Chapter 13
Air Quality and Climate

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Chapter 13 Air Quality and Climate

13.1 Introduction

This chapter assesses the potential air quality and climate impacts associated with the proposed Flood Defences West, the 'proposed development' in townlands of Mountmisery and Newrath in Co. Waterford, the townland of Newrath in Co. Kilkenny located along the north bank and within the foreshore of the River Suir in Waterford City. The proposed development aims to develop flood defence measures for the protection of critical infrastructure including the existing Plunkett Station, the railway line east and west of Plunkett Station and the Rice Bridge roundabout.

The flood defence measures will comprise remedial works on the existing quay wall and the construction of a new flood defence wall, typically in the form of a driven steel sheet pile wall and drainage works involving remedial works to the existing drainage system and the provision of new drainage system. The works will also involve the construction of an impermeable trench in front of the Plunkett Train Station and overground flood defences for the Rice Bridge Roundabout and its three roundabout arms (R680 Rice Bridge, R448 Terminus Street, and R711 Dock Road). Remediation of the existing drainage outfalls and extending them through the new sheet pile wall is also proposed.

13.2 Methodology

13.2.1 Criteria for Rating of Impacts

13.2.1.1 Air Quality

In order to reduce the risk to health from poor air quality, National and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set. Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011 (S.I. No. 180/2011), which incorporate EU Directive 2008/50/EC, which has set limit values for a number of pollutants. The limit values in relation to Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10} and $PM_{2.5}$) are applicable to the proposed development (see Table 13.1).

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland. Furthermore, no specific criteria have been stipulated for nuisance dust in respect of this development.

With regard to dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/(m^2*day) averaged over a one-year period at any receptors outside the site boundary. Recommendations from the Department of the Environment, Heritage & Local Government (DEHLG, 2004) apply the Bergerhoff limit value of 350 mg/(m^2*day) to the site boundary of quarries. This limit value can also be implemented with regard to potential dust impacts from construction of the proposed development.

Table 13.1 Ambient Air Quality Standards 2011 & Dust Deposition Limits

Pollutant	Regulation	Limit Type	Value
Nitrogen Dioxide (NO_2)	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
Nitrogen Oxide (NO_X)	2008/50/EC	Critical level for protection of vegetation	30 µg/m^3 NO + NO_2
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3
		Annual limit for protection of human health	40 µg/m^3
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health	25 µg/m^3
Dust Deposition	TA Luft (German VDI 2002)	Annual average limit for nuisance dust deposition at site boundary	350 mg/m^2/day

13.2.1.2 Climate

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to GHG emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the EU enacted *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013* (the Regulation). The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors[1] amounting to 43% and 30%, respectively, by 2030 compared to 2005. Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels.

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) was enacted (the Act). The purpose of the Act was to enable Ireland '*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050*' (3.(1) of No. 46 of 2015). This is referred to in the Act as the '*national transition objective*'. The Act makes provision for

[1] Non-ETS sectors consist of transport, agriculture, waste and industrial sectors

a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The *Climate Action Plan* (CAP), published in June 2019, outlines the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The CAP also details the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The CAP has set a built environment sector reduction target of 40-45% relative to 2030 pre-NDP (National Development Plan) projections.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019 and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme for the Climate Action (Amendment) Bill 2019 in December 2019. The General Scheme was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP. The draft Climate Action and Low Carbon Development (Amendment) Bill (the Bill) was published on 23rd of March 2021.

In October 2020, the Climate Action and Low Carbon Development (Amendment) Bill 2020 was published in draft format (draft 2020 Climate Act) which amends and enhances the 2015 Climate Act. Once approved, the purpose of the 2020 Climate Act is to provide for the approval of plans '*for the purpose of pursuing the transition to a climate resilient and climate neutral economy by the end of the year 2050'*. The 2020 Climate Act will also '*provide for carbon budgets and a decarbonisation target range for certain sectors of the economy'*. The 2020 Climate Act removes any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority.

13.2.2 Construction Stage Methodology

13.2.2.1 Air Quality

The Institute of Air Quality Management in the UK (IAQM) guidelines (2014) outline an assessment method for predicting the impact of dust emissions from demolition, earthworks, construction and haulage activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this development in order to predict the likely magnitude of the dust impacts in the absence of mitigation measures. The use of UK guidance is considered best practice in the absence of specific Irish guidance.

Firstly, the sensitivity of the area is defined by determining the number of sensitive receptors within various distance bands from the proposed works area. The distance bands extend from 0m to 350m from the works area as per the IAQM guidance (2014). Significant dust emissions are not predicted at distances further than 350m from the site. The sensitivity of the area is then combined with the magnitude of the proposed works in order to determine the risk level of potential dust impacts, high, medium or

low risk. The risk associated with the proposed works is then used to determine the level of site specific mitigation required to prevent significant dust impacts occurring.

Construction phase traffic has the potential to impact air quality. The UK DMRB guidance (UK Highways Agency, 2019a), states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment. The use of the UK guidance is recommended by the TII (2011) in the absence of specific Irish guidance. This approach is considered best practice and can be applied to any development that causes the following changes in traffic:

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- A change in speed band; and
- A change in carriageway alignment by 5m or greater.

By definition of the criteria above, there are no road links impacted as a result of the proposed development. Therefore, no assessment using the DMRB model was required for the proposed development as there is no potential for significant impacts to air quality as a result of traffic emissions.

13.2.2.2 Climate

The impact of the construction phase of the development on climate was determined by a qualitative assessment of the nature and scale of greenhouse gas generating construction activities associated with the proposed development.

Construction traffic also has the potential to impact climate through the release of GHG emissions such as CO_2. The UK Highways Agency DMRB guidance document in relation to climate impact assessments *LA 114 Climate* (UK Highways Agency, 2019b) outlines the following scoping criteria to determine whether a detailed climate assessment is required for a proposed project. If any of the road links impacted by the proposed development meet the below criteria, then further assessment is required:

- A change of more than 10% in AADT;
- A change of more than 10% to the number of heavy duty vehicles; and
- A change in daily average speed of more than 20 km/hr.

None of the road links in the vicinity of the proposed development meet the above criteria and therefore no assessment using the DMRB model was required as there is no potential for significant impacts to climate as a result of traffic emissions.

13.2.3 Operational Phase Methodology

Due to the nature of the proposed development, there are no predicted emissions to atmosphere during the operational phase. Therefore, there is no potential for operational phase impacts to air quality or climate and no assessment is required.

13.3 Description of Receiving Environment

13.3.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality are the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e., traffic levels) (WHO, 2006). Wind is of key importance in

dispersing air pollutants. The potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction.

The nearest representative weather station collating detailed weather records is Johnstown Castle, which is located approximately 42km east of the proposed development. Johnstown Castle met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 13.1). For data collated during five representative years (2016 - 2020), the predominant wind direction is south-westerly with predominantly moderate wind speeds. In addition, dust generation is considered negligible on days where rainfall is greater than 0.2mm. A review of historical 30-year average data (1978 – 2007) for Kilkenny, the closest station with 30-year average data, indicates that on average 193 days per year have rainfall over 0.2mm (Met Eireann, 2021) and therefore it can be determined that over 50% of the time dust generation will be reduced.

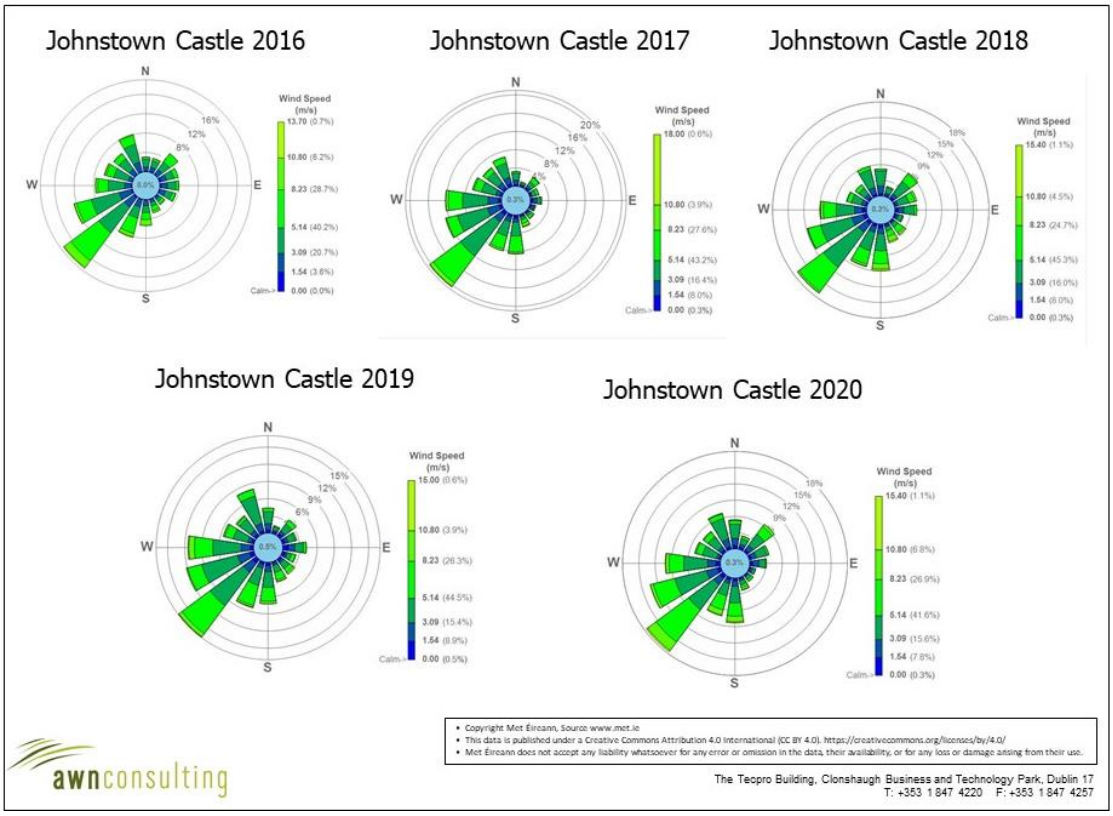

Figure 13.1 Johnstown Castle Windrose 2016 - 2020

13.3.2 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality in Ireland is "*Air Quality In Ireland 2019*" (EPA, 2020a). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2021).

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2021). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the proposed development is within Zone C (EPA, 2021). Long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g., natural sources, industry, home heating etc.).

With regard to NO_2, continuous monitoring data from the EPA (2020a) at the Zone C locations of Kilkenny, Portlaoise and Dundalk show that levels of NO_2 are below both the annual and 1-hour limit values (see Table 13.2). Average long-term concentrations range from 5 – 14µg/m^3 for the 2015 – 2019 period; suggesting an upper average over the five year period of no more than 13µg/m^3. There were no exceedances of the maximum 1 hour limit of 200 µg/m^3 in any year (18 exceedances are allowed per year). Based on these results, a conservative estimate of the current background NO_2 concentration in the region of the proposed development is 14µg/m^3.

Table 13.2 Trends In Zone C Air Quality - Nitrogen Dioxide (NO_2)

Station	Averaging Period Notes 1,2	Year				
		2015	2016	2017	2018	2019
Kilkenny	Annual Mean NO_2 (µg/m^3)	5	7	5	6	5
	Max 1-hr NO_2 (µg/m^3)	70	51	58	71	59
Portlaoise	Annual Mean NO_2 (µg/m^3)	10	11	11	11	11
	Max 1-hr NO_2 (µg/m^3)	84	86	80	119	77
Dundalk	Annual Mean NO_2 (µg/m^3)	-	-	-	14	12
	Max 1-hr NO_2 (µg/m^3)	-	-	-	91	144

Note 1 Annual average limit value - 40 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 1-hour limit value - 200 µg/m^3 as a 99.8th%ile, i.e. not to be exceeded >18 times per year (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Continuous PM_{10} monitoring carried out at the locations of Galway, Ennis and Portlaoise showed 2019 annual mean concentrations of 12 – 15µg/m^3 (Table 13.3), with at most 12 exceedances (in Ennis) of the 24-hour limit value of 50 µg/m^3 (35 exceedances are permitted per year) (EPA, 2020a). Long-term data for the 2015 – 2019 period show concentrations ranging from 10 – 18µg/m^3; suggesting an upper average concentration over the five-year period of no more than 17µg/m^3. Based on the EPA data (Table 13.3) a conservative estimate of the current background PM_{10} concentration in the region of the proposed development is 18µg/m^3.

Table 13.3 Trends In Zone C Air Quality - PM_{10}

Station	Averaging Period Notes 1,2	Year				
		2015	2016	2017	2018	2019
Galway	Annual Mean PM_{10} (µg/m^3)	15	15	-	15	13
	24-hr Mean > 50 µg/m^3 (days)	2	3	-	0	0
Ennis	Annual Mean PM_{10} (µg/m^3)	18	17	16	16	18
	24-hr Mean > 50 µg/m^3 (days)	10	12	9	4	12
Portlaoise	Annual Mean PM_{10} (µg/m^3)	12	12	10	11	15
	24-hr Mean > 50 µg/m^3 (days)	1	1	0	1	0

Note1 Annual average limit value - 40 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 24-hour limit value - 50 µg/m^3 as a 90.4th%ile, i.e. not to be exceeded >35 times per year (EU Council Directive 1999/30/EC & S.I. No. 180 of 2011).

Continuous $PM_{2.5}$ monitoring carried out at the Zone C locations of Ennis and Bray showed average levels of 5 - 14µg/m^3 over the 2015 - 2019 period, with a $PM_{2.5}/PM_{10}$ ratio in Ennis ranging from 0.63 – 0.78 (EPA, 2020a). Based on this information, a conservative ratio of 0.8 was used to generate a background $PM_{2.5}$ concentration in the region of the proposed development of 14.4µg/m^3.

13.3.3 Climate Baseline

Anthropogenic emissions of greenhouse gases (GHG) in Ireland included in the EU 2020 strategy are outlined in the most recent review by the EPA which details provisional emissions up to 2019 (EPA, 2020b). The data published in 2020 states that Ireland will exceed its 2019 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC1 by an estimated 6.98 Mt. For 2019, total national greenhouse gas emissions are estimated to be 59.90 million tonnes carbon dioxide equivalent (Mt CO_2eq) with 45.71 MtCO_2eq of emissions associated with the ESD sectors[2] for which compliance with the EU targets must be met. In Ireland, agriculture is the largest contributor at 35.3% of the total emissions recorded for 2019, with the transport sector accounting for 20.3% of emissions of CO_2.

GHG emissions for 2019 are estimated to be 4.5% lower than those recorded in 2018. Emission reductions have been recorded in 6 of the last 10 years. However, compliance with the annual EU targets has not been met for four years in a row. Emissions from 2016 – 2019 exceeded the annual EU targets by 0.29 MtCO_2eq, 2.94 MtCO_2eq, 5.57 MtCO_2eq and 6.98 MtCO_2eq respectively. Agriculture is consistently the largest contributor to emissions with emissions from the transport and energy sectors being the second and third largest contributors respectively in recent years.

The EPA 2019 GHG Emissions Projections Report for 2018 – 2040 (EPA, 2019) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018. Implementation of these mitigations are classed as a "*With Additional Measures scenario*" for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the 2013 – 2020 period, Ireland is projected to cumulatively exceed its compliance obligations with the EU's Effort Sharing Decision (Decision No. 406/2009/EC) 2020 targets by approximately 10 Mt CO_2eq under the "*With Existing Measures*" scenario and 9 Mt CO_2eq under the "*With Additional Measures*" scenario (EPA, 2019).

13.3.4 Sensitivity of the Receiving Environment

In line with the UK Institute of Air Quality Management (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction'* (2014) prior to assessing the impact of dust from a proposed development, the sensitivity of the area must first be assessed as outlined below.

Both receptor sensitivity and proximity to proposed works areas (between 0m and 350m from the proposed works as outlined in Table 13.4 below) are taken into

[2] Sectors not included in the EU Emissions Trading System (ETS) such as transport, buildings, agriculture and waste.

consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time. Commercial properties and places of work are regarded as medium sensitivity, while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity.

In terms of receptor sensitivity to dust soiling, there are over 100 high sensitivity residential receptors within 100m - 350m of the proposed site boundary as well as a number of commercial/residential units along R680 and O'Connell Street near Rice Bridge (see Figure 13.2). Therefore, the overall sensitivity of the area to dust soiling impacts is considered **low** based on the IAQM criteria outlined in Table 13.4.

Table 13.4 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number Of Receptors	Distance from source (m)			
		<20	**<50**	**<100**	**<350**
High	>100	High	High	Medium	**Low**
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts from dust emissions. The criteria take into consideration the current annual mean PM_{10} concentration, receptor sensitivity based on type (residential receptors are classified as high sensitivity) and the number of receptors affected within various distance bands from the construction works. A conservative estimate of the current annual mean PM_{10} concentration in the vicinity of the proposed development is 18µg/m^3 and there are over 100 residential properties within 200m - 350m of the proposed site boundary as well as commercial/residential properties along the R680 and O'Connell Street near Rice Bridge (see Figure 13.2). Based on the IAQM criteria outlined in Table 13.5, the worst-case sensitivity of the area to human health is considered to be **low**.

Table 13.5 Sensitivity of the Area to Dust Related Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)				
			<20	**<50**	**<100**	**<200**	**<350**
High	< 24 µg/m^3	>100	Medium	Low	Low	Low	**Low**
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	< 24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	< 24 µg/m^3	>1	Low	Low	Low	Low	Low

The IAQM guidance also outlines the criteria for determining the sensitivity of an ecological receptor to dust impacts. The sensitivity is determined based on the distance to the source, the designation of the site, (European, National or local designation) and the potential dust sensitivity of the ecologically important species

present (see Table 13.6). Works will take place directly beside and within a section of the Lower River Suir SAC (site code 002137) (see Figure 13.2). The vegetation within the SAC is potentially dust sensitive. The Lower River Suir SAC is considered a high sensitivity receptor to potential dust soiling impacts on vegetation due to its European designation. As the works will take place directly beside and within a section of the SAC the overall sensitivity of the area to dust related ecological impacts is considered **high** as per Table 13.6.

Table 13.6 Sensitivity of the Area to Dust Related Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	<20	**<50**
High	**High**	Medium
Medium	Medium	Low
Low	Low	Low

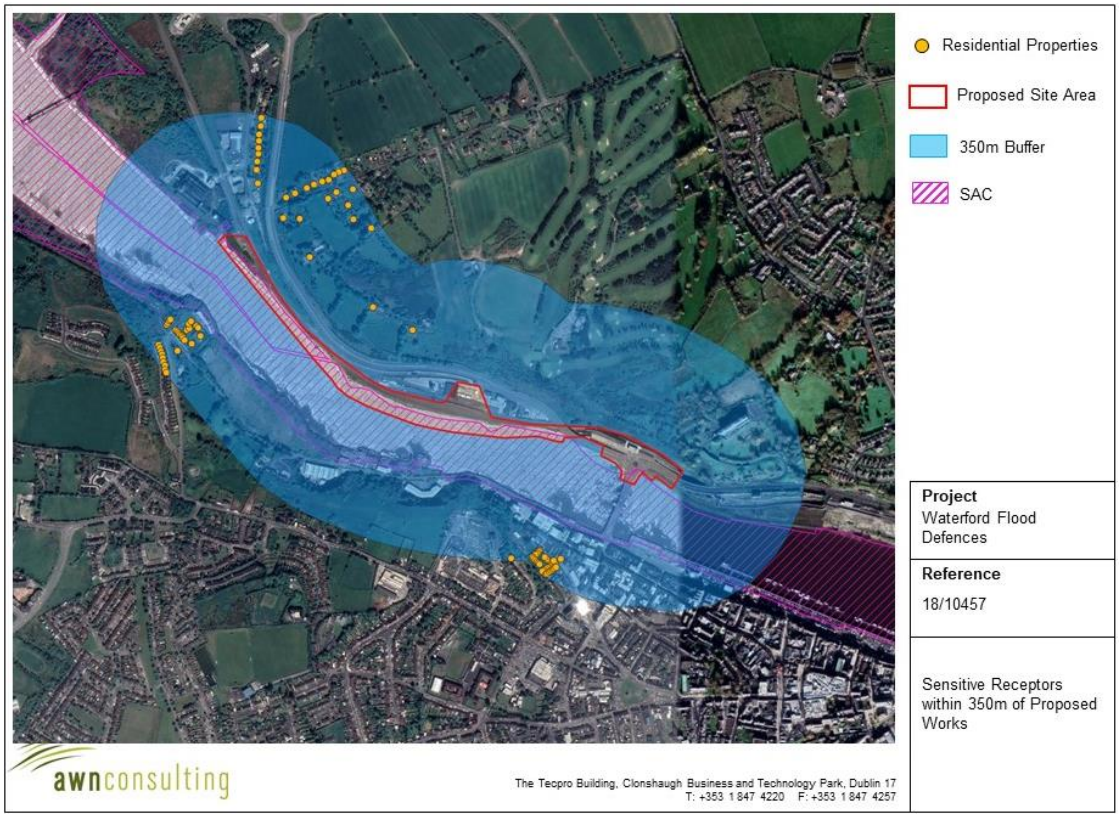

Figure 13.2 Sensitive Receptors within 350m of Proposed Works

13.4 Description of Potential Impacts

13.4.1 Construction Phase

13.4.1.1 Air Quality

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 350m of a construction site, the majority of the deposition occurs within the first 50m. The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels,

silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. As per Section 13.3.4, local meteorological conditions are favourable to dust suppression the majority of the time.

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 13.3.4). The primary activities involved in the proposed flood defences development which have the potential to generate dust include: construction of trenching, construction of flood barriers, remediation of existing quay wall and construction of sheet pile defence wall.

The majority of these works are over relatively small areas and will result in very localised emissions of dust which is unlikely to travel to the sensitive receptors located within 110 - 350m of the works area. The most significant works with dust generation potential are those that involve excavations, filling and piling. Other works are likely to have very minor dust emissions due to their small scale. Worst-case assumptions have been used as part of this assessment. As such, the dust mitigation measures proposed are those associated with a worst-case assessment and actual levels of dust which may arise from the proposed construction activities may be lower than estimated. The major dust generating activites have been divided into three categories as detailed below to reflect their different potential impacts.

Piling and Demolition Activities

In order to determine the level of dust mitigation required during the proposed piling and minor demolition works, the potential dust emission magnitude needs to be taken into account, along with the already established sensitivity of the area. The dust emission magnitude of the IAQM assessment criteria for demolition activities can be classified as small, medium and large as described below, this criteria has been adopted for the piling activities associated with the proposed flood defence works.

Large: Total Building Volume > 50,000m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 20m above ground level;

Medium: Total building volume 20,000m^3 – 50,000m^3, potentially dusty construction material, demolition activities 10-20m above ground level; and

Small: Total building volume < 20,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

Sheet piling will be installed for the proposed flood defence walls on both the land and river sides. Approximately 540m of walls will be installed on the riverside with approximately 190m installed on the landside. The demolition of c.540m of existing quay wall to 800m below ground will be required to faiclitate draiange works. Addtionally, the demolition of minor localised sections of existing masonry quay wall (max width 2m) will also be required in order to connect the section of in-river sheet piles to the adjacent flood walls. A further complete demolition of c.25m of the existing quay wall will be required to construct a pumping station at Ch.390 (see Figure 4.18 in Volume 3 of this EIAR).

The dust emission magnitude for the proposed piling and minor demolition works can be considered small as a worst-case as works will not take place above 10m and steel sheet piling will be used. Combining this with the previously established sensitivtiy of

the area (see Section 13.3.4) results in an overall low risk of temporary dust soiling and human health impacts and a medium risk of temporary ecological impacts as a result of the proposed activites (see Table 13.7).

Table 13.7 Risk of Dust Impacts – Piling & Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Earthworks

Earthworks primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

Large: Total site area > 10,000m^2, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8m in height, total material moved >100,000 tonnes;

Medium: Total site area 2,500m^2 – 10,000m^2, moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8m in height, total material moved 20,000 – 100,000 tonnes;

Small: Total site area < 2,500m^2, soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 20,000 tonnes, earthworks during wetter months.

As part of the construction stage for the proposed flood defence measures, there will be the requirement for removal of some materials and the import of material for fill. It is expected that there will be 4,570m^3 of material required for fill, 1,400 tonnes of steel sheet piles, 1,500 m^3 of pre-cast concrete cladding material and 1,309m of pipes for drainage works. Approximately of 2,400m^3 of waste will be generated from demolision and excavation works which cannot be resued on site, and will be transported to an approriate licensed waste facility. According the the IAQM guidance as a worst-case the potentially dusty materials involved in excavation and infill works could be considered small in scale as the quantities are significantly less than 20,000 tonnes. Dust emissions are not predicted from the steel sheet piles.

The sensitivity of the area, as determined in Section 13.3.1.3, is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 13.8, this results in an overall negligible risk of temporary dust soiling impacts, a negligible risk of temporary dust related human health impacts and a low risk of dust related ecological impacts as a result of the proposed earthworks activities.

Table 13.8 Risk of Dust Impacts – Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Trackout

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

Large: > 50 HGV (> 3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100m;

Medium: 10 - 50 HGV (> 3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 - 100m;

Small: < 10 HGV (> 3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length < 50m.

The construction programme for the construciton phase of proposed development is 30 - 35 weeks. The dust emission magnitude for the proposed trackout can be classified as medium as worst-case as on average there will be between 26 and 32 outward HGV movements per day over approx. 7 weeks of the construction programme. Traffic movements for the remainder of the construction programme range between 4 and 20 HGV movements per day.

The sensitivity of the area is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 13.9, this results in an overall low risk of temporary dust soiling impacts, a low risk of dust related human health impacts and a medium risk of dust related ecological impacts as a result of the proposed trackout activities.

Table 13.9 Risk of Dust Impacts – Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Summary of Dust Emission Risk

The risk of dust impacts as a result of the proposed development are summarised in Table 13.10 for each activity. The magnitude of risk determined is used to prescribe the level of site specific mitigation required for each activity in order to prevent significant impacts occurring.

Overall, in order to ensure that no dust nuisance occurs during the construction activities for the proposed development, a range of dust mitigation measures

associated with a **medium risk** of dust impacts must be implemented. In the absence of mitigation, there is the potential for *negative, temporary, slight* impacts to air quality.

Table 13.10 Summary of Dust Impact Risk used to Define Site-Specific Mitigation

Potential Impact	Dust Emission Risk		
	Piling & Demolition	Earthworks	Trackout
Dust Soiling	Negligible Risk	Negligible Risk	Low Risk
Human Health Impacts	Negligible Risk	Negligible Risk	Low Risk
Ecological Impacts	Medium Risk	Low Risk	Medium Risk

13.4.1.2 Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. The Institute of Air Quality Management document '*Guidance on the Assessment of Dust from Demolition and Construction'* states that site traffic and plant is unlikely to make a significant impact on climate. Therefore, the potential impact on climate is considered to be *imperceptible* and *short-term*.

13.4.1.3 Human Health

Dust emissions from the construction phase of the proposed development have the potential to impact on human health through the release of PM_{10} and $PM_{2.5}$ emissions. As per Table 13.5, the surrounding area is of low sensitivity to potential human health impacts as a result of construction dust emissions. In addition, it was found that there is an overall low risk of significant human health impacts from dust emissions in the absence of mitigation. Therefore, in the absence of mitigation there is the potential for *negative, imperceptible, , short-term* impacts to human health as a result of the proposed development.

13.4.2 Operational Phase

Due to the nature of the proposed development, there will be no emissions to atmosphere during the operational phase. Therefore, there is no potential for impacts to air quality or climate as a result of the proposed development. The operational phase is considered *neutral* in terms of air quality and climate.

Climate change has the potential to alter weather patterns in future years leading to increased rainfall and a greater potential for flooding events. The proposed development will facilitate in mitigating flooding impacts on critical infrastructure within Waterford City which will be beneficial to the area.

13.5 Mitigation & Monitoring Measures

13.5.1 Construction Phase

The proactive control of fugitive dust will ensure the prevention of significant emissions. The key aspects of controlling dust are listed below. These measures will be incorporated into the overall Construction Environmental Management Plan (CEMP) prepared in respect of the proposed development.

In summary, the measures which will be implemented will include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
- During any demolition processes, water suppression should be used, preferably with a hand-held spray. Only the use of cutting, grinding or sawing equipment fitted or used in conjunction with a suitable dust suppression technique such as water sprays/local extraction should be used.
- Drop heights from conveyors, loading shovels, hoppers and other loading equipment should be minimised, if necessary fine water sprays should be employed.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

13.5.2 Operational Phase

As there are no predicted impacts to air quality or climate during the operational stage, there are no mitigation measures proposed.

13.6 Residual Impacts

13.6.1 Construction Phase

13.6.1.1 Air Quality

Once the dust minimisation measures outlined in Section 13.5.1 are implemented, the impact of the proposed development in terms of dust soiling will be negative, *temporary, localised,* and *imperceptible* at nearby receptors.

13.6.1.2 Climate

According to the IAQM guidance site traffic, plant and machinery are unlikely to have a significant impact on climate. Therefore, the predicted impact is neutral, temporary and imperceptible.

13.6.1.3 Human Health

Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust to minimise

generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health (see Table 13.1). Therefore, the impact of construction of the proposed development is likely to be *neutral, temporary, localised,* and *imperceptible* with respect to human health.

13.6.2 Operational Phase

There are no predicted impacts to air quality or climate as a result of the operational phase of the proposed development.

13.7 Difficulties Encountered

There were no difficulties encountered when compiling this assessment.

13.8 References

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