8 Human Health

8.1 Introduction

8.1.1 This Chapter assesses the likely significant human health effects resulting from the K3 Proposed Development, the 'practical effect' of the K3 Proposed Development and the WKN Proposed Development. Full descriptions of the proposed developments are provided in Chapter 2 of this ES.

8.2 Regulatory and Policy Framework

Planning Policies

Health Protection Agency Position Statement

8.2.1 The Health Protection Agency (HPA), now Public Health England (PHE), published a position statement in 2009 regarding the impact on health associated with emissions to air from municipal waste-to-energy projects [1]. The position concludes that well managed facilities operating to strict environmental standards would have only a small contribution to local air quality and no measurable risk to human health.

8.2.2 Since 2009, the emerging health evidence base has only reinforced this position statement. As a result, there has been no update.

National Policy Statements

8.2.3 Planning policy for energy generation Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to human health, is contained within the Overarching National Policy Statement (NPS) for Energy.

8.2.4 Here, NPS EN-1 [2] includes guidance on what matters are to be considered in the assessment:

> *"As described in the relevant sections of this NPS and in the technology-specific NPSs, where the proposed project has an effect on human beings, the ES should assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate. The impacts of more than one development may affect people simultaneously, so the applicant and the IPC should consider the cumulative impact on health".* (paragraph 4.13.2)
>
> *"The direct impacts on health may include increased traffic, air or water pollution, dust, odour, hazardous waste and substances, noise, exposure to radiation, and increases in pests".* (paragraph 4.13.3)

> *"New energy infrastructure may also affect the composition, size and proximity of the local population, and in doing so have indirect health impacts, for example if it in some way affects access to key public services, transport or the use of open space for recreation and physical activity"*. (paragraph 4.13.4)

8.2.5 NPS EN-1 [2] further highlights that the focus of the ES is largely centred on removing and mitigating any significant environmental or socio-economic precursor to a health outcome, but requires further clarity on how community health concerns have been assessed and addressed through the planning process:

> *"Generally, those aspects of energy infrastructure which are most likely to have a significantly detrimental impact on health are subject to separate regulation (for example for air pollution) which will constitute effective mitigation of them, so that it is unlikely that health concerns will either constitute a reason to refuse consents or require specific mitigation under the Planning Act 2008. However, the IPC will want to take account of health concerns when setting requirements relating to a range of impacts such as noise"*. (paragraph 4.13.5)

8.2.6 This approach is further reinforced through NPS EN-3, which states:

> *"Where a proposed waste combustion generating station meets the requirements of WID and will not exceed the local air quality standards, the IPC should not regard the proposed waste generating station as having adverse impacts on health"*. (paragraph 2.5.43)

National Planning Policy Framework (NPPF)

8.2.7 Promoting healthy and safe communities is a central theme of the National Planning Policy framework (NPPF) [3], which states that *"Planning policies and decisions should aim to achieve healthy, inclusive and safe places which a) promote social interaction […], b) are safe and accessible […], and c) enable and support healthy lifestyles […]."* (paragraph 91).

Kent County Council's Development Plan

8.2.8 Policy DM 11 (Health and Amenity) within the Kent Minerals and Waste Local Plan 2013-30 [4] outlines the following planning policy relevant to human health:

> *"Minerals and waste development will be permitted if it can be demonstrated that they are unlikely to generate unacceptable adverse impacts from noise, dust, vibration, odour, emissions, bioaerosols, illumination, visual intrusion, traffic or exposure to health risks and associated damage to the qualities of life and wellbeing to communities and the environment."*

Swale Borough Council's Development Plan

8.2.9 Policy CP 5 (Health and wellbeing) within the Swale Borough Local Plan [5] outlines the following planning policy relevant to human health:

> *"The Council, working in conjunction with relevant organisations, communities and developers, will promote, protect and work to improve the health of Swale's population, and reduce health inequalities. Development proposals will, as appropriate:*
>
> 1. *Bring forward accessible new community services and facilities, including health facilities;*
> 2. *Safeguard existing community services and facilities where they are viable or can be made so, or where replacement facilities can be provided without leading to any shortfall in provision, or where the local Clinical Commissioning Group has indicated a need for health facilities;*
> 3. *Safeguard or provide as appropriate, open space, sport and recreation in accordance with Policy DM 17, additionally enabling access to nature in accordance with the Local Plan Natural Assets and Green Infrastructure Strategy in Policy CP 7;*
> 4. *Promote healthier options for transport, including cycling and walking;*
> 5. *Improve or increase access to a healthy food supply such as allotments, markets and farm shops;*
> 6. *Create social interaction and safe environments through mixed uses and in the design and layout of new development;*
> 7. *Create a healthy environment that regulates local climate by providing open space and greenery to achieve shading and cooling, particularly within existing urban environments; and*
> 8. *Undertake and implement a Health Impact Assessment for relevant proposals that are:*
>
> a. *required to undertake Environmental Impact Assessments; or*
>
> b. *within Swale's most deprived wards; or*
>
> c. *identified as required by the Local Plan."*

8.2.10 On the above basis, the protection of public health is an implicit requirement with a consistent message from the national to local policy level, and further reinforced through the recent amendment to the EU EIA Directive [6] and the subsequent transposition into the UK EIA regulations [7]. The approach taken to address the policy requirement has been to embed the principles of Health Impact Assessment (HIA) within the regulatory assessment process from the outset, drawing from and building upon the wider technical disciplines to further investigate and more effectively communicate any potential health outcome (be it adverse or beneficial).

8.3 Methodology

Scoping and Consultation

8.3.1 As presented in Chapter 3, human health was included within the formal scoping process. Statuary consultee responses have been used to test, refine and inform the final scope and focus of the assessment.

8.3.2 The potentially relevant health determinants that are to be assessed within this chapter are identified in Table 8.1. These health determinants have been identified through analysis of construction, operational and decommissioning activities associated with the K3 Proposed Development, 'practical effect' of the K3 Proposed Development and WKN Proposed Development as defined in Chapter 2: Site Description, Proposed Development and Alternatives, and remain consistent with concerns raised during scoping.

8.3.3 Identification of a potentially relevant health determinant at this stage does not necessarily indicate that there would be a significant effect associated with that determinant. The significance of an effect would depend on the magnitude of change, the sensitivity of receptors and the degree to which they are affected.

Potential Health Determinant	Potential for Impact	Impact Type
Construction		
Changes in air quality (including dust nuisance, PM_{10}, $PM_{2.5}$ and NO_2 from on-site construction vehicles and associated transport movements)	Adverse	Local
Changes in noise exposure from on-site construction activities and associated transport movements (including annoyance)	Adverse	Local
Changes in local transport nature and flow rates (severance and risk of accident and injury)	Adverse	Local/regional
Direct, indirect and induced income and employment opportunities	Beneficial	Local/regional
Completed Development		
Changes in air quality (PM_{10}, $PM_{2.5}$ and NO_2 from on-site activities and associated transport movements delivering waste)	Adverse	Local
Changes in noise exposure from on-site operational activities and associated transport movements (including annoyance and sleep disturbance)	Adverse	Local
Changes in local transport nature and flow rates (severance and risk of accident and injury)	Adverse	Local/regional
Direct, indirect and induced income and employment opportunities	Beneficial	Local/regional
Decommissioning		
Changes in air quality (including dust nuisance, PM_{10}, $PM_{2.5}$ and NO_2 from on-site construction vehicles and associated transport movements)	Adverse	Local
Changes in noise exposure from on-site construction activities and associated transport movements (including annoyance)	Adverse	Local
Changes in local transport nature and flow rates (severance and risk of accident and injury)	Adverse	Local/regional
Direct, indirect and induced income and employment opportunities	Beneficial	Local/regional

Table 8.1 – Health determinants to be assessed

Establishing Baseline Conditions

8.3.4 Information relating to existing health and socio-economic circumstance in the locality was collected through a detailed review of third-party data, available online. Any environmental baseline conditions required to provide context for the completion of the human health assessment have been informed by the relevant technical disciplines, namely Chapter 4: Traffic and Transport, Chapter 5: Air Quality, and Chapter 7: Noise and Vibration.

8.3.5 The geographical study area for environmental health determinants within the human health assessment is informed by the relevant environmental technical disciplines, namely Chapter 4: Traffic and Transport, Chapter 5: Air Quality, and Chapter 7: Noise and Vibration. As such, data collection is confined to Swale Borough as it is anticipated that impacts from environmental health determinants would remain local.

8.3.6 The study area for socio-economic health determinants is also confined to Swale Borough. While it is likely that socio-economic determinants (i.e. income and employment) have a wider sphere of influence (as employment could potentially be sourced from further afield), it is the case that a focus on Swale Borough remains an appropriate study area.

Significance Criteria

8.3.7 A professional judgement on the significance of an effect is determined based on the magnitude of an impact and the sensitivity of the receptor affected by the impact of that magnitude. This section describes the criteria applied in this chapter to characterise the magnitude of potential impacts and sensitivity of receptors.

8.3.8 The criteria for defining magnitude in this chapter are outlined in Table 8.2.

Magnitude of Impact	Definition
Large	Change in environmental and socio-economic circumstance sufficient to result in a major change in baseline population health (adverse or beneficial)
Medium	Change in environmental and socio-economic circumstance sufficient to result in a moderate change in baseline population health (adverse or beneficial)
Small	Change in environmental and socio-economic circumstance sufficient to result in a minor change in baseline population health (adverse or beneficial)
Negligible	Change in environmental and socio-economic circumstance below that for which it is possible to result in any manifest health outcome at a population level (adverse or beneficial)
No change	No opportunity for change in health outcome

Table 8.2 – Criteria for magnitude of impact

8.3.9 Within a defined population, individuals will range in their level of sensitivity; as such, it is not possible to allocate a fair or accurate sensitivity classification to a

population. On this basis, a precautionary approach has been applied by assuming that the population within Swale are of uniformly high sensitivity.

8.3.10 The significance of the effect upon human health is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 8.3. Where a range of significance of effect is presented in Table 8.3, the final assessment for each effect is based upon expert judgement.

8.3.11 For the purpose of this assessment, any effects of slight or less are considered to be not significant.

		Magnitude of impact				
		No change	**Negligible**	**Small**	**Medium**	**Large**
Sensitivity of receptor	**Negligible**	No change	Negligible	Negligible or slight	Negligible or slight	Slight
	Low	No change	Negligible or slight	Negligible or slight	Slight	Slight or moderate
	Medium	No change	Negligible or slight	Slight	Moderate	Moderate or substantial
	High	No change	Slight	Slight or moderate	Moderate or substantial	Substantial or very substantial
	Very high	No change	Slight	Moderate or substantial	Substantial or very substantial	Very substantial

Table 8.3 – Matrix used for the assessment of the significance of an effect

Assessment of Effects

8.3.12 'Health' is commonly defined as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (the definition used by the World Health Organisation, WHO, since 1948) [8].

8.3.13 There is a large body of guidance on HIA generally and in the context of development planning, drawing from expert evidence and national government policy regarding the importance of integrating public health into the planning system.

8.3.14 The basis of this assessment is to apply a broad socio-economic model of health that encompasses conventional health impacts such as disease, accidents and risk, along with wider health determinants vital to achieving good health and wellbeing such as employment and local amenity. It considers both physical and mental health, and addresses equality and social impacts where possible. The assessment is therefore based on both 'social' and 'ecological' (environmental) determinants of health, illustrated in Figure 8.1.

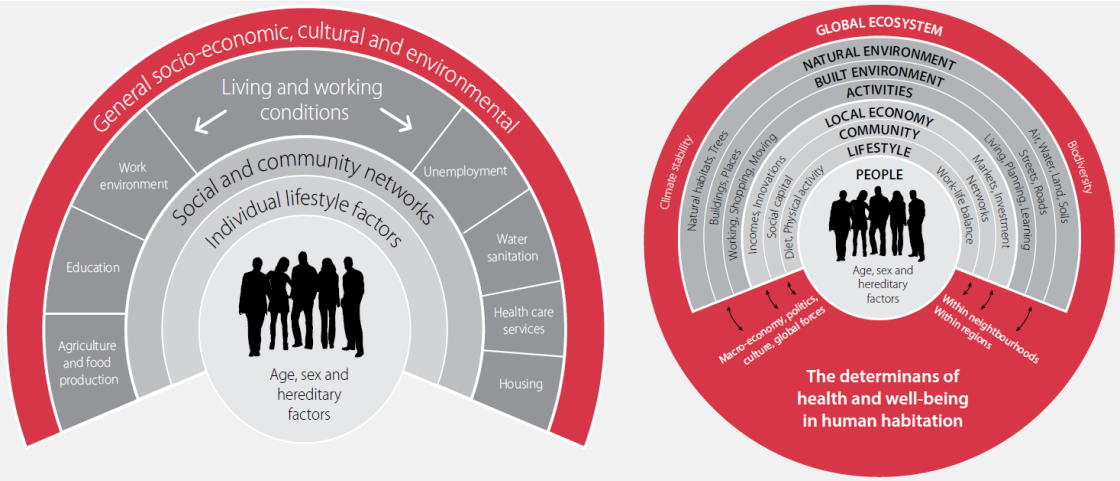

Figure 8.1 – Social (left) and ecological (right) determinants of health – reproduced from [9], citing [10] and [11]

8.3.15 When defining potential health pathways for a development project, it is also useful to consider three broad domains of public health practice:

- Health protection (i.e. environmental pollution and standards set to protect health);
- Health promotion (i.e. healthy lifestyles, socio-economic status and inequalities); and
- Health care (i.e. provision, effectiveness and equity of access to healthcare services).

8.3.16 The assessment follows a source-pathway-receptor approach to identify and assess health impacts that are plausible and directly attributable to the K3 Proposed Development, 'practical effect' of the K3 Proposed Development and WKN Proposed Development. A hazard source by itself is not necessarily a health risk: it is only when there is a hazard source, a sensitive receptor and a pathway of exposure where there is any potential for risk to health. Where a source-pathway-receptor linkage exists, then the nature of the specific hazard source, the magnitude of impact via the pathway and the sensitivity of the receptor determine what level of health risk is predicted, and its significance.

Limitations and Assumptions

8.3.17 The human health assessment partially draws from and builds upon the technical outputs from the air quality, noise and vibration, transport chapters of the ES, and as a consequence the limitations of those assessments also apply to that information as used in this chapter.

8.3.18 It is however, considered that the information available provides a suitable basis for a robust assessment of human health for EIA purposes.

8.4 Baseline Conditions

8.4.1 Evidence suggests that different communities have varying susceptibilities to health impacts and benefits as a result of social and demographic structure, behaviour and relative economic circumstance. The aim of the following information which summarises the human health baseline provided in Appendix 8.1, is to put into context the local socio-economic and health circumstance of the communities within Swale Borough Council, drawing from available statistics.

8.4.2 In addition to the statistics referenced below which relate to health and socio-economic circumstance, baseline environmental conditions referenced in the relevant technical disciplines are used within the human health assessment where appropriate.

Demography and socio-economic

8.4.3 The closest community residential receptor is located approximately 670m south-west of the development site, on Recreation Road. Population growth within Swale is higher than that of the county, regional and national averages. The study area shows a relatively large elderly population, with a higher proportion of the population aged 50-79 year olds compared to the national average. Comparatively, the study area has a lower proportion of the population aged 20-44 years when compared to the national average.

8.4.4 Employment and economic activity figures within Swale are slightly lower than regional and national averages. In addition, the proportion of the population within Swale claiming job seekers allowance is also higher than the regional and national averages, and continues to increase. Income is consistently lower than the regional average but higher than the national average. Qualification attainment within Swale is also lower than regional and national averages.

8.4.5 Overall, there is a larger proportion of Lower Super Output Areas within Swale identified as being in the 20% most deprived areas nationally, compared to the 20% most affluent (indicating both high levels of deprivation and inequality). When considering the individual domains within the combined indices of multiple deprivation, it is the education and crime domains that are particularly prominent, with the highest levels of deprivation in Swale, contrasted against the health domain which has the lowest levels of deprivation in Swale.

Life expectancy and physical health

8.4.6 Male life expectancy in Swale has shown a general decreasing trend over the years and is below the regional and national average. Female life expectancy has fluctuated but is again showing a decreasing trend since 2013 and is now also below both the regional and national average life expectancy.

8.4.7 Emergency hospital admissions for a variety of respiratory and cardiovascular diseases and conditions are lower in Swale compared to the national average. However, all-age all-cause mortality, cardiovascular disease mortality, respiratory disease mortality and cancer mortality within Swale are higher.

8.4.8 Of the data collected for cardiovascular disease mortality and cancer mortality, there is some improvement, with a decreasing trend. However, this is contrasted against an increasing trend for respiratory disease mortality.

Mental health

8.4.9 Mental health statistics within Swale are mixed. Dementia recorded prevalence and hospital stays for self-harm are both lower than the regional and national averages. Conversely, suicide rate and depression recorded incidence are both higher than regional and national averages.

Lifestyle

8.4.10 The proportion of obese children in Swale is similar to the national average and higher than the regional average, while the proportion of adults with excess weight has been increasing to above the regional and national average.

8.4.11 Smoking prevalence has been consistently higher than the regional and national averages and has shown a decreasing trend in recent years. Hospital stays for alcohol related harm (which is used as a proxy for excessive alcohol intake) has fluctuated over the years but has generally remained below regional and national averages.

Conclusion

8.4.12 The population within Swale is growing at a faster rate than the county, regional and national average, and the demographic structure includes a large and increasing elderly population.

8.4.13 Life expectancy for males and females in Swale is low in comparison to regional and national averages. Physical and mental health statistics are mixed, where some (such as mortality statistics, suicide rate, depression) are worse than the national average and others better (emergency hospital admissions, dementia prevalence, hospital stays for self-harm). All lifestyle factors analysed, except hospital stays for alcohol related harm, are worse than the regional and national averages.

8.4.14 Education and crime deprivation domains have the highest levels of deprivation in Swale. Socio-economic indicators such as employment, income and qualification attainment are all lower than geographic comparators, while the proportion of residents claiming job seekers allowance is higher. This suggests that there are higher levels of socio-economic deprivation within Swale than compared to the county, regional and national averages.

8.4.15 On the above basis, residents within the study area are considered sensitive to changes in environmental and socio-economic circumstance (both adverse and beneficial), and statistics indicate that a number of barriers to socio-economic benefit uptake exist, compounding inequality and burdens of poor health. Such factors have been applied to inform the assessment, planning features and mitigation tailored to local circumstance, priority and need.

Sensitive Receptors

8.4.16 For the purpose of assessment, particularly sensitive receptors considered within the assessment are listed in Table 8.4. The assessment in this Chapter has considered the effects listed in the table upon the identified sensitive receptors.

Receptor	Importance/sensitivity/vulnerability to change
Residential Receptors	High
Schools	High
Nursing Homes	High

Table 8.4 – Potentially affected sensitive receptors

8.5 Future Baseline

8.5.1 As it is challenging to predict the future human health baseline with high confidence, trends are analysed as part of the current baseline to provide insight into likely future local community circumstance. For the purpose of this assessment, the present-day baseline human health data have been used.

8.6 The effect of K3 Proposed Development

Construction Effect

Health Effects from Changes to Air Quality

8.6.1 As stated in Chapter 5: Air Quality, the construction dust assessment undertaken as part of the original planning application for K3 as consented provided a list of recommended mitigation measures to ensure that the effect from construction would be not significant (see Document 3.2 submitted with the application). Assuming that these mitigation measures were implemented, the effect is expected to be not significant.

8.6.2 The air quality assessment for K3 as consented did not quantitatively assess the effects of construction traffic on air quality as construction traffic flows were expected to be lower than operational traffic flows.

8.6.3 On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Changes in Noise Exposure

8.6.4 As stated in Chapter 7: Noise and Vibration, an assessment of K3 construction noise and vibration effects was included within the original planning application (see Document 3.2 submitted with the application). Results of the assessment indicated that noise levels during the construction phase would not be expected to exceed 65 dB $L_{Aeq, 12h}$ during the daytime period or 45 dB $L_{Aeq, 8h}$ during the night time period at any sensitive receptor. In addition, changes to noise levels associated with construction related traffic would be <1 dB which is not considered significant in noise terms.

8.6.5 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a timing, duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Changes to Transport Nature and Flow Rate

8.6.6 As stated in Chapter 4: Traffic and Transport, potential effects associated with the construction of K3 as consented were scoped out of assessment for the original planning application (see Document 3.2 submitted with the application), as the level of traffic was assessed to be less than during operation.

8.6.7 Paragraph 8.6.19 to 8.6.22 detail the worst-case assessment relating to potential human health effects associated with operational traffic, which is not considered significant.

Health Effects from Income and Employment Generation

8.6.8 During the peak construction period for the K3 Proposed Development, up to 642 FTE construction staff were required on site.

8.6.9 While this represents the maximum number of direct job opportunities, there would be indirect and induced employment opportunities generated not only at the local level but also at the regional and national level, further down the supply chain and through local spending. Any employment opportunities being provided to the local population would support the uptake of socio-economic related health benefits locally.

8.6.10 Due to the short-term or medium-term nature of the construction phase, the number of job opportunities generated by the K3 Proposed Development are only likely to improve socio-economic circumstance, and thus health and wellbeing, at the individual level rather than at the population level. As such, the magnitude of impact on human health is considered small, where in an area of high sensitivity, would result in a slight beneficial significance of effect, which is not considered significant.

Completed Development Effects

Health Effects from Changes to Air Quality

8.6.11 The changes associated with the operation of the K3 Proposed Development have the potential to influence human health by changing community exposure to a range of pollutants generated by the stack and additional vehicle movements. The relative risk however, is a function of the change in concentration, exposure, individual pollutant hazard characteristics and the existing burden of poor health.

PM10 and NO2

8.6.12 As stated in Chapter 5: Air Quality, the maximum change in PM_{10} and NO_2 associated with the K3 Proposed Development is predicted to be 0.19 µg/m^3 and 0.86 µg/m^3, respectively. This change is not considered to be significant by air quality standards and remains within the relevant air quality objectives set to be protective of the environment and health.

8.6.13 To set potential risk into context, the results from the air quality assessment and baseline health data from all-cause mortality and emergency hospital admissions collected for Swale Borough (detailed within Appendix 8.1), were applied using the World Health Organisation (WHO) Health Risks of Air Pollution in Europe (HRAPIE) guidance to quantitatively assess the potential human health impacts from the operation of the K3 Proposed Development. This represents a worst-case hypothetical scenario where 15% of the population within Swale Borough would be exposed to the maximum increase in PM_{10} and NO_2 at any receptor.

8.6.14 As shown in Table 8.5, in this worst-case hypothetical scenario, the change in concentration and exposure are orders of magnitude lower than what is required to quantify any measurable adverse health outcome on local communities.

Health Outcome	Worst-case Additional Health Outcome	Proportion of Baseline Rate
All-cause mortality	0.4	<0.1%
Hospital admissions (respiratory disease)	0.7	<0.1%
Hospital admissions (cardiovascular disease)	0.04	<0.1%

Table 8.5 – Health outcome effects associated with changes in air quality

8.6.15 Therefore, even when grossly overestimating population exposure, the relative change in concentration is insufficient to quantify any measurable change in mortality rate or hospital admissions. On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Changes in Noise Exposure

8.6.16 As stated in Chapter 7: Noise and Vibration, while the K3 Proposed Development introduces no additional noisy fixed plant above what was already assessed as part of the original planning application (see Document 3.2 submitted with the application), modifications to the design of the K3 Proposed Development have been made and include the relocation of proposed buildings with the potential to influence the magnitude of noise emissions. As a result, this has been reassessed in Chapter 7: Noise and Vibration, with the resultant effects on human health also assessed.

8.6.17 During operation, there would be no increase in ambient noise exposure from on-site activities during both the daytime and night time periods. Regarding traffic related noise during operation, the worst-case change in ambient noise at any sensitive receptor would be 1.2 dB which is not considered significant in noise terms.

8.6.18 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a timing, duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Changes to Transport Nature and Flow Rate

8.6.19 A maximum number of 417 two-way HGV movements and 49 two-way staff movements would be generated per day as a result of the operation of the K3 Proposed Development.

8.6.20 As stated in Chapter 4: Traffic and Transport, the worst-case percentage increase in total daily traffic movements on any road link is predicted to be 31.2% and the worst-case increase in HGV movements is predicted to be 119.3%. These percentage increases are expected to occur on the 'Barge Way east of Fleet End' road link on a Sunday. Percentage increases for daily traffic movements on all other road links are predicted to be below 30%.

8.6.21 The community is situated on one side of the road; therefore, there is no opportunity for severance impacts to occur. In addition, there are no road safety issues identified on the road links assessed. On the basis that the change in transport nature and flow rate would be similar to what is already on the network, traffic associated with operation of the K3 Proposed Development is not expected to alter the risk of accident and injury. However, as the worst-case increase in HGV movements is predicted to be 119.3% (i.e. more than double existing baseline conditions), there is potential for adverse impacts on pedestrian amenity.

8.6.22 On the above basis, the magnitude of impact on human health would be small, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Income and Employment Generation

8.6.23 It is anticipated that during the operational phase, the K3 Proposed Development will generate a maximum of 49 full-time direct job opportunities.

8.6.24 In addition, to the direct job opportunities provided, there would be indirect and induced employment opportunities generated not only at the local level but also at the regional and national level, further down the supply chain and through local spending. Any employment opportunities provided to the local population would support the uptake of socio-economic related health benefits locally.

8.6.25 At this stage, it is unclear where workers would be sourced from. In addition, the number of job opportunities generated by the K3 Proposed Development are only likely to improve socio-economic circumstance, and thus health and wellbeing, at the individual level rather than at the population level. As such, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight beneficial significance of effect, which is not considered significant.

Decommissioning Effects

Health Effects from Changes to Air Quality

8.6.26 As stated in Chapter 5: Air Quality, the air quality effects from decommissioning activities are expected to be the same or lower than during the construction phase.

8.6.27 On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Changes in Noise Exposure

8.6.28 As stated in Chapter 7: Noise and Vibration, noise generation from decommissioning activities are expected to be similar to or less than, those that occurred during the construction phase.

8.6.29 On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Changes to Transport Nature and Flow Rate

8.6.30 As stated in Chapter 4: Traffic and Transport, traffic flows associated with decommissioning would be lower than during the construction phase. Potential effects associated with construction of the now permitted K3 were scoped out of the original planning application (see Document 3.2 submitted with the application) as the level of traffic was assessed to be less than during operation.

8.6.31 Paragraph 8.6.19 to 8.6.22 detail the worst-case assessment relating to potential human health effects associated with operational traffic, which is not considered significant.

Health Effects from Income and Employment Generation

8.6.32 At this stage, the number of workers or length of time required to complete the decommissioning of the K3 Proposed Development is unclear. On the basis that the duration of the decommissioning period would be either short-term or medium-term, the potential human health effects are only likely to improve socio-economic circumstance, and thus health and wellbeing, at the individual level rather than at the population level.

8.6.33 As such, the magnitude of impact on human health would be small, where in an area of high sensitivity, would result in a slight beneficial significance of effect, which is considered not significant.

Summary of Effects

Effect Identified	Receptor Sensitivity	Impact Magnitude	Nature	Duration	Degree of Effect	Level of certainty
Construction Effects						
Health effects from changes to air quality	High	Negligible	Adverse	Short term /medium term	Slight, not significant	Absolute
Health effects from changes in noise exposure	High	Negligible	Adverse	Short term /medium term	Slight, not significant	Absolute
Health Effects from changes to transport nature and flow rate	*Scoped out of the original planning application (see Document 3.2 submitted with the application) as the level of traffic was assessed to be less than during operation. Refer to completed development effects.*					
Health effects from income and employment generation	High	Small	Beneficial	Short term /medium term	Slight, not significant	Reasonable
Completed Development Effects						
Health effects from changes to air quality	High	Negligible	Adverse	Long term	Slight, not significant	Absolute
Health effects from changes in noise exposure	High	Negligible	Adverse	Long term	Slight, not significant	Absolute
Health Effects from changes to transport nature and flow rate	High	Small	Adverse	Long term	Slight, not significant	Absolute
Health effects from income and employment generation	High	Negligible	Beneficial	Long term	Slight, not significant	Absolute
Decommissioning Effects						
Health effects from changes to air quality	High	Negligible	Adverse	Short term /medium term	Slight, not significant	Absolute
Health effects from changes in noise exposure	High	Negligible	Adverse	Short term /medium term	Slight, not significant	Absolute
Health Effects from changes to transport nature and flow rate	*Scoped out of the original planning application (see Document 3.2 submitted with the application) as the level of traffic was assessed to be less than during construction and operation. Refer to completed development effects.*					
Health effects from income and employment generation	High	Small	Beneficial	Short term /medium term	Slight, not significant	Reasonable

Table 8.6 – Summary of effects prior to mitigation

8.7 Mitigation

8.7.1 Mitigation measures proposed relating to K3 Proposed Development would focus on environmental precursors to adverse health outcomes, thereby providing the opportunity for intervention to prevent any manifest health outcome.

8.7.2 The assessment of human health effects has taken into account any embedded mitigation measures as well as any additional mitigation outlined within the relevant environmental technical disciplines associated with the K3 Proposed Development, namely Chapter 5: Air Quality, Chapter 4: Traffic and Transport and Chapter 7: Noise and Vibration. On this basis, no additional mitigation measures relevant to human health are considered necessary.

8.8 Residual Effects

8.8.1 As there are no additional human health mitigation measures proposed, the residual effects remain the same are those set out in Table 8.6.

8.9 The practical effect of the K3 Proposed Development

8.9.1 The practical effect of the K3 Proposed Development will not result in any external physical works to K3 as consented.

8.9.2 The practical effect of the DCO application is therefore to permit K3 to operate at an upgraded capacity of up to 75MW (an additional 25.1 MWe) and to process an additional 107,000 tonnes of waste per annum beyond that possible under the existing Town and Country Planning permission.

8.9.3 The potential health effects that could arise from the practical effect of the K3 Proposed Development beyond those of K3 as consented comprise changes in air quality, noise, transport and employment opportunities which are considered below.

Construction Effect

8.9.4 The practical effect of the K3 Proposed Development will not result in any external physical works to K3 as consented.

Completed Development Effects

Health Effects from Changes to Air Quality

8.9.5 The changes associated with the practical effect of the K3 Proposed Development have the potential to influence human health by changing community exposure to a range of pollutants generated by the stack and additional vehicle movements. The relative risk however, is a function of the change in concentration, exposure, individual pollutant hazard characteristics and the existing burden of poor health.

PM10 and NO2

8.9.6 As stated in Chapter 5: Air Quality, the maximum change in PM_{10} and NO_2 associated with the practical effect of the K3 Proposed Development at any receptor is predicted to be 0.01 06 µg/m^3 and 0.04 µg/m^3, respectively[1]. This change is not considered to be significant by air quality standards and remains within the relevant air quality objectives set to be protective of the environment and health.

8.9.7 On the basis that these increases in concentration are lower than for the K3 Proposed Development scenario (refer to Section 8.6), it can be concluded that neither the change in concentration or exposure to PM_{10} or NO_2 would be sufficient to quantify any change in health outcome at a population level.

8.9.8 As such, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

[1] Note: potential contributions to ambient air quality concentrations associated with additional vehicle movements were not modelled as the change was below the threshold required for modelling

8.9.9 A Human Health Risk Assessment (HHRA) has been commissioned to support the Environmental Permit application. The HHRA assesses the potential risk to human health from lifetime exposure to dioxins, furans, Polycyclic Aromatic Hydrocarbons (PAHs) and heavy metals. The evaluation is based upon worst-case, conservative scenarios with respect to: location of the exposed individual and duration of exposure; exposure rate; and emission rate from the source.

8.9.10 As stated in the HHRA, taking into account the worst-case assumptions adopted for the assessment, the contribution of the K3 facility to the intake of Swanage dioxins/furans and dioxin-like PCBs is negligible.

Health Effects from Changes in Noise Exposure

8.9.11 As stated in Chapter 7: Noise and Vibration, there would be no increase in on-site plant noise resultant from the practical effect of the K3 Proposed Development. However, the practical effect of the K3 Proposed Development has the potential to influence human health from an increase in ambient noise exposure resulting from HGV movements on the existing road network.

8.9.12 The maximum change in ambient noise exposure from the practical effect of the K3 Proposed Development on the existing road network is estimated to be <1 dB which is not considered significant in noise terms.

8.9.13 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a timing, duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Changes to Transport Nature and Flow Rate

8.9.14 It is anticipated that a maximum number of 68 additional two-way HGV movements would be generated per day as a result of the practical effect of the K3 Proposed Development. As there would be no increase in the number of staff required to operate the K3 Proposed Development, there would be no change in two-way staff movements.

8.9.15 As stated in Chapter 4: Traffic and Transport, the worst-case percentage increase in total daily traffic movements on any road link is predicted to be 3.5% and the worst-case increase in HGV movements is predicted to be 9.9%. These percentage increases are expected to occur on the 'Barge Way east of Fleet End' road link on a Sunday and would result in imperceptible effects on severance, pedestrian amenity and risk of accident and injury.

8.9.16 On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Income and Employment Generation

8.9.17 During the operational phase, there would be no increase in the number of staff required to operate the K3 Proposed Development pursuant to the practical effect above K3 as consented.

8.9.18 As such, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight beneficial significance of effect, which is not considered significant.

Decommissioning Effects

8.9.19 Decommissioning effects would remain as set out Section 8.6.

Summary of Effects

Effect Identified	Receptor Sensitivity	Impact Magnitude	Nature	Duration	Degree of Effect	Level of certainty
Completed Development Effects						
Health effects from changes to air quality	High	Negligible	Adverse	Long term	Slight, not significant	Absolute
Health effects from changes in noise exposure	High	Negligible	Adverse	Long term	Slight, not significant	Absolute
Health Effects from changes to transport nature and flow rate	High	Negligible	Adverse	Long term	Slight, not significant	Absolute
Health effects from income and employment generation	High	Negligible	Beneficial	Long term	Slight, not significant	Absolute

Table 8.7 – Summary of effects prior to mitigation

8.10 Mitigation

8.10.1 The assessment of human health effects has taken into account any embedded mitigation measures as well as any additional mitigation outlined within the relevant environmental technical disciplines associated with the K3 as consented, namely Chapter 5: Air Quality, Chapter 4: Traffic and Transport and Chapter 7: Noise and Vibration. No significant effects are predicted to result from the practical effect of the K3 Proposed Development and on this basis, no additional mitigation measures relevant to human health are considered necessary.

8.11 Residual Effects

8.11.1 As there are no additional human health mitigation measures proposed, the residual effects remain the same are those set out in Table 8.7.

8.12 WKN Predicted Effects

8.12.1 The WKN Proposed Development requires construction, completed development and decommissioning effects to be assessed. The health determinants to be assessed for all phases comprise changes in air quality, noise, transport and employment opportunities.

Construction Effects

Health Effects from Changes to Air Quality

8.12.2 The construction of the WKN Proposed Development has the potential to influence human health by contributing to nuisance dust from general on-site construction activities and through track out, and by changing community exposure to PM_{10} and NO_2 levels due to associated transport movements. The relative risk however, is a function of the change in concentration, exposure and existing burden of poor health.

8.12.3 As stated in Chapter 5: Air Quality, the potential impact from nuisance dust would be limited to annoyance and is not considered to be significant. In addition, potential dust emissions would be managed through the implementation of a CEMP. As such, neither the change in concentration or exposure to construction dust emissions are sufficient to quantify any change in health outcome at a population level.

8.12.4 As stated in Chapter 5: Air Quality, the maximum change in PM_{10} and NO_2 associated with construction traffic movements is predicted to be 0.08 µg/m^3 and 0.32 µg/m^3, respectively. This change would be temporary in nature; is not considered to be significant by air quality standards; remains within the relevant air quality objectives set to be protective of the environment and health; and is not of a concentration or exposure sufficient to quantify any adverse health outcome.

8.12.5 On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Changes in Noise Exposure

8.12.6 There is the potential for intermittent noise generation during the construction of the WKN Proposed Development. This disruption will be largely limited to standard working hours, with the exception for essential works such as prolonged concrete pours. Construction activities required to be undertaken outside of normal working hours will only occur following agreement by Swale Borough Council. Overall, site preparation and construction works are anticipated to take approximately 40 months to complete.

8.12.7 The potential health effects from changes in noise exposure associated with the construction of the WKN Proposed Development is therefore limited to annoyance on the basis that construction activities (other than concrete pouring) would

generally take place during day time hours only. On this basis, any health assessment relating to the potential for sleep disturbance is not required.

8.12.8 As stated in Chapter 7: Noise and Vibration, the maximum noise level at any sensitive receptor from on-site construction activities is predicted to be 32 dB L_{Aeq} at any receptor (during the day, evening and night time periods). In addition, the maximum change in ambient noise exposure at any sensitive receptor associated with construction transport movements on the existing road network is estimated to be <1 dB which is not considered significant in noise terms.

8.12.9 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a timing, duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Changes to Transport Nature and Flow Rate

8.12.10 It is anticipated that a maximum number of 92 two-way HGV movements and 818 two-way staff movements would be generated per day as a result of the construction of the WKN Proposed Development.

8.12.11 As stated in Chapter 4: Traffic and Transport, the worst-case percentage increase in total daily traffic movements on any road link is predicted to be 60.5% and the worst-case increase in HGV movements is predicted to be 13.3%. These percentage increases are expected to occur on the 'Barge Way east of Fleet End' road link on a Sunday. Percentage increases for daily traffic movements on all other road links are predicted to be below 30%.

8.12.12 The community is situated on one side of the road; therefore, there is no opportunity for severance impacts to occur. In addition, there are no road safety issues identified on the road links assessed. On the basis that the change in transport nature and flow rate would be similar to what is already on the network, traffic associated with construction of the WKN Proposed Development is not expected to alter the risk of accident and injury. Furthermore, there would be no adverse impact on pedestrian amenity as the worst-case increase in total daily traffic movements or HGV movements is temporary and below the threshold for an effect.

8.12.13 Regarding the movement of abnormal indivisible loads, there is potential for impacts on road safety as a consequence of driver frustration. However, this impact will be managed through the presence of a police escort. In addition, the movement of abnormal indivisible loads has the potential to reduce pedestrian amenity. However, on the basis that movement of abnormal indivisible loads would be infrequent, this is not expected to be significant.

8.12.14 Overall, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Income and Employment Generation

8.12.15 At this stage, the peak number of workers required to complete the construction of the WKN Proposed Development is estimated to be 482. On the basis that the duration of the construction period is anticipated to be approximately 40 months and is therefore considered only short-term or medium-term, the potential human health effects are only likely to improve socio-economic circumstance, and thus health and wellbeing, at the individual level rather than at the population level.

8.12.16 As such, the magnitude of impact on human health would be small, where in an area of high sensitivity, would result in a slight beneficial significance of effect, which is not considered significant.

Completed Development Effects

Health Effects from Changes to Air Quality

8.12.17 The changes associated with the operation of the WKN Proposed Development have the potential to influence human health by changing community exposure to a range of pollutants generated by the stack and additional vehicle movements. The relative risk however, is a function of the change in concentration, exposure, individual pollutant hazard characteristics and the existing burden of poor health.

PM10 and NO2

8.12.18 As stated in Chapter 5: Air Quality, the maximum change in PM_{10} and NO_2 associated with stack emissions and associated vehicle movements at any receptor is predicted to be 0.11 µg/m^3 and 0.90 µg/m^3, respectively. This change is not considered to be significant by air quality standards and remains within the relevant air quality objectives set to be protective of the environment and health.

8.12.19 While the increase in PM_{10} concentration associated with the WKN development is lower than for the K3 Proposed Development (Refer to Section 8.6), the increase in NO_2 concentration associated with the WKN development is marginally higher than for the K3 Proposed Development. On the basis that both pollutants contribute to potential human health effects, a further quantitative assessment (following HRAPIE guidance) for the WKN predicted effects has been undertaken for the avoidance of doubt. This represents a worst-case hypothetical scenario where 15% of the population within Swale Borough would be exposed to the maximum increase in PM_{10} and NO_2 at any receptor.

8.12.20 As shown in Table 8.8, in this worst-case hypothetical scenario, the change in concentration and exposure are orders of magnitude lower than what is required to quantify any measurable adverse health outcome on local communities.

Health Outcome	Worst-case Additional Health Outcome	Proportion of Baseline Rate
All-cause mortality	0.3	<0.1%
Hospital admissions (respiratory disease)	0.6	<0.1%
Hospital admissions (cardiovascular disease)	0.02	<0.1%

Table 8.8 – Health outcome effects associated with changes in air quality

8.12.21 Results for the WKN predicted effects are lower than the effects for the K3 Proposed Development. Therefore, even when grossly overestimating population exposure, the relative change in concentration is insufficient to quantify any measurable change in mortality rate or hospital admissions. On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Changes in Noise Exposure

8.12.22 The WKN Proposed Development will be operational 24 hours per day, 7 days per week. As a result, there is the potential for annoyance and sleep disturbance effects to occur.

8.12.23 As stated in Chapter 7: Noise and Vibration, the maximum change in ambient noise exposure during the operation of the WKN Proposed Development from on-site activities or transport movements on the existing road network is estimated to be <1 dB during the day or night time periods which is not considered significant in noise terms.

8.12.24 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Changes to Transport Nature and Flow Rate

8.12.25 It is anticipated that a maximum number of 252 two-way HGV movements and 71 two-way staff movements would be generated per day as a result of the operation of the WKN Proposed Development.

8.12.26 As stated in Chapter 4: Traffic and Transport, the worst-case percentage increase in total daily traffic movements on any road link is predicted to be 17.7% and the worst-case increase in HGV movements is predicted to be 36.2%. These percentage increases are expected to occur on the 'Barge Way east of Fleet End' road link on a Sunday. Percentage increases for daily traffic movements on all other road links are predicted to be below 30%.

8.12.27 The community is situated on one side of the road; therefore, there is no opportunity for severance impacts to occur. In addition, there are no road safety

issues identified on the road links assessed. On the basis that the change in transport nature and flow rate would be similar to what is already on the network, traffic associated with operation of the WKN Proposed Development is not expected to alter the risk of accident and injury. Furthermore, there would be no adverse impact on pedestrian amenity as the worst-case increase in total daily traffic movements or HGV movements is below the threshold for an effect.

8.12.28 On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is not considered significant.

Health Effects from Income and Employment Generation

8.12.29 It is anticipated that during the operational phase, the WKN Proposed Development will generate up to 50 full-time direct job opportunities.

8.12.30 In addition, to the direct job opportunities provided, there would be indirect and induced employment opportunities generated not only at the local level but also at the regional and national level, further down the supply chain and through local spending. Any employment opportunities provided to the local population would support the uptake of socio-economic related health benefits locally.

8.12.31 At this stage, it is unclear where workers would be sourced from. In addition, the number of job opportunities generated by the WKN Proposed Development are only likely to improve socio-economic circumstance, and thus health and wellbeing, at the individual level rather than at the population level. As such, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight beneficial significance of effect, which is not considered significant.

Decommissioning Effects

8.12.32 The nature of the decommissioning phase would remain similar to, or less than, the construction phase and subject to the same or similar mitigation measures as set out in the CEMP (Appendix 2.1). A Decommissioning Environmental Management Plan (DEMP) is to be produced and subject to the approval of the planning authority prior to the future decommissioning of the WKN Proposed Development. As such, it can be concluded that the potential effects on human health would remain the same as assessed for construction and would not be significant.

8.12.33 For the sake of brevity, refer to paragraph 8.12.2 to 8.12.16 for more detail on potential decommissioning effects.

Summary of Effects

Effect Identified	Receptor Sensitivity	Impact Magnitude	Nature	Duration	Degree of Effect	Level of certainty
Construction Effects						
Health effects from changes to air quality	High	Negligible	Adverse	Short term/ medium term	Slight, not significant	Absolute

Effect Identified	Receptor Sensitivity	Impact Magnitude	Nature	Duration	Degree of Effect	Level of certainty
Health effects from changes in noise exposure	High	Negligible	Adverse	Short term/ medium term	Slight, not significant	Absolute
Health effects from changes to transport nature and flow rate	High	Negligible	Adverse	Short term/ medium term	Slight, not significant	Absolute
Health effects from income and employment generation	High	Small	Beneficial	Short term/ medium term	Slight, not significant	Reasonable
Completed Development Effects						
Health effects from changes to air quality	High	Negligible	Adverse	Long term	Slight, not significant	Absolute
Health effects from changes in noise exposure	High	Negligible	Adverse	Long term	Slight, not significant	Absolute
Health effects from changes to transport nature and flow rate	High	Negligible	Adverse	Long term	Slight, not significant	Absolute
Health effects from income and employment generation	High	Negligible	Beneficial	Long term	Slight, not significant	Absolute
Decommissioning Effects						
Health effects from changes to air quality	High	Negligible	Adverse	Short term/ medium term	Slight, not significant	Absolute
Health effects from changes in noise exposure	High	Negligible	Adverse	Short term/ medium term	Slight, not significant	Absolute
Health effects from changes to transport nature and flow rate	High	Negligible	Adverse	Short term/ medium term	Slight, not significant	Absolute
Health effects from income and employment generation	High	Small	Beneficial	Short term/ medium term	Slight, not significant	Reasonable

Table 8.9 – Summary of effects prior to mitigation

8.13 Mitigation

8.13.1 Mitigation measures relating to the WKN Proposed Development would focus on environmental precursors to adverse health outcomes, thereby providing the opportunity for intervention to prevent any manifest health outcome.

8.13.2 The assessment of human health effects has taken into account any proposed mitigation measures which are outlined within the relevant environmental technical disciplines, namely Chapter 5: Air Quality, Chapter 4: Traffic and

Transport and Chapter 7: Noise and Vibration. On this basis, no additional mitigation measures relevant to human health are considered necessary.

8.14 Residual Effects

8.14.1 As there are no additional human health mitigation measures proposed, the residual effects remain the same are those set out in Table 8.9.

8.15 Cumulative Effects

8.15.1 The human health cumulative assessment is based on the following scenarios:

- K3 Proposed Development+ other cumulative developments;
- Practical effect of the K3 Proposed Development + other cumulative developments;
- WKN Proposed Development + other cumulative developments;
- WKN Proposed Development + K3 Proposed Development + other cumulative developments; and
- WKN Proposed Development + practical effect of the K3 Proposed Development + other cumulative developments.

8.15.2 The relevant "other" cumulative developments assessed remain consistent with the technical disciplines which inform the Human Health chapter, namely Chapter 5: Air Quality, Chapter 7: Noise and Vibration and Chapter 4: Traffic and Transport.

8.15.3 While there is the potential for cumulative effects on human health associated with the generation of nuisance dust during construction and decommissioning, it is anticipated that there would be effective implementation of appropriate mitigation measures on other construction sites to control this. Therefore, cumulative effects on human health from changes in air quality during construction and decommissioning have not been considered further.

8.15.4 Similarly, due to the variable nature of construction, the cumulative impacts of on-site construction noise are generally no greater than what arises for individual projects. While the length of impact may be extended if the construction of projects run non-concurrently, if construction-related mitigation measures are followed, it is unlikely that cumulative construction noise impacts will occur. Consequently, the cumulative effects on human health due to on-site construction noise is unlikely to be greater than for the project alone. On this basis, potential cumulative impacts on human health from increased noise exposure during construction associated with cumulative on-site activities have not been considered further. Potential human health effects from increases in noise exposure associated with cumulative construction traffic will still be assessed for all scenarios which include the WKN Proposed Development.

8.15.5 The cumulative effects associated with income and employment generation have not been considered in detail due to the level of uncertainty surrounding: construction programme and employment numbers for the relevant cumulative developments; and full-time operational employment opportunities associated with the relevant cumulative developments.

8.15.6 Generally speaking, the construction of more than one development concurrently would offer a larger magnitude of construction-related jobs at any one point in time, potentially to the extent that the local construction workforce would not be able to meet the construction job demand. In this instance, construction workers would have to be sourced from further afield. On the other hand, the construction

of more than one development in a staggered manner would offer more in the way of a sustained socio-economic benefits and job retention for locally based construction workers who could move from one development to the other (i.e. a lower magnitude of demand for a longer duration).

K3 Proposed Development + other cumulative developments

Health Effects from Changes to Air Quality

Construction

8.15.7 Refer to paragraph 8.15.3 for an explanation as to why cumulative health effects from changes to air quality have not been considered for construction.

Operation

8.15.8 In a scenario where the K3 Proposed Development and all other relevant cumulative developments were operational, the annual mean ambient concentrations of PM_{10} and NO_2 would still remain below the relevant objective thresholds set to be protective of the environment and health.

8.15.9 Based on the approach to the cumulative assessment applied in Chapter 5: Air Quality, it is not possible to quantitatively assess potential human health impacts at any given sensitive receptor. However, taking into account the results from the quantitative human health assessment detailed in Section 8.6 and on the basis that ambient concentrations of PM_{10} and NO_2 would remain below the relevant objective thresholds set to be protective of the environment and health in a worst-case scenario, it is anticipated that the relative change in concentration is insufficient to quantify any measurable change in local population health outcomes.

8.15.10 On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Decommissioning

8.15.11 Refer to paragraph 8.15.3 for an explanation as to why cumulative health effects from changes to air quality have not been considered for decommissioning.

Health Effects from Changes in Noise Exposure

Construction

8.15.12 Refer to paragraph 8.15.4 for an explanation as to why cumulative health effects from changes in noise exposure have not been considered for construction.

Operation

8.15.13 In a scenario where the K3 Proposed Development was operational and all other relevant cumulative developments were being constructed or were operational,

the worst-case increase in traffic noise is expected to be <1 dB which is not considered significant in noise terms.

8.15.14 As stated in Chapter 7: Noise and Vibration, the only identified scheme with the potential to result in cumulative on-site operational effects is Scheme 16[2]. These effects are not considered significant.

8.15.15 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On the above basis, the magnitude of impact on human health would be slight, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Decommissioning

8.15.16 Increases in noise exposure during decommissioning of the K3 Proposed Development is likely to be similar to or less than those that are predicted to occur during construction. Where decommissioning occurs concurrently with other relevant cumulative developments, appropriate mitigation will be included to ensure decommissioning does not result in additional significant noise impacts.

8.15.17 On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Health Effects from Changes in Transport Nature and Flow Rate

8.15.18 Within Chapter 4: Traffic and Transport, three cumulative assessment years have been assessed for 2021, 2024 and 2031. In all assessment years for all project phases, the projected increase in traffic flows are not anticipated to significantly impact on pedestrian amenity, severance or risk of accident and injury.

8.15.19 On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Practical effect of the K3 Proposed Development + other cumulative developments

Health Effects from Changes to Air Quality

Construction

8.15.20 Refer to paragraph 8.15.3 for an explanation as to why cumulative health effects from changes to air quality have not been considered.

[2] Scheme 16 is for the decommissioning of the existing K1 'combined heat and power plant' (CHP) on the site and the build, commission and operation of a new CHP plant K4 at the adjacent Kemsley Paper Mill

Operation

8.15.21 In a scenario where the practical effect of K3 Proposed Development and all other relevant cumulative developments were operational, the annual mean ambient concentrations of PM_{10} and NO_2 would remain below the relevant objective thresholds set to be protective of the environment and health.

8.15.22 Based on the approach to the cumulative assessment applied in Chapter 5: Air Quality, it is not possible to quantitatively assess potential human health impacts at any given sensitive receptor. However, taking into account the results from the quantitative human health assessment detailed in Section 8.6 and on the basis that ambient concentrations of PM_{10} and NO_2 would remain below the relevant objective thresholds set to be protective of the environment and health in a worst-case scenario, it is anticipated that the relative change in concentration is insufficient to quantify any measurable change in local population health outcomes.

8.15.23 On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Decommissioning

8.15.24 Refer to paragraph 8.15.3 for an explanation as to why cumulative health effects from changes to air quality have not been considered for decommissioning.

Health Effects from Changes in Noise Exposure

Construction

8.15.25 Refer to paragraph 8.15.4 for an explanation as to why cumulative health effects from changes in noise exposure have not been considered for construction.

Operation

8.15.26 As stated in Section 8.9, the practical effect K3 Proposed Development would not result in any increase in on-site noise generation beyond K3 as consented. However, there is the potential for an increase in noise exposure associated with traffic flows.

8.15.27 In a scenario where the practical effect of K3 Proposed Development was implemented and all other relevant cumulative developments were being constructed or were operational, the worst-case increase in traffic noise is expected to be <1 dB which is not considered significant in noise terms.

8.15.28 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a timing, duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On the above basis, the magnitude of impact on human health would be slight, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Decommissioning

8.15.29 Increases in noise exposure during decommissioning of the K3 Proposed Development is likely to be similar to or less than those that are predicted to occur during construction. Where decommissioning occurs concurrently with other relevant cumulative developments, appropriate mitigation will be included to ensure decommissioning does not result in additional significant noise impacts.

8.15.30 On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Health Effects from Changes in Transport Nature and Flow Rate

8.15.31 Within Chapter 4: Traffic and Transport, three cumulative assessment years have been assessed for 2021, 2024 and 2031. In all assessment years for all project phases, the projected increase in traffic flows are not anticipated to significantly impact on pedestrian amenity, severance or risk of accident and injury.

8.15.32 On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

WKN Proposed Development + other cumulative developments

Health Effects from Changes to Air Quality

Construction

8.15.33 Refer to paragraph 8.15.3 for an explanation as to why cumulative health effects from changes to air quality have not been considered for construction.

Operation

8.15.34 In a scenario where the WKN Proposed Development and all other relevant cumulative developments were operational, the annual mean ambient concentrations of PM_{10} and NO_2 would remain below the relevant objective thresholds set to be protective of the environment and health.

8.15.35 Based on the approach to the cumulative assessment applied in Chapter 5: Air Quality, it is not possible to quantitatively assess potential human health impacts at any given sensitive receptor. However, taking into account the results from the quantitative human health assessment detailed in Section 8.6 and on the basis that ambient concentrations of PM_{10} and NO_2 would remain below the relevant objective thresholds set to be protective of the environment and health in a worst-case scenario, it is anticipated that the relative change in concentration is insufficient to quantify any measurable change in local population health outcomes.

8.15.36 On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Decommissioning

8.15.37 Refer to paragraph 8.15.3 for an explanation as to why cumulative health effects from changes to air quality have not been considered for decommissioning.

Health Effects from Changes in Noise Exposure

Construction

8.15.38 Refer to paragraph 8.15.4 for an explanation as to why cumulative health effects from changes in noise exposure associated with on-site construction activities have not been considered.

8.15.39 The worst-case change in noise exposure from traffic generated during construction of the WKN Proposed Development plus construction/operation of all other relevant cumulative developments is predicted to be 1 dB which is not considered significant in noise terms.

8.15.40 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Operation

8.15.41 In a scenario where the WKN Proposed Development was operational and all other relevant cumulative developments were being constructed or were operational, the worst-case increase in traffic noise is expected to be <1 dB (below what is regarded as a perceptible change) which is not considered significant in noise terms.

8.15.42 As stated in Chapter 7: Noise and Vibration (refer to the "*WKN Proposed Development + K3 Proposed Development + other cumulative developments*" scenario), the only identified scheme with the potential to result in cumulative on-site operational effects is Scheme 16. These effects are not considered significant.

8.15.43 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On the above basis, the magnitude of impact on human health would be slight, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Decommissioning

8.15.44 Increases in noise exposure during decommissioning of the WKN Proposed Development is likely to be similar to or less than those that are predicted to occur during construction. Where decommissioning occurs concurrently with other relevant cumulative developments, appropriate mitigation will be included to ensure decommissioning does not result in additional significant noise impacts.

8.15.45 On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Health Effects from Changes in Transport Nature and Flow Rate

8.15.46 Within Chapter 4: Traffic and Transport, three cumulative assessment years have been assessed for 2021, 2024 and 2031. In all assessment years for all project phases, the projected increase in traffic flows are not anticipated to significantly impact on pedestrian amenity, severance or risk of accident and injury.

8.15.47 On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

WKN Proposed Development + K3 Proposed Development + other cumulative developments

Health Effects from Changes to Air Quality

Construction

8.15.48 Refer to paragraph 8.15.3 for an explanation as to why cumulative health effects from changes to air quality have not been considered for construction.

Operation

8.15.49 In a scenario where the WKN Proposed Development, K3 Proposed Development and all other relevant cumulative developments were operational, the annual mean ambient concentrations of PM_{10} and NO_2 would remain below the relevant objective thresholds set to be protective of the environment and health.

8.15.50 Based on the approach to the cumulative assessment applied in Chapter 5: Air Quality, it is not possible to quantitatively assess potential human health impacts at any given sensitive receptor. However, taking into account the results from the quantitative human health assessment detailed in Section 8.6 and on the basis that ambient concentrations of PM_{10} and NO_2 would remain below the relevant objective thresholds set to be protective of the environment and health in a worst-case scenario, it is anticipated that the relative change in concentration is insufficient to quantify any measurable change in local population health outcomes.

8.15.51 On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Decommissioning

8.15.52 Refer to paragraph 8.15.3 for an explanation as to why cumulative health effects from changes to air quality have not been considered for decommissioning.

Health Effects from Changes in Noise Exposure

Construction

8.15.53 Refer to paragraph 8.15.4 for an explanation as to why cumulative health effects from changes in noise exposure associated with on-site construction activities have not been considered.

8.15.54 The worst-case change in noise exposure from traffic generated during construction of the WKN Proposed Development plus construction/operation of the K3 Proposed Development and all other relevant cumulative developments is predicted to be 1.5 dB which is not considered significant in noise terms.

8.15.55 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Operation

8.15.56 In a scenario where the WKN Proposed Development and K3 Proposed Development were operational and all other relevant cumulative developments were being constructed or were operational, the worst-case increase in traffic noise is expected to be <1 dB which is not considered significant in noise terms.

8.15.57 As stated in Chapter 7: Noise and Vibration, the only identified scheme with the potential to result in cumulative on-site operational effects is Scheme 16. These effects are not considered significant.

8.15.58 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On the above basis, the magnitude of impact on human health would be slight, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Decommissioning

8.15.59 Increases in noise exposure during decommissioning of the WKN Proposed Development are likely to be similar to or less than those that are predicted to occur during construction. Where decommissioning occurs concurrently with the K3 Proposed Development and other relevant cumulative developments, appropriate mitigation will be included to ensure decommissioning does not result in additional significant noise impacts.

8.15.60 On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Health Effects from Changes in Transport Nature and Flow Rate

8.15.61 Within Chapter 4: Traffic and Transport, three cumulative assessment years have been assessed for 2021, 2024 and 2031. In all assessment years for all project phases, the projected increase in traffic flows are not anticipated to significantly impact on pedestrian amenity, severance or risk of accident and injury.

8.15.62 On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

WKN Proposed Development + the practical effect of the K3 Proposed Development + other cumulative developments

Health Effects from Changes to Air Quality

Construction

8.15.63 Refer to paragraph 8.15.3 for an explanation as to why cumulative health effects from changes to air quality have not been considered for construction.

Operation

8.15.64 In a scenario where the WKN Proposed Development, the practical effect of K3 Proposed Development and all other relevant cumulative developments were operational, the annual mean ambient concentrations of PM_{10} and NO_2 would remain below the relevant objective thresholds set to be protective of the environment and health.

8.15.65 Based on the approach to the cumulative assessment applied in Chapter 5: Air Quality, it is not possible to quantitatively assess potential human health impacts at any given sensitive receptor. However, taking into account the results from the quantitative human health assessment detailed in Section 8.6 and on the basis that ambient concentrations of PM_{10} and NO_2 would remain below the relevant objective thresholds set to be protective of the environment and health in a worst-case scenario, it is anticipated that the relative change in concentration is insufficient to quantify any measurable change in local population health outcomes.

8.15.66 On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Decommissioning

8.15.67 Refer to paragraph 8.15.3 for an explanation as to why cumulative health effects from changes to air quality have not been considered for decommissioning.

Health Effects from Changes in Noise Exposure

Construction

8.15.68 Refer to paragraph 8.15.4 for an explanation as to why cumulative health effects from changes in noise exposure associated with on-site construction activities have not been considered.

8.15.69 The worst-case change in noise exposure from traffic generated during construction of the WKN Proposed Development plus construction and/or operation of the K3 Proposed Development (practical effect) and all other relevant cumulative developments is predicted to be 1.1 dB which is not considered significant in noise terms.

8.15.70 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Operation

8.15.71 In a scenario where the WKN Proposed Development and the practical effect of the K3 Proposed Development were operational and all other relevant cumulative developments were being constructed or were operational, the worst-case increase in traffic noise is expected to be <1 dB which is not considered significant in noise terms.

8.15.72 As stated in Chapter 7: Noise and Vibration (refer to the *"WKN Proposed Development + K3 Proposed Development + other cumulative developments"* scenario), the only identified scheme with the potential to result in cumulative on-site operational effects is Scheme 16. These effects are not considered significant.

8.15.73 As such, the potential change in noise exposure is below what is generally considered intrusive or perceptible and is not of a duration or magnitude sufficient to result in sleep disturbance or quantify any manifest health outcome at a population level. On the above basis, the magnitude of impact on human health would be slight, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Decommissioning

8.15.74 Increases in noise exposure during decommissioning of the WKN Proposed Development are likely to be similar to or less than those that are predicted to occur during construction. Where decommissioning occurs concurrently with the practical effect of the K3 Proposed Development and other relevant cumulative developments, appropriate mitigation will be included to ensure decommissioning does not result in additional significant noise impacts.

8.15.75 On this basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

Health Effects from Changes in Transport Nature and Flow Rate

8.15.76 Within Chapter 4: Traffic and Transport, three cumulative assessment years have been assessed for 2021, 2024 and 2031. In all assessment years for all project phases, the projected increase in traffic flows are not anticipated to significantly impact on pedestrian amenity, severance or risk of accident and injury.

8.15.77 On the above basis, the magnitude of impact on human health would be negligible, where in an area of high sensitivity, would result in a slight adverse significance of effect, which is considered not significant.

8.16 Summary

8.16.1 Overall, it is not anticipated that there would be any significant human health effects resulting from the construction, operation or decommissioning of the K3 Proposed Development; K3 Proposed Development 'practical effect'; or WKN Proposed Development when assessed in isolation.

8.16.2 Similarly, it is not anticipated that there would be any significant human health effects resulting from any of the cumulative scenarios assessed relating to the K3 Proposed Development and/or WKN Proposed Development and their cumulative interactions with other relevant proposed developments in the locality.

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