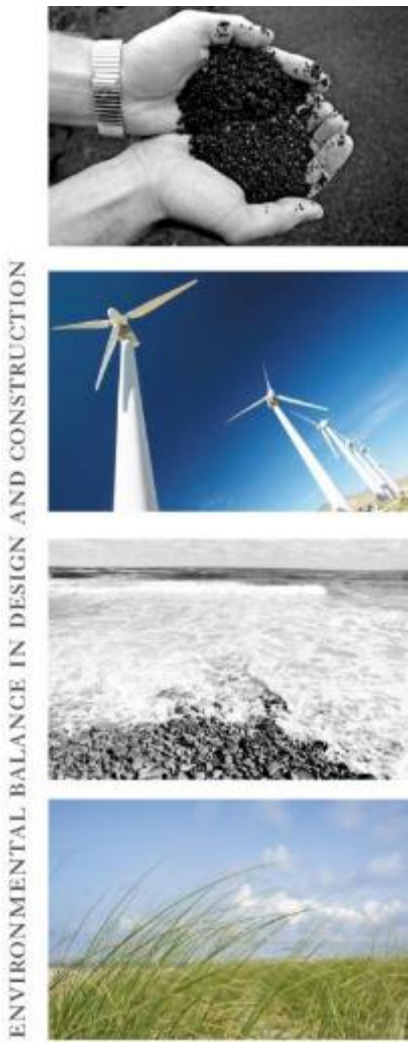

KERRY COUNTY COUNCIL

ENVIRONMENTAL IMPACT ASSESSMENT REPORT / ENVIRONMENTAL IMPACT STATEMENT FOR SOUTH KERRY GREENWAY, CO. KERRY

VOLUME 2 – MAIN EIAR/EIS

CHAPTER 8 – AIR AND CLIMATE

AUGUST 2018

FEHILY TIMONEY & COMPANY

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

8 Air and Climate

8.1 Introduction

This chapter describes the existing air and climate environment of the proposed 32km long South Kerry Greenway development. It examines the various elements of the construction and operational phases of the proposed development which have the potential to impact on air quality and climate. Mitigation measures and the residual impacts after the proposed mitigation measures have been implemented are also described.

8.1.1 Air Quality

To protect our health, vegetation and ecosystems, EU Directives have set out air quality standards for Ireland and the other member states for a wide variety of pollutants. These Directives include how we should monitor, assess and manage ambient air quality. The European Commission set down the principles to this approach in 1996 with its Air Quality Framework Directive. Four "daughter" directives lay down limits for specific pollutants:

- 1st Daughter Directive: Sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead;
- 2nd Daughter Directive: Carbon monoxide and benzene;
- 3rd Daughter Directive: Ozone;
- 4th Daughter Directive: Polyaromatic hydrocarbons, arsenic, nickel, cadmium and mercury in ambient air.

The Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC) was published in May 2008. It replaced the Framework Directive and the first, second and third Daughter Directives. The fourth Daughter Directive (2004/107/EC) will be included in CAFE at a later stage. The limit and target values for both Directives are outlined below.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). It replaces the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and S.I. No. 33 of 1999. The fourth Daughter Directive was transposed into Irish legislation by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009). Table 8.1 details the limit values for pollutants as per the CAFÉ Directive.

Table 8-1: Limit Values of CAFE Directive 2008/50/EC

Pollutant	Limit Value Objective	Averaging Period	Limit Value ug/m3	Limit Value ppb	Basis of Application of the Limit Value
SO_2	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year
SO_2	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year
SO_2	Protection of vegetation	calendar year	20	7.5	Annual mean
SO_2	Protection of vegetation	1 Oct to 31 Mar	20	7.5	Winter mean

Pollutant	Limit Value Objective	Averaging Period	Limit Value ug/m3	Limit Value ppb	Basis of Application of the Limit Value
NO_2	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year
NO_2	Protection of human health	calendar year	40	21	Annual mean
NO + NO_2	Protection of ecosystems	calendar year	30	16	Annual mean
PM_{10}	Protection of human health	24 hours	50		Not to be exceeded more than 35 times in a calendar year
PM_{10}	Protection of human health	calendar year	40		Annual mean
$PM_{2.5}$ - stage 1	Protection of human health	calendar year	25		Annual mean
$PM_{2.5}$ - stage 2	Protection of human health	calendar year	20		Annual mean
Lead	Protection of human health	calendar year	0.5		Annual mean
Carbon Monoxide	Protection of human health	8 hours	10,000	8620	Not to be exceeded
Benzene	Protection of human health	calendar year	5	1.5	Annual mean

There are no statutory limits for dust deposition, however, the TA Luft (German Government 'Technical Instructions on Air Quality') state a guideline value of 350 mg/m^2/day.

There are no limit values in relation to ozone. The Ozone Daughter Directive however sets target values. These are detailed in Table 8.2 along with information threshold and alert threshold values.

Table 8-2: Target Values for Ozone

Objective	Calculation	Target Value for 2020
Protection of Human Health	Maximum daily 8-hour mean	120 µg/m^3
Protection of vegetation	AOT40, calculated from 1-hour values from May to July	6000 µg/m^3-h
Information threshold	1-hour average	180 µg/m^3
Alert Threshold	1-hour average	240 µg/m^3

The World Health Organisation (WHO) in 2012 (WHO, 2017) estimated that exposure to air pollution accounted for 6.5 million deaths worldwide. In 2012 (WHO, 2014) the WHO also estimated that exposure to air pollution accounted for 7 million deaths worldwide in 2012 and of these, 600,000 premature deaths were in the WHO European Region. According to the Environmental Protection Agency (EPA, 2016a), in Ireland the number of deaths directly linked to air pollution is estimated at 1,200 Irish deaths attributable to fine particulate matter ($PM_{2.5}$) and 30 Irish deaths attributable to Ozone (O_3). Generally, air quality in Ireland is acceptable and there have been no exceedances of target values.

However, in the short term, when compared with WHO guideline values and the European Environment Agency (EEA) reference level values; ozone, particulate matter and PAHs (Polycyclic Aromatic Hydrocarbons) are of concern in the short term and NO2 is expected to increase as traffic on our roads increase. Greenways are walked and cycled and therefore do not produce any NOx or SOx emissions.

8.1.2 Climate

Carbon dioxide (CO_2) is a greenhouse gas which, if released in excessive amounts, can lead to increases in global temperatures known as 'global warming' or the 'greenhouse effect' which can influence climate change. Once the proposed greenway is constructed it will offer people the opportunity to travel via foot and bicycle; these forms of travel do not produce CO_2. The proposed greenway developments within Ireland contribute to normalising the activity of cycling; having an indirect impact in Ireland's transition to a low carbon economy (DoTTS, 2017).

At the Paris climate conference (COP21) in December 2015, 195 countries adopted the first-ever universal, legally binding global climate deal. The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C above pre-industrial levels and to limit the increase to 1.5°C. Under the agreement, Governments also agreed on the need for global emissions to peak as soon as possible, recognising that this will take longer for developing countries and to undertake rapid reductions thereafter in accordance with the best available science.

The Intergovernmental Panel on Climate Change (IPCC) has put forward its clear assessment that the window for action on climate change is rapidly closing. In this regard the Government enacted the *Climate Action and Low Carbon Development Bill 2015* which provides for the approval of plans by the Government in relation to climate change for the purpose of pursuing the transition to a low carbon, climate resilient and environmentally sustainable economy; the creation of greenways forms part of this transition to a low carbon economy.

Under the Kyoto Protocol, Ireland is required to limit total national greenhouse gas emissions to 314.2 M tonnes of CO2eq over the five-year period 2008 – 2012 which is equivalent to 62.8 M tonnes of CO2eq per annum. The Kyoto Protocol limit is calculated as 13% above Ireland's 1990 baseline value which was established and fixed at 55.61 M tonnes of CO2eq following an in-depth review of Ireland's 2006 greenhouse gas inventory submission to the United Nations Framework Convention on Climate Change (UNFCCC).

An amendment to the Kyoto Protocol – the Doha Amendment, was adopted on 8th December 2012 in Doha, Qatar. A second commitment period was agreed (2013-2020), a revised list of greenhouse gases was to be reported on by Parties in the second commitment and nitrogen trifluoride was added to the list of greenhouse gases. Amendments were made to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the first commitment period, 37 industrialized countries and the European Community committed to reduce greenhouse gas (GHG) emissions to an average of five percent against 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020; however, the composition of Parties in the second commitment period is different from the first.

Under the EU Commission's Climate and Energy Package, Ireland is required to deliver a 20% reduction in non-ETS (Emissions Trading Scheme) greenhouse gas emissions by 2020 (relative to 2005 levels). In addition, Ireland also has binding annual emission limits for the period 2013-2020 to ensure a gradual move towards the 2020 target. In the EPA's (2016b) bulletin *Greenhouse Gas Emission Projections to 2020 – An Update*, it is stated that the latest projections are that Ireland will at best be 11% below 2005 levels, well below the 20% target.

Ireland's GHG emissions are tracked and projected by the EPA for submission to the EU UNFCCC annually. Carbon dioxide emissions are reported alongside methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perflurocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

For 2016, total national greenhouse gas emissions are estimated to be 61.19 million tonnes carbon dioxide equivalent (Mt CO2eq) (EPA, 2017a). According to 'Ireland's Greenhouse Gas Emissions Projections 2016-2035' (EPA, 2017b), Ireland is projected, under the *With Existing Measures* scenario, to exceed its obligations by 13.7 Mt of CO_2eq over the period 2013-2020.

Under the *With Additional Measures* scenario, Ireland is projected to cumulatively exceed its obligations by 11.5 Mt of CO_2eq over the period 2013-2020. This accounts for the overachievement of the annual limits in the period 2013-2015 which is banked and used between 2016-2020. Through this mechanism, Ireland is expected to exceed its obligations in 2019.

It must be noted that if Ireland does reach its 2020 obligations there will be a new set of obligations put in place. If Ireland were to overachieve the emissions limits they could be banked to be used towards future compliance. However, if Ireland does not reach the set target in 2020 it will mean '*severe compliance challenges towards decarbonising the economy*'.

8.2 Methodology

As decommissioning of the proposed greenway is not envisioned it will be not be mentioned further on within the chapter. In respect of air and climate, this chapter focusses on the potential emissions which may arise during the construction and operation phase of the proposed South Kerry Greenway.

8.2.1 Air Quality

A review of existing air quality monitoring data undertaken by the EPA was reviewed and used to characterise the existing environment. International Directive targets discussed in Section 8.1.1 have been considered in the assessment of air quality.

The impact assessment methodology involved the review and assessment of the proposed greenway and associated infrastructure to identify the potential for air emissions during construction and operation.

To assess the impacts of construction dust emissions, the National Roads Authority's[1] *Assessment Criteria for the impact of dust emissions from construction activities with standard mitigation in place* was used. This table is provided in Appendix 7 of *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes* (NRA, 2011) and reproduced below in Table 8.3. To assess the impact of magnitude of NO_2 and PM_{10}, the NRA's (2011) modified *Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations* was used; see Table 8-4. Details of the descriptors for changes in annual mean nitrogen dioxide, PM_{10} and $PM_{2.5}$ at receptors can be found in Table 8.5.

Table 8-3: Assessment Criteria for the Impact of Dust Emissions from Construction Activities, with Standard Mitigation in Place

Source		Potential Distance for Significant Effects (Distance from source)		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation Effects**
Major	Large construction sites, with high use of haul routes	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul routes	50m	15m	15m
Minor	Minor construction sites, with limited use of haul routes	25m	10m	10m

(source: NRA, 2011)

[1] The National Road Authority (NRA) is now called Transport Infrastructure Ireland (TII)

Table 8-4: Definition of Impact Magnitude

Magnitude of Change	Annual Mean NO_2/PM_{10}	No. Days with PM_{10} conc. >50µg/m³	Annual Mean PM_{10}
Large	Increase/Decrease ≥4µg/m³	Increase/Decrease > 4 days	Increase/Decrease ≥2.5 µg/m³
Medium	Increase/Decrease 2-<4µg/m³	Increase/Decrease 3 or 4 days	Increase/Decrease 1.25 - <2.5 µg/m³
Small	Increase/Decrease 0.4 - <2 µg/m³	Increase/Decrease 1 or 2 days	Increase/Decrease 0.25 - <1.25 µg/m³
Imperceptible	Increase/Decrease <0.4 µg/m³	Increase/Decrease <1 day	Increase/Decrease <0.25 µg/m³

(source: NRA, 2011)

Table 8-5: Air Quality Impact Descriptors for Changes to Annual Mean Nitrogen Dioxide and PM10 and PM2.5 Concentrations at a Receptor

Absolute Concentration In relation to Objective/Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value with Scheme (≥40µg/m³ of NO_2 or MP_{10}) (≥25µg/m³ of $PM_{2.5}$)	Slight adverse	Moderate adverse	Substantial adverse
Just below objective/limit value with scheme (36- <40 µg/m³ of NO_2 or PM_{10}) (22.5 - <25 µg/m³ of $PM_{2.5}$)	Slight adverse	Moderate adverse	Moderate adverse
Below objective/limit value with scheme (30-<36 µg/m³ of NO_2 or PM_{10}) (18.75 - < 22.5 µg/m³ of $PM_{2.5}$)	Negligible	Slight adverse	Slight adverse
Well below objective/limit value (<30 µg/m³ of NO_2 or PM_{10}) (<18.75 µg/m³ of $PM_{2.5}$)	Negligible	Negligible	Slight adverse
Decrease with Scheme			
Above objective/limit value without scheme (≥40 µg/m³ of NO_2 or PM_{10}) (≥25 µg/m³ of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Substantial beneficial

Absolute Concentration In relation to Objective/Limit Value	Change in Concentration		
	Small	Medium	Large
Just below objective / limit value without scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Moderate beneficial
Below objective/limit value without scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight beneficial	Slight beneficial
Well below objective/limit value without scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight beneficial

(source: NRA, 2011)

The traffic figures for the construction phase of the project, outlined in Chapter 9 Traffic and Transportation, were used in a basic air quality prediction screening model. This prediction tool is provided in the Design Manual for Roads and Bridges (DMRB) (Volume 11, Section 3 Air Quality, May 2007) and published by the UK Highways Agency. The DMRB model predicts vehicle emissions for SO_2, NO_2 and NO_x, PM_{10}, 1,3-butadience, benzene and CO.

The DMRB model requires several inputs such as traffic flow (annual average daily traffic), speed and vehicle mix and annual background pollutant concentrations. Recent traffic volumes for the existing local road network adjacent to the proposed development were sourced from Kerry County Council (KCC) and reference to automatic traffic counter data provided by TII. Predicted concentrations for the construction phase of the proposed development were used. Annual background pollutant concentrations were sourced from the EPAs three most recent ambient air quality reports (2015 - 2013) ((EPA, 2015c), (EPA, 2014) & (EPA, 2013). No values for 1,3-butadience were available within the EPA's reports and values for benzene were not available for Zone D; and will not be considered in calculations. Results from the DMRB model were then compared with the Irish ambient air quality standard - S.I. No. 180 of 2011 – Air Quality Standards Regulations, 2011. These regulations set limit values and averaging periods, which are used to assess the impact of emissions on human health, vegetation and ecosystems.

8.2.2 Climate

The assessment of the impact of the proposed greenway on climate aims to both identify and assess the sources as well as to produce mitigation measure to minimise the release of GHGs. Both natural and human activities have the potential to release GHGs which contribute to global warming. Due to the varied sources and dispersed nature of GHGs, the impact of the proposed greenway on climate cannot be calculated within this assessment.

A desk-top study assessment was undertaken of available climatic information from Met Éireann to characterise the existing environment. In the completion of the assessment of the proposed development on climate the following was consulted:

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports, Draft, EPA, August 2017.
- Advice Notes for Preparing Environmental Impact Statements, Draft, EPA, 2015.

- Model results from Design Manual for Roads and Bridges, UK Highways Agency, 2007 (see Section 7.2.1 for further information).
- Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes, NRA, 2011 (see Table 8.4 and 8.5 for further information).

8.3 Existing Environment

KCC proposes to develop the South Kerry Greenway from Reenard in the West to Glenbeigh in the North East of the Iveragh Peninsula in County Kerry. The proposed Greenway follows the route of an abandoned railway line, approximately aligned with the N70 national secondary road from Glenbeigh to Foilmore National School. At this point it diverges to take a more northerly route, crossing the River Ferta using the old railway bridge and into Cahersiveen. The Greenway will be ca. 32 km long with a two-way shared cycling and walking route.

The proposed greenway route, traverses a mix of coastal and inland areas and, except for two locations where the route ascends to 100m, is generally situated at lower elevations.

The site's overburden geology typically consists of till deposits (typically Acid Brown Earths / Brown Podzolics soils) derived from the Devonian Sandstone. Undifferentiated Alluvium Deposits are identified south of Glenbeigh, with rock identified at the surface along the Mountain Stage. To the south of Kells and to southwest at Cloghanelingahan Blanket Peat is present see Figure 12-2 Quaternary Geology for general location of blanket peat.

Of the 32km of greenway, 57% will be developed on existing railway line, 8% will be constructed on existing road and 35% will be constructed off line (i.e. fields).

8.3.1 Air Quality

European air quality legislation requires that each member state be defined in terms of Zones and Agglomerations for air quality, with Ireland divided into four zones. Dublin Conurbation is one zone – Zone A and Cork Conurbation is defined as Zone B. Zone C consists of 24 cities and towns (such as Galway, Limerick and Waterford cities and towns such as Naas, Newbridge, Celbridge, Leixlip) with a population of greater than 15,000 while Zone D covers the remainder of the country. The proposed development is in Zone D.

The air quality in each zone is monitored by the EPA and classified with respect to upper and lower assessment thresholds based on measurements over the previous five years. The number of monitoring locations required is dependent on population size and whether ambient air quality concentrations exceed the upper assessment threshold, are between the upper and lower assessment thresholds, or are below the lower assessment threshold. The Air Quality Report 2016 (EPA 2016c) noted that Ireland's ambient air quality did not go above EU levels. The Air Quality Index for Health map on the EPA website, shows that the current air quality within the proposed development site is classed as 2 – Good.

8.3.2 Climate

The dominant influence on Ireland's climate is the Gulf Stream. Consequently, Ireland does not suffer from the extremes of temperature experienced by many other countries at similar latitude. The climatic conditions for the wider geographical area have been derived from historical meteorological measurements complied by Met Éireann at Valentia synoptic station which is approximately 5 km west of Reenard Point. These meteorological conditions are presented in Table 8.6 for the period 2014 – Feb 2017 and Table 8-7 for climatic data averages for the period of 2013-1983 (source www.met.ie/climate).

For the period 2014 – 2017, mean monthly rainfall varied between 73.7mm – 237.1mm; mean monthly temperature varied between 7°C – 15.2°C; mean monthly grass temperature varied between -4.7°C – 4.8°C; mean monthly sunshine duration varied between 33.2hrs – 262.9hrs (for 2014 only) and monthly mean wind speed varied between 8.1knots – 12.3knots. See Table 8-6 below for more information.

Data from the period 2013-1983, indicates mean monthly values over 30 years for temperature, precipitation, grass minimum temperature, wind and sunshine duration. Mean 30yr monthly values for rainfall ranged from 92.3mm to 176.9mm; mean monthly temperature varied between 7.2°C and 15.3°C; mean hours of sunshine ranged from 39.2hrs to 184.7hrs and a mean monthly wind speed varied from 7.9knots to 11.9knots. See Table 8-7 below for more information.

Table 8-6: Meteorological Conditions at Valentia Synoptic Station

Rainfall (mm) for Valentia													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual mean**
2017	167.2	138.7	135.1	51.4	77.8	141.5	108.4	102.8	204.4	162.2	107.4	198.8	133.0
2016	293.8	190.6	104.6	104.0	77.9	108.0	83.3	105.1	182.7	186.4	76.7	103.8	134.7
2015	199.4	108.1	135.2	54.0	127.6	81.4	120.5	126.0	148.9	96.1	199.9	339.0	144.7
2014	288.1	292.4	135.2	85.5	115.5	56.0	81.4	73.7	26.5	192.4	202.3	135.4	140.4
mean	237.1	182.5	127.5	73.7	99.7	96.7	98.4	101.9	140.6	159.3	146.6	194.3	n/a
Mean air temperature (degrees Celsius) for Valentia													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual mean**
2017	7.8	8.1	9.4	9.3	12.5	14.1	14.8	14.7	13.3	12.4	9.2	8.0	11.1
2016	8.1	6.7	7.5	8.4	12.1	14.5	15.2	15.6	14.4	12.0	7.7	9.2	11.0
2015	7.3	6.3	7.5	10.0	10.5	13.0	14.3	13.8	13.5	11.9	10.8	10.0	10.7
2014	7.4	6.7	7.9	10.4	11.4	14.7	16.3	14.7	15.6	12.3	9.7	8.3	11.3
mean	7.7	7.0	8.1	9.5	11.6	14.1	15.2	14.7	14.2	12.2	9.4	8.9	n/a
Grass Minimum Temperature (degrees Celsius) for Valentia													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual mean**
2017	-7.1	-3.9	-1.2	-1.4	0.9	2.8	2.6	5.6	1.1	2.2	-4.7	-3.2	-0.5
2016	-1.0	-4.9	-5.0	-2.3	-0.2	4.0	5.5	7.7	2.3	-1.6	-7.1	-6.4	-0.8
2015	-5.5	-7.8	-4.3	-2.3	0.3	1.9	5.3	2.5	2.1	-0.3	-0.9	-0.7	-0.8
2014	-4.0	-2.3	-5.2	0.9	0.2	0.2	5.7	2.1	1.9	0.5	-1.4	-3.8	-0.4
mean	-4.4	-4.7	-3.9	-1.3	0.3	2.2	4.8	4.5	1.9	0.2	-3.5	-3.5	n/a
Sunshine duration (hours) for Valentia													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual mean**
2017	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014	56.7	59.4	129.1	142.8	163.8	262.9	136.2	187.1	n/a	81.4	77.1	33.2	120.9
mean	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mean Wind Speed (knot) for Valentia													

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2017	8.7	11.5	10.9	7.1	7.8	10.0	7.9	8.5	9.5	10.3	9.2	11.0	9.4
2016	12.4	12.2	9.6	8.3	7.4	8.2	8.2	9.2	9.0	7.9	8.1	9.7	9.2
2015	14.0	10.1	11.4	8.0	10.3	8.5	9.9	8.2	8.1	7.5	13.6	14.8	10.4
2014	13.0	15.4	9.3	8.9	9.1	7.0	7.0	8.5	5.7	10.2	8.4	12.3	9.6
mean	12.0	12.3	10.3	8.1	8.7	8.4	8.3	8.6	8.1	9.0	9.8	12.0	n/a

n/a = not applicable NA = not available

Table 8-7: Climatic Data for Valentia (1983 – 2013)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Air Temperature (degrees Celsius)	7.2	7.3	8.1	9.2	11.5	13.5	15.3	15.3	14.0	11.7	9.3	8.0
Maximum Air Temperature (degrees Celsius)	12.8	12.7	15.0	17.3	21.0	21.9	22.6	21.9	21.2	18.3	15.3	13.6
Minimum Air Temperature (degrees Celsius)	-1.5	-1.0	-0.7	0.9	3.7	6.1	8.6	7.8	5.5	2.9	0.6	-0.6
Mean Maximum Temperature (degrees Celsius)	9.8	9.8	11.0	12.4	14.8	16.5	18.1	18.2	16.9	14.5	11.8	10.4
Mean Minimum Temperature (degrees Celsius)	4.7	4.7	5.3	6.1	8.2	10.5	12.5	12.3	11.0	8.9	6.7	5.6
Precipitation Amount (mm)	176.9	119.8	113.8	102.1	92.3	99.0	105.5	116.0	117.1	174.6	176.7	167.7
Grass Minimum Temperature (degrees Celsius)	-5.6	-4.9	-4.3	-2.9	-0.1	2.4	5.2	4.2	1.8	-0.9	-3.5	-4.8
Mean Wind Speed (knot)	11.9	11.2	10.4	9.4	8.9	8.2	7.9	7.9	8.6	9.7	10.4	11.4
Highest Gust (knot)	59.7	56.3	54.5	47.9	45.0	40.1	38.2	40.6	45.6	54.8	54.1	59.2
Sunshine duration (hours)	46.0	62.2	95.5	155.3	184.7	163.1	137.1	138.3	115.6	84.7	55.3	39.2

8.4 Impact Assessment

8.4.1 Do-nothing Impacts

If the proposed greenway does not proceed local air quality and the micro climate will remain unchanged. However, on a larger scale this greenway alongside other existing and proposed greenways have the potential to contribute to normalising the activity of cycling; indirectly contributing in Ireland's transition to a low carbon economy. If the proposed greenway does not go ahead, this potential will be lost.

8.4.2 Air Quality

8.4.2.1 Construction Phase Impacts

The principle source of potential air emissions during the construction of the proposed greenway will be dust arising from:

- Ground excavation works,
- repair works on 3 no. existing structures (i.e. Cahersiveen Railway Bridge, Gleensk Viaduct & Glenbeigh Tunnels),
- construction of 5 no. new structures (Kells underpass, Drung Hill gabion wall, Nimmo's Bridge, boardwalk at Coolnaharragil, Reenard revetment wall & N70 re-alignment,
- construction of new lengths of greenway (on road; ca. 2,608km and off-road ca. 11,178km),
- upgrade works to existing railway corridor (ca. 18,087km),
- upgrading of 2 no existing carparks (Cahersiveen Marina car park and Glenbeigh Quarry car park (to also be extended),
- construction of 3 no. carparks (Reenard Trail Head, Glenbeigh trail head car park and Kells car park),
- temporary storage of excavated materials,
- the movement of construction vehicles,
- construction of 24 no. temporary compounds,
- loading and unloading aggregates/materials and,
- the movement of material around site.

Dust emissions arise when particulate matter becomes airborne making it available to be carried downwind from the source. Dust emissions can lead to elevated PM_{10} and $PM_{2.5}$ concentrations and may also cause dust soiling. The amount of dust generated and emitted from a working site and the potential impact on the surrounding areas varies according to:

- The type and quantity of material and working methods
- Distance between site activities and sensitive receptors
- Climate/local meteorology and topography

Applying the NRA criteria in Table 8.3, the overall construction of the proposed greenway would be considered a major construction site. However, as the development is spread over 32km, will be carried out in a phased manner and is transient in nature the development is therefore deemed to be a moderate construction site. As a moderate construction site this will result in soiling effects which have the potential to occur up to 50m from the source, with PM_{10} deposition and vegetation effects occurring up to 15m from the source. Within 15m of the proposed greenway footprint there are 29 residential properties and 4 residential/commercial properties; there is potential for these properties to receive significant effects from dust soiling. Within 50m of the proposed greenway footprint there are 197 residential properties and 43 residential/commercial properties; there is potential for these properties to receive PM_{10} deposition and vegetation effects. However, due to the transient nature of the works the impact prior to mitigation will result in small impacts.

Due to the transient nature of the proposed development, significant impacts from dust and PM_{10} deposition and vegetation effects are more likely to occur beside site entrances/compounds where activities are more concentrated.

However, as the proposed development will be phased, all 23 site compounds/entrances will not be in operation for the full duration of the construction phase and any impacts will be temporary. One residential property is located 15m from compound 7 and prior to mitigation measures PM_{10} deposition and vegetation effects are expected. 21 residential properties are located within 50m of temporary compounds and prior to mitigation measures dust soiling is expected, see table below for more information.

Table 8-8: Residential properties within 15 and 50m of temporary compounds

Temporary Compound ID	Residential buildings within 15m	Residential buildings within 50m
1	0	1
23	0	1
7	1	3
24	0	1
12	0	1
14	0	1
15	0	3
18	0	1
19	0	1
20	0	2
21	0	1
22	0	5

Construction vehicles have the potential to increase concentrations of compounds such as NO_2, Benzene and PM_{10} in the receiving environment. The number and types of vehicles accessing the proposed greenway during the construction period is described in Chapter 9 Traffic and Transportation. Works throughout the construction phase have been grouped via Activity; see Table 8-9 below for further information.

Table 8-9: Outline Construction Programme and Activity

Activity	Works Description	Prog. Work Sequence	Compounds	Prog. Start	Duration	OWM[2]	Vehicle Class
A	Commence works for Section 8 (4,000m)	1	1,2,3	Week 1	16 weeks	1211	HGV
	mobilise three works crews (a/b/c) working east and west					2880	LGV
B	Commence works for Section 9/10/11 (9,350m)	3	4, 5, 6, 7, 8, 9, 23	Week 1	37 weeks	2526	HGV
	mobilise four works crews (d/e/f/g) working east and west					8880	LGV

[2] One-way vehicle movements

Activity	Works Description	Prog. Work Sequence	Compounds	Prog. Start	Duration	OWM²	Vehicle Class
C	Commence works for Section 12/13/14 (9,100m)	4	11,12,13,14,15,16	Week 1	36 weeks	2858	HGV
	mobilise four works crews (h/i/j/k) working east and west					8640	LGV
D	Commence works for Section 15/16 (4,175m)	5,6	18,19,20,21,22	Week 17	17 weeks	1940	HGV
	mobilise three works crews (a/b/c) working east and west					3060	LGV
E	Element 1, Cahersiveen Bridge	2	4	Week 17	16 weeks	120	HGV
	repairs and improvement works – use specialist works contractors a					960	LGV
F	Element 2, Kells Underpass	3,4	10,24	Week 1	12 weeks	644	HGV
	underpass works – use specialist works contractors b					720	LGV
G	Element 3, Gleesk Viaduct	4	15,16	Week 1	3 weeks	130	HGV
	viaduct works – use specialist works contractors c					180	LGV
H	Element 4, Drung Hill Tunnels and Nimmo's Bridge	5	18	Week 1	6 weeks	50	HGV
	bridge and tunnel works – use specialist works contractors d					360	LGV
I	Element 5, Mountain Stage (gabion basket)	5	19	Week 15	24 weeks	1001	HGV
	Gabion basket works – use specialist works contractors e					1440	LGV
J	Element 6, Boardwalk	6	19	Week 36	3 weeks	40	HGV
	boardwalk works - use crew a					180	LGV
K	Element 7, Car Parks (1 to 6)	1,4,6	1, 3, 13, 22	Week 36	18 weeks	450	HGV
	car park works – use two crews (b/c and a once available)					2160	LGV

To assess the potential impacts on local air quality, a DMRB screening model was used to estimate the baseline for CO, NO_x, NO_2 and PM_{10} traffic emissions using 2017 surveyed traffic data along the proposed routes in which construction phase traffic will take in relation to compounds/site entrances.

While the construction phase will be transient the N70 will be used throughout the construction phase to either directly access temporary compounds or to access local roads. Firstly, the emissions for the N70, for the length feeding all 24 no. site compounds on the busiest week (week 3) was calculated alongside predicted traffic for the busiest month for road traffic (August). For this analysis, it has been assumed that all construction traffic generated during week 3 (W3) will pass a single point along the N70. This highly unlikely scenario has been chosen to assess worst case in terms of the potential impact on existing traffic volumes on this national secondary road.

Secondly, to get a more realistic idea on the use of the N70 (as activities will be concentrated to smaller sections of the N70) emissions for Activity C which encompasses compounds 11, 12, 13, 14, 15 and 16 was calculated. Activity C comprises the construction of 9.1km of the greenway over 36 weeks.

Emissions were calculated for the most significant work sequence during the busiest M3 alongside predicted traffic for the busiest month for road traffic (August). This highly unlikely scenario has been chosen to assess worst case in terms of the potential impact on existing traffic volumes on this section of national secondary road.

Finally, to adequately analyse the impact of the project's construction on the local road network, the L4005 was selected as a representative location. The L4005 will provide access to compounds 1 and 2 (Activity A). Activity A accounts for approximately 4,000m (12%) of the total length of the greenway project, approximately 2,600m (65%) of which shall be constructed from Compounds 1 and 2. Emissions were calculated for the most significant work sequence during the busiest M3 alongside predicted traffic for the busiest month for road traffic (August). This highly unlikely scenario has been chosen to assess worst case in terms of the potential impact on existing traffic volumes on the local road network.

Emission levels were calculated at the nearest receptor for the N70 (all compounds), N70 Activity C and the L4005 Activity A; with distances of 2m, 5m and 2m respectively. An assessment was then conducted to calculate the predicted increase on base levels because of increased traffic movements along roads during the construction period.

The results from the DMRB screening assessment (see Table 8-10 below) indicates that the predicted traffic emissions during the construction phase will not breach Air Quality Standards Regulation 2011 limits air quality limits (see Table 8-11 over). According to the NRAs definition of impact magnitude (see Table 8-4) the increase in PM_{10} at the N70 (all), N70 (Activity C) and L4005 (Activity A) will be imperceptible, as will the increase of $N0_2$. The changes to annual mean $N0_2$ and PM_{10} (see Table 8-5), are deemed to be negligible.

Table 8-10: Predicted Levels of Pollutants from Traffic Emissions for Construction Phase

N70 Activity A, B, C, F, G, H					
Pollutant	**CO (mg/m3)**	**NOx (µg/m3)**	**NO2 (µg/m3)**	**PM10 Annual Mean (µg/m3)**	**PM10 >50 µg/m3**
Present (2018)	0.43	11.93	7.35	13.25	0.00
Construction Phase (2019)	0.44	12.31	7.48	13.29	0.00
Increase	0.01	0.38	0.13	0.04	0.00
N70 Activity C					
Present (2018)	0.43	11.93	7.35	13.25	0.00
Construction Phase (2019)	0.44	12.08	7.40	13.26	0.00
Increase	0.01	0.15	0.05	0.01	0.00
L4005 Activity A					
Present (2018)	0.42	9.36	6.43	12.98	0.00
Construction Phase (2019)	0.42	9.42	6.45	12.99	0.00
Increase	0.00	0.06	0.02	0.01	0.00

Table 8-11: Air Quality Standards Regulations 2011 limits

Pollutant	Air Quality Limits
CO	10,000 µg/m^3 or 8620 ppb
NO_x	-
NO_2	200 µg/m^3 or 105ppb measured over 1 hr or 40 µg/m^3 or 21 ppb measures over a year
PM_{10}	50 µg/m^3 measured over 24hrs and 40 µg/m^3 measured over a calendar year

Plant and machinery such as generators, excavators etc. will be required at various stages of the construction works. These will be relatively small units which will be operated on an intermittent basis. Although there will be an emission from these units, given their scale and the length of operation time, the impacts of emissions from these units will be negligible.

8.4.2.2 Operational Phase Impacts

On operation, the greenway will be used by walkers and cyclists. The greenway will be mainly comprised of hardstanding and dust production will be negligible. However, there is potential for an increase in traffic emissions from greenway users visiting and parking at proposed car parks (see Table 8-13).

As with the Construction phase, a DMRB screening model was used to estimate the potential impact on air quality from the operation phase of the development. Again 2017 surveyed traffic data was used. As part of the operation phase, five car parks will service the proposed greenway (see Table 8-13 below). For a worst-case scenario, predicted traffic volumes for the areas busiest month (August) was used alongside the predicted busiest car park usage month (August) – the figure for predicted usage at each of the car parks was based on the estimated greenway usage in August (1424 persons) divided by the number of car parks (5) to give an estimated usage per car park of 284.8. To get an understanding of the impact on local roads the L4005 which will service the proposed Reenard Trail Car Park was assessed. To evaluate the impact on the N70 national road, Kells Car Park was assessed.

Emission levels were calculated at the nearest receptor; 2m for the N70 (Kells Car Park), and 2m for the L4005 (Reenard Trail Car Park). An assessment was then conducted to calculate the predicted increase on base levels because of increased traffic movements along roads during the operation phase.

The results from the DMRB screening assessment (see Table 8-12 over) indicates that the predicted traffic emissions during the operation phase will not breach Air Quality Standards Regulation 2011 limits air quality limits (see Table 8-11). According to the NRAs definition of impact magnitude (see Table 8-4) the increase in PM_{10} and NO_2 for the N70 (Kells Car Park) and the L4005 (Reenard Trail Car Park) will be imperceptible. The changes to annual mean $N0_2$ and PM_{10} (see Table 8-5), are deemed to be negligible. The closest residential property to any car park is located approximately 32m from the Glenbeigh Trail Head car park. At this distance the impact from dust soiling and PM_{10} and vegetation effects will be negligible.

Table 8-12: Predicted Levels of Pollutants from Traffic Emissions for Operation Phase

Pollutant	CO (mg/m3)	NOx (µg/m3)	NO2 (µg/m3)	PM10 Annual Mean (µg/m3)	PM10 >50 µg/m3
N70 Kells Car Park					
Present (2018)	0.43	11.93	7.35	13.25	0.00
Operation Phase (2021)	0.44	12.33	7.48	13.29	0.00
Increase	0.01	0.40	0.13	0.04	0.00
L4005 Reenard Trail Car Park					
Present (2018)	0.42	9.36	6.43	12.98	0.00
Operation Phase (2021)	0.42	9.61	6.52	13.01	0.00
Increase	0.00	0.25	0.09	0.03	0.00

Table 8-13: South Kerry Greenway Car parks

Location/Car Park Name	Residential buildings within 30m from car parks	Car parking spaces	Road Name
Reenard Trail Head	0	86	Local Primary L-4005-0
Cahersiveen Marina (existing)	0	71	Quay Street
Kells (existing)	0	74	National Secondary N70
Glenbeigh Trail Head	0	61	Local tertiary L11652-14
Glenbeigh Quarry	0	35	Regional R-564

8.4.3 Climate

There is the potential for GHG emissions to the atmosphere during the construction phase such as those arising from construction vehicles, the use of on-site generators, excavators etc. and soil disturbance and excavation; including blanket peat. There is potential for GHG emission during the operational phase from visitor vehicles using the greenway's five car parks.

Microclimate - The significance of impacts associated with the conversion of vegetated surfaces to un-vegetated surfaces is assessed through the consideration of the area of the land experiencing such a change. Approximately 35% or 11.17km of the proposed new greenway (not part of the existing railway line) is predominately greenfield site. Impacts to air quality by emissions will be negligible and there will therefore be no direct or indirect impact on air temperature and microclimate due to the development.

Macroclimate - Carbon dioxide (CO_2) is a GHG which if released in excessive amounts can lead to increases in global temperatures known as 'global warming' or 'greenhouse effect' which can influence climate change. GHGs are produced from a number of sources such as burning fossil fuels (for energy production and transport), harvesting peat, tree felling and agriculture (livestock, fertiliser and soil). Once operational the greenway will offer the opportunity for people to cycle, helping to normalise cycling over cars which are a producer of GHGs.

8.4.4 Cumulative Impacts

In terms of cumulative impacts, negative cumulative impacts in relation to air quality would only occur if a large development was located in the vicinity of the site and was being constructed at the same time.

One Part VIII process has been completed by KCC which has the potential to overlap with the construction phase of the proposed development. The development involves raising the existing N70 overbridge (structure ID KY-N70-029.00) at Coolnaharrigill Lower, Caherciveen. If this development overlaps with the construction phase of the proposed development, there is potential for localised dust nuisance. However, with the implementation of mitigation measures, dust nuisance is not envisaged.

8.5 Mitigation Measures

8.5.1 Construction Phase

- Temporary compounds will be constructed before the construction phase of each section of works begins, this will minimise soil disturbance and dust production.
- During the upgrading works of the existing railway corridor (on-line), excavation works are to be limited to the existing railway ballast which will see the removal of less than 10cm of surface layer. The capping layer will be rolled as soon as it is placed which will reduce the amount of dust allowed to enter the surrounding air. Works will be programmed so that sub-base is completed as soon as possible, this will minimise the disturbance of the ground and potential for carbon loss and dust production into the surrounding environment. Soil is a source of carbon, while loss due to the excavation of soil is expected to be minimal overall the aforementioned mitigation will further lower effects.
- During the construction of the off- line section of greenway, exposed ground at subgrade level will be rolled as soon as it is exposed to minimise the disturbance of the ground and potential for carbon loss and dust production into the surrounding environment. The capping layer will be rolled as soon as it is placed which will reduce the amount of dust allowed to enter the surrounding air. Works will be programmed so that sub-base is completed as soon as possible, this will minimise the disturbance of the ground and potential for carbon loss and dust production into the surrounding environment. Soil disturbance outside the footprint of works will be minimised to prevent the release of carbon and dust production.
- The seeding of margins will be carried out with a seed mix which is compatible with local species so that vegetation cover will be quick, this will provide protection to soil so that disturbance is minimal resulting in minimised dust production. Seeding will be undertaken during late summer to mid-autumn and/or mid spring which are optimal times of the year for germination. Where this is not possible, hydroseeding will be undertaken during the suboptimal period. The organic mulch used will provide protection to the soil surface as well as grass seeds.
- During pavement construction excavated topsoil will be stored in heaps for reuse. These heaps will be damped and covered where necessary to prevent the creation of dust.
- Excess topsoil and subsoil will be brought to the nearest available compound and will be appropriately covered to prevent dust nuisance. Stockpiles will be temporarily stored (damped and covered where necessary) before being transported off site by an appropriately licenced contractor and disposed of at an appropriately licenced/permitted facility.
- Capping/foundation material will be brought to the excavation areas on the return journey from delivering excess soil to temporary compounds. All loads will be appropriately covered to prevent dust nuisance.
- Excess rock, gravel and or aggregates will be temporarily stored at appropriate compounds. This material will be transported to compounds appropriately covered to prevent dust nuisance. The material will then be transported offsite; covered to prevent dust nuisance.
- Excavation activities will stop during periods of strong winds in conjunction with dry weather if it is likely to lead to fugitive dust emissions;
- Wheel washing facilities will be provided at the entrance/exit point of the proposed development site;

- The developer in association with the contractor will be required to develop and implement a dust control plan as part of the CEMP. This plan will address aspects such as excavations, haul roads, temporary stockpiling and restoration works. The plan will be prepared prior to any construction activities and will be established and maintained through the construction period.
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.

8.5.2 Operational Phase

No mitigation measures are required.

8.6 Residual Impacts

8.6.1 Air Quality

Following the implementation of mitigation, the proposed development will have a negligible impact on local air quality.

8.6.2 Climate

Regarding climate there will be no residual impact on microclimate. With regard to macroclimate a slightly positive impact is envisaged due to the potential for the greenway to normalise cycling; increasing the opportunity to cycle and the increase of bicycle use over cars.

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