
CP = Car park volume (m^{-3})

Street canyon emissions

5.60 There are a number of roads within the study area which have the potential to generate a street canyon effect. This occurs when the width of the road is narrower than the height of the buildings on either side of the road. The resulting canyon effect traps emissions and generally generates higher pollutant concentrations adjacent to the roadside due to the lack of dispersion.

5.61 Those roads which have been considered as canyons in this assessment are given in **Table 5.4** and are displayed in Figure 5.3 of Volume III.

Table 5.4: Information for Roads Modelled as Street Canyons

Road ID	Name	Canyon Width (m)	Canyon Height (m)
14	Kensington Street	7.0	9.0
15	Kensington Place	8.5	12.0
16	Kensington Place	8.5	12.0
17	Kensington Place	8.9	12.0
18	Lewis Street	7.5	10.0
19	Kensington Place	8.5	12.0
20	Kensington Place	8.5	12.0
35	Patriotic Street	9.3	16.7
36	Patriotic Street	9.3	16.7
37	Gloucester Street	12.0	13.0
38	Gloucester Street	13.0	14.0
39	Gloucester Street	13.0	14.0
42	Patriotic Place	10.0	16.7
61	Lewis Street	7.5	10.0
68	Gloucester Street	12.0	13.0

Sensitive receptors

5.62 Sensitive receptors have been selected at worst case locations on the road network and are shown in Figure 5.4 of Volume III. Receptors adjacent to the car park and modelled roads surrounding the hospital were chosen and diffusion tube locations adjacent to the modelled roads were chosen for the assessment. The details of modelled receptors are presented in **Table 5.5**. Each receptor is assumed to be at 1.5m, which is representative of a typical inhalation height. No ecologically designated sites sensitive to NOx have been identified in the study area.

Table 5.5: Details of modelled receptors

Receptor	X**	Y	Height	Type
S1	41600	65912	1.5	Residential
S2	41652	65945	1.5	Residential
S3	41678	65924	1.5	Residential
S4	41693	65900	1.5	Residential
S5	41727	65855	1.5	Residential
S6	41537	65928	1.5	Residential
S7	41465	65883	1.5	Residential
S8	41577	65898	1.5	Residential
S9	41541	65873	1.5	Residential
S10	41512	65855	1.5	Residential
S11	41484	65837	1.5	Residential
S12	41582	65792	1.5	Residential
S13	41600	65760	1.5	Residential
S14	41497	65758	1.5	Residential
S15	41733	65806	1.5	Residential
S16	41695	65784	1.5	Residential
S17	41639	65750	1.5	Residential
S18	41663	65764	1.5	Residential
S19	41555	65797	1.5	Residential
S20	41572	65804	1.5	Residential
S21	41546	65767	1.5	Residential
S22	41562	65742	1.5	Residential
S23	41467	65748	1.5	Residential
S24	41427	65800	1.5	Residential
S25	41607	65733	1.5	Residential
S26	41556	65702	1.5	Residential
S27	41529	65700	1.5	Residential
S28	41575	65946	1.5	Residential

Receptor	X**	Y	Height	Type
S29	41630	65983	1.5	Residential
S30	41436	65866	1.5	Residential
S31	41717	66018	1.5	Residential
S32	41467	65926	1.5	Residential
S33	41427	65897	1.5	Residential
S34	41750	66062	1.5	Residential
S35	41790	66062	1.5	Residential
S36	41837	65996	1.5	Residential
S37	41832	65848	1.5	Residential
S38	41609	66006	1.5	Residential
S39	41595	66024	1.5	Residential
S40	41553	65913	1.5	Residential
S41	41657	65811	1.5	Residential
S42	41705	65841	1.5	Residential
S43	41356	65824	1.5	Residential
S44	41379	65804	1.5	Residential
S45	41434	65755	1.5	Residential
S46	41492	65703	1.5	Residential
S47	41575	65814	1.5	Residential
** Coordinates are in Jersey Transverse Mercator				

Meteorological data

5.63 Meteorological data used in this assessment was measured at Jersey Airport meteorological station for 2016. Jersey Airport is located approximately 5.8km north-west of the proposed JFH. Figure 5.2 shows the wind rose for 2016; it shows that the predominant wind direction is westerly.

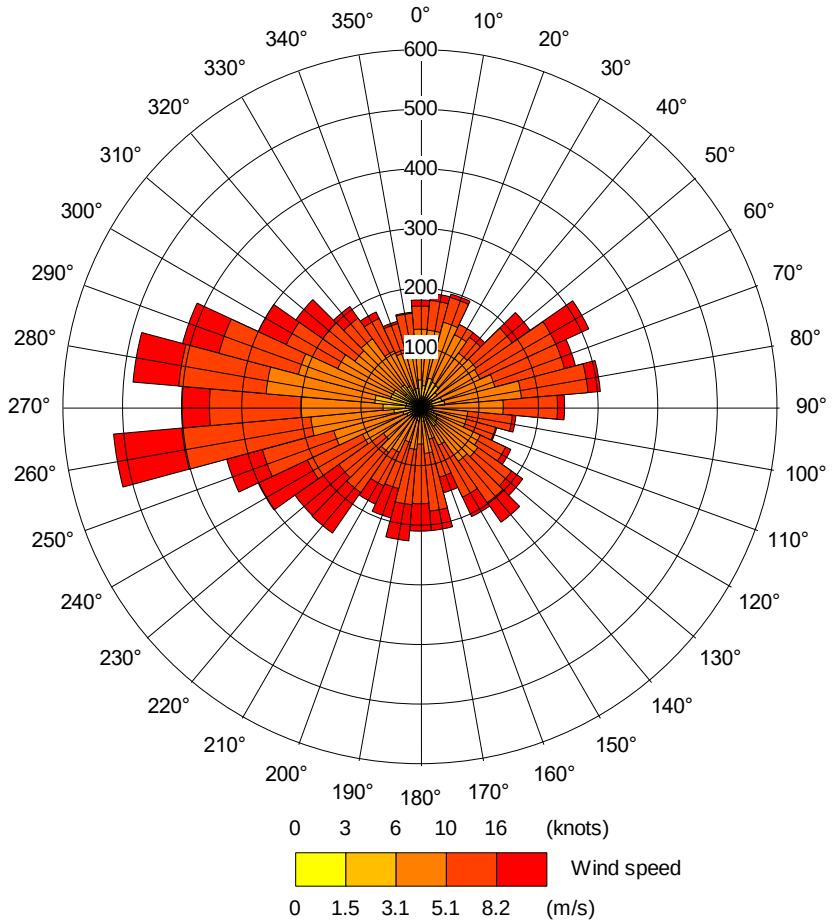

Figure 5.2: Wind Rose for Jersey Airport, 2016

Other input parameters

5.64 The level of mechanical turbulence (and hence, mixing) in the atmosphere is affected by the roughness of the surface/ground over which the air is passing. Typical surface roughness values range from 1.5m (for cities, forests and industrial areas) to 0.0001m (for water or sandy deserts).

5.65 Land around the Proposed Development site can be best described as “parkland and open suburbia” with a corresponding surface roughness of 0.5m.

5.66 The minimum Monin-Obukhov length is a model parameter which describes the extent to which the urban heat island effect limits stable atmospheric conditions. For this model, a length of 10m was used corresponding to “small towns”.

Background Pollutant Concentrations

5.67 Background concentrations refer to the existing levels of pollution in the atmosphere, produced by a variety of sources, such as roads, industrial processes and a variety of other sources. Background pollutant concentrations are added to the predicted model results (which only include contributions from the local sources) to ensure that predicted concentrations can be compared to air quality

objectives. The only available source of background pollutant concentrations is monitoring undertaken by SoJ. Annual mean data from SoJ monitoring have been used as background concentrations for NO_2, PM_{10} and $PM_{2.5}$.

NOx to NO_2 conversion

5.68 The model predicts NOx concentrations which comprise nitric oxide (NO) and nitrogen dioxide (NO_2). NOx is emitted from combustion processes, primarily as NO with a small percentage of NO_2. The emitted NO reacts with oxidants in the air (mainly ozone) to form NO_2. NO_2 is associated with effects on human health and therefore the air quality standards for the protection of human health are based on NO_2 rather than total NOx or NO. A suitable NOx to NO_2 conversion has been applied to the modelled NOx concentrations in order to determine the impact of the NOx emissions on ambient concentrations of NO_2.

5.69 LAQM.TG16 details an approach for calculating the roadside conversion of NOx to NO_2, which takes into account the difference between ambient NOx concentrations with and without the proposed JFH, the concentration of ozone and the different proportions of primary NO_2 emissions in different years. This approach is available as a spreadsheet calculator, with the most up to date version having been released in October 2017 (v6.1)[11].

5.70 The calculator requires the selection of a local authority in order to run. Jersey is not included in the calculator and therefore Cornwall was selected as it has a similar setting and mix of land uses as Jersey which should give similar background concentrations.

Model verification

5.71 Model verification refers to the comparison of modelled and measured pollutant concentrations at the same location(s) to determine the performance of the model. Should the model results for NO_2 annual mean concentrations be largely within ±25% of the measured values and there is no systematic over or under-prediction of concentrations, LAQM.TG16 guidance advises that no adjustment is necessary. If this is not the case, then the modelled values are adjusted based on the observed relationship between modelled and measured NOx concentrations due to road traffic to provide a better agreement.

5.72 Modelled results may not compare as well at some locations for a number of reasons, including:

- Errors/uncertainties in model input data (e.g. traffic flow and speed data estimates);
- Model setup (including street canyons, road widths, location of monitoring sites);
- Model limitations (treatment of surface roughness and meteorological data);
- Uncertainty in monitoring data, notably diffusion tubes (e.g. bias adjustment factors and annualisation of short-term data); and
- Uncertainty in emissions and emission factors.

[11] Defra, 2017. NO_x to NO_2 calculator. http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

5.73 Monitoring is undertaken by SoJ at only one location on the modelled road network (The Parade). Whilst it is advised that model verification should not be undertaken based on a sole monitoring location it is considered to be important to review the performance of the model against monitored concentrations. The outcome of the model verification exercise is reported in section 5.104.

1-Hour NO_2 Mean objective

5.74 Where annual mean concentrations are predicted to be <60 µg/m^3 it will be assumed that the 1-hour mean objective will not be exceeded in accordance with guidance seet out in LAQM TG.16.

Significance criteria

5.75 The 2017 EPUK/IAQM guidance note 'Land-Use Planning & Development Control' provides an approach to determining the air quality impacts resulting from a proposed development and the overall significance of local air quality effects arising from a proposed development.

5.76 First, impact descriptors are determined based on the magnitude of incremental change as a proportion of the relevant assessment level, in this instance the annual mean NO_2, PM_{10} and $PM_{2.5}$ objectives. The change is then examined in relation to the predicted total pollutant concentrations in the assessment year and its relationship with the annual mean objectives.

5.77 The assessment framework for determining impact descriptors at each of the assessed receptors is shown in **Table 5.6**.

Table 5.6: Impact Descriptors

Annual average concentrations at receptor in the assessment year	% Change in concentrations relative to annual mean objective			
	1	2-5	6-10	>10
75% or less of objective	Negligible	Negligible	Slight	Moderate
76-94% of objective	Negligible	Slight	Moderate	Moderate
95-102% of objective	Slight	Moderate	Moderate	Substantial
103-109% of objective	Moderate	Moderate	Substantial	Substantial
110% of more of objective	Moderate	Substantial	Substantial	Substantial

Note: Changes in pollutant concentrations of 0% i.e. <0.5% would be described as negligible

5.78 The impact descriptors at each of the assessed receptors are then used as a starting point for making a judgement on the overall significance of effect of a proposed development, however, other influences would also need to be taken into account, such as:

- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts; and

- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

5.79 Professional judgement should be used to determine the overall significance of effect of the proposed development, however, in circumstances where the proposed development can be judged in isolation, it is likely that a 'moderate' or 'substantial' impact will give rise to a significant effect and a 'negligible' or 'slight' impact will not result in a significant effect.

Non road mobile machinery

5.80 The use of site equipment and machinery during the demolition/construction of the proposed JFH would result in emissions to the atmosphere of exhaust gases. Mitigation measures are available to minimise/reduce any impacts. These include equipment meeting recent emission control standards for NRMM, operating well-maintained vehicles and planning to reduce trip generation. Ultra low sulphur diesel fuel should also be used. It is currently not known if these mitigation measures will be achievable based on the NRMM fleet available in Jersey.

5.81 At this stage of the process, no detailed information is available to allow an assessment of NRMM. It is considered that the impact from NRMM may be significant for users of the existing hospital, where no mitigation is in place. It is recommended that specific consideration is given and potentially further assessment undertaken during the detailed design phase to assess the potential impact from NRMM on users of the existing hospital.

Operational effects

Road traffic emissions

5.82 A screening exercise for traffic predicted as part of the operational scenario has also been undertaken following the methodology outlined above to determine whether an assessment is required. Whilst the EPUK/IAQM criteria for changes to traffic flows are not met, a modelling scenario of the future year Do Something (with proposed JFH) has been undertaken in order to demonstrate any effect as a result of the development. This scenario includes the changes to the Patriotic Street car park and Westaway.

Combustion plant emissions

5.83 As discussed above, an all-electric solution is proposed to provide heat and power to the proposed JFH. However, as the proposed JFH needs a constant and uninterrupted supply of electricity, stand-by emergency generators are proposed to be installed as part of the proposed JFH and Westaway development.

5.84 These stand-by generators are anticipated to be tested for two hours per month and would only be operational in the event of any emergency such as a power cut. Even during an emergency event, it is considered that the operation of these stand-by generators would be short-term. As a result, emissions from these sources are considered to have a negligible impact on local air quality and any further assessment of these sources has been scoped out.

Limitations and assumptions

Limitations

5.85 There are no significant limitations to this assessment, however the assessment is indicative as the design, particularly in regard to the use of NRMM during construction and standby emergency generators during operation, is still evolving. This should be understood when considering the results of this assessment and a review with potential further assessment should be undertaken at detailed design stage to ensure the assessment remains valid.

5.86 A number of assumptions have been made which are detailed in paragraph 5.90.

Assumptions

5.87 As stated above, the assessment of road traffic emissions is considered to be a worst case assessment and does not take into account any improvement in vehicle emissions or background pollutant concentrations with time associated with cleaner vehicle entering the fleet.

Baseline environment

Sources of air pollution

Industrial processes

5.88 There are few heavy industrial processes in Jersey. The Island Plan identifies Jersey Electricity Company power station and the island crematorium as notable sources of potential air quality issues. The power station is more than 1km away from the proposed JFH and the crematorium is approximately 600m north-west of the proposed JFH. The ontribution to ambient air pollutant concentrations from these sources is already included in monitoring data used in this assessment.

Local air quality

5.89 SoJ carries out monitoring of NO_2 concentrations using automatic monitors and passive diffusion tubes within the vicinity of the proposed JFH. Monitoring sites are shown in Figure 5.5 in Volume III of the EIS, site location details are shown in Table 5.7. Monitoring of PM_{10} and $PM_{2.5}$ is undertaken at an automatic monitor at Halkett Place.

Table 5.7: SoJ Monitoring Locations

ID	Site name	Monitor	Type	Pollutants*	X**	Y**
1	Les Bas Centre	Diffusion tube	Urban background	NO_2. and BTEX	42773	65750
2	Halkett Place (Central Market)	Automatic Monitor	Roadside	NO_2, BTEX, automatic NOx (and automatic PM_{10} – locally managed)	42216	65540
3	Union Street	Diffusion tube	Kerbside	NO_2	42089	65688
4	New Street	Diffusion tube	Kerbside	NO_2	42079	65581
5	Broad Street	Diffusion tube	Urban background	NO_2	41982	65462
6	Weighbridge	Diffusion tube	Roadside	NO_2	41959	65308
7	Liberation Station	Diffusion tube	Kerbside	NO_2	41849	65362
8	The Parade	Diffusion tube	Roadside	NO_2	41725	65878
9	Faux Bie	Diffusion tube	Urban background	BTEX	42379	66366
10	Georgetown	Diffusion tube	Kerbside	NO_2	43028	64862

* BTEX, benzene, toluene and ethyl-xylene (not relevant to this assessment)
** Coordinates are in Jersey Transverse Mercator

5.90 Monitored NO_2 results are shown in Table 5.8. Monitoring data available for 2016, reported by SoJ[12], shows that the annual mean NO_2 objective is met at all monitoring locations. Hourly mean NO_2 concentrations are also recorded at the automatic monitor at Halkett Place; no exceedances of the hourly mean NO_2 objective were recorded in 2016. The closest monitoring location to the proposed JFH is at The Parade where monitored concentrations are 60% of the annual mean NO_2 objective.

[12] States of Jersey, 2016. Air Quality Monitoring in Jersey 2016.

Table 5.8: Monitored Annual Mean NO_2 Concentrations

ID	Site name	Annual Mean NO_2 (µg/m^3)
Automatic monitor		
1	Halkett Place (Central Market)	27.0
Diffusion Tubes		
2	Les Bas Centre	20.0
3	Halkett Place (Central Market)	27.0
4	Union Street	29.0
5	New Street	22.0
6	Broad Street	29.0
7	Weighbridge	34.0
8	Liberation Station	31.0
9	The Parade	24.0

5.91 Monitoring of PM_{10} and $PM_{2.5}$ concentrations is also undertaken at the automatic monitoring station in Halkett Place. Data for 2016 has not been reported by SoJ, however, monitored results from 2015 are available and presented in Table 5.9 as this is the most recent available year with a full set of annual data. These data for Halkett Place have been used to determine the baseline particulate matter concentrations. This location is representative of the proposed JFH site and the surrounding area and has been used in the processing of model outputs.

Table 5.9: Monitored PM_{10} and $PM_{2.5}$ results 2015

ID	Site name	Annual Mean PM_{10} (µ/m^3)	Number of Days Where Daily Concentrations Were Greater Than 50µg/m^3	Annual Mean $PM_{2.5}$ (µ/m^3)
1	Halkett Place (Central Market)	19.0	10	5.7

5.92 The proposed JFH will be operational in 2023., It has been assumed, as a conservative assumption, that existing air quality conditions will remain the same in the future and these have been used to process model results.

Background concentrations

5.93 Urban background monitoring data for Le Bas Centre in 2016 has been considered to be representative of background NO_2 concentrations in the vicinity of the proposed JFH. This has been

used in the processing of model outputs to determine total pollutant concentrations by adding together the background and modelled road contribution concentrations.

5.94 As PM_{10} and $PM_{2.5}$ are monitored at Halkett Place only, these monitored concentrations have been used as background concentrations for these pollutants. Road traffic uses Halkett Place and therefore the monitored concentrations from this location includes some contribution from road traffic. Therefore, using this data as a background concentration as part of the assessment is considered to be worst case.

Design mitigation

5.95 The design of JFH incorporates mains electricity heating and power systems which will replace the existing oil-fired combustion plant for the hospital. The electrical power will therefore aid in removing a source of air pollution.

Assessment of effects from construction

Construction dust

5.96 The IAQM guidance takes into consideration four dust-generating activities, demolition, earthworks, construction and trackout. The site of the proposed JFH covers an area of approximately 10,000m^2. For the purposes of assessing worst case dust impacts the dust assessment has considered all construction activities at both the hospital site and Westaway, regardless of which construction phase they occur within.

5.97 The closest sensitive receptors are within 20m of the site boundary; these include residential properties and hospital wards. Figure 5.6 in Volume III shows the locations where impacts from dust generation may arise.

5.98 The sensitivity of nearby receptors to dust soiling and PM_{10} exposure has been classified as high.

5.99 There are no ecological receptors sensitive to changes in dust identified within 50m of the site boundary.

Dust emission magnitude

5.100 Each dust generating activity has been assigned a dust emission magnitude as shown in Table 5.10. This has been determined based on information provided by the construction/design team.

Table 5.10: Dust emission magnitude for dust-generating activities

Activity	Dust emission magnitude	Reasoning
Demolition	Large	>50,000m^3 of existing building to be demolished and concrete structures to be demolished.
Earthworks	Large	>10,000m^2 of earthworks area. 20,000-100,000 tonnes to be removed.
Construction	Large	Total building volume is >100,000m^3.
Trackout	Medium	The peak additional HGV movements required per day is 15. The length of unpaved road is estimated to be between 50 and 100m.

Sensitivity of the area

5.101 The sensitivity of the area to dust soiling and human health effects has been assigned as **high** due to the presence of high sensitivity receptors within 20m of the site boundary.

5.102 A **high** sensitivity of the area has been assumed for both dust soiling and human health effects primarily because demolition, construction and all consequential dust-generating activities will be happening adjacent to operational hospital wards and laboratories.

Risk of impacts

5.103 Taking into consideration the dust emission magnitude and the sensitivity of the area, the site, prior to dust mitigation, has been classified as at **high** risk of dust soiling and human health impacts for all activities, with the exception of trackout (Table 5.11). Specific mitigation therefore needs to be implemented effectively to minimise the risk of dust soiling and human health impacts, this is described in paragraph 5.125.

Table 5.11: Summary dust risk prior to mitigation

Activity	Dust soiling	Human health
Demolition	High risk	High risk
Earthworks	High risk	High risk
Construction	High risk	High risk
Trackout	Medium risk	Medium risk

Assessment of effects from construction traffic and car park emissions

Model verification

5.104 The model verification exercise used 2016 diffusion tube data from The Parade. This diffusion tube site was selected as it is a roadside site located on the modelled road network. Other diffusion tubes in the area were not located adjacent to the modelled road network.

5.105 Monitored and modelled road contributions to the total NOx concentration were calculated and verification was undertaken following the methodology described in the LAQM.TG16 guidance. A comparison of monitored and modelled annual mean NO_2 concentrations for 2016 is shown in Table 5.12.

Table 5.12: Comparison of 2016 Modelled and Monitored Annual Mean NO_2 Concentrations ($\mu g/m^3$)

Monitoring location	Receptor	2016 Monitored NO_2 concentration ($\mu g/m^3$)	2016 Background concentration NO_2 ($\mu g/m^3$)	Modelled NO_2 ($\mu g/m^3$)	% Difference between modelled/ monitored NO_2
The Parade	M8	24.0	20.0	27.3	+13.8%

5.106 Table 5.12 shows that the model is performing well and over-predicts concentrations at the monitoring location by less than 15%. It is therefore considered that adjustment of the modelled NOx concentrations is unnecessary.

Phase 1A

5.107 The impact of the Phase 1A construction scenario at assessed receptors is described below.

Nitrogen Dioxide (NO_2)

5.108 Predicted annual mean NO_2 concentrations for Phase 1A are shown in Table B.1 of Appendix B-2. The results show that concentrations are predicted to be below the NO_2 air quality objective of 40$\mu g/m^3$ at all receptors modelled for all scenarios. The highest predicted concentration is 39.2$\mu g/m^3$ at receptor S25 however the change due to the construction phase at this receptor is <0 $\mu g/m^3$ and the impact is therefore negligible.

5.109 The largest increase in concentration as a result of construction Phase 1A is 4.1 $\mu g/m^3$ at S6 and S7 where the impact is slight adverse. There is also a moderate adverse impact at S29 where there is an increase of 3.7$\mu g/m^3$. Although this change at S29 is smaller than the changes at S6 and S7, it is still considered to have a moderate adverse impact according to EPUK/IAQM guidance[6 above] as the change at S29 increases the concentration to 32.4 $\mu g/m^3$, which is 81.1% of the annual mean objective for NO_2. The change at S6 and S7 remains a slight adverse impact as the change increases the concentrations to a level that is still below 76% of the annual mean NO_2 objective.

5.110 All modelled results predict annual mean concentrations <60µg/m^3, following LAQM.TG16 it is unlikely that Phase 1A would result in exceedances of the hourly mean NO_2 objective.

5.111 It should be noted that predicted concentrations for all future year scenarios are considered to be worst case as vehicle emissions and background concentrations have been held at baseline (2016) levels to replicate a future scenario in which there are no improvements in vehicle emission technology.

Particulate matter (PM_{10} and $PM_{2.5}$)

5.112 Predicted annual mean PM_{10} concentrations are well below the air quality objective of 40µg/m^3 at all receptors assessed. These results are shown in Table B.2 of Appendix B-2. The highest annual mean PM_{10} concentration (22.0µg/m^3) is predicted at receptor S25 for all scenarios. The largest increase in concentration as a result of construction Phase 1A is 0.6 µg/m^3 at S6 and S7. The change in concentrations as a result of construction Phase 1A is very small and therefore the impact is negligible at all receptors.

Predicted annual mean $PM_{2.5}$ concentrations are well below the air quality objective of 25.0µg/m^3. The highest annual mean $PM_{2.5}$concentration (7.6µg/m^3) are predicted at receptor S25. Results are displayed in Table B.3 of Appendix B-2. The largest increase in concentration as a result of construction Phase 1A is 0.4 µg/m^3 at S6 and S7. The change in concentrations as a result of construction Phase 1A the proposed development is very small therefore the impact is negligible at all receptors.

Phase 1B

5.113 The impact of the Phase 1B construction scenario at all assessed receptors is set out below.

Nitrogen Dioxide (NO_2)

5.114 Predicted annual mean NO_2 results for Phase 1B are shown in Table B.4 of Appendix B-2. The highest predicted concentration is 39.0µg/m^3 at receptor S25. The largest increase in concentration as a result of construction Phase 1B is 1.8 µg/m^3 at S22. The change in concentrations as a result of construction Phase 1B the proposed development is very small therefore the impact is negligible at all receptors.

Particulate matter (PM_{10} and $PM_{2.5}$)

5.115 Predicted annual mean PM_{10} concentrations are well below the air quality objective of 40µg/m^3 at all receptors assessed. These results are shown in Table B.5 of Appendix B-2. The highest annual mean PM_{10} concentration (22.2µg/m^3) is predicted at receptor S25 for all scenarios. The change in concentrations as a result of the proposed development is very small and therefore the impact is negligible at all receptors.

5.116 Predicted annual mean $PM_{2.5}$ concentrations are well below the air quality objective of 25.0µg/m^3. Results are shown in Table B.6 of Appendix B-2. The highest annual mean $PM_{2.5}$ concentration

($7.6\mu g/m^3$) is predicted at receptor S25 for all scenarios. The largest increase in concentration as a result of construction Phase 1B is $0.2\mu g/m^3$ at S22. The change in concentrations as a result of the proposed development is very small therefore the impact is negligible at all receptors.

Phase 2

5.117 Construction Phase 2 was not assessed as discussed in section 5.50.

Assessment of effects from operation

Road traffic and car park emissions

Nitrogen Dioxide (NO_2)

5.118 Predicted annual mean NO_2 results for Phase 1B are shown in Table B.7 of Appendix B-2. The highest predicted concentration is $39.3\mu g/m^3$ at receptor S25. The largest increase in concentration as a result of the development is $0.1\ \mu g/m^3$ at S36. Results are displayed in Table B.7 of Appendix B-2.

5.119 Though $39.3\mu g/m^3$ is close to the annual mean objective, it should be noted that this is a worst case prediction as it assumes no reduction in vehicle emission due to improvements in emissions technology. Additionally the background concentrations used for this assessment will include a contribution from the existing oil-fired boiler which will be decommissioned in the future.

Particulate matter (PM_{10} and $PM_{2.5}$)

5.120 Predicted annual mean PM_{10} concentrations are well below the air quality objective of $40\mu g/m^3$ at all receptors assessed. These results are shown in Table B.8 of Appendix B-2. The highest annual mean PM_{10} concentrations ($22.2\mu g/m^3$) are predicted at receptor S25 for all scenarios. The largest increase in concentration as a result of the development is less than $0.1\mu g/m^3$ at all sensitive receptors. The change in concentrations as a result of the proposed development is very small and therefore the impact is negligible at all receptors.

5.121 Predicted annual mean $PM_{2.5}$ concentrations are well below the air quality objective of $25.0\mu g/m^3$. The highest annual mean $PM_{2.5}$ concentrations ($7.6\mu g/m^3$) are predicted at receptor S25 for all scenarios. Results are displayed in Table B.9 of Appendix B-2. The largest increase in concentration as a result of the development is less than $0.1\mu g/m^3$ at all sensitive receptors. The change in concentrations as a result of the proposed development is very small therefore the impact is negligible at all receptors.

Assessment of significance during construction

5.122 There is one moderate adverse impact and fives slight adverse impacts on NO_2 concentrations as a result of Phase 1A. There are also four moderate beneficial impacts in Phase 1A. All other impacts are negligible in Phase 1A and Phase 1B. Due to the temporary nature of the construction works and the low number of adverse impacts in Phase 1A, the effects of the assessed construction phases are considered to be not significant with regards to NO_2.

5.123 All PM_{10} and $PM_{2.5}$ impacts on assessed receptors are negligible; therefore the effects of the construction phases are predicted to be not significant during the assessed construction phases.

Assessment of significance during operation

5.124 The impacts of the development on NO_2, PM_{10} and $PM_{2.5}$ concentrations are predicted to be negligible and therefore the effects are not significant during the operation of the development.

Mitigation and enhancement

Mitigation of effects from construction

Construction

5.125 The dust-emitting activities assessed in the assessment of effects section can be greatly reduced or eliminated by applying the site-specific mitigation measures for high risk sites according to the IAQM guidance. The following measures from the guidance are relevant and should be included in the Construction Environmental Management Plan for the site.

General

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- Develop and implement a Dust Management Plan, which will include measures to control other emissions, approved by the local authority.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on or off-site and the action taken to resolve the situation in the log book.
- Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.

Monitoring

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.

- Carry out regular site inspections to monitor compliance with the Dust Management Plan, record inspection results and make an inspection log available to the local authority, when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.

Site Maintenance

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out.

Operating Vehicle/Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum speed limit of 15mph on surfaced and 10mph on un-surfaced haul roads and work areas.
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport.
- Produce a construction logistics plan.
- Implement a travel plan that supports and encourages sustainable travel (public transport, cycling, walking and car sharing).

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques, such as water sprays or local extraction.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use the fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Fires should not be held on site.

Specific Measures

Demolition

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil as practicable.
- Only remove the cover in small areas during work and not all at once.

Construction

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in soils with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Trackout

- Regularly use water-assisted dust sweeper(s) on the access and local roads, to remove, as soon as practicable any material tracked out of the site.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10m from receptors where possible.

Additional recommended mitigation

5.126 There are a number of additional mitigation options that can be implemented in order to reduce the effect of dust soiling and potential particulate generation during construction on receptors such as hospitals that may have unique dust and human health sensitivities due to sensitive equipment and immunocompromised health of patients.

5.127 These options include but are not limited to: indoor and outdoor dust particulate monitoring, dummy facades and positive air pressure systems within the remaining hospital buildings. It is recommended that further consideration is given to the mitigation measures that may reduce the effects of dust in sensitive hospital environments.

5.128 SoJ have requested a dust monitoring strategy be implemented during demolition/construction in order to monitor particulate concentrations and also to inform on site dust mitigation. This will be developed further through discussion with SoJ and the appointed contractor once the methods of demolition/construction are fully understood.

Mitigation of effects from operation

5.129 As the operational phase is predicted to have a negligible effect on local air quality, no mitigation is required nor proposed.

5.130 The SoJ has noted however, that congestion in the area of the proposed JFH could be an issue in the future. SoJ has requested that a monitoring survey of both NO_2 and PM_{10} be undertaken throughout all phases of the development to monitor changes in concentrations as a result of vehicle emissions/congestion in the area and to assess compliance with the air quality objectives.

Residual effects

Residual effect from construction

5.131 Following implementation of the mitigation measures above, no significant residual effects are anticipated during the demolition/construction phase.

Residual effects from operation

5.132 As no mitigation is required for the operational phase, the residual effect remains not significant.

Table 5.13: Assessment summary matrix

Potential Effect	Receptor (s)	Sensitivity of Receptor	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments
Dust impacts from construction	Existing Hospital/Surrounding properties within 350m	High	High risk	Significant	Dust control measures as set out in paragraph 5.125.	Low risk	Not Significant	Discussions will need to be undertaken with SoJ to determine an appropriate monitoring strategy to protect the existing hospital and patients.
Increased pollutants from additional traffic during the construction and operational phases	Existing and proposed hospital as well as residential properties within 200m of the local road network	High	Negligible	Not Significant	N/A	Negligible	Not Significant	N/A

A3

Issue	Date	By	Chkd	Appd
P01.1	2018-04-05	LL	LL	RE

Metres
0 40 80 160

ARUP

Client
Department for Infrastructure

Job Title
Jersey Future Hospital

Figure 5.3 Assessed Road Network (including car park and street canyons)

Scale at A3
1:3,000

Job No	Drawing Status
237035	**For Issue**

Drawing No	Issue
Figure 5.3	**P01.1**

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A3

Issue	Date	By	Chkd	Appd
P01.1	2018-04-05	LL	LL	RE

Metres
0 30 60 120

ARUP

Client
Department for Infrastructure

Job Title
Jersey Future Hospital

Figure 5.4 Sensitive Receptors on Road Network

Scale at A3
1:2,500

Job No
237035

Drawing Status
For Issue

Drawing No
Figure 5.4

Issue
P01.1

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A3

Legend

- Site Boundary
- Diffusion Tube Monitoring Locations

Issue	Date	By	Chkd	Appd
P01.1	2018-04-05	LL	LL	RE

Metres
0 95 190 380

ARUP

Client
Department for Infrastructure

Job Title
Jersey Future Hospital

Figure 5.5 Diffusion Tube Monitoring Locations

Scale at A3
1:7,000

Job No
237035

Drawing Status
For Issue

Drawing No
Figure 5.5

Issue
P01.1

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A3

Legend

- Site Boundary
- Construction Dust Buffer

Issue	Date	By	Chkd	Appd
P01.1	2018-03-29	LL	LL	RE

Metres
0 60 120 240

ARUP

Client
Department for Infrastructure

Job Title
Jersey Future Hospital

Figure 5.6
Construction Dust Buffers

Scale at A3
1:4,500

Job No	Drawing Status
237035	**For Issue**

Drawing No	Issue
Figure 5.6	**P01.1**

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