# 16 Population and Human Health

## 16.1 Introduction

This chapter assesses the potential for likely significant effects on Population and Human Health during the construction and operation of the proposed scheme. As described in **Chapter 2,** '*Background and Need for the Scheme'*, the town of Arklow has, for many years, experienced recurring flooding problems that have caused widespread damage to public and private property, as well as large-scale community disruption.

This chapter draws on the outcomes of other specialist chapters within this EIAR, including traffic and transport, air quality, odour, noise, water, landscape and visual and material assets. Specifically, the chapter addresses:

- The impact of construction works on population subsets, community facilities and economic activity, on amenity use of the river, and on pedestrian, cyclist and traffic movement.
- The impact of construction works on human health, from noise, odour and emissions to air and water from plant and equipment, and from community disturbance
- The operational impact of the scheme on both population and human health based on the potential effects of the constructed flood defences, public realm works, and also the benefits of much reduced flood event frequency and extent of flood damage.

## 16.2 Assessment Methodology

### 16.2.1 General

This chapter examines the socio-economic and health characteristics of Arklow and in particular, the areas of the town vulnerable to flooding, focusing especially on the location and vulnerability of community facilities and on sensitive population subsets. The assessment is guided by the requirements of the EU Flood Directive (2007/60/EC) and by Preliminary Flood Risk Assessment and Flood Risk Management Plans prepared on the basis of guidance supplied by the Office of Public Works.

Potential effects on human health are primarily considered through an assessment of the environmental pathways by which health may be affected (i.e. the determinants of health) such as air, noise, water or soil. The assessment on human health therefore draws on the findings of other sections of the EIAR as necessary to ensure that the likely significant effects on human health are considered herein.

Social inequalities are another important determinant of human health. Social class is a predictor of longevity and health.

Any development which could make a contribution to reducing social inequalities can make an important contribution to human health. Other aspects to consider, include the potential for improvements to health, for example, improved opportunities to exercise. The assessment so considers access to services as well as any potential positive or negative psychological effects.

### 16.2.2 Guidance and Legislation

#### 16.2.2.1 Population

This assessment has been undertaken with due regard to the overarching EPA and EC guidance (described in **Section 1.3** of **Chapter 1**, *Introduction*). Regard has also been given to the Fáilte Ireland Guidelines on the Treatment of Tourism in an Environmental Impact Statement (Fáilte Ireland, 2011).

The assessment of effects relevant to human beings in the local area (i.e. the local population) has been undertaken in line with these guidelines.

#### 16.2.2.2 Human Health

This assessment has been undertaken with due regard to the overarching EPA and EC guidance (described in **Section 1.3** of **Chapter 1**, *Introduction*). No specific guidance on the definition for Human Health has been provided in the context of EIA to date. The relevant topic-specific guidance that has been considered includes the following:

- The World Health Organisation (WHO) (2009) Night Time Noise Guidelines for Europe;
- US EPA (2016) Health Impact Assessment Resource and Tool Compilation;
- WHO (1999) Guidelines for Community Noise;
- IEMA (2017) Health in Environmental Impact Assessment - A Primer for a Proportionate Approach;
- IEMA 2020 Health Impact Assessment in Planning: Thought pieces from UK practice. Impact Assessment Outlook Journal, Volume 8: October 2020
- Institute of Public Health Ireland (2009) Health Impact Assessment Guidance;
- WHO (2005) WHO Air Quality Guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide;
- British Standards Institution (2014) 5228-1 and 2:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites. Noise and Vibration[1];
- EPA (2016) Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4);
- Air Quality Standards Regulations 2011;

[1] British Standards Institution (BSI) (2014) 5228-1 and 2:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites. Noise and Vibration

- European Communities Environmental Objectives (Surface Waters) Regulations 2009 (SI No 272 of 2009), as amended by the European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2012 (S.I. No. 327 of 2012); and the European Communities Environmental Objectives (Surface Water) (Amendment) Regulations 2015 (SI No. 386 of 2015); and
- Bathing Water Quality Regulations 2008 (SI No 79 of 2008), as amended by Bathing Water Quality (Amendment) Regulations 2011 (SI No 351 of 2011) and Bathing Water Quality (Amendment) Regulations 2016 (SI No 163 of 2016)
- Specific guidance on the human health is discussed further in Section 16.2.6.2.

### 16.2.3 Study Area

The principal study area is determined by the scheme boundary (Refer to Drawing 1002 in **Appendix 4.1**) and extends along the Avoca River from the vicinity of River Walk continuing east along South Quay to include Arklow Harbour, and the built area beside Arklow Town Marsh west of Ferrybank and Dublin Road. The principal study area also includes the site compounds. A construction compound (SC1) will be located in a green area off the Dublin Road at the edge of Arklow Town Marsh. A second construction compound (SC2) will be located at the southern end of Arklow Sports field which is used for amenity purposes, opposite Bridgewater Shopping centre parking facility, along Mill Road. SC3 is a site compound located at a vacant site at the southern end of Ferrybank (No. 1 Ferrybank). A construction compound will also be located at the municipal carpark off Main Street (SC4). The fifth site compound (SC5) will be located at an open area at the eastern end of North Quay (North Pier). Site compound six (SC6) is situated along South Beach Road.

The wider study area is that area which is affected by the social or economic effects arising from construction works for the scheme. It includes places frequented by people in the immediate environs of the construction works themselves, and also the location of site compounds and the movement of traffic.

In the operational phase, the relevant area includes all those who will be impacted by the proposed scheme which includes, primarily, those who live and work in the area of the scheme infrastructure, but also those who may come in contact with the effect of the scheme, including recreational users of the Avoca river and its banks.

The study area includes parts of the town which have previously been affected by flood events where these have impacted on the economic life of the town, for example, by forcing the closure of the bridge or other access or causing a loss of economic income from tourism, etc. The wider study area also includes those areas which have the potential to be affected by future and potentially worsening flood events. This wider area is represented by the greater Arklow urban area, including residential, commercial and industrial areas.

### 16.2.4 Consultation

The authors of this chapter have had due regard to the outcomes of all consultation undertaken for the overall scheme, as detailed in **Section 1.6** of **Chapter 1**, *Introduction.*

### 16.2.5 Categorisation of the Baseline Environment

#### 16.2.5.1 Population

The assessment of population requires that an understanding of the baseline community characteristics is established prior to the assessment. Data has been collected by means of:

- Primary data sources (e.g. demographic data from Census 2016 and Census 2011 produced by the Central Statistics Office).
- Study area map;
- Spatial data, including Google Maps and Google Streetview, Open Street Map, and Department of Education school maps;
- Relevant environmental data collected by other disciplines during the assessment;
- A review of relevant planning documents including the Wicklow County Development Plan 2016-2022 and the Arklow and Environs Local Area Plan 2018-2024;
- A review of secondary sources including the National Planning Framework (GOI 2018a) and the National Development Plan (GOI 2018b);
- A review of previous EIARs, including of the Arklow Wastewater Treatment Plant Project (2018):
- Observation of local settlement, travel patterns and amenity activity along with the identification of community facilities;
- Websites identifying recreational use of the river and riverbanks.

#### 16.2.5.2 Human Health

In addition to those data sources outlined previously, the following data sources was examined in order to establish the baseline environment relating to human health:

- Other relevant environmental baseline data gathered and considered as part of this EIAR, especially traffic, air quality and odour, noise, landscape and visual assessments.
- Available community health profiles including the Health Profile completed by the HSE for the area (Health Profile 2015, Wicklow[2)].

[2] HSE (2015) *Health Profile 2015 Wicklow*. Dublin, Ireland

## 16.2.6 Impact Assessment Methodology

### 16.2.6.1 Population

This section sets out the methodology used to assess the effects of the proposed scheme on population. The purpose of the assessment is to identify the likely significant effects on the local community and users of the local area during both construction and operation, along with the likely economic effects at the local and regional level. The methodology includes the assessment of likely significant effects on:

- Local Traffic Movements (Journey Amenity);
- Economic Activity and Employment; and
- Tourism and Amenity

For this scheme, most of the identified impacts are of a socio-economic nature and concern general amenity and journey amenity.

Effects on journey patterns also arise during the construction phase due to the addition of construction traffic movements to normal traffic volumes or due to construction works, road closures or diversions as they affect the movement of vehicles, cyclists and pedestrians. Sub-criteria include journey time, journey time reliability, and connectivity. Journey amenity effects arise from the proximity to construction traffic or works as they affect the pleasantness and perceived or actual safety of the environment for walking, cycling or driving.

**Table 16.1** provides a definition of local traffic movements (journey amenity) impacts consistent with the impact levels recommended by the EPA 2017).

**Table 16.1:** Criteria used in the assessment of Local Traffic Movements (Journey Amenity effects)

| Impact Level | Significance Criteria |
|---|---|
| Imperceptible | No significant journey amenity impacts are apparent. |
| Slight | A small impact on journey amenity can be attributed to a proposed scheme, but journey patterns are largely maintained. |
| Moderate | A moderate impact on journey amenity can be attributed to a proposed scheme such as to affect some people's use of specific routes or modes. |
| Significant | A proposed scheme has the potential to impact on journey amenity such that some people choose to use alternative routes or modes to arrive at their destination. |
| Very Significant | A proposed scheme has the potential to substantially impact on journey amenity such that most people choose to use alternative routes or modes to arrive at their destination. |
| Profound | Effects of a scale to significantly impact on journey amenity to an extent that people's travel choices or behaviour are substantially changed. |

General amenity effects can arise due to any effect that a development may have on residential quality of life, community wellbeing, amenity or recreation due to environmental effects such as noise or visual intrusion, for which specific significance levels are identified in the respective chapters of the EIAR. There are links also between amenity and tourism, and with social inclusion and health, given the priority of protecting sensitive receptors from environmental effects associated with the scheme, but also from environmental events such as flooding. **Table 16.2** provides a definition of general amenity (or local amenity) impacts consistent with the impact levels recommended by the EPA 2017).

**Table 16.2:** Criteria used in the assessment of General Amenity effects

| Impact Level | Significance Criteria |
|---|---|
| Imperceptible | No significant amenity impacts are apparent. |
| Slight | A small impact on community wellbeing or an amenity can be attributed to the proposed scheme. |
| Moderate | A moderate impact on community wellbeing, or an amenity can be attributed to the proposed scheme. |
| Significant | A proposed scheme has the potential to impact on community wellbeing or an amenity such as to significantly affect many people's behaviour and quality of life or the functioning of the amenity. |
| Very Significant | A proposed scheme has the potential to substantially impact on community wellbeing, or an amenity such as to affect most people's behaviour and quality of life or the viability of the amenity. |
| Profound | Effects of a scale to significantly impact on community wellbeing to an extent that people's behaviour or quality of life is substantially changed. |

There is also the potential for economic effects. These could arise from the construction employment and purchasing of local inputs, or from the impact of construction works on local economic activity or businesses. In the operational phase, there are potential interactions with other economic activity, or with regard to settlement patterns, population change and tourism. The significant criteria used to assess the economic and employment effects of the proposed scheme are consistent with those outlined in the EPA Guidance[3]. Refer to **Table 1.1** in **Chapter 1**, *Introduction*.

### 16.2.6.2 Treatment of Population Effects

Likely significant effects are categorised in accordance with the Draft EPA Guidelines. Significant effects are compared between the Do-Nothing and the Do-Something scenarios and arise from direct, indirect, secondary and cumulative effects on environmental conditions. Significant effects can be positive, neutral or negative. It usually follows that the significance of an impact depends, among other considerations, on:

- The location and character of the local environment
- The sensitivity of the local population and its capacity to absorb change

[3] Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2017)

- The nature of the environmental effect
- The timing and duration of an effect
- The scale or extent of the effect in terms of area or population affected
- The magnitude (duration and frequency) of an effect
- The probability of an effect's occurrence

Effects may be temporary or permanent. Construction impacts relevant to the assessment are finite in duration but can sometimes extend for prolonged periods of time. The rationale for applying a particular level of significance to an impact as it would affect the worst hit subset of the population is given in the Summary **Tables 16.17 and 16.18**.

The tables summarise:

- The nature of an effect
- Location and the population subgroup affected
- The potential impact due to the proposed scheme
- Impact significance
- Impact scale/number of receptors
- Impact duration (i.e. temporary, short, medium or long term)
- Interactions with other impact types
- Proposed mitigation
- The residual impact

Impact scale qualifies the preceding assessment of significance by identifying the number of receptor types, i.e. people or businesses, likely to be affected as an approximate proportion of the local population or the total number of businesses. This proportion is assessed qualitatively as: 'high', 'medium' or 'low'. For instance, an impact may be significant for a particular population subset, but the number of people impacted could be few in number.

#### 16.2.6.3 Human Health

**Overview**

This section sets out the methodology that has been used to assess the likely significant effects of the proposed development on human health.

Directive 2014/52/EU of the European Parliament and of the Council requires an EIAR to provide information on the aspects of the environment likely to be significantly affected by the proposed development including Population and Human Health. Under Council Directive 2011/92/EEC the equivalent aspect of the environment was 'population'.

The EPA guidelines[4]note that:

"*while no specific guidance on the meaning of the term Human Health has been issued in the context of Directive 2014/52/EU, the same term was used in the SEA Directive (2001/42/EC)*".

Section 5.26 of the Commission's SEA Implementation Guidance[5] states the following, whilst Paragraph (f) of Annex I of Council Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (SEA Directive) lists the environmental factors including soils, water, landscape, air etc.):

"*The notion of human health should be considered in the context of the other issues mentioned in paragraph (f) and thus environmentally related health issues such as exposure to traffic noise or air pollutants are obvious aspects to study*".

The draft EPA guidelines[6] note under Section 3.3.6 that the above health assessment approach is consistent with the approach set out in the 2002 EPA Guidelines where health was considered through assessment of the environmental pathways through which it could be affected, such as air, water or soil, viz:

*"The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment".*

The draft EPA guidelines also note under Section 3.3.6 that in an EIAR:

*"the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc and that "assessment of other health & safety issues are carried out under other EU Directives, as relevant. These may include reports prepared under the Integrated Pollution Prevention and Control, Industrial Emissions, Waste Framework, Landfill, Strategic Environmental Assessment, Seveso III, Floods or Nuclear Safety Directives. In keeping with the requirement of the amended Directive, an EIAR should take account of the results of such assessments without duplicating them".*

The Institute of Environmental Management and Assessment (IEMA) is the largest professional body for environmental practitioners in the UK and worldwide, with nearly 15,000 members and as such it is an authoritative body on environmental matters.

[4] EPA: Revised Guidelines on The Information to be Contained in Environmental Impact Statements, Draft, August 2017
[5] European Commission (EC) Guidance (2003) Implementation of Directive 2001/42 on the assessment of the effects of certain plans and programmes on the environment.
[6] EPA: Revised Guidelines on The Information to be Contained in Environmental Impact Statements, Draft, August 2017

IEMA issued a discussion document on the methodology for the assessment of Human Health in an Environmental Impact Assessment Report in 2017[7], which it describes as a primer for discussion on what a proportionate assessment of the impacts on health should be in EIA and is a useful document when considering what can and should be assessed in the context of this EIAR. Due regard has been had to the general approach advocated in this document when undertaking this assessment.

One of the messages in the IEMA document in terms of assessing health in EIA, is that there should be a greater emphasis on health outcomes, (that is the potential effects on human health), rather than simply the health determinants, (that is the agents or emissions which could have the potential to have health effects). The IEMA document noted that in EIA, there has previously been a strong focus on just the agents or emission levels (e.g. dust) rather than focusing on the effects of these agents/emission levels on human health. This change in emphasis does not mean a complete change in practice. For example, measurement and modelling of dust levels continues to be an essential part of the health assessment.

The IEMA document notes that:

*"Public health is defined as the science and art of promoting and protecting health and well-being, preventing ill-health and prolonging life through the organised efforts of society and has three domains of practice: health protection, health improvement and improving services*".

The IEMA document suggests that these three domains should be considered in the assessment of human health in EIA. Examples of health protection issues to be considered could include issues such as chemicals, radiation, health hazards, emergency response and infectious diseases whilst health improvement issues could include lifestyles, inequalities, housing, community and employment. Examples of improving services issues could include service planning, equity and efficiencies. This correlates well with the EIA Directive.

These principles have been reiterated in a recent journal article by the IEMA, entitled IEMA 2020 Health Impact Assessment in Planning: Thought pieces from UK practice, published in the Impact Assessment Outlook Journal

The World Health Organization (WHO) defined health in its broader sense in its 1948 constitution as:

"*a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity"*.

Therefore, whilst the draft EPA guidance is useful in terms of health protection, for a more holistic assessment as per the IEMA document, it is also worthwhile to look at broader health effects in terms of opportunities for improvement of health and for improvement of access to services. While it is important to do this, it is also important not to attribute every conceivable event as being a health effect.

[7] IEMA (2017) Health in Environmental Impact Assessment - A Primer for a Proportionate Approach

To further rely on the WHO definition, a health effect would be something that would have a material impact on somebody's physical mental and social well-being be that positive or negative.

Therefore, *health protection, health improvement and improving services* are all considered in this assessment of human health effects. The methodology for assessing health protection is considered further below.

**Health Impact Assessment and Environmental Impact Assessment**

The IEMA document notes that Health Impact Assessment (HIA) and EIA are separate processes and that whilst a HIA can inform EIA practice in relation to human health, a HIA alone will not necessarily meet the requirements of the EIA Directive in relation to human health. Further, HIA is not routinely carried out for major infrastructure schemes in Ireland and it is typically a non-statutory document that is normally prepared on a voluntary basis by developers overseas, e.g. in the UK.

Guidance for performing HIAs has been issued by the Institute of Public Health in Ireland[8] and they have outlined that there are considerable difficulties in performing a HIA for a project of this nature. Not least of these is the difficulty of getting baseline health data as it is quite difficult (due to patient confidentiality and other reasons) to accurately determine levels of even relatively common medical conditions in a relatively defined population that might be affected. Qualitative and quantitative baseline health data is a vitally important part of the HIA process.

This is because it is first important to determine the baseline health status of the community before it is possible to determine the quantitative impacts that a proposal might have on health. In the absence of accurate baseline data it is very difficult to assess qualitative and quantitative changes that might occur as a result of a project of this nature.

More useful generalised data that might exist for larger areas (such as a city or county) may be used, but these datasets would be at most an estimate of the local baseline and not accurate enough to allow for meaningful interpretation specific to the proposed development. Possible local effects, perhaps due to socio-economic variations or for other reasons would not be evident using data for larger population areas making the process inaccurate. This difficulty is not unique to the proposed development.

The IEMA document, for example, notes that the WHO provides an overview of health in different types of impact assessment[9] and presents the WHO perspective on the relationship of HIA to other types of impact assessment as follows:

*"The health sector, by crafting and promoting HIA, can be regarded as contributing to fragmentation among impact assessments. Given the value of impact assessments from a societal perspective, this is a risk not to be taken lightly ... The need ... and justification for separate HIA cannot automatically be*

[8] Institute of Public Health (2009) Health Impact Assessment Guidance
[9] World Health Organization Regional Office for Europe. Health in impact assessments: opportunities not to be missed. 2014

*derived from the universally accepted significance of health; rather, it should be demonstrated whether and how HIA offers a comparative advantage in terms of societal benefits …*

*Health issues can, and need to, be included [in impact assessment] irrespective of levels of integration. At the same time, from a civic society perspective, it would be unacceptable for HIA to weaken other impact assessments. A prudent attitude suggests optimizing the coverage of health along all three avenues*:

- *better consideration of health in existing impact assessments other than HIA;*
- *dedicated HIA; and*
- *integrated forms of impact assessment."*

It is clear therefore that the WHO does not support a stand-alone HIA unless it can be demonstrated to be of advantage over the assessment of population and human health in the EIAR. In this case no such advantage exists and indeed given the lack of baseline data a standalone HIA would add very little to the assessment process. It is for these reasons that this assessment of human health is part of this EIAR and that no stand-alone HIA has been prepared for the proposed development.

It is therefore important to note that this assessment on human health is provided as part of the overall EIAR rather than a stand-alone HIA.

The HIA is defined as a combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a policy, plan, programme or project on both the health of a population and the distribution of those effects within the population.

In contrast, the assessment of human health in the context of EIAR focuses the attention of the assessment on likely significant effects, i.e. on effects that are deemed likely to occur and, if they were to occur, would be expected to be significant (as per the requirements of the Directive 2014/52/EU of the European Parliament and of the Council). Conducting a HIA will not necessarily meet the population and human health requirements of the EIA Directive.

**Health Protection**

The assessment of human health for the proposed development, in terms of health protection, follows the approach set out in the draft EPA Guidelines, the IEMA guidelines referred to above and in Directive 2014/52/EU of the European Parliament and of the Council. It is also similar in nature to the US EPA guidance[10]. Human Health protection is considered through the assessment of the environmental factors (pathways) through which health could be affected such as air, noise, water and soils. The US EPA guidance includes a four-step approach which is represented graphically in **Figure 16.1** below.

[10] US EPA (2016) Health Impact Assessment Resource and Tool Compilation

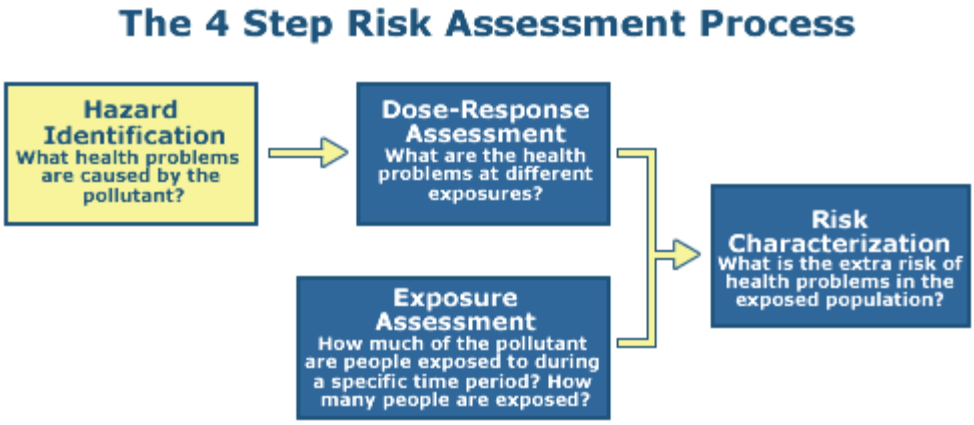


**Figure 16.1:** Four Step Human Risk Assessment Process

The likely significant effects associated with noise, air, soils and water that could affect human health were identified (Hazard Identification), the scale of these effects (Dose-Response Assessment) and their duration (Exposure Assessment) were assessed and the significance of the likely significant effect on human health was determined (Risk Characterisation).

When using a recognised Health Based Standard, such as one issued by the WHO[11], the dose-response assessment is actually included in the standard.

In other words, the authorities or expert committees which recommended a specific threshold or parameter (i.e. a limit value) in a standard will have inherently taken into account the health problems at the different exposure levels and thus set the limit value within the standard to prevent these health problems (i.e. significant effects on human health) from occurring.

### Health Improvement

Projects that have the potential to generate environmental benefits, protect the population from public health dangers as well as support regeneration, reduce unemployment and improve socio-economic circumstance, could contribute to improving the health and wellbeing of communities.

The assessment for the proposed development, in terms of health improvement, includes an assessment of the likely significant effects of the proposed development on the socio-economics of the community (refer to **Section 16.4** for further detail).

### Significance of Health Impacts

There is a difficulty in assigning levels of significance to human health impacts. In medicine, as in all science, the concept of statistical significance is used. This involves attaching a value to significance, often expressed as a percentage level of confidence in the data. Confidence measures of 95% or even 99% are often used to measure levels of certainty or changes that are not due to chance alone.

[11] The World Health Organisation (WHO) (2009) Night time Noise Guidelines for Europe

This is a valid approach for the study of the impacts on a population but does not absolutely exclude a response to an impact on an individual. However, it is difficult to assign levels of significance to individual human health impacts without detailed information about that individual. Thus, the significance of health effects is assessed on a group or community basis rather than on an individual basis. There is such a variability in human response that one could never identify all possible individual effects and so, in accordance with the guidance referred to above, it is considered to be more appropriate to assess the significance of health effects at a population level. The significance criteria for the assessment of the health of communities are therefore as outlined in **Table 16.3** below.

**Table 16.3:** Criteria used in the assessment of Community Human Health Protection Impacts

| Impact Level | Significance Criteria |
|---|---|
| Imperceptible | No significant human health impacts are apparent |
| Not Significant | An impact which causes noticeable changes but without significant consequences |
| Slight | A small impact on individual reported symptoms but no change in health status can be attributed to the proposed development |
| Moderate | A moderate impact on health status of an individual but no change in morbidity or mortality can be attributed to the proposed development |
| Significant | The proposed road development has the potential to impact on individual health status with an associated change in morbidity |
| Very Significant | The proposed road development has the potential to impact on the health status of groups of people |
| Profound | The proposed road development has the potential to impact on the health status of communities |

Asthma can be used as an example when using these criteria:

- An Imperceptible impact would be one with no measurable effect on asthma;
- A Slight impact might be a temporary increase in symptoms in an individual but no change in the severity of the underlying condition or treatment required;
- A Moderate impact might be an individual increasing their use of inhalers attributable to the proposed flood relief scheme (FRS) but no change in underlying condition and no effect on the vast majority of asthmatics;
- A Significant effect might be an individual becoming asthmatic or an individual's asthma becoming measurably more severe as a result of the proposed FRS;
- A Very significant effect might be a group of individuals becoming asthmatic or their asthma becoming measurably more severe as a result of the proposed FRS; and
- A Profound effect might be a measurable increase in the incidence or severity of asthma in a community as a result of the proposed FRS.

**Identification of Vulnerable Groups**

While every human being should be considered a sensitive receptor, the vulnerable are the most sensitive. These vulnerable groups may be more susceptible to impacts associated with the proposed FRS.

Children and adolescents constitute a vulnerable group partly due to their need to be able to move around freely to and from school and recreational activities. They lack the experience and judgement displayed by adults when moving around traffic in public spaces. Studies show that they may also be more sensitive than adults to air pollution and other environmental factors.

Elderly people constitute a very variable group when it comes to their need and scope for moving around the community. Generally speaking, elderly people are slower in their movements and more health conditions may occur. Elderly people in general have greater sensitivity to air pollution and potential effects on the respiratory system and cardiovascular system and are more likely to express anxieties in relation to potential air quality or noise impacts due to the proposed flood relief scheme. There are many reasons for this sensitivity, including the possible presence of other medical conditions such as respiratory or cardiovascular disease. Subtle changes in the environment have the potential to have an adverse effect that would not be experienced by younger more resilient persons.

There are other vulnerable groups also, for example, persons with disabilities or persons with mental illness. It is important to note that, in this assessment, it is assumed that all areas contain highly vulnerable individuals including the old, the very young, disabled and persons with disabilities, as well as people who are sick today or who may be sick at the time the proposed FRS is being constructed or operational. However, as noted above, there are some particular areas with higher levels of sensitive population subsets than others.

Vulnerable groups of people occur throughout the receiving environment for the proposed flood relief scheme and include among others, a crèche, schools, nursing home and areas with a higher number of older family groups.

## 16.3 Baseline Conditions

### 16.3.1 Population

#### 16.3.1.1 Context

County Wicklow's location within the Greater Dublin Area (GDA) and proximity to County Dublin are central to its socio-economic development. Historically, the settlement patterns and economic development of the county have been heavily influenced by key infrastructure, notably the M11 and the Dublin-Rosslare railway, which mainly follow the east coast. The increase in population by 4.2% to 142,425 between 2011 and 2016 was slightly above the national average of 3.8%, although this was a reduction of the previous growth of 8.3%.

Arklow town is located in the southern part of the County. It is bisected by the Avoca River and is also a port town, connected by the motorway and the railway line. The town has a population of approximately 13,163. This population is largely included within two Electoral Divisions (EDs), Arklow No. 1 Urban, which is located to the south of the Avoca River, and Arklow No. 2 Urban, to the north. These two EDs capture most of the built-up area for the relevant population. Arklow Rural ED in located inland and to the south, while Kilbride ED is located to the north. Arklow serves a large area of rural Wicklow and possesses a cross section of retail outlets, a small hospital, a primary and four secondary schools, and leisure and cultural facilities. It has a maritime and industrial infrastructure as a shipping and fishing port. The M11, connecting Dublin with Gorey, is due to be extended beyond Enniscorthy with onward access to Wexford town and Rosslare.

The local population, whether defined as Arklow town (13,163) or the former legally defined town area (12,989), has grown modestly in recent years (see **Table 16.4**). **Table 16.5** shows the age profile to be similar to the state as a whole with a slightly higher representation of people in the youngest category and lower representation in the 17-25 year category (similar to nearby Wicklow town). Just over 46% of the population are under the age of 35 years, while 13% are aged over 65 years.

**Table 16.4:** Population - Main settlements

| Electoral Division | Population 2016 | Population 2011 | Per cent change |
|---|---|---|---|
| **Arklow town** | 13,163 | 13,009 | 1.2% |
| Arklow No1 Urban ED | 9,976 | 9,817 | 1.6% |
| Arklow No2 Urban ED | 3,013 | 2,953 | 2.0% |
| Arklow Rural ED | 1,367 | 1,310 | 4.4% |
| Kilbride ED | 889 | 909 | -2.2% |
| Wicklow town | 6,752 | 6,761 | -0.1% |
| Co Wicklow | 142,332 | 136,640 | 4.2% |
| State | 4,757,976 | 4,588,252 | 3.7% |

Source: CSO Census of Population 2011 and 2016:

**Table 16.5:** Age (Arklow town)

| | 0-16 | 17-25 | 26-35 | 36-45 | 46-55 | 56-65 | 65+ |
|---|---|---|---|---|---|---|---|
| Male | 1,729 | 565 | 797 | 1,067 | 869 | 662 | 736 |
| Female | 1,763 | 575 | 935 | 1,125 | 872 | 658 | 781 |
| **Total** | **3,492** | **1,140** | **1,732** | **2,192** | **1,741** | **1,320** | **1,546** |
| % Arklow | 26.5% | 8.7% | 13.2% | 16.7% | 13.2% | 10.0% | 15.5% |
| % Co Wicklow | 25.4% | 8.6% | 11.9% | 16.1% | 14.1% | 10.9% | 17.5% |
| % State | 23.7% | 10.6% | 14.4% | 15.5% | 12.9% | 10.4% | 12.5% |

Source: CSO Census of Population 2016:

The total number of households is 4,788. **Table 16.6** reveals a similar proportion of numbers of persons per household for the two EDs. **Table 16.7** shows that a large proportion of properties were built between 2001 and 2010. The proportions for each time period are similar for the two halves of the town, but for slightly more construction in Arklow No.2 between 1980 and 2000. Very little construction has occurred since 2010. Overall, the residential building stock would be younger than for Wicklow town where only 10.4% was built between 2001 and 2010.

**Table 16.6:** Numbers of persons in private households

| | 1 | 2 | 3 | 4 | 5 | 6 | 7+ |
|---|---|---|---|---|---|---|---|
| **Arklow town** | 1,172 | 1,326 | 890 | 897 | 388 | 120 | 54 |
| Arklow No.1 | 892 | 1,001 | 678 | 688 | 301 | 91 | 45 |
| Arklow No.2 | 264 | 309 | 200 | 193 | 89 | 26 | 11 |
| **Total** | **1,156** | **1,310** | **878** | **881** | **390** | **117** | **56** |
| % Arklow | 24.2% | 27.4% | 18.4% | 18.5% | 8.0% | 2.5% | 1.1% |

Source: CSO Census of Population 2016:

**Table 16.7:** Private households by year built

| | Pre-1971 | 1971-91 | 1991-2000 | 2001-10 | 2011 or later | Not stated |
|---|---|---|---|---|---|---|
| **Arklow town** | 1,305 | 949 | 824 | 1,415 | 19 | 333 |
| Arklow No.1 | 1,082 | 715 | 546 | 1,084 | 15 | 254 |
| Arklow No.2 | 218 | 228 | 267 | 296 | 3 | 78 |
| **Total** | **1,300** | **943** | **813** | **1,380** | **18** | **117** |
| % Arklow | 26.9% | 19.6% | 17.0% | 29.2% | 0.4% | 6.9% |

Source: CSO Census of Population 2016:

Social class is indicated by **Table 16.8**. Although the town's traditional shipping and fishing industries have declined, the table indicates a relatively high proportion of skilled and semi-skilled workers supported by the presence of the strong industrial base. There is a correspondingly lower proportion of people in the professional and managerial/technical subsets. The town retains boat building businesses, including vessels for the aquaculture sector and for maintenance of an offshore wind farm.

**Table 16.8:** Social class/Workforce

| | Professional | Managerial / Technical | Non-manual | Skilled | Semi-skilled | Unskilled | Other |
|---|---|---|---|---|---|---|---|
| **Arklow town** | 628 | 3,027 | 2,331 | 2,218 | 1,917 | 491 | 2,596 |
| % Arklow | 4.8% | 23.0% | 17.7% | 16.8% | 14.6% | 3.4% | 19.7% |
| % Mid-East | 7.9% | 30.2% | 18.1% | 15.0% | 10.3% | 3.6% | 15.0% |

Source: CSO Census of Population 2016:

The Pobal Deprivation Index for Small Areas (Haase and Pratschke, 2017) is based on census data where this indicates relevant population attributes and an absence of possessions or opportunities. Its value is in providing comparisons between locations and between census years. The assessment of the most recent data for 2016 shows that relatively high levels of disadvantage are to be found in small towns across the country, although much recovery will have occurred since 2016 as the economy had been growing prior to 2020.

Arklow is not uncharacteristic of the fortunes of small towns. In 2016, the Arklow No. 1 and No. 2 Urban EDs had absolute deprivation scores of -12.0 and -7.3 respectively[12]. This is defined as "marginally below average" when compared with the national mean of 4.2 but is significantly above the minimum value recorded for a location in Ireland of -43.5. The highest levels of deprivation are recorded for the district of Sheephouse and around Abbey Street in Arklow No. 1. The absolute scores have improved on the values of -13.6 and -7.9 recorded for 2011 but are still well below the indices of -5.6 and -1.6 recorded for 2006 indicating a slow level of economic recovery, at least until 2016. The age dependency ratios[13] at 35.8 and 34.0 are below the national average of 36.5.

Some characteristics of deprivation can correlate with age, for which **Table 16.5** (above) is relevant as it shows that the proportion of people in the older age categories is slightly higher than the national average. **Table 16.9** indicates typical proportions of household occupancy types, when compared with aggregate town areas nationally, but for a lower level of private rentals. County Wicklow as a whole has a high proportion of social housing compared with the national average. **Table 16.10** lists principal economic status as of 2016. Arklow town had lower levels of employment and higher levels of unemployment than those for the Mid-East Region and aggregate town areas nationally. Male and female unemployment rates as of 2016 were 25.1% and 19.7% above the national average. Since 2016 the economy had been growing prior to the current Covid-19 pandemic.

**Table 16.9:** Type of household occupancy

| | Owner occupied | Rented from private landlord | Rented from local authority | Rented from voluntary body | Occupied free of rent | Not stated |
|---|---|---|---|---|---|---|
| **Arklow** | **3,140** | **956** | **531** | **43** | **70** | **105** |
| % Arklow | 64.8% | 19.7% | 11.0% | 0.9% | 1.4% | 2.2% |
| % Mid-East | 71.6% | 15.6% | 7.2% | 0.8% | 1.5% | 2.4% |
| Aggregate town area | 61.4% | 24.8% | 11.2% | 1.4% | 1.2% | 3.8% |

Source: CSO Census of Population 2011 and 2016:

**Table 16.10:** Principal Economic Status

| | at work | looking for first job | unemployed | student | home duties | retired | unable to work | other |
|---|---|---|---|---|---|---|---|---|
| **Arklow** | **4,855** | **91** | **1,167** | **995** | **962** | **1,322** | **582** | **36** |
| % Arklow | 48.4% | 0.9% | 11.5% | 9.9% | 9.8% | 13.2% | 5.8% | 0.4% |
| % Mid-East | 55.0% | 0.8% | 7.1% | 11.4% | 8.8% | 12.6% | 3.9% | 0.3% |
| Aggregate town area | 53.4% | 0.8% | 7.1% | 11.4% | 8.1% | 14.5% | 4.2% | 0.4% |

Source: CSO Census of Population 2011 and 2016:

12 Where the scores range from roughly -40 (most disadvantaged) to +40 (most affluent).
13 Dependency ratios are used to give a useful indication of the age structure of a population with young (0-14) and old (65+) shown as a percentage of the population of working age (15-64).

### 16.3.1.2 Character

The proposed flood relief scheme extends to both terrestrial and riverine areas lands as illustrated in **Figure 16.2**. The site extends along the Avoca River immediately north of the town centre, and includes River Walk, the Avoca River channel and the eastern extent of the Arklow Town Marsh upstream of Arklow Bridge; the Arklow Bridge; and the South Quays and Avoca River channel downstream of Arklow Bridge and including the area around Arklow Harbour (also referred to as Arklow Dock).


**Figure 16.2** Arklow town illustrating extent of proposed works. Not to scale.

Arklow is centred on the Avoca River and the coast with a natural setting that is conducive to amenity and recreation, and economic activities associated with fishing and the port. Much retail and other commercial activity is located along the Main Street, including Upper and Lower Main Street, the latter extending east of Arklow Bridge. Newer larger scale retail offering is located in and around the Bridgewater Shopping Centre on the north side of the bridge. Some port related industrial activity is located on the North Quay and around the harbour area. Other industrial activity is associated with industrial and business parks closer to the M11.

The historic Arklow Bridge has been widened in recent decades to provide an improved pavement for pedestrian crossings on both sides of the bridge. The bridge is the only one connecting the two halves of the town. There is no pedestrian pavement beside the river on the South Quay, but traffic is rather light at this location. Leisure walking occurs on South Quay as far as the harbour/dock but extending also to South Beach.

Six walking routes have been designated around the town, taking in locations such as the North and South Quays and harbour, and which are supported by heritage signage. River Walk, to the west of Arklow Bridge, is a popular route which extends to Vale Road.

River Walk extends from The Alps along the south bank of the Avoca River to the Arklow Bridge. The existing riverside walk west of River Walk begins as an attractive amenity, but there are problems with littering and vegetation encroachment. River Walk comprises riverbank footpaths, the town carpark (also referred to as Main Street car park or St Marys carpark), and River Walk local access road serving the rear of the properties along Main Street and incorporating on street parking and areas of open space. A number of laneways and paths including New Coomie Lane, Coomie Lane, River Lane and Condren's Lane connect River Walk to the Main Street and to Vale Road.

Upstream of the carpark, River Walk is an attractive riverfront amenity walkway, comprising a grass riverbank with occasional mature trees and shrubs. Downstream of the carpark, River Walk provides convenient pedestrian connection and local vehicular access. The walkway along the riverbank is formed in concrete, and a low concrete wall separates the walkway from the roadway and on-street parking. Access to the river by small leisure craft (kayaks etc) is via a modern slipway/steps as shown in **Figure 16.3** or by climbing over the existing quay wall/path.

**Figure 16.3** Slipway/steps at junction of River Lane and River Walk upstream of Arklow Bridge

South Quay, downstream of Arklow Bridge, is notably different in character to River Walk as the buildings along South Quay were built to front onto the river and South Quay also faces the buildings along North Quay as opposed to the wooded riverbank at Arklow Town Marsh that lies opposite River Walk. From Doyle's Lane, there is a notable change in the scale, use and intensity of buildings, where almost all buildings as far downstream as the harbour area are residential and are clearly more contemporary and a later extension of the town centre (**Figures 16.4-16.5**).

The roadway along South Quay varies considerably to include one-way single carriageway and wider two-way sections.

There are minimal footpaths on one side only between Doyle's Lane and South Green, beyond which there are frequently no footpaths on either side of the road. Depending on the width of the roadway, parking is generally defined on either one or both sides of the road. Further downstream, there is space for parking but it is not generally defined. South Quay is mostly used for residential access, however, a substantial number of heavy goods vehicles also use South Quay for access to and from the harbour area and the quarry at Arklow Rock to the south of the town.

**Figure 16.4** South Quay, with residential buildings directly facing the quayside.

**Figure 16.5** South Quay looking west

Just downstream of Arklow Bridge, there is a disused slip (referred to as Coal Quay slip elsewhere in the EIAR) in considerable disrepair (**Figure 16.6**). Access to the river via this slipway is restricted given its structural condition.

Another slipway (referred elsewhere in the EIAR as Tyrells slipway) is located on South Quay directly opposite the Arklow Marina on North Quay (**Figure 16.7**).

A wooden demountable had to be installed as storm surges regularly came up the river and inundated the road (Harbour master pers comm.) (**Figure 16.8**). This slipway is generally open between May-September and tends to be used as a spill over launch point for the rowing club/others when the public slip at the Dock is busy (Harbour master pers comm.). There are no other publicly accessible points to the river along South Quay (aside from directly off the quayside/quay wall).

**Figure 16.6** Former slipway at Coal Quay, now in disrepair, looking south east from Arklow Bridge.

**Figure 16.7** Slipway (referred to as Tyrells slip) along South Quay.

**Figure 16.8** Slipway (referred to as Tyrells slip) along South Quay protected by a wooden demountable.

There are a number of small landscaped areas with seating maintained by the local community. Opposite Harbour Road and Rockview Terrace, the Arklow Seafarers Memorial Garden is a modest public space on the quayside that includes a simple paved central area with seating benches, and is flanked on either side by an area of grass and a further row of mostly young Norway Maple trees (**Figure 16.9**). Grassed areas are maintained along South Quay as shown on **Figure 16.5**.

South Quay continues beyond this point to the Arklow Harbour (Dock) area and is increasingly maritime in character with two storey pitched roof buildings incorporating both residential and port related uses, and facing onto a wide tarmac quayside with a low plinth wall along the quay edge. The harbourmaster office marks the corner of South Quay where it joins Arklow Harbour.

**Figure 16.9:** Arklow Seafarers Memorial Garden, South Quay

Arklow Harbour (also referred to elsewhere in the EIAR as Arklow Dock) is located on the southern side of the Avoca River, and South Quay leads around the harbour area to South Pier. The harbour itself is c.150m x 200m, and caters for fishing and cargo vessels, and pleasure craft. The harbour is also the base for the RNLI Arklow Lifeboat Station.

The western side of the harbour is used for loading and unloading trawlers and cargo vessels, and trucks can access the quayside directly from the local road network. A pier on the northern side of the harbour separates the harbour from the river and is used as a general marshalling areas and is also used on occasions for loading and unloading larger vessels.

The harbour is surrounded on the southern, eastern and western sides by industrial units of various sizes, but typically single storey warehouse type buildings or two storey warehouse and office units.

The harbour is part of the South Quay amenity, and people regularly walk around it from the South Quay to the South Pier further downstream.

Most of the harbour area is publicly accessible, however, some sections along the southern edge are in private ownership. The south western corner includes a substantial secured compound with shipping containers and a number of stored boats. A syncrolift provides access from this compound to the water and connects southwards across the public road to the yards and warehouses south of the harbour. To the east of this facility, there is a small public slipway with modest landscaped areas to either side. The Arklow RNLI Lifeboat station building then occupies the south eastern corner of the harbour. This slipway is the main public vehicular access point to the river for recreational activities such as rowing, boating and other uses. It is used by Arklow Rowing Club, sea scouts and others. The slip is used in conjunction with the “set-down” pontoon just around the corner, next to the RNLI.

**Figure 16.10**: Public slip at the Dock/Harbour (Source Google Earth).

Some fishing boats and windfarm maintenance vessels also operate out of the harbour as does the lifeboat.

The Avoca river itself is also used for angling, although anglers are discouraged from taking home their catch due to toxic mineral pollution in the river from past mine workings. The river is, however, a salmonid river and has high quality beats upstream. There is small boating activity. Arklow Sea Scouts and the Rowing Club are active organisations in the town. The Seabreeze Festival is held in Arklow each July along with a Maritime Festival in August. When weather permits, a biannual Celtic Challenge Rowing Race occurs between Arklow and Aberystwyth in Wales.

Further south, the beach and Roadstone jetty are used for local sea fishing, mainly for flat fish (whiting, flounder) and dog fish. The area behind the beach which will be used as a site compound (SC6) is used for amenity purposes (**Figure 16.12**).

The Avoca River is used extensively for amenity purposes- including sailing, boating and other uses as outlined above. The main access points on the south bank as described previously are the public slip and set-down pontoon at the Dock and to a lesser extent, the slip at Tyrells Yard. The steps/slipway at River Walk is also used. A pontoon, which is within the ownership of Wicklow County Council, is located along the North Quay side of the Avoca River. A slipway is also located just upstream of the pontoon. Arklow marina is also located on the north quay and a number of floating moorings are located in the Avoca River. Refer to **Figure 16.11** below.

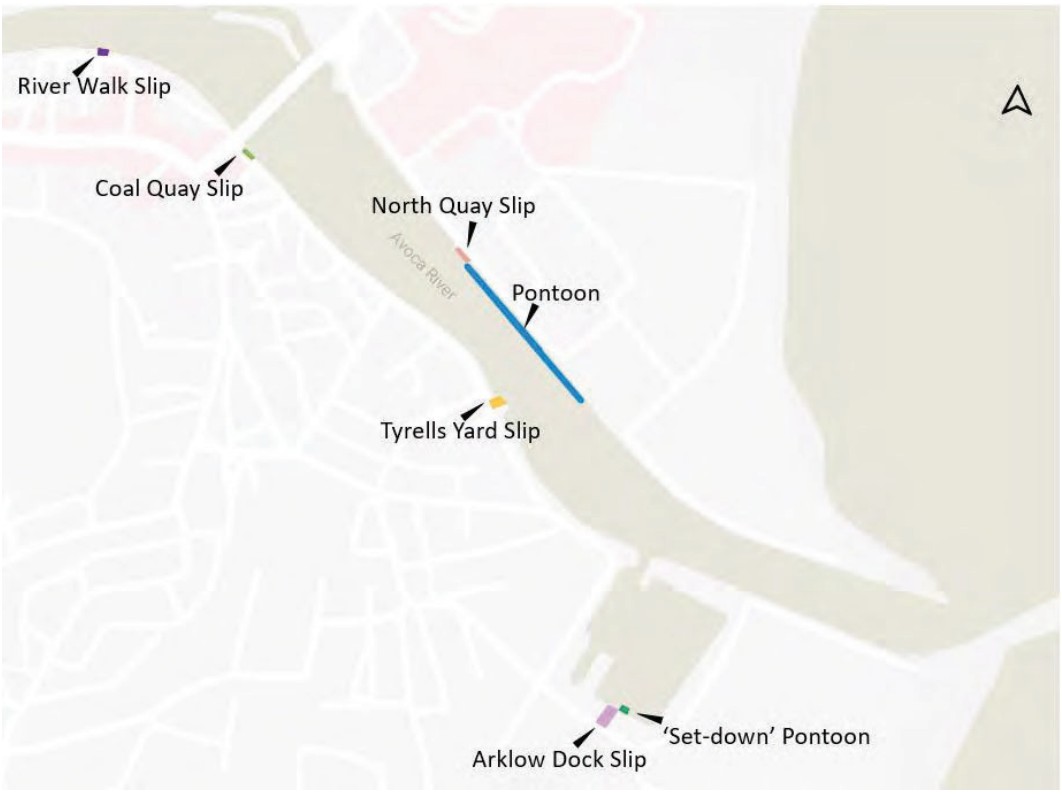


**Figure 16.11 Public access for recreation amenity on the Avoca river. Not to scale**

**Figure 16.12** Proposed temporary Site Compound 6 at South Beach

### 16.3.1.3 Significance

Arklow has been designated by Wicklow County Council as a Level 3 - Large Growth Town II. Trends towards lower household size means that more housing units are likely to be needed in the coming years. The Arklow and Environs Local Area Plan (LAP) 2018-2024 refers to proposals for a large increase in population, ultimately to 23,000. Four Area Actions Plans are proposed for new residential development of up to 3,205 units in the south of the town area and to the north of Arklow Marsh. Since the opening of the N11 bypass in 1999 (now the M11), sequential built development has been permitted up to the road boundary. However, where local circumstances allow, it is proposed that housing density will be increased to make best use of appropriately zoned lands. Infill development is therefore expected to accommodate some of the proposed new development. The LAP includes a Waterfront Strategy to provide a mix of development types and identifies two sites in particular between the Main Street and the river.

Wicklow County Council also plans to improve and widen the retail offering and town centre facilities. In recent years, some of the North Quay has been re-developed for mixed use, including apartments and retail facilities, namely the Bridgewater Shopping Centre in 2007. There are other areas of semi-derelict land along the waterfront available for new development, but which are currently vulnerable to flooding.

Up-river from Arklow Bridge, a narrow corridor of green space follows the river with a footpath extending from River Walk, on the south bank. Behind this footpath is an area identified as a future site for redevelopment- the ‘Alps’ site.

Below Arklow Bridge, the river is followed by roadways on both sides alongside the waterfront area which includes the North and South Quays and former industrial areas. This area is the subject of proposals to realise the locations' full potential amenity and tourism value. County Wicklow receives a quarter of a million visitors per year. Arklow has been identified as a potential visitor hub under the County's Tourism Strategy and marketing plan (2018). The town's maritime heritage, built heritage, coastal golf course and beaches underpin this tourism potential locally.

There are two heritage trails served with information signage to allow visitors and locals to learn more about the town's heritage. The Kynock Heritage Trail follows North Quay before turning inland to the Arklow Bay Hotel. The Bluewalk tour takes in 17 places of historic interest in Arklow Town. Arklow's only bridge, the Nineteen Arches bridge, is the longest handmade stone bridge in Ireland and is an attraction in its own right. In addition, the nearby hinterland includes the Vale of Avoca to the northwest, Brittas Bay to the north and Clogga Beach to the south, for each of which, Arklow has been identified as a potential gateway. A greenway between Arklow and Shillelagh is also proposed. Annual festivals, such as the Seabreeze Festival, celebrate the town coastal location, and maritime and musical heritage. As well as the Arklow Bay Hotel on Sea Road, the existing flow of visitors is supported by two small hotels in the centre of town, several local B&Bs and a caravan park.

Transport infrastructure includes connections to the M11. It is proposed to develop a Port Access Road to the south of Arklow to link the M11/R772 to the Roadstone jetty and South Quays to reduce the volume of heavy good vehicles in the centre of the town. A longer-term goal is the provision of a new bridge across the Avoca River to the west of the town.

As part of the Wicklow/Arklow Core Economic Area, the town is regarded as a major employment centre with a function to attract national and international investment. The focus of industrial development to date has been in the south of the town in the vicinity of the M11 interchange, but the LAP identifies additional potential locations, including Shelton Abbey on the Avoca River to the west of the M11. The LAP also identifies potential opportunities for development of the maritime sector given the existing infrastructure and services available in the port area.

#### 16.3.1.4 Sensitivity

Wicklow County Council's proposals for planning, economic and built development target Arklow for a significant expansion in population, industrial, retail and tourism growth, but this development has been held back by the frequency and severity of flooding within the centre of the town and the inadequate status of wastewater treatment. The combination of inadequate wastewater treatment and flood risk has restricted new development and compromised the town's ability to attract waterfront development and tourism.

The OPW Flood Maps reveals the area at risk of flooding to be bounded by South Quay, Harbour Road and Lower Main Street, and including also Rockview Terrace, on the south side of the river as well as Seaview Avenue, the lower part of Sea Road and of Dublin Road. Floods in 2002 left the Quays impassable. Drains outflow was blocked by the floodwaters and led to secondary flooding on Lower Main Street. Floods in 2010 forced the closure of Ferrybank and the bridge. The Strategic Flood Risk Assessment accompanying the more recent LAP also identifies the area around the harbour, Tinahask Lower and Dock Road, an area that includes the lifeboat station and the Smurfit Kappa Packaging business, as the subject of a Preliminary Flood Risk Assessment (PFRA).

The commercial centre of Arklow is on raised ground and so is at a lower risk from flooding. Nevertheless, should a flood event occur, total closure of the bridge due to flooding would have an inevitable and serious impact on social and economic activity in the town.

The area south of the river also contains social housing, some small businesses and community facilities. The socio-economic status of the neighbourhood invariably means that there will be some population subsets who will be more vulnerable to a flood event, including older people and those on lower incomes. Although there are no public services within the area at flood risk, properties occupied by elderly people are classified as being of high vulnerability by the Strategic Flood Risk Assessment.

By comparison, the area north of the river that falls within the area susceptible to flooding, includes a large area of green space to the north of the North Quay, but less in the way of residential areas. Nevertheless, a residential area bounded by Sea Road, Ticknock Court, and the Dublin Road is included within this vulnerable area, as well as Worsboro Terrace which was badly impacted in 2002. Businesses and community facilities are located in this vulnerable zone including much of the Bridgewater Centre, the sports centre, swimming pool, leisure club and businesses on Sea Road. The open space area includes a running track, but other areas within the Waterfront area closer to the town centre are identified within the LAP as having passed a Flood Justification Test and being capable of supporting c. 800 residential units. The LAP also identifies the potential for public realm enhancement to turn the town towards the riverfront, an opportunity that would be enhanced by investment in flood protection.

## 16.3.2 Human Health

### 16.3.2.1 Overview

As outlined in **Section 16.2.7**, a standards-based approach has been used particularly in regard to health protection. Therefore, appropriate health standards have been chosen as outlined in **Sections 16.3.2.2 – 16.3.2.4** and justification for the particular standards chosen for each assessment from a human health perspective is provided therein. It is important to bear in mind that it is not possible to use standards for all possible health effects.

### 16.3.2.2 Air Quality

**Appropriate Standards**

The relevant air quality standards applied in this assessment are described in **Chapter 8**, *Air Quality and Odour* and reproduced below.

Limit values for a range of air pollutants have been set through European and national legislation. These limit values are set for the protection of human health and ecosystems.

On 12 April 2011, the *Air Quality Standards (AQS) Regulations 2011*[14] came into force and transposed *EU Directive 2008/50/EC* [15] on ambient air quality and cleaner air for Europe into Irish law. The purpose of the AQS Regulations is to:

- establish limit values and alert thresholds for concentrations of certain pollutants;
- provide for the assessment of certain pollutants using methods and criteria common to other European Member States;
- ensure that adequate information on certain pollutant concentrations is obtained and made publicly available; and
- provide for the maintenance and improvement of ambient air quality where necessary.

The limit values established under the AQS Regulations relevant to this assessment are included in **Table 16.11**.

**Table 16.11:** Limit values in the AQS Regulations

| Pollutant | Limit value for the protection of: | Averaging period | Limit value ($\mu g/m^3$) | Basis of application of limit value |
|---|---|---|---|---|
| $NO_2$ | Human Health | 1-hour | 200 | ≤ 18 exceedances p.a. (99.79%ile) |
| | | Calendar year | 40 | Annual mean |
| $NO_x$ | Vegetation | Calendar year | 30 | Annual mean |
| $PM_{10}$ | Human Health | 24-hours | 50 | ≤ 35 exceedances p.a. (90%ile) |
| | | Calendar year | 40 | Annual mean |
| $PM_{2.5}$ | Human Health | Calendar year | 25 Note 1 | Annual mean |

Note 1: Limit value to be reviewed by the Commission in light of further information on health and environmental effects, technical feasibility and experience of the Target Value in Member States.

There are no statutory limits for dust at a European or national level. However, *TA Luft*[16] provides a guideline for the rate of dust deposition of 350 $mg/m^2$/day averaged over one year.

[14] Air Quality Standards (AQS) Regulations 2011 (S.I. No. 180 of 2011)
[15] E.C (2008). Directive 2008/50/EC. *Ambient Air Quality and Cleaner Air for Europe*
[16] TA Luft (2002) *Technical Instructions on Air Quality.*

The EPA concurs[17] that this guideline may be applied, although the EPA typically applies the guideline limit as a 30-day average. Dust deposition levels will be compared to the limit on a monthly basis.

**Baseline conditions**

Please refer to **Chapter 8,** *Air Quality and Odour* for a detailed description of the baseline conditions in relation to air quality.

### 16.3.2.3 Odour

**Appropriate Standards**

As outlined in **Chapter 8** *Air Quality and Odour*, there is currently no general statutory odour standards or limits in Ireland.

The relevant limits applied in the odour impact assessment are based on the UK's Environment Agency Odour Management Guidance[18] and the Institute of Air Quality Management (IAQM) Guidance[19] and are described in **Chapter 8**, *Air Quality and Odour*.

From a human health perspective, generally three odour classifications are considered to determine severity of odour:

- **Unreasonable odour** amounting to serious pollution is being or is likely to be caused (regardless of whether appropriate measures are being used).
- **Odour that is perceptible** beyond the boundary.
- **No odour** beyond the boundary

This human health impact assessment uses the findings of the odour impact assessment in **Chapter 8**, *Air Quality and Odour* and applies one of the three comparable classifications outlined above to determine the potential human health effects of odour.

Odour has a subjective element. People may react differently to the same odour. Some may find the smell offensive where others might not. People also vary in their ability to smell particularly at lower levels. Olfactory fatigue is also a well-known phenomenon where people become desensitised to smell after a short period. An example of this would be putting on a perfume or aftershave which can be smelled for a short period of time but thereafter not smelled by the individual wearing it but may be smelled by others.

In health terms, odour itself, is unlikely to have significant health impacts in the medium to long term other than the effects of the chemicals which may be constituting the odour.

[17] EPA (2006) *Environmental Management in the Extractive Industry (Non-Scheduled Minerals).*
[18] Environment Agency (2011) H4 Odour Management How to comply with your environmental permit
[19] Institute of Air Quality Management (IAQM) (Version1.1 July 2018) Guidance on the assessment of odour for planning

Short-term or immediate effects however are well recognised as some people may become nauseous or even vomit from the effects of an odour. Potential psychological impacts of long-term or recurring odours are also possible.

The variability of the effects of odour and the difficulty in measuring it also poses difficulty in setting odour standards.

The IAQM guidance documents recommend that odour standards should be between 1.5 and 6.0 OU/$m^3$ as a 98$^{th}$ percentile of one-hour averaging periods at all receptors. This 98$^{th}$ percentile limit allows for exceedances for 176 hours over a full year (8,760 hours).

This is the chosen standard used in this assessment as this allows limits to be set based on the offensiveness of the odour and allows adjustments for local factors such as proximity to sensitive receptors and population density. This is therefore considered an appropriate standard to apply for the purpose of the human health assessment.

**Baseline conditions**

Please refer to **Chapter 8,** *Air Quality and Odour* for a detailed description of the baseline conditions in relation to odour.

The existing situation in Arklow is one where raw sewage is being discharged into the river, which has the potential for flooding. It is therefore clear that unacceptable odour can and does exist at a number of times in the year. This may include summer where river levels are low and also at other times of year when flooding can occur.

### 16.3.2.4 Noise and Vibration

**Appropriate Standards**

The relevant noise and vibration standards applied in this assessment are described in **Chapter 9**, *Noise and Vibration* and reproduced below**.**

As set out in **Chapter 9** *Noise and Vibration*, there is no specific legislation which sets out environmental noise limits that must be achieved. The noise assessment criteria are based on the Guidelines set out by regulatory bodies such as the EPA, the WHO and the Department of Communications, Climate Action and Environment (DCCAE), whose guidance and standards are based on international best practice.

Construction Noise Criteria

Construction noise is temporary in nature and usually experienced over a short to medium-term period. This characteristic requires it to be considered differently to other longer-term sources of noise. Construction activities on larger-scale developments of such as the FRS will inevitably result in noise being generated temporarily.

BS 5228-1/2:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise and Vibration* outlines guidance on construction noise criteria with reference to the existing noise environment, as well as prediction methodologies to estimate the effect. This guidance is considered the most appropriate to apply in this instance as it considers the existing baseline noise environment. BS 5228[20] states that *a potential significant effect is indicated if the $L_{Aeq,\ T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.* **Table 16.12** sets out the ABC method for establishing the impact criteria for construction noise as presented in BS 5228.

**Table 16.12:** BS5228 (Part 1) ABC assessment categories and thresholds at dwellings[21]

| **Assessment category and threshold value period $L_{Aeq,\ 1\ hour}$** | **Threshold value in decibels (dB)** | | |
|---|---|---|---|
| | **A[A)]** | **B[B)]** | **C[C)]** |
| Night (23:00-07:00hrs) | 45 | 50 | 55 |
| Evening and weekends [D)] | 55 | 60 | 65 |
| Day (07:00-19:00hrs) and Saturdays (08:00-14:00) | 65 | 70 | 75 |

A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than category A values.

B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

D) 19:00 – 23:00hrs weekdays, 14:00-23:00hrs Saturdays and 07:00-23:00hrs Sundays.

The construction noise criteria outlined in **Table 16.13** have been applied at the nearest noise sensitive properties (NSP) to the construction works based on the BS5228[22] criteria. Based on the monitoring data, the noise limits presented in **Table 16.13** have been assigned.

**Table 16.13:** Noise limits to be applied based on BS5228 criteria

| **Assessment category and threshold value period $L_{Aeq}$** | **Proposed noise limits along South Quay and either side of Arklow Bridge works ($L_{Aeq,\ 1\ hour}$)** | **Proposed noise limits for all other locations ($L_{Aeq,\ 1\ hour}$)** |
|---|---|---|
| Day (07:00-19:00hrs) ($L_{Aeq}$, dB) | 70 (Cat B) | 65 (Cat A) |
| Evening (19:00-23:00hrs) ($L_{Aeq}$, dB) | 65 (Cat C) | 55 (Cat A) |
| Night (23:00-07:00hrs) ($L_{Aeq}$, dB) | 55 (Cat C) | 45 (Cat A) |

[20] BS 5228-1 Code of practice for noise and vibration control on construction and open sites.
[21] BS 5228-1 Code of practice for noise and vibration control on construction and open sites.
[22] BS 5228-1 Code of practice for noise and vibration control on construction and open sites.

Where an exceedance of the construction noise criteria, as outlined in **Table 16.13**, is predicted, the effect associated with the noise increase is rated in accordance with **Table 16.14**.

The construction impact magnitudes outlined in **Table 16.14**, are taken from the DMRB LA 111 Noise and Vibration[23]. The impact ratings are based on the lowest observable adverse effect level (LOAEL), i.e. the baseline noise level, $L_{Aeq,T}$ and the significant observed adverse effect level (SOAEL), i.e. the threshold level outlined in **Table 16.13**.

**Table 16.14:** Construction impact magnitudes

| Construction noise level | Magnitude of impact | EPA Impact Rating |
|---|---|---|
| Above or equal to SOAEL +5dB | Major | Significant |
| Above or equal to SOAEL and below SOAEL +5dB | Moderate | Moderate |
| Above or equal to LOAEL and below SOAEL | Minor | Slight |
| Below LOAEL | Negligible | Not significant |

**Table 16.15** outlines the duration and frequency of effect based on EPA guidance[24].

**Table 16.15:** Duration and frequency of effects

| Effect Type | Duration |
|---|---|
| Momentary Effects | Effects lasting from seconds to minutes |
| Brief Effects | Effects lasting less than a day |
| Temporary Effects | Effects lasting less than a year |
| Short-term Effects | Effects lasting one to seven years. |
| Medium-term Effects | Effects lasting seven to fifteen years. |
| Long-term Effects | Effects lasting fifteen to sixty years. |
| Permanent Effects | Effects lasting over sixty years |

## Vibration

The relevant vibration standards applied in this assessment are described in **Chapter 9**, *Noise and Vibration* and reproduced below.

23 DMRB,2020. LA 111 Noise and Vibration https://www.standardsforhighways.co.uk/prod/attachments/cc8cfcf7-c235-4052-8d32-d5398796b364

24 EPA (2017) Guidelines on the information to be contained in Environmental Impact Assessment Reports.

Guidance relevant to acceptable vibration in order to avoid damage to buildings is contained within both the TII guidance and BS 7385-2 (1993)[25]. The guidance values contained within BS 7385 are also reproduced in BS 5228-2 (2014)[26].

These standards differentiate between transient and continuous vibration. Surface construction activities are considered to be transient in nature as they occur for a limited period of time at a given location. The standard notes that, below a peak particle velocity (PPV) of 12.5 mm/s, the risk of damage tends to zero. Typically, the most significant sources of transient vibration during the construction phase of the development are likely to be from the piling for foundations. **Table 16.16** outlines the vibration limits that have been applied to the nearest sensitive receptors for buildings and structurally sound structures.

**Table 16.16:** Vibration limits at the nearest sensitive receptor

| **Category of Building** | **Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:** | | |
|---|---|---|---|
| | **Less than 10Hz** | **10 to 50Hz** | **50 to 100 Hz (and above)** |
| Structurally sound and non-protected buildings (TII Guidance) | 8 mm/s | 12.5 mm/s | 20 mm/s |

The main potential source of vibration during the construction programme is associated with sheet piling.

**Baseline conditions**

Please refer to **Chapter 9,** *Noise and Vibration* for a detailed description of the baseline conditions in relation to noise and vibration.

## 16.4 Likely Significant Effects

### 16.4.1 Do-Nothing Scenario

#### 16.4.1.1 Population

Should the proposed scheme not proceed, there would likely be significant negative effects on population as a result of ongoing flood events in Arklow. While these could be classified as occasional effects- having regard to the recurring nature of flood events- there is also the potential for ongoing negative effects on population.

25 BS 7385-2:1993 *Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration.*
26 *BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites –Vibration.*

As outlined in **Chapter 2**, Background and Need for the Scheme, there are increased liabilities and premium costs for insurance in areas at risk of flooding, as well as potential development and investment restrictions.

Recurring flooding in Arklow would likely impact most on the community south of the river, causing damage to property and leaving homes inaccessible until such time that flood waters recede. The area contains pockets of economic and social disadvantage and some population subsets would consequently be vulnerable to health risks and economic loss, particularly where property insurance is costly or not available. In addition, flood waters would disrupt movement in the town, and potentially traffic between the north and the south of the town in the event of a bridge closure due to flooding. This disruption would have severe economic implications due to loss of earnings and increased insurance costs and discourage future investment.

#### 16.4.1.2 Human Health

Under the 'do-nothing' scenario, the recurring flooding in Arklow would have negative physical and psychological health effects. There is a risk of physical injury occurring to the population during severe flood events- as a result of strong currents or falling debris, for example. Flooding increases the risk of waterborne diseases including but not limited to Hepatitis A and E. coli. It may also facilitate an increase in vermin in the flooded areas increasing the risk of vermin borne diseases including but not limited to leptospirosis.

Psychological impacts of recurrent flooding cannot be underestimated. There is the stress of damage to one's property, potential loss of valuables but also the real significant financial pressures as insurance does not usually cover areas subject to recurrent flooding.

### 16.4.2 Assessment of effects during construction

#### 16.4.2.1 Population

The main construction activities of relevance with a potential to impact on human beings arise from the following works:

- **WP 1:** Lowering the floor of Arklow Bridge including bridge underpinning, bridge remedial works and scour protection works.
- **WP 2:** Channel dredging upstream and downstream of Arklow Bridge. Dredge material will require archaeological examination at Site Compounds 1,2, 5 and 6. Works will also include an extension of the north riverbank with planting, installation of roosting platforms upstream of Arklow Bridge and local raising of riverbed adjacent to the flood defence walls for bird refuges.
- **WP 3:** Construction of debris and gravel traps with associated maintenance access ramp.
- **WP 4:** Construction of flood defence walls along River Walk, South Quay and around the dock on the south (right) bank, upstream and downstream of Arklow Bridge including the adjacent stormwater drainage. Installation of

public realm and landscape features along River Walk and South Quay including footpaths, terraces, planters and seating will be constructed along the working area.

- **WP 5:** Construction of flood defence earth embankment and flood defence wall on north (left) bank along the eastern side of Arklow Town Marsh including stormwater drainage diversion works. Upon completion of the earth embankment, the green space on the dry side of embankment will be planted with trees. Landscaping will be carried out on the river side of the flood defence wall.

Impacts due to construction works will involve some traffic disruption and modified pedestrian access, elevated traffic levels due to works HGVs, potential noise and visual impacts, and loss of moorings/berths and some river access and use. The works are expected to commence in Q2 of 2022 and to continue for a maximum of 54 months. This is assessed in **Section 16.4.2.2** below.

**Local traffic movement**

Much construction activity will occur beneath and in the vicinity of Arklow Bridge which carries approximately 18,000 vehicles each day, most of which are represented by local journeys given the availability of the M11 for regional traffic, but which includes commuting to employment, in-work journeys and deliveries. The proposed underpinning of the bridge will impact on this traffic movement, particularly in the summer months over three consecutive years. Construction traffic movements will add to the total number of HGVs on the bridge, although this will be a fraction of the total number of vehicles using the bridge on a daily basis. Single lane closures, operating on a shuttle basis, will be required during grouting works, scheduled for the Spring months for up to three years, while pile works are carried out from the deck of the bridge, and during other underpinning works including remedial works on the bridge superstructure. However, it is proposed that the work will be undertaken during the night-time so as to minimise disruption, subject to any restrictions on noise. Pedestrian movement across the bridge will be maintained at all times, but as the adjacent pedestrian footpath will also be closed at this time, temporary pedestrian crossings will be provided at each end of the works. Given the night-time timing of the works, the residual impact on journey amenity and community severance is expected to be slight.

Traffic flow on Main Street will be maintained where possible, given that the road provides access to the town centre and to the south-east of the town including the harbour. However, a short period of drainage works will require lane closures which will be undertaken at night and in a different period to the bridge works, so as to minimise impacts on traffic flow. Pedestrian access will be maintained at all times but will be subject to restrictions during the night-time works. Again, given the night-time timing of the works and the short duration of the works, the residual impact on journey amenity and community severance is expected to be slight.

In WP1, River Walk will remain accessible to all traffic, although it will be necessary to remove some car parking in the vicinity of the river works access point at RA6. It will be necessary to provide a safe pedestrian accessway on River Walk and at the start of South Quay.

In WP2 in-channel dredging is proposed upstream and downstream of the bridge . The works will involve the removal of a considerable volume of dredged material during a period of five months in Q2 and Q3 of 2026. In both WP2 and WP3, traffic management will be needed with pedestrians being accommodated with secure pathways along the narrow River Lane and Condren's Lane south of the river. Some restrictions on informal parking in the vicinity of RA3 on North Quay may be needed in WP2 and beside RA8 on South Quay. The temporary removal of spaces at the Main Street Car Park will be required throughout the construction phase as it will be used to facilitate Site Compound 4 and to provide access from River Walk to Main Street. The construction of the debris trap and gravel traps will mainly involve deliveries of concrete and so involve fewer HGV movements.

Works on upstream defence walls and drainage (WP4) will follow the bridge underpinning works. Temporary haul access will be needed to the working area for WP4 on River Walk and at RA7 on South Quay for construction of the flood defence wall in WP4 and during the subsequent public realm works. A reduction in parking of approximately 50% will be required at River Walk at this time.

In WP5, works will include approximately 550m of flood defence earthen embankment with adjoining maintenance track and approximately 155m of sheet-piled wall with concrete cap to be constructed upstream of Arklow Bridge on the north bank (east of Arklow Marsh). It will also include a permanent access road from Dublin Road to the maintenance track. Traffic management will again be needed during this period. The working area for WP5 is located east of the Marsh and will serve the construction of the embankment and this will involve HGV movements on Ferrybank. Physical works will involve the driving of steel sheet-piles into the ground and this will introduce noise impacts for residents along Ferrybank (see **Chapter 9**: *Noise and Vibration*).

**Economic activity and employment**

Works on the bridge during the first three summers will occur close to businesses, including the hotel at Bridge Street and cafés on River Walk, with access to the bridge supports being needed from each corner of the bridge. Safe pedestrian accessways will be provided during this time at River Walk. Micro piling works in WP1 and other works will involve noise, but mitigation is proposed in the form of a hoarding and low noise equipment. Noise levels are not predicted to exceed threshold daytime values, although a slight exceedance is possible for some night-time works which will be addressed by mitigation (see **Chapter 9**, *Noise and Vibration*). Restrictions on car parking, and the removal of approximately half of the ~80 spaces at the Main Street Car Park during this time, will have an impact on local businesses, although spaces will be maintained for people with disabilities. It is intended that access for deliveries and pedestrians will remain, although occasional disruption will be possible due to construction traffic.

Access to the Arklow Dock will be maintained throughout the construction period.

Over the course of the scheme, there are likely to be construction traffic movements in the vicinity of the bridge, river access points and site compounds, in particular those at the southern end of Ferrybank (SC3) and at the Main Street Car Park (SC4) off Main Street.

These will involve vehicle movements associated with the site offices and material storage from River Lane onto Main Street. This construction traffic movement has the potential to impact on business access and have an economic impact, but this should not be significant.

A positive effect will arise from the employment of up to 25 workers at any one time (WP1), some of whom are likely to stay and spend in the locality.

**Tourism and Amenity**

Tourism

The construction works have the potential to impact on both tourism and local amenity. Most tourism and amenity activity in the area occurs at the coast, on the river or further inland, but the town itself attracts a proportion of tourists too, in particular to the maritime museum and for riverside walks. Some tourists are likely to stay in Hoey's Bridge Hotel which is located beside the river and River Walk. In other respects, the characteristics of tourism activity by outside visitors will resemble those of local amenity and, as such, can be addressed together. Tourists and local amenity users are likely to be among customers of the cafes on River Walk or on North Quay outside the Bridgewater Shopping Centre. Both tourists and locals will be visiting the Maritime Museum.

Most activity occurs during the summer months and this will coincide with underpinning and scour protection works on the bridge which are scheduled to continue over at least three years. The bridge works will involve short-term slight noise impacts which will impact on the general amenity of people staying nearby or moving across, or in the vicinity, of the bridge (see **Chapter 9**: *Noise and Vibration*). The works on flood defence walls are expected to begin in Q3 of 2024 on the south bank and to continue until the end of the following year, before works commence on a smaller section of the North Bank in in the fourth year (refer to the programme detailed in **Figure 5.1** of **Appendix 5.1** of the EIAR). However, by commencing in the autumn months of 2024 at River Walk, the impact on tourism and amenity is likely to be lower as this is a location where people are more likely to congregate in the warmer summer months. Nevertheless, safe pedestrian access will be needed at River Walk, while the section upstream of River Lane will be closed in the fourth year as far as the Vale Road access for WP3 (dredging). There will also be an impact from works along South Quay in the subsequent period as this stretch too is used for walking. Impacts will include construction traffic which will access the works using a one-way system. This traffic will add 5%-10% more vehicles on a daily basis and no more than 10%-12% at peak times (see **Chapter 7**: *Traffic and Transportation*). Construction and HGV movements during this time will frustrate the full appreciation of the amenity.

River Amenity

The summer timing of in-channel works is intended to accommodate fish movement at other times. Dredging works will have an impact on general amenity due to access restrictions, visual effects, and a projected slight residual noise impact.

As outlined in **Section 16.3.1.2,** the Avoca River is used extensively for amenity purposes,- including sailing, boating and other uses. There are as such a number of access points to the Avoca river and boat mooring facilities located within the study in the area as described in **Section 16.3.1.2** above.

The steps/slipway along River Walk will be demolished during the construction period to facilitate WP4 and will be replaced by a pontoon. A moderate negative, but temporary effect on amenity is therefore identified at this location during the construction phase of the proposed scheme. A pontoon will be installed at this location during the operational phase of the proposed scheme.

As described in **Chapter 5**, *Construction Strategy*, WP2 (in-river dredging works) will be carried out during Q2 and Q3 2026. Thus, there will be restricted use of the Avoca river at this location for river users due to the physical in-channel works.

During WP2 (May-September in-river works 2026), the pontoon located in the North Quay side of the Avoca River, will be rendered inaccessible from the water as dredging will be ongoing during this period. Any boats using the existing berths at the pontoon will be required to relocate in order to facilitate the river dredging. Similarly, the existing floating mooring facilities within the Avoca River will be removed to facilitate the dredge works and any boats using these will also be required to relocate for the duration of the river dredging. A temporary significant negative effect on boat users who use the existing pontoon and floating moorings is therefore identified during the 5 month in-river construction phase of WP2 in 2026. All mooring and berth facilities will be reinstated following completion of construction.

The existing slipway at North Quay will be used to facilitate RA3 during WP2 and, as such, will be rendered inaccessible for the duration of those works (May-September in-river works 2026)). A temporary, significant negative effect on amenity is therefore identified during WP2 of the construction phase.

The proposed bridge underpinning works (WP1), river dredging (WP2), as well as the construction of the flood defence walls along South Quay (WP4) will render the existing Coal Quay slip permanently inaccessible from the commencement of works (Q1 2023) until the slip is eventually demolished as part of WP4. However, this slip is currently in disrepair and is not extensively used by the public (Refer to **Figure 5.9** in **Chapter 5,** *Construction Strategy*). A permanent slight, negative effect on amenity is therefore identified as a result of the loss of this river access.

The proposed river dredging, as well as the construction of the flood defence walls along South Quay will also render the existing slipway (Tyrells Yard) permanently inaccessible from the commencement of the South Quay element of WP 4 (Q2 2025). It should be noted, however, that current access to the river via this slipway is not continuously maintained due to the demountable barrier currently in place. A permanent moderate, negative effect on amenity is therefore identified as a result of the loss of this river access.

The existing public slipway at Arklow Harbour/Dock will be inaccessible for a temporary period during the construction of the flood defence walls (WP4). Similarly, the 'set-down' pontoon at Arklow Harbour will be rendered inaccessible from the land at this time. River access will likely only be unavailable at these locations for the short period in which the flood walls are being constructed at Arklow Harbour/Dock and not for the entire duration of WP4, or indeed for the full timeframe for the South Quay element of the work between Q2 2025-Q1 2026. In the absence of mitigation measures, a significant negative, but temporary effect on river users who might access the river at this location is therefore identified during the construction phase of the proposed scheme. When temporarily inaccessible, the slipway at North Quay will be available for use, depending on its suitability for users.

It is anticipated that other access to Arklow Marina and Arklow Harbour will be maintained at all times throughout the construction period of the proposed scheme. Alternative measures will be put in place at the time of summer maritime festivals as necessary

Local Amenity

Local amenity during the construction phase is most likely to be impacted by traffic movements (see **Chapter 7**, *Traffic and Transportation*) and noise (see **Chapter 9**, *Noise and Vibration*). Over the course of the project, most traffic movements will occur along Ferrybank which is partly lined with residential properties. The proportion of HGVs represented by construction traffic will be reach a maximum during WP2 and WP5. There will also be noise and traffic related effects during these periods in the vicinity of the WP4 and the slipways at RA1/SC3 at the southern end of Ferrybank, RA8 on South Quay and potentially SC1 which is set back somewhat further from residential premises at the edge of Arklow Marsh. There is predicted to be slight-moderate daytime noise exceedances at noise sensitive receptors R02 and R07 and at some residential locations, including R08, and R09 (sheet piling and wall defences) during WP4 and at R03 for embankment works in WP5 (see **Chapter 9:** *Noise and Vibration* including for the locations of the noise sensitive receptors).

Local drainage works are proposed at Main Street and Bridge Street, Brookfield Gardens, Harbour Road and Dock Road. Access to residences will be maintained, but the works are likely to have a slight-moderate but temporary negative effect on local amenity and businesses in the vicinity, along with some temporary loss of parking.

The temporary spreading of dredge material for archaeological examination will occur at SC1, SC2, SC5 and SC6. Dredged material from WP2 which could be a source of odour will be examined and transported for storage temporarily at SC5 or SC6. These compounds are located away from residential properties and amenities. Overall, the impact on general amenity from odour is expected to be imperceptible (Refer to **Chapter 8** *Air Quality and Odour* for further details.

SC2 will be located at the southern end of Arklow Sports Field which is used for amenity purposes, opposite Bridgewater Shopping centre parking facility, along Mill Road. This area will be unavailable for amenity use during WP2 (2026). SC6, which is situated along South Beach Road is also used for amenity purposes

and will be unavailable for the duration of WP2 and WP4. The presence of SC6 will have no impact on the adjacent car parks at this locaiton.

**Chapter 17**, *Material Assets* and **Appendix 17.1** include an assessment, from a property ownership perspective, of the land acquisition arising from the implementation of WCCs Compulsory Purchase Order (CPO) for the proposed scheme. However, some temporary and permanent effects on local and local amenity and community use will also occur as a result of these land acquisitions.

Temporary loss of amenity/community use is identified at the following land parcels during the construction phase of the proposed scheme:

- Land along River Walk and South Quay- which are used for amenity purposes[27]
- Site Compounds 2 and 6 (Land Parcels No. 127 and 125 respectively)- which are currently open green space and used for amenity purposes.

During the construction phase of the proposed scheme, the physical presence of construction works along River Walk and South Quay will reduce the amenity and community use of these areas. A temporary, significant negative effect on amenity and community-use is therefore identified during the construction phase of the proposed scheme.

Permanent loss of amenity/community use has been identified at the following land parcels commencing in the construction phase of the proposed development:

- Land Parcel No. 100- Presbyterian Church/Arklow Marsh.

While the earth embankment will not encroach on the land parcel itself, the land-parcel will be permanently acquired by WCC. For the purposes of this assessment, a permanent significant negative effect on amenity and community use at this location is therefore identified during the construction phase.

While there is additional land acquisition associated with the CPO for the proposed scheme, no temporary or permanent negative effects are identified on amenity or community use at these locations. These land parcels are therefore not assessed further in this chapter.

### 16.4.2.2 Human Health

#### Traffic

As outlined in **Chapter 7,** *Traffic and Transport,* some moderate adverse effects are predicted in some locations around the eastern end of River Walk, Arklow Bridge, South Quay and North Quay on traffic operations during construction associated with increased traffic flows on the network and diversions. This has potential to lead to some annoyance for drivers, pedestrians and cyclists as well as residents of properties adjoining traffic routes.

27 Land Parcels (Refer to Appendix 17.1): 114a, 114b, 114c, 118a, 118 b, 119a, 119c, 119d, 119e, 120a, 120b, 120c, 120d, 120 e, 120f, 120g, 120h, 120j, 120k, 120l, 120m, 120n, 121a, 124a, 124b, 124c

Annoyance however is not in itself a health effect. Further, given the defined duration of the construction phase, and the extensive mitigation outlined in **Chapter 7**, *Traffic and Transport*, the likely significant effect on human health associated with traffic is negligible.

**Air Quality**

As outlined in **Chapter 8,** *Air Quality and Odour,* no likely significant effects are predicted on air quality during construction. Further, extensive mitigation including a dust monitoring programme is outlined in **Section 8.7 of Chapter 8,** *Air Quality and Odour*.

On the basis of complying with the limit values outlined in the AQS Regulations, likely significant effects on human health associated with air quality are not predicted during construction.

**Odour**

Typically, during dredging, sediment is anaerobic. As outlined in **Chapter 8**, *Air Quality and Odour,* control of odour from anaerobic sediments containing hydrogen sulphide from dredging is rarely more than a temporary problem[28]. When first discharged it may cause odours, but these are lost within a few days of its exposure to air. However, the repetition of this process will add to the duration of potential odour generation.

The odour impact assessment outlined in **Chapter 8**, *Air Quality and Odour* determines that there will be a 'moderate temporary negative impact' resulting from dredge material storage at SC1, a 'moderate temporary negative' impact at SC2 and 'not significant' impacts at SC5 and SC6. From a human health perspective, this impact is considered to be 'odour that is perceptible beyond the boundary'.

There is potential that the odorous material may attract pests to the various site compounds. A Pest Control Plan (PCP) has been prepared which details how to control rodents during the construction phase of the proposed scheme. The Pest Control Plan is included in **Appendix 5.1** '*Construction and Environmental Management Plan.'* The PCP is a working document and will be finalised by the Contractor following appointment and in agreement with the Project Ecologist and prior to commencing works on site to include any additional requirements stipulated by An Bord Pleanála should the proposed scheme be approved.

**Noise**

As outlined in **Chapter 9**, *Noise and Vibration*, the noise assessment of the construction phase impacts has shown that compliance with noise limit values can be achieved at the nearest sensitive receptors to the proposed works for WP1 (daytime) and WP2. For all other WPs, noise limits are predicted to be exceeded at the nearest sensitive receptors.

28 EPA Victoria. Best Practice Environmental Management Guideline for Dredging, 2001. Section 3.7.

The implementation of the mitigation measures outlined in Section 9.6 of **Chapter 9**, *Noise and Vibration* will assist in reducing the impact on nearby sensitive receptors. Residual short-term, slight to moderate noise negative impacts are predicted during the construction phase of the proposed development.

The implementation of the mitigation measures outlined in **Section 9.6** will assist in reducing effects on nearby sensitive receptors.

**Vibration**

As outlined in **Chapter 9**, *Noise and Vibration*, sheet-piling is proposed during two construction phases of the proposed development; to enable the construction of the flood defence walls during WP 4 and the flood defence wall during WP 5. An assessment on vibration impacts has been carried out and is presented in **Chapter 9**.

No potential impacts on human health are identified as a result of vibration.

Detail on the mitigation and monitoring measures proposed are outlined in **Section 9.6** of **Chapter 9** '*Noise and Vibration*.'

**Wellbeing**

During the construction phase of the proposed scheme, while access will generally be maintained for pedestrians and other users along River Walk and South Quay, these areas will be less attractive for recreation.

**Water Safety**

The potential for effects on water safety during the construction phase of the proposed scheme have also been considered. During the construction phase of the proposed scheme, some life buoys will be required to be relocated along South Quay, River Walk and Arklow Dock/Harbour to facilitate construction works. However, access to the river will also be significantly hindered due the physical presence of the construction works and associated disconnect from the river. A neutral effect on water safety is therefore identified during the construction phase of the proposed scheme.

### 16.4.3 Assessment of effects during operation

#### 16.4.3.1 Population

Without intervention, Arklow faces the continued onset of a range of issues associated with flooding including flood damages, extensive community disruption and health and safety issues. Further, the existing flood risk in Arklow continues to influence the nature, scale and extent of development in the area. The delivery of the proposed flood relief scheme will significantly improve the impacts of recurrent flooding events which have caused widespread damage to public and private property in Arklow and will deliver increased resilience for potentially worsening flood events in the future.

By providing for a 1 in 100 year 1% Annual Exceedance Probability (AEP) the FRS will protect Arklow Town from serious fluvial flooding. It will also provide protection from 1 in 200 year 0.5% AEP coastal flooding. The foundations for the proposed flood walls also provide for a possible future increase in height should this be required to respond to higher order rainfall or higher than expected sea level rise due to climate change. The public realm improvements proposed as part of the FRS along River Walk and South Quay will considerably improve the quality of the public realm and will greatly enhance the overall appearance and recreational utility of the area.

**Local traffic movement**

Once the FRS has been constructed, there will be a need for ongoing maintenance works during operation. The traffic impact of this regular maintenance is not expected to be significant- refer to **Chapter 7**, *Traffic and Transport*.

**Economic activity and employment**

One of the key benefits of the proposed scheme is the avoidance of physical and material damage to both residences and commercial premises, including lost trade in respect of the latter. This includes the avoidance of damage to, or functional loss of, buildings and property, damage or disruption to infrastructure and utilities, loss of earnings, loss of retail or commercial income, travel inconvenience and associated costs, and potentially the avoidance of the temporary evacuation of residents. The flood protection measures will also reduce the risk of flood damage to tourism amenities in the area such as shops, cafes, restaurants, hotels and guesthouses. This includes the subsequent cost of clean-up and repair operations.

There will also be benefits for residents and businesses from improved access to affordable commercial buildings and property insurance.

A total of approximately 123 commercial properties have been estimated to benefit from the scheme. Intangible benefits include legacy impacts on the profitability of businesses- due to historic flood events, and access to insurance.

**Tourism and Amenity**

Tourism

In the long term, in the operational phase, the reduction in flood risk and investment in the public realm will provide a significant positive effect on tourism. The proposed Arklow Flood Relief Scheme will significantly reduce the risk of flooding in the area. This will provide significant economic benefits in terms of avoided flood damage to businesses and utilities. The public realm improvements will also make Arklow a more attractive place to tourists.

River Amenity

In the operational phase of the proposed scheme, access to, and use of the pontoon along the North Quay, as well as the floating moorings in the river, will be re-instated. A neutral effect on the users of these existing moorings is therefore identified.

However, the river dredging will have given rise to an improved estuarine environment for moorings and improved navigational environment for sailing.

The existing slipway at North Quay will be reinstated in the operational phase of the proposed scheme, following its temporary use as a River Access point for WP2. A neutral effect on amenity is therefore identified at this location during operation.

At River Walk, a new floating pontoon will have replaced the demolished steps/slipway, resulting in a positive effect on amenity at this location. The existing slipway at South Quay (Tyrells Yard) will be maintained during the operational phase with a glass panel, but be rendered inaccessible. A permanent moderate negative effect on river users is identified, although continuous access to the river via this slipway is not currently maintained due to the presence of a demountable barrier .

It is proposed that a demountable flood barrier will be installed and maintained in a closed position at the existing public slipway at the Dock. Arrangements will be put in place for interested parties to gain access to the slipway during operation, as required. A significant, permanent negative effect on access for recreational amenity on the river is identified during the operational phase. This is attributed to the lack of alternative public vehicular access to the river elsewhere on the south bank noting also that this slip is used on a near daily basis.

During the operational phase of the proposed scheme, the existing pedestrian access to the 'set-down' pontoon at Arklow Harbour will be restricted by the 600mm flood wall in this location. Given that the pontoon is used in conjunction with the slip for launching boats using a vehicle, a significant negative and permanent effect is therefore identified.

Local Amenity

During the operational phase of the proposed scheme, the lands at River Walk and the riverside land at South Quay will be reinstated to their original amenity and community use. Public realm improvements commencing at Vale Road/River Walk and along South Quay will provide a more attractive riverscape and consequently enhanced public engagement with the river. Landscaping will involve the planting of additional trees and a naturalistic boardwalk aided by hand railings. These public realm improvements will contribute positively to both the cultural and natural heritage appreciation of the river with both tangible and less tangible benefits for local amenity, health and wellbeing.

On approaching River Walk from the west, pedestrian and cyclist access will be available via a ramp to ascend a raised pedestrian area on the riverside section of the existing car park, which will provide for enhanced views across the river above a low 1.15m wall. A floating pontoon will be constructed alongside the raised section to permit river-based activities where river craft can be man-handled such as kayaking. Glass panels will be inserted into sections of the wall to permit continued views of the river where the wall height increases. The enhanced environment will provide a significant permanent positive impact.

Below the bridge along South Quay, a new promenade comprising a riverside footpath with seating will follow the river. Currently there is no footpath beside the river. Traffic calming will be introduced, and overhead electricity cables will be buried out-of-sight in underground ducts. The current low wall ends at South Green, but a new wall will be provided along South Quay following the roadside where the present grassed strip and land extends very slightly into the river. Where the existing wall recommences approaching Anchor Mews, the existing slipway (Tyrells slipway) will be retained. Access to the ramp will be closed permanently, but glass panelling will allow views of this historic feature.

The new flood wall averaging 1.15m in height to be constructed along the green area by Harbour Road will permit continued views of the river or of the far bank from at least the higher levels of residents' houses and, in many cases, the ground level too. New trees will be planted and the green areas preserved along with sections of the existing quay wall, although this will be upgraded in places (refer to the Public Realm drawings in Appendix 4.2). The higher environmental quality and reduction in flood risk could potentially encourage new residential development, including on the north bank where flooding impacts on the existing apartment area are more indirect and associated with road access. A potential significant positive effect is therefore identified on future residential opportunities.

Whilst it is noted that the grassed areas at the land-side of the road along South Quay will be permanently removed during construction, this amenity will be replaced by an improved public realm and pedestrian access . Following construction, South Quay will benefit from substantial widening and redevelopment of the street-space to a more pedestrian friendly environment. A permanent, but imperceptible effect on amenity and community use at South Quay is expected as a result of the removal of these grassed areas.

Lands at SC2 and SC6 will have been reinstated to their original amenity and community use. A neutral effect on amenity and community use is therefore identified at these locations during operation.

Permanent loss of amenity/community use has been identified at the following land parcels commencing in the construction phase of the proposed development:

- Land Parcel No. 100- Presbyterian Church/Arklow Marsh.

While the earth embankment will not encroach on the land parcel itself during the operational phase, the land-parcel will be permanently acquired by WCC. For the purposes of this assessment, a permanent significant negative effect on amenity and community use at this location is therefore identified during the operational phase.

### 16.4.3.2 Human Health

**Traffic**

As outlined in **Chapter 7**, *Traffic and Transport*, During the operation of the proposed scheme the projected increases in traffic flows will be limited, with some annual traffic expected to facilitate the removal of material from the debris and gravel traps. Routine dredging will also occur approximately every 10 years and will involve some operational traffic. Impacts of this operational traffic flow are described in **Chapter 7**, *Traffic and Transport*- and no significant negative effects on the local area are identified as a result.

**Air Quality and Odour**

As outlined in **Chapter 8,** *Air Quality and Odour*, the only operational air emission sources will be from emergency water pumps and associated emergency generator, as well as the limited operational traffic discussed above. As such, the impact on nearby receptors is not considered significant.

**Noise and Vibration**

As outlined in **Chapter 9,** *Noise and Vibration*, a surface water drainage network and pumping stations will be constructed on the dry side of the flood defence walls along River Walk, South Quay and the Dock to prevent flooding occurring from rainwater run-off from hardstanding areas in the flood zones when gravity discharge into the river is prevented by flood events. In total, six non return valves will be installed at the pump stations outlet points. As the pumps will be in operation during emergency flooding events only, their impact on noise at nearby receptors is not considered significant.

**Wellbeing**

During the operational phase of the proposed scheme there will be improved opportunities for exercise and recreation with associated well-being as a result of the improved public realm along South Quay and River Walk. Exercise and recreation will be encouraged by more attractive and reliable riverside paths with a decreased risk of flooding to interrupt this.

**Water Safety**

As outlined in Section 16.4.2.6, some life buoys will be relocated along South Quay, River Walk and Arklow Dock/Harbour to facilitate construction works

During the operational phase, lifebuoys will be installed at approximately 100mm centres along River Walk and South Quay. Four rescue points in the form of access ladders will be installed between Arklow Bridge and the Dock. These can be seen on **Drawing No. 1060.**

## 16.5 Mitigation Measures and Monitoring

The mitigation and monitoring measures relating to construction and operation of the proposed flood relief scheme have been addressed in the specific assessment chapters of the EIAR, as follows:

- **Chapter 7** *Traffic and Transport,*
- **Chapter 8** *Air Quality and Odour,*
- **Chapter 9** *Noise and Vibration***,**
- **Chapter 11** *Archaeological, Architectural and Cultural Heritage***,**
- **Chapter 12** *Landscape and Visual,*
- **Chapter 13** *Land and Soils,*
- **Chapter 14** *Water,*
- **Chapter 15** *Resource and Waste Management,*
- **Chapter 17** *Material Assets,*
- **Chapter 18** *Major Accidents and Disasters,*
- **Chapter 19** *Climate.*
- **Appendix 5.1 Construction Environmental Management Plan (CEMP)**

From the perspective of the Population and Health assessment, the mitigation proposed in these chapters is sufficient to address potential effects on sensitive receptors including pedestrians, cyclists, residents, businesses and visitors, and for amenity activity, especially during the summer and for festivals and tourism events.

In addition to the above, a Pest Control Plan has been included in the CEMP, as outlined in 16.4.2.6, in order to ensure the control of pests in the spreading of the dredge material.

Further, access to the existing slipway and set-down pontoon at Arklow Harbour/Dock will be maintained during the summer months (June-August).

## 16.6 Cumulative Impacts

This section includes an assessment of the potential for likely significant direct and indirect cumulative effects on population and human health of projects listed in **Table 20.1** in **Chapter 20,** *Cumulative and Interactive Effects*, in combination with the proposed scheme. It also includes an assessment of the potential for likely significant direct and indirect cumulative effects of all projects listed in **Table 20.1** in **Chapter 20** *Cumulative and Interactive Effects*, taken together in combination with the proposed scheme

Assessments of current and proposed projects listed in **Table 20.1** identified potential cumulative effects from the following projects**:**

- **Irish Water Arklow, Co. Wicklow (SI201801)**

As previously outlined, it is anticipated that the Arklow WwTP project will commence construction in 2021 and as such, construction activities may have to be coordinated between the WwTP project and the proposed scheme, depending on the final construction programmes for the same. This includes coordination and management of any common temporary working areas.

It has also been identified that there are some works which are common to both projects. The key works in common to both projects are described in **Section 5.2.3** in **Chapter 5**, *Construction Strategy.*

There is much potential for cumulative impacts from both the construction works for FRS and the proposed WwTP. There is a shared degree of Bridge underpinning works, construction of the interceptor sewer and flood defence walls, widening and construction of a new quay wall along South Quay, and works along River Walk.

Whether the construction phase of the WwTP project occurs either concurrently or sequentially with the construction phase of the proposed scheme, there is likely to be cumulative negative effects on local businesses, such as cafes and restaurants in vicinity to the works, and on the amenity of people living along South Quay and River Walk. However, these effects will be temporary in nature and will have been moderated by the implementation of the proposed mitigation for both schemes.

There are potential cumulative effects on emissions to air including odour and noise. However, in a cumulative situation construction work will still observe maximum emissions such as outlined in BS5228 for noise and Air Quality standards. All works, in particular those on the Bridge, will have traffic management, and works on South Quay and River Walk will be coordinated to minimise a cumulative negative impact on the public from prolonged works. Given the observation of standards no adverse population and human health impact is anticipated.

Cumulative effects on Human Health are best considered through an examination of the predicted cumulative effects on Air Quality and Odour, Noise and Traffic. As outlined in **Chapter 9,** *Noise and Vibration*, a moderate, negative and short-term cumulative effect is predicted- under a worst-case scenario. There is also the potential for cumulative Air Quality effects- such as soiling, $PM_{10}$ and vegetation effects arising from the cumulative construction activities along the South Quays. However, as stated within the WwTP EIAR, "*with the implementation of the standard mitigation measures outlined no significant negative effects are envisaged*".

As both projects are predicted to have positive effects on population and human health in the operational phase, cumulative benefits are anticipated from both projects.

- **FS007049 Sure Partners Site Investigations at Arklow Bank**

  This Site Investigation (SI) work was assessed for potential to give rise to cumulative effects with the proposed scheme as it relates to a range of

geotechnical and other surveys within the foreshore of Arklow- including Arklow Harbour, which is within the working area of the proposed scheme. As outlined in the Foreshore Licence application (FS007049), no restrictions on public use of the foreshore are expected as a result of the SI. Public access to the beach/foreshore will not be disrupted, and there will be limited interactions with members of the public.

The SI proposed is of a nature and location, where it is not expected to give rise to significant human health effects from noise, vibration, air quality, disturbance etc.

- Parade Ground- WCC Part 8 This project relates to proposed public realm improvement works at Parade Ground, Arklow. Should the construction phase of this project be carried out concurrently with the proposed scheme there may be some minor cumulative negative effects on population through disturbance from increased traffic management in the town. However, these are expected to be temporary and not significant in nature.

  The operational phases of both projects are expected to result in an overall positive cumulative effect on population through the achievement of an overall enhanced public realm in Arklow.

Potential cumulative effects from the following projects were excluded based on the relatively small scale of these developments, and/or distance from the Arklow FRS:

- Action Health Enterprises GP Limited the Former Boland's Builders Providers, Castle Park (181170) - This project relates to the development of a primary care facility at Castle Park.
- Circle K Safeway Service Station (20426) This project relates to the demolition of the existing, and construction of a new, fuel forecourt at the existing Circle K service station,
- Frank & Sandra Duffy No 7 and 8 Bridge Street and No 34 Main Street (19750) - The project relates to the demolition of 2 existing buildings and the construction of a new retail and commercial building on Main Street.
- Gaines Europe Ltd Unit 1A Lower Tinahisk, South Quay (16248) - This project relates to the development of a new warehouse and distribution facility at Arklow Harbour.
- Gaines Europe Ltd Tinahisk Lower, South Quay (16414) - This project relates to the demolition of an existing industrial building at Arklow Harbour.
- Joby Developments North Quay, Arklow (15857) This project relates to the demolition of existing structures and construction of retail and residential units at North Quay.
- Mill Sea Ltd North Quay, Arklow (18316) This project relates to the demolition of existing structures at Arklow Harbour
- Arklow Bank Wind Park, Co. Wicklow- Pre-Application (306662) This project relates to the development of onshore transmission connection

infrastructure related to the Arklow Bank Wind Park offshore wind energy project.

- Wicklow County Council Inner Harbour / Dock, Off South Quay (20469)- This project relates to the development of storage units at Arklow Harbour.
- Crag Digital Avoca Limited (201285)- This project relates to industrial development at the Shelton Abbey site.

**All projects taken together in combination with the proposed scheme**

Overall, taking all of the projects together in-combination with the proposed scheme, there are cumulative positive effects where proposed developments would have been at risk from flood events, including loss of access. There is not considered to be any cumulative risk of population and human health impacts occurring during the construction and operational phase due to the nature of the proposed scheme and its distance to other projects.

## 16.7 Residual Effects

### 16.7.1 Residual effects during construction

Residual effects during construction are expected, with regards traffic movements, the economy and tourism and amenity. These will range from slight-significant but will be temporary in nature.

During all construction stages, the individual working areas will result in some restrictions and inconvenience to the movement of people and traffic. These restrictions will be temporary in nature and particularly felt in the immediate vicinity of the proposed working areas. A slight negative but temporary residual effect on local traffic movements is therefore identified during the construction phase of the proposed scheme.

Works on the bridge during the first three summers will occur close to businesses, including the hotel at Bridge Street and cafés on River Walk, with access to the bridge supports being needed from each corner of the bridge. During the construction phase of the proposed scheme, construction traffic movement has the potential to impact on business access and have an economic impact, but this should not be significant. Restrictions on car parking, and the removal of approximately half of the ~80 spaces at the Main Street Car Park during this time, will have an impact on local businesses, although spaces will be maintained for people with disabilities. It is intended that access for deliveries and pedestrians will remain, although occasional disruption will be possible due to construction traffic. A slight negative but temporary residual effect on the local economy is therefore identified during the construction phase of the proposed scheme.

The steps/slipway along River Walk will be demolished during the construction period to facilitate WP4. A moderate negative, but temporary residual effect on amenity is therefore identified at this location. A pontoon will be installed at this location during the operational phase of the proposed scheme.

Existing floating moorings and berths at the pontoon at North quay will be required to be relocated during the construction phase. A significant negative but temporary effect on boat users currently using these facilities is therefore identified.

The construction phase of the proposed scheme is expected to have a residual significant negative but temporary effect (North Quay slip), residual slight negative and permanent effect (Coal Quay slip), residual moderate negative and permanent effect (public slip at Tyrells Yard).

Given that access to the existing slipway and set-down pontoon at Arklow Harbour/Dock will be maintained during the summer months (June-August), a residual moderate negative but temporary effect on river access for amenity purposes is identified at the public slip/ 'set-down' pontoon at Arklow Dock.

There will be moderate-significant negative residual effects on tourism and amenity during the construction phase of the proposed scheme, due the physical presence of construction works and associated restrictions to amenity areas and river access locations, as well as restricted use of the river during WP2. Access to the harbour will be maintained throughout the construction period.

During the construction phase of the proposed scheme, the physical presence of construction works along River Walk and South Quay will reduce the amenity and community use of these areas.

During the construction phase of the proposed scheme, the physical presence of construction works along River Walk and South Quay will reduce the amenity and community use of the following land-parcels.

- Land along River Walk and South Quay- which are used for amenity purposes[29]
- Site Compounds 2 and 6 (Land Parcels No. 127 and 125 respectively)- which are currently open green space and used for amenity purposes.

A temporary, significant negative residual effect on amenity and community-use is therefore identified during the construction phase of the proposed scheme at the above land-parcels.

Permanent loss of amenity/community use has been identified at the following land parcels commencing in the construction phase of the proposed development:

- Land Parcel No. 100- Presbyterian Church/Arklow Marsh.

While the earth embankment will not encroach on the land parcel itself, the land-parcel will be permanently acquired by WCC. For the purposes of this assessment, a permanent significant negative effect on amenity and community use at this location is therefore identified during the construction phase.

29 Land Parcels (Refer to Appendix 17.1): 114a, 114b, 114c, 118a, 118 b, 119a, 119c, 119d, 119e, 120a, 120b, 120c, 120d, 120 e, 120f, 120g, 120h, 120j, 120k, 120l, 120m, 120n, 121a, 124a, 124b, 124c

## 16.7.2 Residual effects during operation

### 16.7.2.1 Population

In the long term, in the operational phase, the reduction in flood risk and investment in the public realm will provide a significant positive effect. The proposed Arklow Flood Relief Scheme will significantly reduce the risk of flooding in the area. This will provide significant economic benefits in terms of avoided flood damage to residences, businesses, utilities and movement and social benefits too in terms of personal movement, safety and health.

Impacts identified in **Chapter 2***, Background and Need* that are of particular relevance from a socio-economic perspective include the avoidance of damage to, or functional loss of, buildings and property, damage or disruption to infrastructure and utilities, loss of earnings, loss of retail or commercial income, travel inconvenience and associated costs, and potentially the avoidance of the temporary evacuation of residents.

Likewise, the flood protection measures will reduce the risk of flood damage to tourism amenities in the area such as shops, cafes, restaurants, hotels and guesthouses. This includes the subsequent cost of clean-up and repair operations.

There will also be benefits for residents and businesses from improved access to affordable commercial buildings and property insurance.

As a result, the scheme will have a long-term significant positive impact both for residents, local amenities, tourism and economic activities. The increased flood protection will contribute to securing businesses and jobs in the area. Existing properties will benefit from the greater flood protection and this will also contribute towards attracting additional investment and jobs to the area as properties become more attractive to rent or buy. Areas that might previously have been subject to flood risk or consequent development restrictions will potentially be available for new development and investment.

The overall impact of the scheme on the local amenity value will be significantly positive and permanent with flood defence measures designed to protect local amenities such as shops and restaurants. The improved public realm along River Walk and South Quay will also result in a significant positive effect on local amenity through the creation of a more accessible and attractive public realm.

A new pontoon will be installed at River Walk as part of the proposed scheme, resulting in a positive effect on amenity at this location. The operational phase of the proposed scheme is however expected to have a residual slight negative effect (Coal Quay slip), residual significant negative effect (public slip at Dock) and residual moderate negative effect (public slip at Tyrells Yard) on river access for amenity purposes.

The key benefit of the proposed flood relief scheme will be to provide much needed flood protection to existing homes and businesses in Arklow town. This positive benefit will also extend to future developments and new infrastructure in Arklow town. While it is acknowledged that, following construction of the proposed scheme, access to the Avoca River may be restricted at the locations

outline above, any removal or restriction of access to the river was considered integral to the design and implementation of the flood relief scheme.

The Avoca river will be significantly improved from a navigational point of view, following the dredging of the same.

Permanent loss of amenity/community use has been identified at the following land parcels commencing in the construction phase of the proposed development:

- Land Parcel No. 100- Presbyterian Church/Arklow Marsh.

While the earth embankment will not encroach on the land parcel itself, the land-parcel will be permanently acquired by WCC. For the purposes of this assessment, a permanent significant negative residual effect on amenity and community use at this location is therefore identified during the operational phase.

No adverse effect during the construction phase on human health is predicted. Significant positive impacts in terms of public health and socio-economic benefits with resultant benefits for human health are predicted on the basis of having an effective flood relief scheme.

## Table 16.17: Impacts Summary - CONSTRUCTION

| Location | Nature of Impact | Population subsets | Impact of the proposed scheme | Significance | Duration | Mitigation proposed | Residual Impact |
|---|---|---|---|---|---|---|---|
| Arklow Bridge and surrounding roads | Lane closures on bridge (journey amenity) | Town traffic | Lane closures affecting traffic movement across the town's only bridge. Temporary pedestrian crossings. | Moderate negative | Temporary. Summer up to 3 years | Restrict to night-time closures | Slight negative |
| River Lane, & Condren's Lane Upper | Construction traffic movements (journey and general amenity) | Local traffic, pedestrians. | Additional HGV traffic on minor roads, reduced journey amenity from the need to use secure pathways or to make short detours. Local noise and air quality impacts. | Moderate-significant negative | Autumn Year 2 & summer Year 5 | Minimise inconvenience to pedestrians and deliveries | Moderate negative |
| Main Street | Construction traffic movements (journey and general amenity) | Town traffic and pedestrians | Additional traffic and short term lane closures | Moderate negative | 2-3 weeks | Minimise inconvenience, especially to pedestrians, cyclists shoppers and deliveries | Slight negative |
| Ferrybank | Works on embankment and HGV movements (general amenity) | Local residents | Noise and visual impacts | Moderate-significant negative | Year 5 | Noise and visual mitigation | Moderate negative |
| South Quay and Harbour | Works on flood wall and road surfacing (journey and general amenity) | Local residents and pedestrians | Noise and visual impacts. Traffic disruption during road works | Moderate negative | Year 4 | Noise and visual mitigation | Slight-moderate negative |
| South Quay | Works on South Quay (general amenity) | Visitors and local amenity | Reduced amenity and possibly reduced visits. Some transfer to North Quay. | Moderate-significant negative | Year 4 | Noise and visual mitigation. | Slight-moderate negative |

| Location | Nature of Impact | Population subsets | Impact of the proposed scheme | Significance | Duration | Mitigation proposed | Residual Impact |
|---|---|---|---|---|---|---|---|
| Area of bridge, including River Walk | Economic impact due to works on bridge (economic) | Local businesses, e.g. hotel and cafes | Noise and visual impact, restrictions on parking in immediate area of works, disruption to pedestrian access and deliveries | Moderate negative | Years 2-4 | Noise and visual mitigation. Facilitate access where possible. | Slight-moderate negative |
| Area of bridge, including River Walk | Bridge works (general amenity) | Visitors and locals, including by extension cafes and other businesses (see above) | Reduced amenity and reduced visits | Moderate negative | Years 2-4 | Noise, visual and dust mitigation. Minimise duration of any closure/diversion of access | Slight negative |
| River Walk upstream of River Lane | General amenity | Local people and visitors engaging in walks for amenity | Closure of River Walk in WP2 and WP3 | Moderate negative | Up to 6 months. | Avoid any period of unnecessary closure. Maintain alternative access to west. | Slight negative |
| In-channel works | General amenity | Water-based activities | Reduced access to parts of the river. Dredging will render existing moorings and berths temporarily inaccessible | Significant negative | Years 2 & 5 | Minimise duration of works where feasible | Significant negative |
| Businesses in wider area, including & N Quay. | Economic impact due to HGV traffic | Local businesses | Elevated HGV traffic | Slight-moderate negative | Years 2 &5 S.Quay Year 5 North Bank. | Minimise daytime traffic movements | Slight negative |
| Vicinity of SC1, 2, 5 and 6 | Odour impacts on amenity | Residents and local amenity | SC1, SC2, SC5 and SC6 | Moderate negative | Mainly year 5 | Move most odorous material to SC5 or keep other at maximum distance from residences | Slight negative |
| River Access | Amenity | All users | Reduced access to river for amenity purposes at: four existing slipways (one of which is in disrepair and not used, another which is only temporarily available due to demountable barrier) | Slight-significant negative | Y2- Y5 | Access to the existing slipway and set-down pontoon at Arklow Harbour/Dock will be maintained during the | Slight-significant negative |

| Location | Nature of Impact | Population subsets | Impact of the proposed scheme | Significance | Duration | Mitigation proposed | Residual Impact |
|---|---|---|---|---|---|---|---|
| | | | | | | summer months (June-August). | |

## Table 16.18: Impacts Summary – OPERATION

| Location | Nature of Impact | Population subsets | Current situation | Impact of FRS | Significance | Duration |
|---|---|---|---|---|---|---|
| Areas previously vulnerable to flooding as revealed by OPW flood maps | Journey patterns | All, including private and business journeys | Areas remain vulnerable to regular, if temporal traffic disruption. | Reduction in flooding of roads consistent with 1% fluvial AEP | Significant positive | Permanent in effect, but temporal during potential flood events |
| As above | Economic | All businesses, particularly where dependent on physical sales, including employees | Businesses remain vulnerable to physical damage, damage to stock and loss of custom. Difficulty accessing insurance. | Reduction in flooding of businesses consistent with 1% fluvial AEP and maintenance of access for consumers and deliveries. | Significant positive | Permanent in effect, but temporal during potential flood events, but with legacy economic impact |
| Vale Road to River Walk | Tourism and general amenity | Visitors and local users | Modest amenity value and use | Improved public realm comprising a boardwalk and raised pedestrian area. | Very significant positive | Permanent |
| South Quay to Arklow Dock | Tourism and general amenity | Visitors, local users and residents | Limited amenity value and use. | Improved public realm comprising footpath and landscaping | Very significant positive | Permanent |
| Areas vulnerable to flooding especially S Quay and Tinahask. | Local amenity | All residents in vulnerable areas | Households remain vulnerable to physical damage and loss of access. | Reduction in damage caused by surface water and poor drainage | Very significant positive | Permanent in effect, but temporal during potential flood events, but with legacy economic impact |
| South and North Quays | Local amenity | Residents | Household amenity and investment in property is constrained by risk of regular flooding. Difficulty accessing insurance. | New landscaping and relief from flooding enhance amenity and support property improvement and new investment | Significant positive | Permanent |

| Location | Nature of Impact | Population subsets | Current situation | Impact of FRS | Significance | Duration |
|---|---|---|---|---|---|---|
| Residents in other areas vulnerable to flooding | Health and wellbeing | Residents | Impact on property and on mental and potentially physical health | Significant reduction in risk of intangible impacts on earnings, other property, wellbeing and health. | Very significant positive | Permanent in effect, but temporal during potential flood events, but with legacy health impact |
| South Quays | Health and wellbeing | Local users | Recreational health benefits limited by substandard public realm | Contribution to health and wellbeing due to public realm improvements | Significant positive | Permanent |
| River channel | Amenity | All users | Build-up of sediment and debris interfering with navigation and presenting possible safety risk | Capture of much debris upstream and deepening of channel. | Significant positive | Permanent, but requiring regular maintenance |
| River Access | Amenity | All users | Four existing slipways (one of which is in disrepair and not used, another which is only temporarily available due to demountable barrier) | Reduced access to river for amenity purposes | Slight-significant negative | Permanent |

## 16.8 References

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