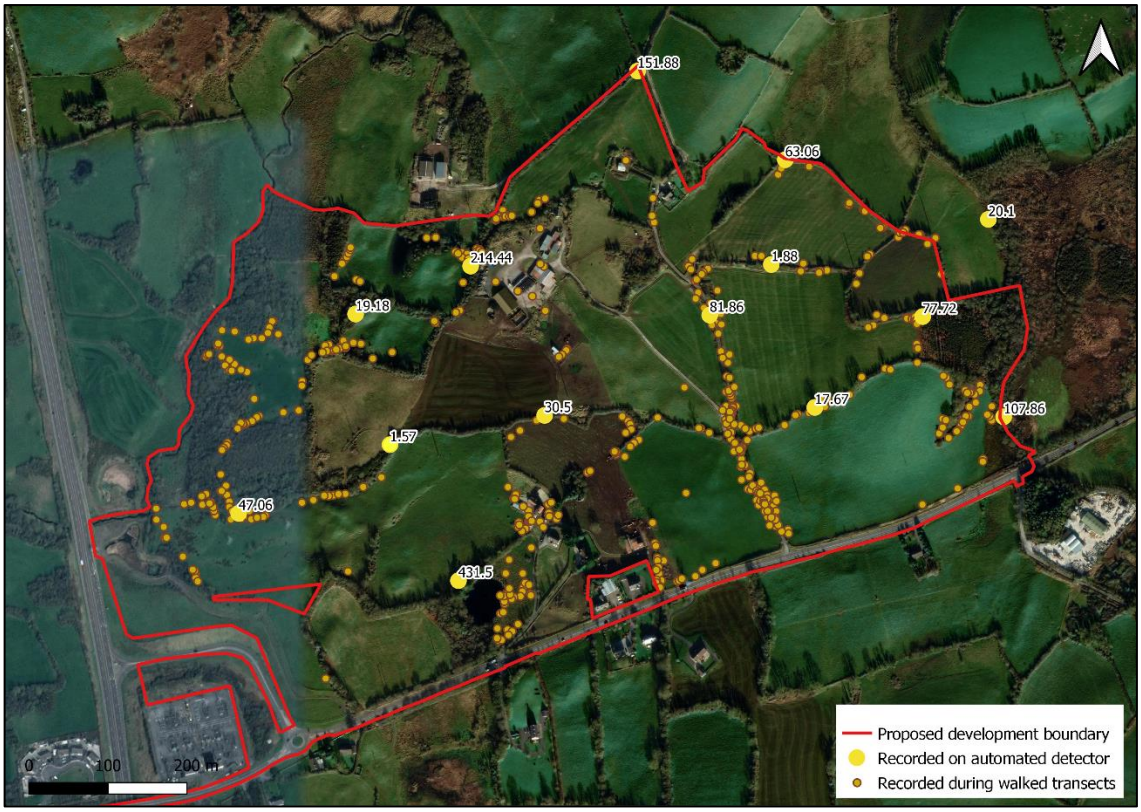

Figure 7.13 *Location of soprano pipistrelle calls recorded during both walked transects and automated static bat detector deployment, along with the average number of soprano pipistrelle calls recorded per night during the static deployment only*

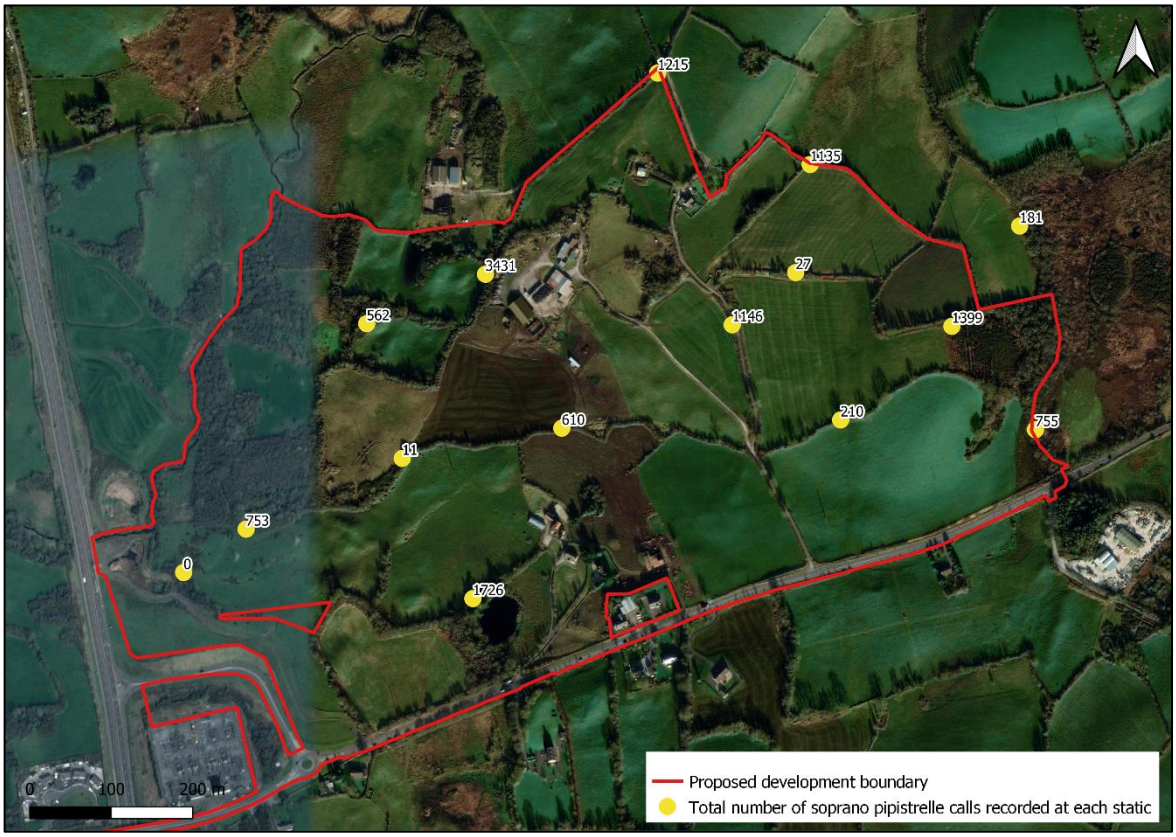

Figure 7.14 *Total number of Soprano pipistrelle calls recorded at each static*

Roost emergence/re-entry activity surveys

Of the 16 buildings on site that were surveyed, 18 soprano pipistrelle roosts were identified. Full details of the surveys and species identified can be found in Appendix 7.5, and buildings can be found in Figure 7.4. The following buildings contained soprano pipistrelle roosts:

- BB 1A – One individual soprano pipistrelle bat was recorded at this roost during the first survey in July at this building.
- BB 2 – Four soprano pipistrelle roosts identified at this building across two surveys. Small roosts of one to two individual bats.
- BB 3 – Five soprano pipistrelle roosts identified at this building across three surveys. 30 individual bats were recorded emerging/re-entering from one location in this building. 11 other individual bats were recorded at another roost location within this same building, the other roosts were smaller with one to three individual bats.
- BB 5A – Four soprano pipistrelle roosts identified at this building across three surveys; all of which comprised small roosts with one to two individual bats.
- BB 8 – Three soprano pipistrelle roosts identified at this building across two surveys. 13 individual bats were recorded emerging from one roost, while two individual bats were recorded emerging/re-entering from two other roosts.
- BB 9 – One soprano pipistrelle roost was identified at this building during one survey, with 8 individual bats recorded emerging from one roost.

Soprano pipistrelle calls were also identified foraging and commuting during the activity surveys at the buildings on site. Moderate to high numbers of calls were noted around all of the farm buildings, with soprano pipistrelle observed foraging within and around BB 1A, 1B, BB 4A -D, 5B, and 6A–C and using the treelines and hedgerows as commuting corridors to these buildings. Activity was also recorded around the treelines and hedgerows of the residential houses and gardens associated with the houses.

Evaluation

Soprano pipistrelle was the most commonly recorded bat species identified within the proposed development site, during all the survey types carried out. This is consistent with the results of the 2018 surveys. Levels of activity were particularly high along well-established linear hedgerows and treelines, and adjacent to waterbodies and farm buildings, where prey availability is likely to be high. Soprano pipistrelle bats are a specialist species, and tend to favour riparian habitats more than other pipistrelle species (Rachwald *et al.*, 2016). The large roosts in BB 3 and BB 8, are potentially maternity colonies. This is deduced from the numbers of bats identified emerging/re-entering from these buildings, and from the obvious increase in numbers around the peak breeding season, and the drop in numbers of individuals, post breeding season (*i.e.* September). Pipistrelle species typically forage near their roost (BCT, 2021), and the results from the transect surveys and emergence re-entry surveys would suggest that bats roosting in these buildings use the nearby Toureen Lough and hedgerows/treelines connected to this for foraging, and commute along the linear features adjacent to other areas of foraging within the site. Toureen Laneway was also an area that exhibited high activity levels of this species. This laneway is lined with

mature trees, and as such would provide suitable commuting and/or foraging habitat for pipistrelle species in the area.

Soprano pipistrelle bats are known to have a widespread distribution across the region, and in Ireland (Roche *et al*., 2014). Soprano pipistrelles populations vary in abundance across the country (Aughney *et al*., 2018), with populations trends steadily increasing. Taking this into account, as well as the availability of suitable roosting, commuting and foraging habitat in the immediate surrounding environment, the presence of potential maternity colonies on site, as well as multiple other small roosts, the local soprano pipistrelle population is valued as being of County Importance.

Common Pipistrelle Bat

Transect surveys

Full details from each transect survey are provided above in Appendix 7.6 and locations of each of the recorded common pipistrelle calls are shown on Figure 7.15 – 7.16. Common pipistrelle was recorded during all three transect visits during the surveys in 2020, and on both transect visits carried out in 2018. It was the second most frequent species encountered during all transect surveys undertaken. The areas with the highest numbers of calls from this species were very similar to soprano pipistrelle, and included; Toureen Laneway, woodland in north west, hedgerows in the east, and around the farm buildings in the north of the site (BB 6A, B, C and BB 5B). Toureen Lough had noticeably less number of common pipistrelle calls compared to soprano pipistrelle calls. This was also the case for the surveys carried out in 2018. Areas with lower activity levels for this species included the south western area of the site, the southern boundary along the R352, and the northern boundary. As with soprano pipistrelle, activity was associated with well established hedgerows and mature treelines, and around farm buildings where foraging opportunities of insects are higher.

Static detector surveys

Common pipistrelle was identified on 14 of the 15 static detectors deployed on site in 2020, and on all 14 detectors deployed in 2018. Similar to soprano pipistrelle, and the results from the transects, common pipistrelle was identified throughout the site, with high levels of activity recorded along Toureen Laneway, along the hedgerows and treelines of the woodland in the north west, and around the farm buildings in the north of the site (BB 6A, B, C, D). This species was not identified on Static 9, located in the west of the site, adjacent to the M18 Attenuation pond. Static 1 and 2 located along the hedgerow directly east of Static 9, also had low numbers of calls[30]. Full details of the number of calls per night and number of nights static bat detectors were deployed are presented in Table 7.11, and in Figure 7.15 and 7.16 below.

[30] However Static 1 only recorded calls for 7 nights, which may have impacted the results, as it was deployed for a shorter amount of time, and would have a lower number of calls than if it had been deployed for longer.

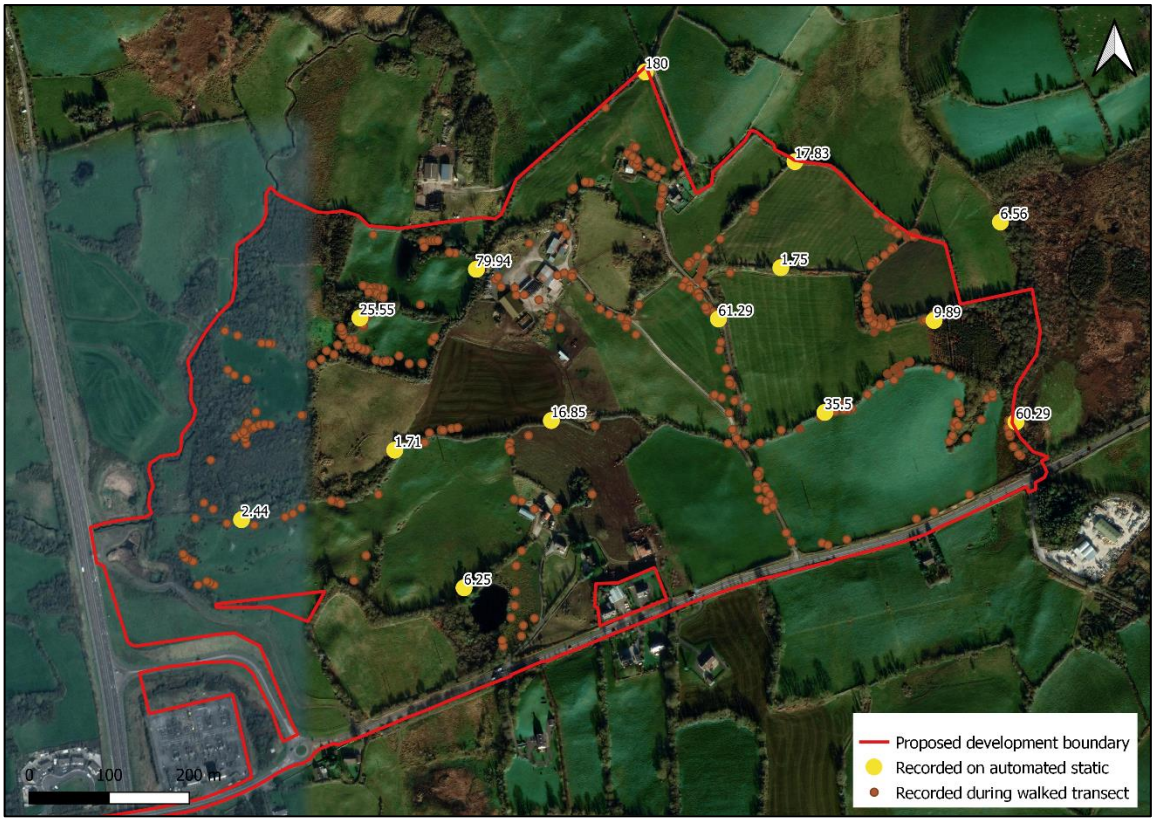

Figure 7.15 *Location of common pipistrelle calls recorded during both walked transects and automated static bat detector deployment, along with the average number of common pipistrelle calls recorded per night during the static deployment only*

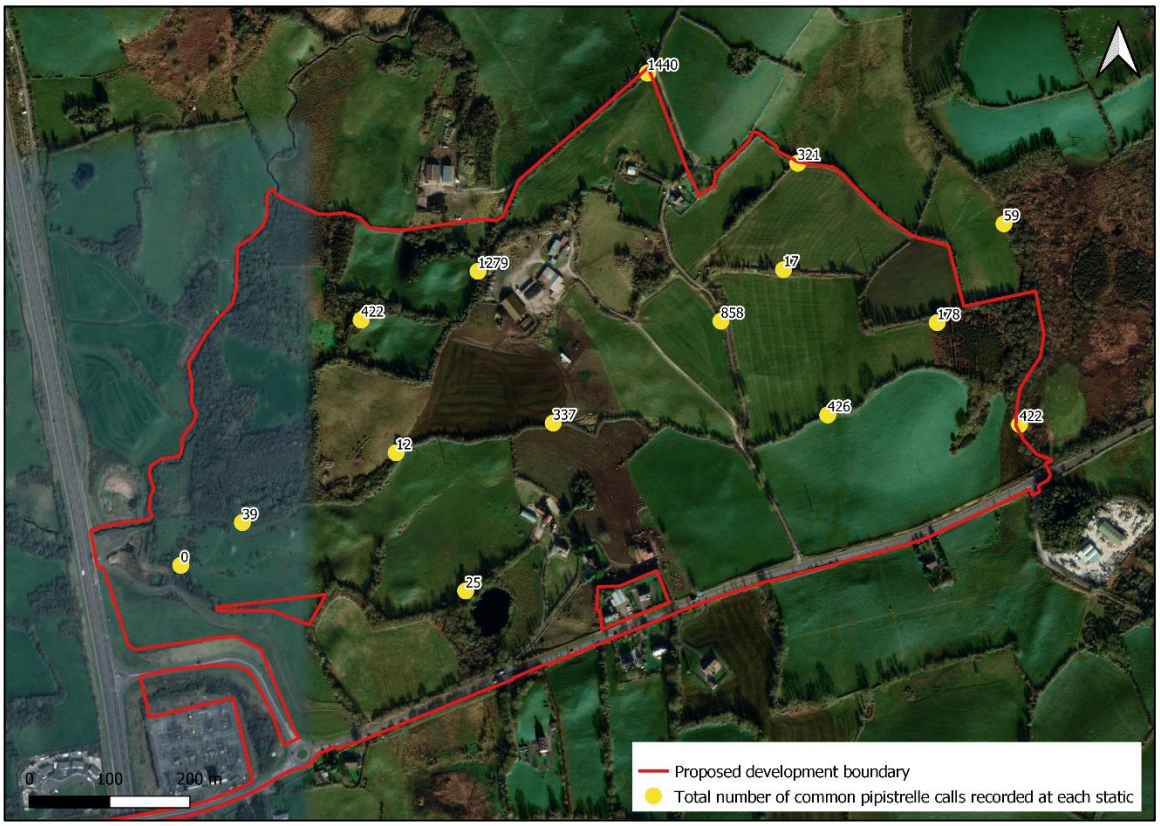

Figure 7.16 *Total number of common pipistrelle calls recorded at each static*

Roost emergence/re-entry activity surveys

One common pipistrelle roost was identified within one of the 16 buildings on site. This roost was identified at BB 5A, with one individual bat emerging during one survey. No other roosts of this species were identified. Similar to soprano pipistrelle, common pipistrelle bats were observed foraging around the barn buildings previously mentioned, and using hedgerows and treelines connected to these buildings.

Evaluation

Common pipistrelle was the second most commonly recorded bat species identified within the proposed development site. This is consistent with the results of the 2018 surveys. The areas that exhibited the highest levels of activity were very similar to the locations where soprano pipistrelle was recorded; however only one roost was identified across the proposed development site. This suggests that the site is an important foraging area for common pipistrelle, who may be roosting in structures and/or trees close to the site. The site may also be used by bats commuting to and from local roost sites. The mature hedgerows and treelines along field boundaries within the site provide linear corridors for commuting bats through the site between foraging areas within the farm buildings in the north (BB 6A, B, C) and in the south (BB 4A, B, C, D) (likely feeding off insects attracted to cow dung), and to the wetland habitats.

Common pipistrelle bats are widespread in Ireland; however, they tend to show a southern bias in their distribution, with greater numbers occurring in the south west and east of the country that in the north (Roche *et al.,* 2014). This species has also shown increasing population trends in recent years. Taking this into account, as well as the availability of suitable roosting, commuting and foraging habitat in the immediate surrounding environment, the local common pipistrelle population within the study area are considered to be of local importance (higher value).

Brown long-eared bat

Transect surveys

Full details from each transect survey are provided above in Appendix 7.6 and locations of each of the recorded brown long-eared bat calls are shown on Figure 7.17 – 7.18. brown long-eared were recorded during two of the three transect visits carried out within the site. Brown long-eared calls were not identified during any of the transect visits carried out in 2018. The number of brown long-eared calls recorded during transects was relatively low in comparison to other bat species. Brown long-eared bats have very quiet, short echolocation calls, forage in cluttered habitats and therefore are less likely to be recorded by handheld bat detectors (Aughney *et al.*, 2011). This species also emerges from roosts later than other species, as their typical prey (Lepidopterans) tend to be available later in the night. However, the all night transect survey, with the addition of static detectors, addresses this limitation.

A number of areas within the site were identified as important commuting corridors for this species. The area with the highest number of calls recorded was Toureen Laneway, with a total of 20 calls recorded during two of the three visits. Five brown long-eared bat calls clustered together were recorded in the area adjacent to the woodshed located in the north of the site (BB 5B), These were likely to be the individual brown long-eared bats roosting within BB 5B. Single brown long-eared calls were also recorded within and along the woodland edge in the north west of the site, and in the south adjacent to the R352 and a small pocket of woodland in an agricultural field.

Static detector surveys

Brown long-eared bats were identified on 13 of the 15 static detectors deployed on site in 2020, and on six of the 14 detectors deployed in 2018. Activity levels were low across the site, with the highest number of calls and highest average number of calls per night recorded along Toureen Laneway. This is consistent with the transect data and static data recorded in 2018. Activity was highest in the northern section of the site, along the northern boundary and adjacent to the farm buildings (BB 6A-C), compared to the southern section of the site. These deployment locations (*i.e.* Static locations 10, 11, 12) are connected to the brown long-eared bat roost in BB 5B by hedgerows and treelines. The two statics located along the hedgerow through the site in the west (*i.e.* location 1 and 2), did not record any brown long-eared bat calls, with the other statics in the south, recording a low number of brown long-eared calls and a low average number of calls per night across the duration of deployment. Full details of the number of calls per night and number of nights static bat detectors were deployed are presented in Table 7.11, and in Figure 7.17 and 7.18 below.

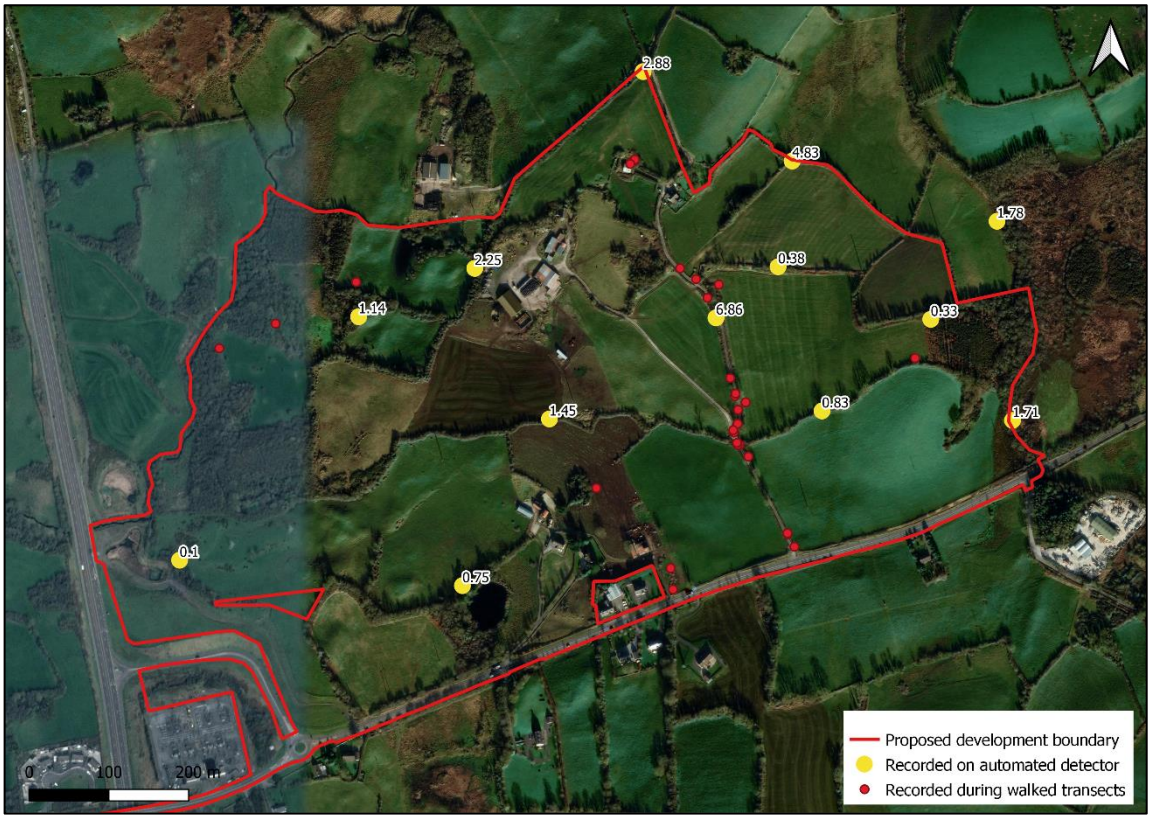

Figure 7.17 *Location of brown long-eared bat calls recorded during both walked transects and automated static bat detector deployment, along with the average number of brown long-eared bat calls recorded per night during the static deployment only*

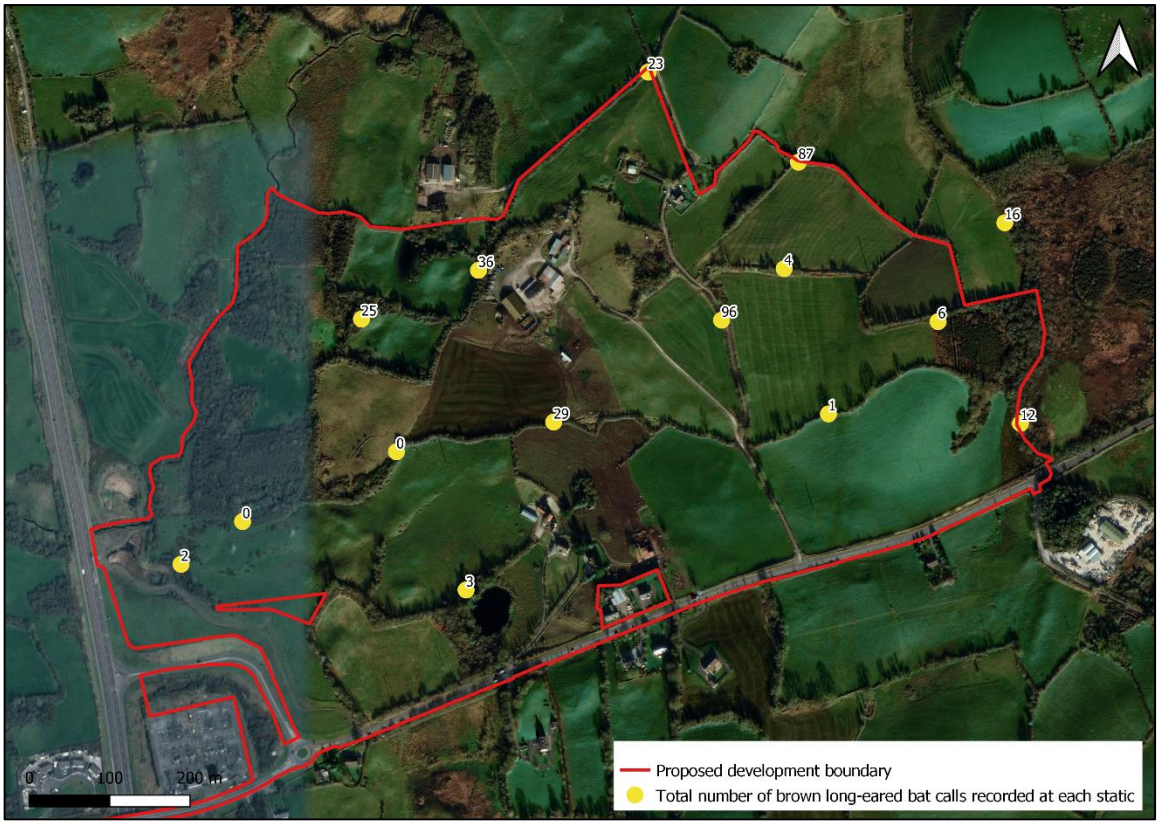

Figure 7.18 *Total number of brown long-eared bat calls recorded at each static*

Roost emergence/re-entry surveys

One brown long-eared bat roost was identified within one of the 16 buildings on site (*i.e.* BB 5B). Two individuals were observed emerging from features in the interior wall inside this farm building, where it was densely covered in ivy. Following emergence, these bats proceeded to fly around barn, possibly warming up before emerging from the building to feed. One of the individuals also landed on a wooden supporting beam, where surveyors could identify the species as brown long-eared and record the brown long-eared calls on the handheld bat detector. Both individuals emerged after *c.* 20 minutes within the building.

Brown long-eared bat calls were also recorded during numerous other emergence/re-entry surveys on site, however no other brown long-eared bat roosts were identified. Activity was recorded near the farm buildings and residential houses, in the south of the site (*i.e.* BB 1A, 1B, 2, 3, 8), with activity noted primarily along hedgerows and treelines adjacent to the buildings. Brown long-eared bat was also identified in the north near BB 5A. These arelikely to be the individual bats commuting to/from foraging sites and their roost in BB 5B.

Evaluation

Whilst brown long-eared bat were not the most frequently identified bat species within the site with other species showing higher levels of activity, they were recorded widely across the site, as demonstrated by the results from the static bat detector surveys. It is possible that brown long-eared bats were under-recorded within the proposed development site, due to their short, quiet echolocation calls which can go undetected

by bat detectors[31]. Static bat detectors would be more likely to record the calls as they are deployed all night and brown long-eared typically emerge an hour after sunset, however, the bats would have to be flying relatively close to the detectors to be picked up as the detection of these calls by bat detectors is limited to a distance of approximately 0.7m (Aughney and Roche, 2008[32]). On this basis, a precautionary principle has been applied, and it has been assumed that most hedgerows and treelines within the site are important for foraging and commuting brown long-eared bats, particularly heavily wooded areas such as the woodland area in the north west, the mature treelined Toureen Laneway and the mature hedgerow along the northern boundary. Toureen Laneway is particularly important for this species as it connects the roost building (BB 5B) to the wider landscape via hedgerows and treelines.

As brown long-eared bats are widely distributed across the country and have also shown a stable increasing population trend[31] , due to the presence of a roost within the site, and the widespread distribution of this species across the site, this local population of brown long-eared bat is considered to be of local importance (higher value).

Leisler's bat

Transect surveys

Full details from each transect survey are provided above in Appendix 7.6, and locations of each of the recorded Leisler's bat calls are shown on Figure 7.19–7.20. Leisler's bats were the third most commonly identified species during transect surveys of the proposed development, and calls were detected on all three transects carried out in 2020, and both transects in 2018. Areas with the highest levels of activity were along Toureen Laneway, and in the wet grassland habitat adjacent to Toureen Lough. Whilst this species was identified with higher numbers of calls in similar areas in 2018 i.e. Toureen Laneway and Toureen Lough, activities levels in 2018 were a lot lower than activity levels in 2020. Very little activity was recorded in the woodland in the north west, which differs from the all other bat species identified within the lands. This is likely due to the feeding preferences of Leisler's bat, as it is an exclusively aerial-hawking species[33], foraging up to heights of 30m. Although this species was identified from calls along hedgerows and treelines, this likely just reflects the walking route that was undertaken by surveyors, potentially resulting in missed commuting and/or foraging Leisler's bats that were feeding at a height over the fields and pastures. In this essence, whilst treelines and hedgerows are important for this species, they are less likely to be impacted directly from the removal of these features. High buildings or structures could pose collision risk issues for this species as a result.

Static detector surveys

Leisler's bat were detected on 14 out of 15 static detectors deployed in 2020, and 11 out of 14 in 2018. Activity levels were highest in the north of the site, along Toureen

[31] Aughney, T., Langton, S. & Roche, N. (2011) Brown long-eared bat roost monitoring scheme for the Republic of Ireland: synthesis report 2007-2010. Irish Wildlife Manuals, No. 56. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

[32] Aughney, T & Roche, N. (2008) *Brown long eared bat Plecotus auritus Roost Monitoring 2007, Irish Bat Monitoring Programme.* Bat Conservation Ireland www.batconservationireland.org.

[33] Vincent Wildlife Trust, Ireland. Species profile – Leisler's bat. Accessed here: https://www.vincentwildlife.ie/species/leislers-bat

Laneway, and along the southern mot hedgerow associated with the laneway. Little to no activity was recorded in the west, particularly the south west, south of the woodland habitat. Static detectors deployed in 2018, had significantly lower numbers of calls picked up on detectors, however activity was highest along Toureen Laneway, and in the north of the site.

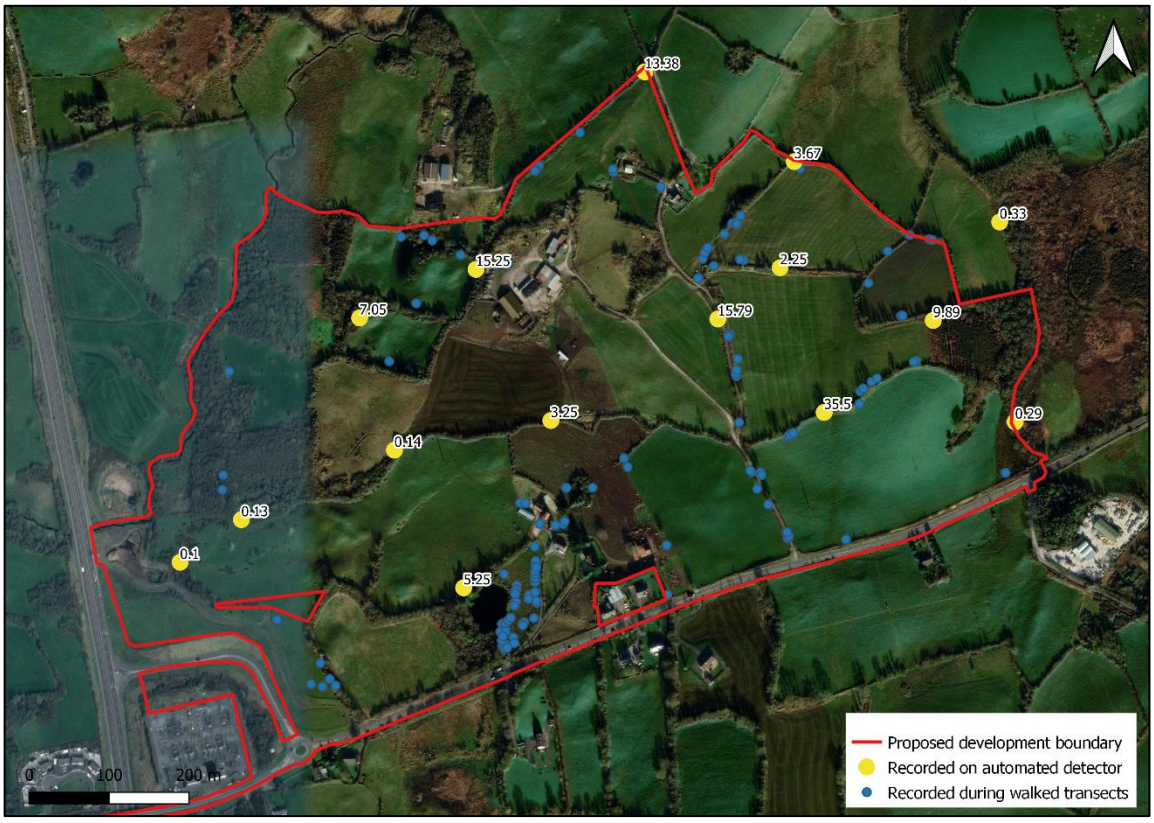

Figure 7.19 *Location of Leisler's bat calls recorded during both walked transects and automated static bat detector deployment, along with the average number of Leisler's bat calls recorded per night during the static deployment only*

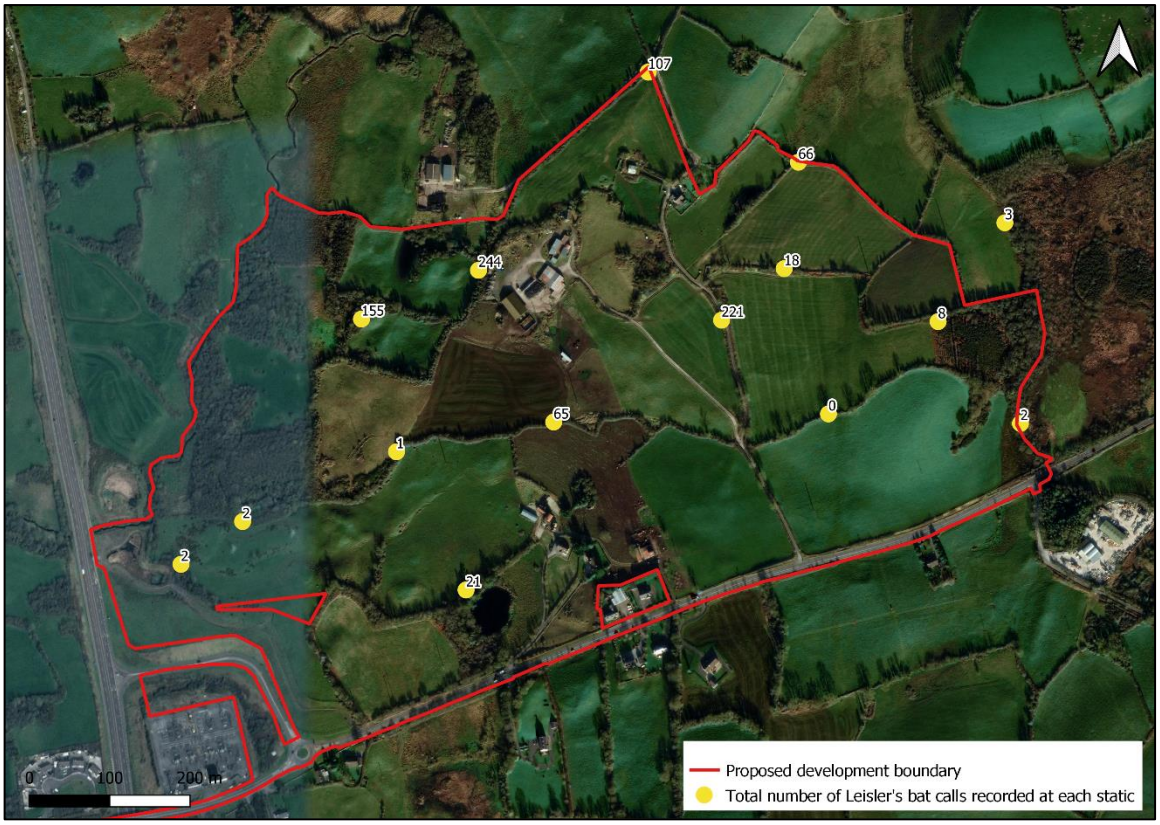

Figure 7.20 *Total number of Leisler's bat calls recorded at each static*

Roost emergence/re-entry surveys

There were no Leisler's bat roosts identified within the proposed development site. Leisler's are predominantly tree roosting bats but can occasionally roost in buildings as nursery roosts[33]. Roost emergence/re-entry surveys on trees were not carried out.

Evaluation

Leisler's bats were recorded in high numbers across the site, particularly in surveys carried out in 2020. They are known to have a widespread distribution across the region, and in Ireland (Roche *et al.*, 2014), however Leisler's bats tend to show a southern bias in their distributions, with greater numbers occurring in the south west and east of the country than in the north. Populations of this species have shown to be increasing in recent years. Leisler's are high flying bats, and as such, they may have been using areas not covered by detectors (middle of fields etc.), and therefore potentially not identified. However, Leisler's bat calls are typically loud and can be heard from a significant distance away, and would likely have been picked up by static and/or handheld detectors despite this. Given the high suitability of the site for this species, and the increasing population trends, particularly in the south west of the country, the local population of Leisler's bat is valued as being of local importance (higher value).

Myotis sp.

Transect surveys

Full details from each transect survey are provided above in Appendix 7.6, and locations of each of the recorded *Myotis* sp. calls identified are shown on Figure 7.21–

7.22. *Myotis* sp. was identified on all three transect surveys undertaken in 2020, and during one transect survey undertaken in 2018. Higher activity levels were mainly associated with Toureen Laneway, and in areas close to the barns/farm buildings in the north (*i.e.* BB 6C and BB 5B). There was very little activity recorded in the south western and eastern areas of the site. Similarly, very few *Myotis* sp. calls were recorded during transect surveys undertaken in 2018.

Static detector surveys

Myotis sp. were identified on all 15 static detectors in 2020, and all 14 detectors in 2018. Although *Myotis sp.* calls were widespread across the site, activity levels were varied. Detectors on the eastern boundary of the site adjacent to wetland features, and Toureen Laneway, had the highest number of calls and highest average number of calls per night. Daubenton's bat, a *Myotis* sp. bat that typically feeds above water by gleaning insects from the surface[34], was are likely to use the areas of open water located within the eastern section of the site site as feeding habitat. Toureen laneway is lined with mature ash and oak trees, and with high numbers of calls from *Myotis* sp. identified along this corridor, Natterer's bat could potentially be the *Myotis* sp. foraging along here. The woodland in the north west had moderate levels of activity, particularly on the southern edge. The highest levels of *Myotis* sp. recorded in the 2018 surveys were located in the north west of the site, in the woodland habitat.

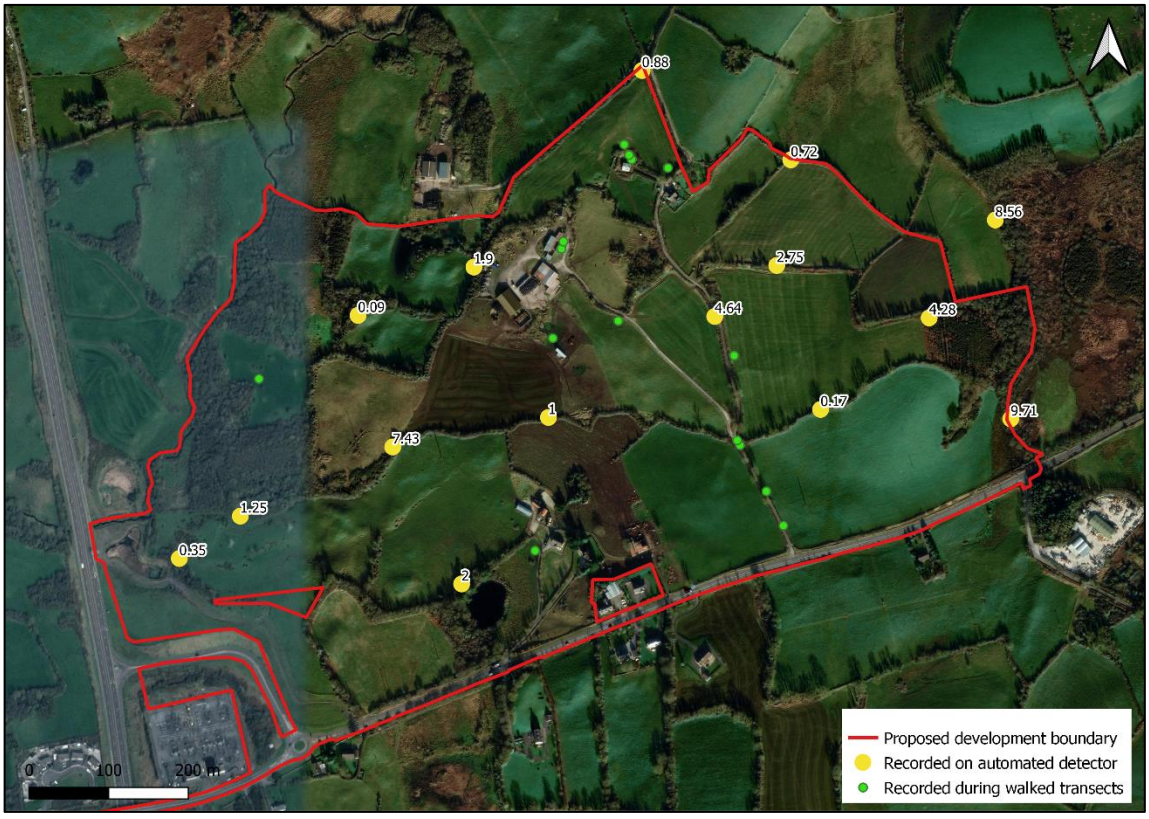

Figure 7.21 *Location of Myotis sp. bat calls recorded during both walked transects and automated static bat detector deployment, along with the average number of Myotis sp. calls recorded per night during the static deployment only*

[34] *Daubenton's bat, Woodland Trust.* Accessed here: https://www.woodlandtrust.org.uk/trees-woods-and-wildlife/animals/mammals/daubentons-bat/

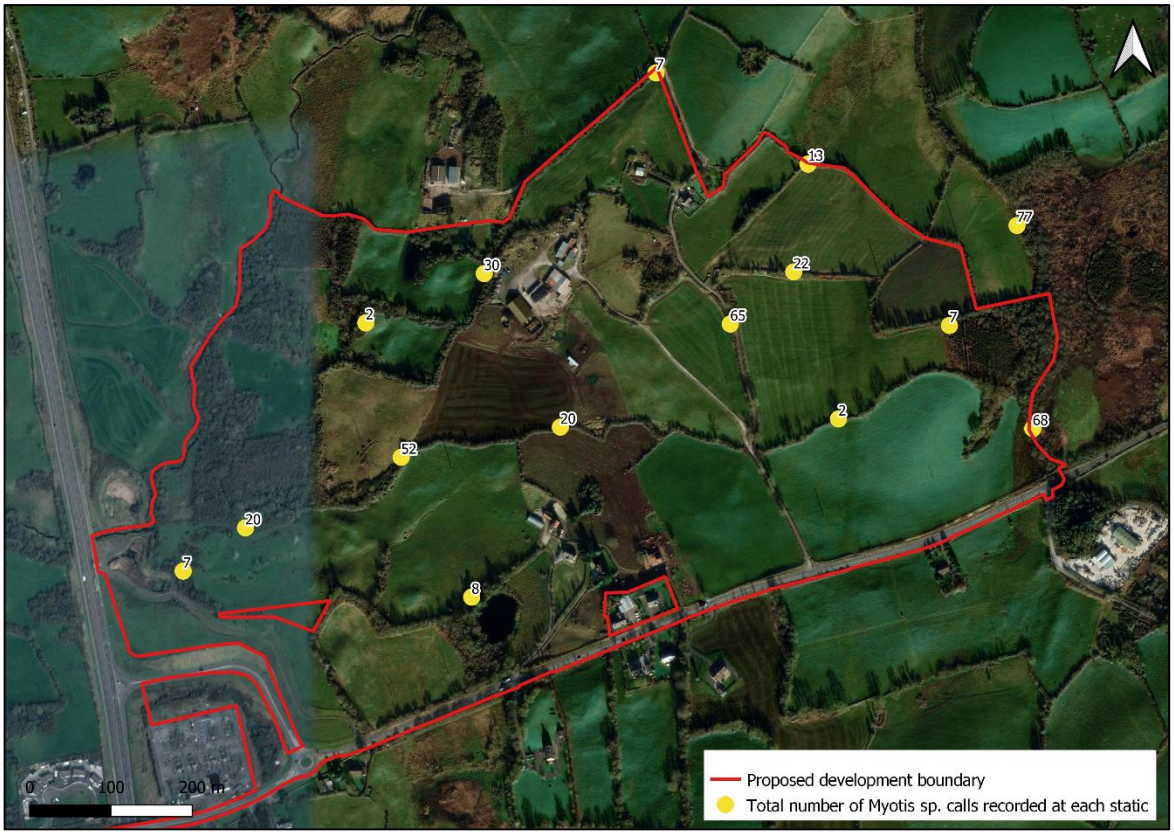

Figure 7.22. *Total number of Myotis species calls recorded at each static*

Roost emergence/re-entry surveys

There were no *Myotis* sp. bat roosts identified within the proposed development. *Myotis* sp. bats can roost in a range of roost types, including buildings and trees.

Evaluation

Whilst widely recorded within the proposed development site, moderate levels of activity were observed from the various survey types carried out. Commuting routes along hedgerows and treelines are important corridors for these species who prefer to feed close to vegetation to avoid predation[35]. *Myotis* bat species, including Daubenton's bat, whiskered bat and Natterer's bat have a relatively wide but dispersed distribution throughout Ireland. Bat species of the genus *Myotis* were associated most commonly with habitats within the west and east of the site, *i.e.* the woodland area, and the wetlands in the east. Outside of the subject lands the next closest area of significant woodland is *c.* 110m south. Similarly, certain species in the genus *Myotis* (*i.e.* Daubenton's bat) perform the majority of its foraging over water. Numerous smaller waterbodies are present outside of the subject lands, such as the larger lakes of Holaan Lough, located *c.* 500m south-east of the subject lands, Girroga Lough located *c.* 2.3km west, and Ballyallia Lake located *c.* 2.6km north-west, and a smaller lough, Ballymacahill Lough, located c. 250m north of the subject lands. Given the widespread distribution of bats of the genus *Myotis* and the availability of similar habitat (woodland

[35] Jones, G., Rydell, J. (1994) Foraging strategy and predation risk as factors influencing emergence time in echolocating bats. Philosophical Transactions Of The Royal Society Of London. Series B: Biological Sciences, *346*(1318), 445-455.

and waterbodies) within the immediate surrounding environment, the local population of *Myotis* sp. is considered to be of local importance (higher value).

Tree surveys

The habitat within the lands provides excellent commuting and foraging routes for bats within the area. The treelines and hedgerows within and along the boundaries of the site follow linear routes which are connected to treelines and hedgerows in the surrounding area. The subject lands are unlit by adjacent roads or buildings, and therefore are suitable for foraging bats. A total of 17 trees (*i.e.* 14 Ash *Fraxinus excelsior* and three sycamore *Acer pseudoplatanus)* were identified to have the potential to support roosting bats within the proposed development site (Figure 7.23). 14 of these trees were deemed as having low potential, with two trees deemed as having moderate potential, and one deemed as having high potential, assessed in accordance with Collins *et. al* (2016) bat survey guidelines (Figure 7.23).

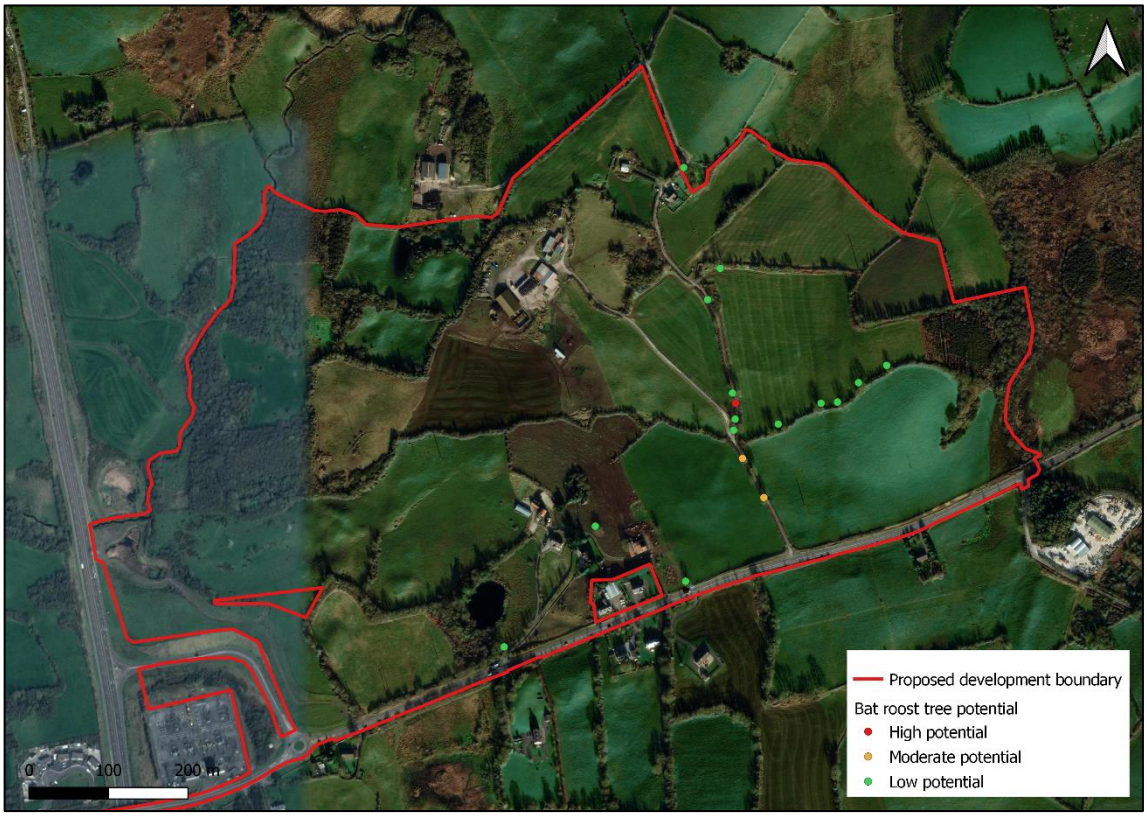

Figure 7.23 *Location of trees with potential bat roost features*

7.3.3.6 Fish

Fish species are protected under the Fisheries Acts and by fishing bye-laws. Atlantic salmon, river lamprey, sea lamprey and brook lamprey are listed on Annex II of the EU Habitats Directive.

The proposed development site lies within the Fergus_SC_040 catchment. The EPA segment of the Spancelhill Stream which is contained within the study area is Spancelhill_010. Spancelhill_010 segment is c. 7.5km and consists of the channel of the Spancelhill Stream from its starting point in O'Briens Big Lough, to where it joins the River Fergus downstream of the proposed development site. The Spancelhill Stream and the River Fergus have not been surveyed by Inland Fisheries Ireland (IFI)

for their Ecological Fish Status. There are five Annex II fish species found within the Lower River Shannon SAC, *i.e.* sea lamprey *Petromyzon marinus*, brook lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis*, Atlantic salmon *Salmo salar* and twaite shad *Alosa fallax*, the four former species of which are Qualifying Interests of the SAC. The three lamprey species and Atlantic salmon have all been observed to be spawning in the Lower Shannon and its tributaries (NPWS, 2013d). There was one fish species record, sea lamprey, identified within c. 2km returned from the desk study. While fish surveys were not carried out in the waterbodies within the proposed development site, Toureen Lough, and the M18 Attenuation Pond have potential to hold populations of small fish species. Spancelhill Stream is not suitable for salmonid species due to the heavy poaching from cattle using the stream from nearby lands. This poaching has resulted in very silty, soft substrate, and little instream vegetation. Instream vegetation is important for rivers/streams used by salmonid species, as it provides protection from predators[36]. Lamprey species tend to live in soft substrate, where they can hide from predators[37]. As this habitat is present along the Spancelhill Stream that borders the proposed development site, there is potential for lamprey species to be directly impacted from the installation of the drainage pipes, headwall and mattress.

Annex II fish species are classified as being of international importance, while non-Annex II fish species are classified as being of local importance (higher value).

7.3.3.7 Invertebrates

White-Clawed Crayfish Austropotamobius pallipes

White-clawed crayfish are legally protected under the Wildlife Acts and are also listed on Annex II of the Habitats Directive. Ireland remains the only part of the EU with no introduced species of crayfish, as such is of key conservation concern.

The desk study did not return any records for white-clawed crayfish within 2km of the proposed development. The closest record for this species is located in Lough Cullaunyheeda, c. 10.1km south-east of the proposed development and is not hydrologically linked to the site. Although this species is not known to be within the River Fergus Catchment, this species is present in the Shannon Catchment[38], and therefore populations could expand into the River Fergus Catchment, which has a direct hydrological link to the proposed development site via the Spancehill Stream. The local population of white-clawed crayfish is therefore considered to be of local importance (higher value).

Freshwater Molluscs (including freshwater pearl mussel Margaritifera margaritifera)

The freshwater pearl mussel population of the Lower River Shannon SAC is present in the Cloon River, which is located in a different river catchment to that of the proposed development, *c.* 20.5km south west of the proposed development (NPWS, 2012a). The

[36] Marsh, JE, Lauridsen, RB, Gregory, SD, et al. Above parr: Lowland river habitat characteristics associated with higher juvenile Atlantic salmon (Salmo salar) and brown trout (S. trutta) densities. Ecol Freshw Fish. 2019; 00: 1– 15.

[37] Lamprey habitats, Lamprey Surveys and consultancy advice UK & Ireland. Found here: https://lampreysurveys.com/lamprey-habitats/

[38] Reynolds, J.D., O'Connor, W., O'Keeffe, C. & Lynn, D. (2010) A technical manual for monitoring white-clawed crayfish Austropotamobius pallipes in Irish lakes. Irish Wildlife Manuals, No 45, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

desk study returned no records for freshwater mollusc species and will not be considered further.

Marsh Fritillary Euphydras aurina

Marsh fritillary are legally protected under Annex II of the Habitats Directive. Surveys for marsh fritillary were not carried out as part of this assessment. In an Irish context, the conservation status of these species in Ireland is designated as 'Vulnerable' (Regan *et al.* 2010).

The desk study did not return records for marsh fritillary within the footprint of the proposed development. Desk study records in the wider area were largely historical (pre-1980s). The most recent record was from 2011 and located c. 800m north west of the proposed development site in Cappagh More. Although specific butterfly surveys were not carried out within the proposed development, the site was surveyed for various other species multiple times (See Table 7.1), and any evidence of this species would have been identified if present. This species was not identified within the proposed development site during surveys carried out in 2018 and 2020.

Marsh fritillary are restricted to habitats containing a low, open sward with abundant devil's-bit scabious *Succisa pratensis* including sand dunes, calcareous grassland, fens, raised and blanket bogs, upland heaths and grasslands. Calcareous grass is present within the footprint of the proposed development site and outside the footprint of the development. Suitable habitat for marsh fritillary, namely devil's-bit scabious, was not identified within the proposed development, and as such the site is not suitable for this species and is not considered further.

Other invertebrates

The desk study returned records for 26 species listed on Ireland Red List No. 4 (Regan *et al.* 2010), and Ireland Red List No. 6 (Nelson *et al.* 2011), within c. 2km of the proposed development site. There were no Red Listed or rare bee species records identified within c. 2km of the proposed development site. None of these species were identified within the proposed development site during surveys carried out in 2018 or 2020.

14 of the 18 red-listed butterfly species records identified were of Least Concern. The remaining four species included; small heath *Coenonympha pamphilus* (Near Threatened) with the most recent record from 1978, wall butterfly *Lasiommata megera* (Endangered) with the most recent record from 1998, wood white *Leptidea sinapis* (Near threatened) with the most recent record from 2006, and marsh fritillary (as described above). Butterfly are known to favour nectar-rich flowers which provide larval foodplants, preferred species include cock's-foot grass *Dactylis glomerata*, bird's-foot trefoil *Lotus corniculatus*, common nettle *Urtica dioica*, cuckoo flower *Cardamine pratensis*, garden nasturtium *Tropaeleum majus*, common holly *Ilex aquifolium* and common ivy *Hedera helix* (Butterfly Conservation Ireland 2020).

The remaining eight red-listed species identified within c. 2km of the proposed development included six species of damselfly, and two species of dragonfly, all listed as species of Least Concern (Appendix 7.2).

Corresponding habitats within the proposed development are located in dry meadows and grassy verges (GS2), amenity grassland (GA2), dry calcareous and neutral grassland (GS1) habitats, wet grassland (GS4) and the various wetland habitats within the site (Toureen Lough, Lough Ardnamurry, M18 Attenuation pond). Species diversity

was low in terms of foodplants in these habitats. Butterfly communities that are known to survive in highly fragmented landscapes are mobile species that can feed off a range of plants (Öckinger *et al.* 2010).

The local invertebrate population is considered to be of local importance (higher value).

7.3.4 Summary of Ecological Evaluation

Table 7.12 below summarises the ecological evaluation of all receptors taking into consideration legal protection, conservation status and local abundance, and identifies the Key Ecological Receptors (KERs). Species, habitats and features not qualifying as KERs are not subjected to impact assessment in line with current best practice of assessing the impacts on what are determined to be important ecological or biodiversity features: CIEEM and TII guidelines (CIEEM, 2018 and National Roads Authority, 2009).

Table 7.12 *Summary of the ecological evaluation*

Ecological Receptor	Ecological Valuation	KER?
Designated Sites		
Lower River Shannon SAC	International	Yes
Ballyallia Lake SAC	International	Yes
Dromore Woods and Loughs SAC	International	Yes
Old Domestic Building (Keevagh) SAC	International	Yes
Old Domestic Buildings, Rylane SAC	International	Yes
Ballyallia Lough SPA	International	Yes
Slieve Aughty Mountains SPA	International	Yes
River Shannon and River Fergus Estuaries SPA	International	Yes
Corofin Wetlands SPA	International	Yes
All other SAC or SPA sites	International	No
Newpark House (Ennis) pNHA	National	Yes
Old Domestic Building (Keevagh) pNHA	National	Yes
Ballyallia Lake pNHA	National	Yes
Lough Cleggan Lake pNHA	National	Yes
Durra Castle pNHA	National	Yes
Dromore Woods and Loughs pNHA	National	Yes
Fergus Estuary and Inner Shannon, North Shore pNHA	National	Yes
All other NHA or pNHA sites	National	No
Habitats		
Wet Willow-Alder-Ash woodland (WN6) Alluvial woodland [*91E0]	International	Yes
Reed and large sedge swamp (FS1) *Cladium* Fen [*7210]	International	Yes

Ecological Receptor	Ecological Valuation	KER?
Designated Sites		
Dry calcareous and neutral grassland (GS1) Calcareous grassland [6210]	National	Yes
Wet grassland (GS4) Molinia meadows [6410]	National	Yes
Rich fen and flush (PF1) Alkaline fen [7230]	National	Yes
Oak-Ash-Hazel woodland (WN2)	County	Yes
Mesotrophic lake (FL4)	Local importance (higher value)	Yes
Depositing/lowland rivers (FW2)	Local importance (higher value)	Yes
Other artificial lakes and ponds (FL8)	Local importance (higher value)	Yes
Rich fen and flush (PF1)	Local importance (higher value)	Yes
Reed and large sedge swamps (FS1)	Local importance (higher value)	Yes
Marsh (GM1)	Local importance (higher value)	Yes
Dry calcareous and neutral grassland (GS1)	Local importance (higher value)	Yes
Wet grassland (GS4)	Local importance (higher value)	Yes
Hedgerows (WL1)	Local importance (higher value)	Yes
Treelines (WL2)	Local importance (higher value)	Yes
Oak-Ash-Hazel Woodland (WN2)	Local importance (higher value)	Yes
Immature Woodland (WS2)	Local importance (higher value)	Yes
All other habitats	Local importance (lower value)	No
Fauna Species		
Lesser horseshoe bat	International importance	Yes
Soprano pipistrelle	County importance	Yes
All other bat species	Local importance (higher value)	Yes
SCI Wintering birds	International importance	Yes
All other wintering birds	Local importance (higher value)	Yes
Otter	International importance	Yes
Grey wagtail	County importance	Yes
Other breeding birds	Local importance (higher value)	Yes
Pine marten	Local importance (higher value)	Yes
Other mammal species	Local importance (higher value)	Yes
Badger	Local importance (higher value)	Yes
Reptiles	Local importance (higher value)	Yes
Amphibians	Local importance (higher value)	Yes
Annex I Fish species	International importance	Yes
Other fish species	Local importance (higher value)	Yes
Freshwater molluscs	Local importance (lower value)	No

Ecological Receptor	Ecological Valuation	KER?
Designated Sites		
White-clawed crayfish	Local importance (higher value)	Yes
Marsh fritillary	N/A	No
Other invertebrates	Local importance (higher value)	Yes

7.4 CHARACTERISTICS OF THE DEVELOPMENT

The proposed development is to demolish a number of existing dwelling houses and farm outbuildings and to develop six data storage facilities, an energy centre, an Above Ground Installation (AGI) building, a vertical farm, a substation compound and associated ancillary development on a c. 60ha greenfield site (currently used for agriculture and hosting power transmission infrastructure) in the townlands of Tooreen and Cahernalough, Ennis, Co. Clare. The development is fully described in Chapter 2 Description of the Proposed Development. This section outlines the characteristics of the development in relation to biodiversity.

Figure 7.24 presents the site layout for the proposed masterplan. The footprint of the proposed development occupies c. 17.3ha of the c. 60ha development site; the site layout reserves c. 10 ha of lands as ecological buffer zones. The indicated buffer zones on Figure 7.24 were delineated following assessment undertaken as part of the area assessment within the Clare County Development Plan 2017 – 2023 (Variation No. 1).

To facilitate the footprint of the development, there will be a total loss of 2.7km of hedgerows, and 30 trees. There will also be approximately 1,525m^2 of scrub being removed. In order to ensure the site continues to remain suitable for local wildlife species, there will be replacement planting of 4.86km of new native hedgerows, 57 new native trees and 58,567m^2 of native woodland planting. The proposed planting plan will be carried out in phases, with the first phase carried out pre-construction before any removal of vegetation takes place. In order to reduce the amount of soil being removed from the lands, berms will be utilised in a number of places within the proposed development. These areas will be planted with woodland species, and will further screen the development. The proposals for the site have been prepared taking account of the of the All-Ireland Pollinator Plan with the majority of the species proposed in the various habitats recommended in the Plan. Further details on the landscaping proposals and phasing of the development can be found in Chapter 10 *Landscape And Visual Impact Assessment* of the EIAR[39], The Landscape and Biodiversity Management Plan[40], and the Landscape Design Strategy[41] that will be submitted as part of this application.

[39] Chapter 10 *Landscape and Visual Impact Assessment.* Nicolas de Jong Associates (July 2021)

[40] *Landscape and Biodiversity Management Plan, Art Data Centres – Ennis Campus*. Nicholas de Jong Associates (July 2021)

[41] *Landscape Design Strategy, Art Data Centres – Ennis Campus.* Nicholas de Jong Associates (July 2021)

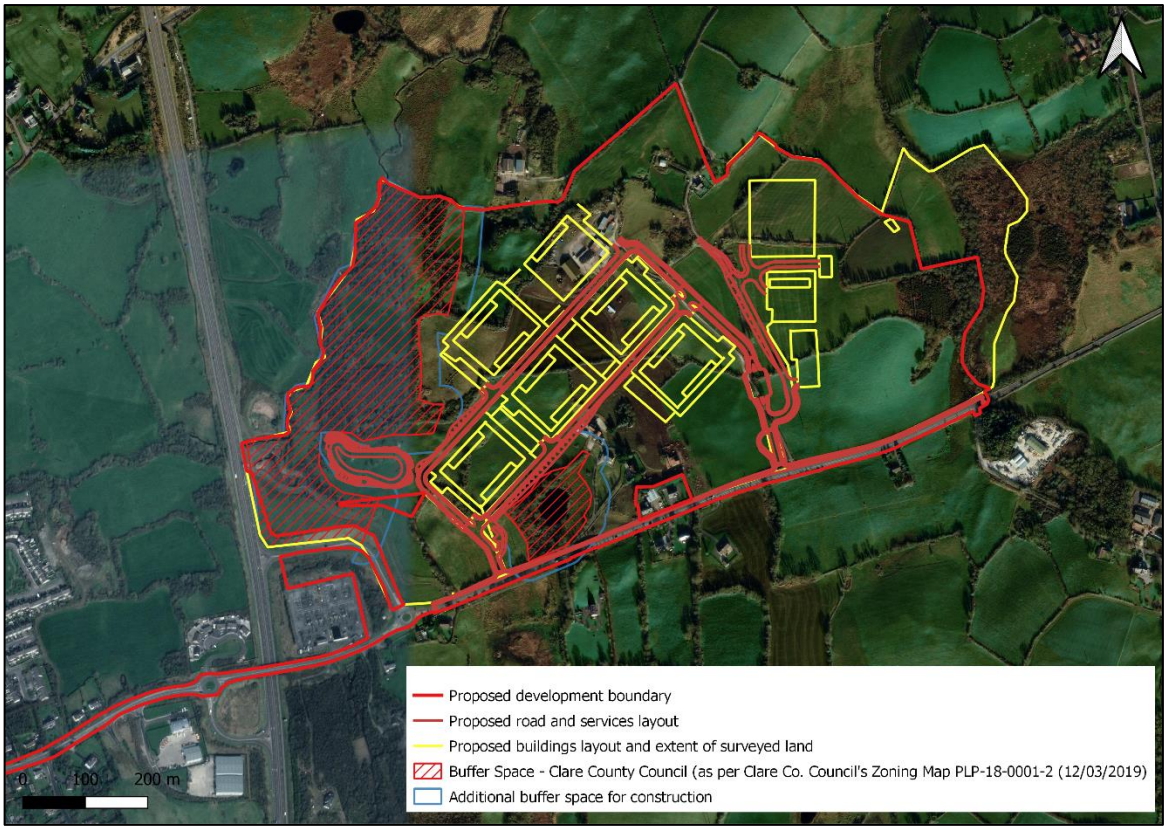

Figure 7.24. *Proposed layout. Red hatched areas show the buffer zones included in the proposed development.*

Foul water

There is an existing 225mm diameter foul drain that forms part of an existing foul drainage network that services the existing Knockanean area southwest of the proposed development along the existing Tulla Road/R352. This existing foul drain discharged to the existing Pumping Station of Gort Na mBlath located approximately 550m further west from the proposed development. It is proposed to convey and discharge all domestic foul flows generated from the proposed development into the existing Gort Na mBlath Pumping Station. A temporary trench excavation along the Tulla road will be undertaken to facilitate pipe laying for connection with existing public wastewater sewer and mains water supply.

There is no trade effluent proposed for this development. Foul sewage will be collected from site (data storage facility, offices and energy centre washroom facilities and canteen) and discharged through a new pumping station which will be constructed as part of this proposed development, to the foul drainage network which runs along the Tulla Road and ultimately discharges to Ennis North (Clonroadmore) Wastewater Treatment Plant (WWTP) Reg D0048. Ennis North WWTP has no capacity issues and consultation with Clare County Council has confirmed that sufficient wastewater capacity is available and a pre-connection enquiry PCE application form has been submitted to Irish Water (IW).

Surface water

The proposed surface water drainage design for the development comprises various drainage components including positive stormwater networks, attenuation systems and several Sustainable Drainage System (SuDS) elements. Stormwater will be

attenuated on site for the 1:1000 yr flood event. An over flow subsurface pipeline will discharge at current discharge rates (greenfield) to the Spancelhill Stream (also known as Ballymacahill River).

The roofs, yards and internal access roads proposed throughout and within the footprint of the proposed development will be drained through a sealed drainage system that will ultimately be collected by gullies and conveyed through a series of proposed storm water pipes prior to discharging into a proposed open attenuation basin. There will be no direct discharge from hardstand area to swallow holes or existing pond features within the site boundary. Further details are provided in Chapter 7 of the EIAR and within the CSEA engineering reports and drawings[42] prepared for planning.

7.5 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

As per the relevant guidelines, significant effects have only been assessed for KERs, as listed in Table 7.12. An impact is considered to be ecologically significant if it is predicted to affect the integrity or conservation status of a KER at a specified geographical scale. All impacts are described in the absence of mitigation.

7.5.1 Construction Phase

7.5.1.1 Designated Sites

This section describes and assesses the potential for the proposed development to result in likely significant effects on European sites that lie within the ZoI of the proposed development. In the context of European sites this is focussed on the habitats and species for which the sites are selected (*i.e.* Qualifying Interest (QIs) for SACs and Special Conservation Interest species (SCIs) for SPAs) and the conservation objectives supporting their conservation status in each site. In the case of NHAs and pNHAs the assessment considers whether the integrity of any such site would be affected by the proposed development with reference to the ecological features for which the site is designated, or is proposed.

European sites

In the context of assessing whether the proposed development would be likely to result in an impact on the integrity of any European sites, the tests and assessment presented in the Natura Impact Statement (NIS) fulfil this role. The NIS considers whether the proposed development will affect the conservation objectives supporting the favourable conservation condition of any European sites' QIs/SCIs and as a result presents an assessment of whether the integrity of any European sites would be affected – *i.e.* if the proposed development would adversely affect the integrity of a European site, this would constitute a likely significant effect in the context of the EIA Directive.

The nature and scale of the proposed development, the identified potential impacts and their relationship to European sites were considered in order to determine which European sites were located within the ZoI of the proposed development, in view of best scientific knowledge and in view of conservation objectives, and therefore

[42] *Engineering Planning Report, Art Data Centre – Ennis Campus.* Clifton Scannell Emerson Associates (CSEA), July 2021

potentially at risk of the proposed development affecting their conservation objectives. The potential impacts associated with the proposed development are discussed below in relation to those European sites within its ZoI (see also Section 5 and Section 6 of the NIS[43]).

The Zone of Influence (ZoI) is a distance within which the proposed development could potentially affect the conservation condition of QI habitats or QI/SCI species of a European site.

The mechanism to define the ZoI is summarised as follows:

- Consider the nature, size and location of the proposed development;
- Consider the sensitivities of the ecological receptors;
- Identify impact sources and pathways; and
- Determine the ZoI based on the extent of the impact.

Considering the ZoI, in the absence of mitigation measures, the proposed development was assessed as having the potential to adversely affect the integrity of the following eight European sites (refer to Section 5 and Section 6 of the NIS[33]):

- Lower River Shannon SAC
- Dromore Woods and Loughs SAC
- Old Domestic Building (Keevagh) SAC
- Old Domestic Buildings, Rylane SAC
- River Shannon and River Fergus Estuaries SPA
- Ballyallia Lough SPA
- Slieve Aughty Mountains SPA
- Corofin Wetlands SPA

The locations of these European sites relative to the proposed development, and the predicted ZoI, are shown on Figure 7.5.

The following potential impacts on European sites have been identified based on the existing ecological environment and the extent and characteristics of the proposed development (see information provided below for detailed description of these potential impacts and relevant European site):

- Habitat loss and fragmentation;
- Habitat degradation/effects on QI/Sci species as a result of hydrological impacts;
- Habitat degradation as a result of hydrogeological impacts;
- Habitat degradation as a result of air quality impacts;
- Habitat degradation as a result of introducing/spreading non-native invasive species;
- Disturbance and displacement impacts; and
- Direct injury/mortality

As the proposed development does not traverse any European sites, there is no potential for habitat fragmentation of any European site to occur.

[43] *Natura Impact Statement, Art Data Centre – Ennis Campus.* Scott Cawley, May 2021

A potential source-pathway-receptor link exists between the proposed development site and the following European sites : Lower River Shannon SAC and River Fergus and River Shannon Estuaries SPA. This link is via the Spancelhill Stream, which flows along the north western boundary of the proposed development site, flowing downstream before joining the River Fergus and finally discharging into the Fergus Estuary. QI and SCI species/habitats of these European sites located downstream of the proposed development site are therefore at risk of habitat degradation, which may occur in the event of a pollution event affecting surface water quality. The Dromore Woods and Loughs SAC is located c. 4.5km north west of the proposed development site, and is upstream of the proposed development site. A portion of the River Fergus flows through this European site. The River Fergus then flows c. 9.3km downstream, via Ballyallia Lough SAC, and combines with the outfall of the River Fergus that connects with the Spancelhill Stream, upstream of this. There is therefore a hydrological link between the proposed development site and these aforementioned European sites.

Otters are QI species of the Lower River Shannon SAC and Dromore Woods and Loughs SAC, and therefore at risk from the proposed development should an accidental pollution event affect surface water quality. QI habitats within this European site are not at risk due to this European site being located upstream of the proposed development site.

There are a number of European sites in the vicinity of the proposed development that are designated for lesser horseshoe bat (Appendix 7.1). This species has been identified commuting and foraging within the proposed development site. The normal core foraging range for lesser horseshoe bat is within 2-3km of roosts, which sometimes extends up to 4km (Bontadina, 2002 and Biggane, 2003). This distance can reduce down to a few hundred metres in the birthing season whilst larger scale movements of up to c. 15km are not unreasonable when bats move between winter and summer roosts. The Core Sustenance Zone (CSZ) for this species is described as the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost. A review carried out by BCT of radio-tracked individuals, has defined the CSZ as within 2.5km of their roosts[44]. From research carried out in Galway on radio-tracked lesser horseshoe bats, this species has been shown to travel as far as c. 5.15km from roosts for foraging (Rush and Billington, 2014). In consideration of this, it is possible that individual lesser horseshoe bats recorded within the proposed development site may be connected to the populations of the following European sites located within 6km of the proposed development site: Old Domestic Building (Keevagh) SAC, Dromore Woods and Loughs SAC, and Old Domestic Buildings, Rylane SA. European sites outside of 6km from the proposed development will not be impacted by the proposed development as a result.

Ballyallia Lough SPA and Corofin Wetlands SPA are not hydrologically or otherwise connected to the proposed development site. However, a number of SCI species of these European sites were recorded within the proposed development site during the wintering bird surveys, and therefore the conservation objectives of these European sites could be indirectly impacted on a result of the proposed development site.

[44] NPWS (2018) *Conservation objectives supporting document – lesser horseshoe bat (Rhinolophus hipposideros) Version 1*. Conservation Objectives Supporting Document Series. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland.

As the NIS concluded, the potential impacts associated with the proposed development have the potential to affect the receiving environment and, as a result, the conservation objectives supporting the QIs/SCIs of eight European sites: Dromore Woods and Loughs SAC, Lower River Shannon SAC, Old Domestic Building (Keevagh) SAC, Old Domestic Buildings, Rylane SAC, Ballyallia Lough SPA, River Shannon and River Fergus Estuaries SPA, Slieve Aughty Mountains SPA and Corofin Wetlands SPA.

Lower River Shannon SAC

As described in Section 7.1 of the NIS, the proposed development has the potential to affect the qualifying interests and conservation objectives, and therefore the integrity, of the Lower River Shannon SAC because of the following:

Habitat degradation/effects on QI species as a result of hydrological impacts

The release of contaminated surface water runoff and/or an accidental spillage or pollution event into any surface water features during construction, has the potential to affect water quality in the receiving aquatic environment. Such a pollution event may include: the release of sediment into receiving waters and the subsequent increase in mobilised suspended solids; and the accidental spillage and/or leaks of containments (e.g. fuel, oils, lubricants, paints, bituminous coatings, preservatives, weed killer, lime and concrete) into receiving waters. The associated effects of a reduction of surface water quality could potentially extend for a considerable distance downstream of the location of the accidental pollution event or the discharge. The proposed development is hydrologically connected to the Spancelhill Stream and the River Fergus both of which discharge into the Fergus Estuary. Therefore, (albeit unlikely due to the distance between the main construction activities and watercourses) there is potential for the proposed development to result in effects which could have implications for the conservation objectives of Lower River Shannon SAC as a result of hydrological impacts.

Habitat loss and fragmentation

Otter are a QI species for Lower River Shannon SAC, which is downstream of the proposed development. Research carried out by Ó Néill et al. (2008) on ranging behaviours of otter on river systems in Ireland found that female otter ranges averaged *c.* 7.5km while male otter home ranges varied between *c.* 7-19km. Evidence of otter was identified within the proposed development site along Spancelhill Stream. As there is a hydrological connection between the proposed development and the European site (located *c.* 2.1km downstream), it is considered that the proposed development site is within the potential home range of otter associated with the Lower River Shannon SAC and, therefore, otter present within Spancellhill Stream at this location may be connected with this SAC population. Construction works within the Spancelhill Stream will include the installation of a grated culvert with associated headwall and mattress, with a total loss of $2m^3$ of bankside habitat. This habitat loss is considered to be temporary (2-3 weeks), and will be reinstated following completion of this. The total area of this installation will be $2m^3$. Therefore, the predicted habitat loss impact will not have any long-term effects on the QI otter population in terms of distribution/range, extent of available habitat, couch/holt sites, and barriers to connectivity. Therefore the impact on otter populations connected to the Lower River Shannon SAC as a result of direct habitat loss/fragmentation, is not considered to be significant.

The installation of this culvert, headwall and mattress, may require instream works. As the section of the Spancelhill Stream where works will be required has suitable habitat

for lamprey species, there is potential for the proposed development to directly impact these QI species, i.e. brook lamprey, river lamprey, and sea lamprey.

Indirect habitat loss as a consequence of severe habitat degradation arising from a reduction in water quality and/or change to the hydrological regime, could also affect the conservation status of the Lower River Shannon QI species, including: otter, sea lamprey, river lamprey, brook lamprey, and Atlantic salmon from the Lower River Shannon SAC.

Disturbance and/or displacement

A temporary and/or permanent increase in noise, vibration and/or human activity levels during the construction and/or operation of the proposed development could result in the disturbance to and/or displacement of QI otter populations present in the vicinity of the proposed development. Such disturbance effects would not be expected to extend beyond a distance of *c.* 150m[45] for the majority of the proposed development, as noise levels associated with general construction activities would attenuate to close to background levels at that distance and beyond. Noisy works associated with the proposed development could include piling works between c. 150-200m away from watercourses known to support otter. These potential impacts could occur to such a degree that the conservation objectives of the Lower River Shannon SAC are undermined. As the works are planned during the day, levels of noise would not be expected to be dissimilar to background traffic noise, to which the mostly nocturnal otter would be habituated to from the M18 Motorway directly west of the site. If works were required at night time, however, an increase in noise levels in close proximity to watercourses used by otter could result in disturbance impacting otter movements. Furthermore, temporary works that will be occurring adjacent to Spancelhill Stream for the construction of services pipes for drainage and fibre optics, and the installation of a headwall and mattress with culvert, could also result in disturbance. It is predicted that the disturbance could affect the local population over the short term, but that the local otter population could utilise other unaffected suitable habitat along the watercourse during this temporary period. This is not uncommon among otter who can maintain a number of resting sites within their territory[46].

The temporary works required in the bank of Spancelhill Stream, may also result in a disturbance and/or displacement of lamprey species in the watercourse, that are from the Lower River Shannon SAC. Lamprey species may utilise the soft, silty substrate within this section of the Stream for burrowing into, and therefore any instream works required may temporarily impact the conservation objectives of this QI species.

Therefore, there is potential for the proposed development to result in significant effects (albeit temporary) which could have implications for the conservation objectives of Lower River Shannon SAC as a result of disturbance/displacement impacts,

Habitat degradation as a result of introducing/spreading non-native invasive species

[45] This is consistent with Transport Infrastructure Ireland (TII) guidance (Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes and Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes) documents. This is a precautionary distance, and likely to be moderated by the screening effect provided by surrounding vegetation and buildings, with the actual ZoI of construction related disturbance likely to be much less in reality.

[46] Species Profiles: Otter. Vincent Wildlife Trust (VWT). Accessed here: https://www.vincentwildlife.ie/species/otter

No non-native invasive plant species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011 were present within, or in close proximity to, the proposed development. During construction and/or routine maintenance/management work, non-native species could potentially be introduced to terrestrial habitats located within downstream European sites via surface water features. The introduction and/or spread of these invasive species to downstream European sites could potentially result in the degradation of existing habitats present, in particular coastal habitats not permanently or regularly inundated by seawater. These species may outcompete other native species present, negatively impacting the species composition, diversity and abundance and the physical structural integrity of the habitat. This in turn could undermine the conservation objectives of these European sites. The proposed development is hydrologically connected to the Spancelhill Stream, River Fergus, both of which flow into the Fergus Estuary. Therefore, there is potential for the proposed development to result in significant effects which could have implications for the conservation objectives of the Lower River Shannon SAC as a result of invasive species spread.

Affecting the integrity of the Lower River Shannon SAC would result in a significant effect at the international geographic scale.

Dromore Woods and Loughs SAC

As described in Section 7.2 of the NIS, the proposed development has the potential to affect the qualifying interests and conservation objectives, and therefore the integrity, of Dromore Woods and Loughs SAC because of the following:

Habitat loss and fragmentation

Otter are a QI species for Dromore Woods and Loughs SAC, which is upstream of the proposed development. Research carried out by Ó Néill et al. (2008) on ranging behaviours of otter on river systems in Ireland found that female otter ranges averaged c. 7.5km while male otter home ranges varied between c. 7-19km. Evidence of otter was identified within the proposed development site along Spancelhill Stream. As there is a hydrological connection between the proposed development and the European site (located c.12km downstream), it is considered that the proposed development site is within the potential home range of male otters associated with the Dromore Woods and Loughs SAC and, therefore, otter present within Spancellhill Stream at this location may be connected with this SAC population. Construction works within the Spancelhill Stream will include the installation of a grated culvert with associated headwall and mattress, with a total loss of $2m^3$ of bankside habitat. This habitat loss is considered to be temporary (2-3 weeks), and will be reinstated following completion of this. The total area of this installation will be $2m^3$. Therefore, the predicted habitat loss impact will not have any long-term effects on the QI otter population in terms of distribution/range, extent of available habitat, couch/holt sites, and barriers to connectivity. Therefore the impact on otter populations connected to the Dromore Woods and Loughs SAC as a result of direct habitat loss/fragmentation, is not considered to be significant.

However, indirect habitat loss as a consequence of severe habitat degradation arising from a reduction in water quality and/or change to the hydrological regime, could affect the conservation status of this QI species from Dromore Woods and Loughs SAC.

Lesser horseshoe bat is a QI species for Dromore Woods and Loughs SAC which is located *c.* 4.5km north west of the proposed development site. This species has been recorded using the proposed development site for foraging and/or commuting during surveys carried out in 2018 and 2020. No roosts were identified within the site.

However, records from BCI (as discussed in Section 7.3.3.5), identified nine lesser horseshoe roosts within 2km of the proposed development site, with the closest being *c*. 430m south. Research carried out on this species has suggested that the majority of feeding activity takes place within c. 2-3km of roosts during the year with occasional movements in excess of *c.* 4km (Bontadina, 2002 and Biggane, 2003). This distance can reduce down to a few hundred metres in the birthing season whilst larger scale movements of up to 15km are not unreasonable when bats move between winter and summer roosts. The Core Sustenance Zone (CSZ) for this species is described as the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost. A review carried out by BCT of radio-tracked individuals, has defined the CSZ as within 2.5km of their roosts**Error! Bookmark not defined.**. From research carried out in Galway on radio-tracked lesser horseshoe bats, this species has been shown to travel as far as c. 5.15km from roosts for foraging (Rush and Billington, 2014). In consideration of this, a precautionary approach has been adopted and it has been assumed for the purposes of this assessment that the lesser horseshoe bats recorded within the proposed development site may be connected with the lesser horseshoe bat populations of Dromore Woods and Loughs SAC. Although there will be a loss of suitable habitats within the site for this species including 2.7km of hedgerows and 30 trees, the design layout of the proposed development has been designed to minimise the amount of suitable foraging and/or commuting habitat removal through an iterative process. However, as there will be a loss of lesser horseshoe bat foraging and/or commuting habitat to facilitate the development, therefore there is potential for the conservation status of this species to be compromised by the development in the absence of mitigation.

As Dromore Woods and Loughs SAC is located upstream of the proposed development site, there is no impact pathway for effects on designated QI habitats at risk of habitat loss and fragmentation.

Habitat degradation/effects on QI/SCI species as a result of hydrological impacts

As the Dromore Woods and Loughs SAC is located upstream of the proposed development, there is no potential for a pollution event of any magnitude to affect any QI habitats or associated plant species for which this European site is designated. However, as the proposed development is hydrologically connected to the River Fergus and there is potential for impacts to occur on otter populations (a mobile species) associated with Dromore Woods and Loughs SAC. The release of contaminated surface water runoff and/or an accidental spillage or pollution event into any surface water features during construction, or operation, has the potential to affect water quality in the receiving aquatic environment. Such a pollution event may include: the release of sediment into receiving waters and the subsequent increase in mobilised suspended solids; and, the accidental spillage and/or leaks of containments (*e.g.* fuel, oils, lubricants, paints, bituminous coatings, preservatives, weed killer, lime and concrete) into receiving waters. The associated effects of a reduction of surface water quality which could in turn negatively affect the otter population through direct contact with pollutants or a decline in fish prey. These potential impacts could occur to such a degree that the conservation objectives of Dromore Woods and Loughs SAC QI species are undermined.

Therefore, (albeit very unlikely due to the distance between the main construction activities and watercourses) there is potential for the Proposed development to result in effects which could have implications for the conservation objectives of Dromore Woods and Loughs SAC as a result of hydrological impacts.

Disturbance and displacement impacts

A temporary and/or permanent increase in noise, vibration and/or human activity levels during the construction and/or operation of the proposed development could result in the disturbance to and/or displacement of the otter population present in the vicinity of the proposed development. Disturbance and/or displacement effects on otter populations connected to Dromore Woods and Loughs SAC are as described above in Section 7.5.1.1 under the Lower River Shannon SAC heading., and are considered to be a temporary potential impact on this QI species.

Lesser horseshoe bat, a QI species for Dromore Woods and Loughs SAC, have been identified using the site as foraging and/or commuting grounds predominately located along hedgerows and treelines within the site, and along the woodland area in the north west of the proposed development. There are no lesser horseshoe bat roosts within the proposed development site. The closest roost identified to the site is approximately c. 430m south, in Kilfelim. It is considered likely that Dromore Woods and Loughs SAC is within the normal core foraging range and the normal commuting range of this species. Research carried out on this species has suggested that the majority of feeding activity takes place within *c.* 2-3km of roosts during the year with occasional movements in excess of c. 4km (Bontadina, 2002 and Biggane, 2003). This distance can reduce down to a few hundred metres in the birthing season, with research carried out in Galway on radio-tracked lesser horseshoe bats, this species has been shown to travel as far as c. 5.15km from roosts for foraging (Rush and Billington, 2014). Larger scale movements of up to c. 15km are not unreasonable when bats move between winter and summer roosts. The Core Sustenance Zone (CSZ) for this species is described as the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost. A review carried out by BCT of radio-tracked individuals, has defined the CSZ as within 2.5km of their roosts. There will be removal of treelines and hedgerows within the footprint of the development, and additional lighting proposed. In the absence of mitigation, removal of suitable foraging and commuting habitat within the proposed development site, and an increase in light levels may potentially indirectly impact on lesser horseshoe bat species that utilise the site for roosting, foraging and/or commuting by making it unsuitable.

Therefore, there is potential for the proposed development to result in effects which could have implications for the conservation objectives of Dromore Woods and Loughs SAC as a result of disturbance/displacement impacts.

Affecting the integrity of the Dromore Woods and Loughs SAC would result in a likely significant effect at the international geographic scale.

Old Domestic Building (Keevagh) SAC & Old Domestic Buildings, Rylane SAC

As described in Section 7.3 of the NIS, the proposed development has the potential to affect the qualifying interests and conservation objectives, and therefore the integrity, of the Old Domestic Building (Keevagh) SAC, and Old Domestic Buildings, Rylane SAC because of the following:

Habitat loss and fragmentation

Lesser horseshoe bat is a QI species for Old Domestic Building (Keevagh) SAC which is located c. 4.3km south east of the proposed development site, and Old Domestic

Buildings, Rylane SAC, located c. 5.9km north east. This species has been recorded using the proposed development site for foraging and/or commuting during surveys carried out in 2018 and 2020. Habitat loss and fragmentation impacts on lesser horseshoe bat populations from Old Domestic Building (Keevagh) SAC and Old Domestic Buildings, Rylane SAC, are as described above in Section 7.5.1.1. under the Dromore Woods and Lough SAC heading. As there will be a loss of lesser horseshoe bat foraging and/or commuting habitat to facilitate the development, therefore there is potential for the conservation status of this species to be compromised by the development in the absence of mitigation.

Disturbance and displacement

A temporary and/or permanent increase in noise, vibration and/or human activity levels during the construction and/or operation of the proposed development could result in the disturbance to and/or displacement of QI populations present in the vicinity of the proposed development. Lesser horseshoe bat, a QI species for Old Domestic Building (Keevagh) SAC, and Old Domestic Buildings, Rylane SAC, have been identified using the site as foraging and/or commuting grounds, predominately located along hedgerows and treelines within the site, and along the woodland area in the north west of the proposed development. Results from the surveys carried out within the proposed development site can be found above in Section 7.3.3.5. There will be removal of treelines and hedgerows within the footprint of the development, and additional lighting proposed. In the absence of mitigation, removal of suitable foraging and commuting habitat within the proposed development site, and an increase in exiting light levels may potentially indirectly impact on lesser horseshoe bat species that utilise the site for roosting, foraging and/or commuting by making it unsuitable.

Therefore, there is potential for the proposed development to result in significant effects in the absence of mitigation which could have implications for the conservation objectives of Old Domestic Building (Keevagh) SAC, and Old Domestic Buildings, Rylane SAC as a result of disturbance/displacement impacts.

Affecting the integrity of the Old Domestic Building (Keevagh) SAC and Old Domestic Buildings, Rylane SAC would result in a likely significant effect at the international geographic scale.

Ballyallia Lough SPA, River Shannon and River Fergus Estuaries SPA, Slieve Aughty Mountains SPA and Corofin Wetlands SPA

As described in Section 7.3 of the NIS, the proposed development has the potential to affect the qualifying interests and conservation objectives, and therefore the integrity, of Ballyallia Lough SPA, River Shannon and River Fergus Estuaries SPA, Slieve Aughty Mountains SPA and Corofin Wetlands SPA because of the following:

Habitat degradation/effects on QI/SCI species as a result of hydrological impacts

The release of contaminated surface water runoff and/or an accidental spillage or pollution event into any surface water features during construction, or operation, has the potential to affect water quality in the receiving aquatic environment. Such a pollution event may include: the release of sediment into receiving waters and the subsequent increase in mobilised suspended solids; and, the accidental spillage and/or leaks of containments (*e.g.* fuel, oils, lubricants, paints, bituminous coatings, preservatives, weed killer, lime and concrete) into receiving waters. The associated effects of a reduction of surface water quality could potentially extend for a considerable distance downstream of the location of the accidental pollution event or

the discharge. The proposed development is hydrologically connected to the River Fergus, which discharges into the Fergus Estuary and thereafter the River Shannon and River Fergus Estuaries SPA. Whilst Ballyallia Lough SPA and Corofin Wetlands SPA are upstream of proposed development, some of the SCI species overlap with the River Shannon and River Fergus Estuaries SPA *i.e.* teal, wigeon, whooper swan, black-tailed godwit and wetland and waterbirds. Therefore it cannot be excluded that SCI species from Ballyallia Lough and Corofin Wetlands SPA also feed in the River Shannon and River Fergus Estuaries SPA.

Therefore, (albeit unlikely due to the distance between the main construction activities and watercourses) this reduction in water quality (either alone or in combination with other pressures on water quality) could result in the degradation of sensitive habitats present within River Shannon and River Fergus Estuaries SPA, which in turn would negatively affect the SCI bird species that rely upon these habitats as foraging and/or roosting habitat. It could also negatively affect the quantity and quality of prey available to SCI bird species. These potential impacts could occur to such a degree that they result in significant effects which could have implications for the conservation objectives of Ballyallia Lough SPA, River Shannon and River Fergus Estuaries SPA, and Corofin Wetlands SPA.

Disturbance and displacement

A temporary and/or permanent increase in noise, vibration and/or human activity levels during the construction and/or operation of the proposed development could result in the disturbance to and/or displacement of SCI bird species present within the footprint and/or the vicinity of the proposed development. Such disturbance effects would not be expected to extend beyond a distance of *c.* 300m, as noise levels associated with general construction activities would attenuate to close to background levels at that distance and beyond. Construction activities such as piling could extend beyond a distance of c. 300m however, this will be occurring within the west of the footprint of the design, at Data Centre 6 and Data Centre 5.

There were five SCI species identified within the proposed development site during wintering bird surveys carried out on the site, these included: coot, mallard, gadwall, teal and lesser black-backed gull (see Section 5.1.3.3). Suitable habitat for these species was identified in the wetland habitats within the proposed development site, including; Toureen Lough, the M18 Attenuation Pond, the wetland in the east of the site (outwith the redline boundary), and the temporary pond features in the north west of the site. Toureen Lough, and the wetland feature in the north west, are within 300m of the footprint of the proposed development, and therefore are likely to be impacted by construction activities and SCI bird species may potentially be disturbed from these suitable habitats. The majority of the wetland habitat will be screened visually from the development by the existing planting and additional planting proposed (*i.e.* Toureen Lough and wetlands in the east, and attenuation pond in the west). During construction there will be an increase in noise and vibration within the site**Error! Bookmark not defined.**, however this is predicted to be a Moderate and Short-Term Impact at worst during initial ground works, reducing to Not Significant following this. The small temporary pond features in the north (floods in winter months only) will be directly adjacent to the proposed development construction. Whilst this alteration of suitable habitat will result in a temporary disturbance (*i.e.* over one winter period), due to the small numbers identified on this feature (<10 individuals), the size of the feature, and the suitable habitat in the surrounding lands (*i.e.* Ballymacahill Lough c. 250m north, Cahernalough Lough c. 550m north east, Holaan Lough c. 880m south east, O'Briens Big Lough c.3km north east) the disturbance and displacement impacts are not likely to result in effects which could have implications for the conservation objectives of Ballyallia

Lough SPA, River Shannon and River Fergus Estuaries SPA, and Corofin Wetlands SPA. There are no predicted impacts on SCI bird species during the operational phase of the proposed development, as noise levels are predicted to be Not Significant at the areas of suitable habitat within the site, and due to the establishment of additional and retained planting that will further screen wetland areas from any disturbance associated with the development.

The Slieve Aughty Mountains SPA is designated for breeding populations of hen harrier and merlin. There is no suitable breeding or foraging habitat within or near the proposed development for merlin, however suitable wintering roosting habitat for hen harrier was identified in the east of the site slightly outside the red line boundary, where a wetland/swamp habitat was located. Winter surveys carried out here did not identify any hen harrier using the site within or surrounding the lands. However, as suitable winter foraging/roosting habitat was identified, it cannot be ruled out that hen harrier may be impacted by the proposed development as a result of disturbance/displacement impacts. The suitable habitat extends outside the proposed development site in the east, and other areas of suitable wintering roosting/foraging habitat exist in close proximity to the proposed development in lowland wetland habitats, and within the Fergus Estuary downstream of the site.

Habitat loss and fragmentation

Records of hen harrier, an Annex I bird species were returned from the vicinity of the proposed development. Hen harriers have been found to travel up to 9km from nests (Arroyo et al., 2014), and the nearest European site designated for this species is Slieve Aughty Mountains SPA, c. 4.5km from the proposed development. This species is known to breed and forage in the summer on heather moorland and young forestry plantations where they nest on the ground. They will then spend winter in more coastal and lowland areas throughout Ireland. Therefore, there is potential that hen harriers associated with the Slieve Aughty Mountains SPA may hunt and roost during winter in the vicinity of the proposed development. However, dedicated hen harrier vantage point surveys were carried out within the proposed development and no individuals were identified within or in the adjoining lands. Given that the proposed development will sit into the landscape and the nearest building to suitable habitat to be constructed will be over 250m away, there is no potential for the proposed development and predicted habitat loss impact to have any long-term effects on the QI populations in terms of population trends, distribution/range, extent of available habitat or loss of territory on SCI populations of hen harrier associated with the Slieve Aughty Mountains SPA.

Direct injury/Mortality

The development has been designed so that the buildings will be set into the existing landscape and will be 40m maximum in height, will be screened by various landscaping features including tree and hedgerow planting carried out during the first phases of the development which will have matured by the time the buildings will be established. The development is also not on a known flight path for SCI and wintering bird species, with gull species typical flying height range up to 250m above sea level while foraging and travelling[47]. Given the small numbers of SCI species identified using the proposed development, most of which were located in the west or north west of the site, it is

[47] Thaxter, C., Ross-Smith, V., & Cook, A. (2015). How high do birds fly? A review of current datasets and an appraisal of current methodologies for collecting flight height data: Literature review. British Trust for Ornithology Research Report No. 666.

predicted that there is no potential for the proposed development to increase the collision risk to mobile SCI species which are present in the area, during the construction and operational phases.

The proposed development does not require any tall structures to be constructed (maximum height at 40m), and whilst hen harrier do tend to fly at lower altitudes[48], they were not identified within the site, and the only suitable foraging and roosting habitat is located outwith the redline boundary and the footprint of the site. As such there is no potential, for the proposed development to present a collision risk to hunting and/or breeding hen harrier, during the construction and operational phases. Therefore, there is no potential for the proposed development to result in mortality of SCI bird species associated with European sites

Affecting the integrity of the Ballyallia Lough SPA, River Shannon and River Fergus Estuaries SPA, Slieve Aughty Mountains SPA and Corofin Wetlands SPA would result in a likely significant effect at the international geographic scale.

Nationally designated sites

In the case of NHAs and pNHAs the assessment considers whether the integrity[49] of any such site would be affected by the proposed development with reference to the ecological features for which the site is designated or is proposed.

As the proposed development does not traverse any national site, there is no potential for habitat fragmentation of any national site to occur.

The boundaries of the Fergus Estuary and Inner Shannon, North Shore pNHA overlaps with the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA. In the absence of site synopses for this pNHAs, it has been assumed that these sites are designated for the same reasons as the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA. Similarly, the boundaries of Old Domestic Building (Keevagh) pNHA, Ballyallia Lake pNHA, and Dromore Woods and Loughs pNHA overlap with Old Domestic Building (Keevagh) SAC, Ballyallia Lake SAC, and Dromore Woods and Lough SAC. Therefore, the potential impacts during construction on these national sites would be as previously described above in Section 7.5.1.1, under their respective headings. These potential impacts could affect habitat and species within the pNHAs, and therefore, the integrity of the pNHAs which could potentially result in a significant negative effect at the national geographic scale.

Newpark House (Ennis) pNHA

There is no site synopsis available for this national site, however detail from Newpark House Hotel website[50], describes the site as containing “Irish Oak, beech and some magnificent specimens of lime and poplar.” This national site is not hydrologically connected or otherwise to the proposed development site, and as such the integrity of the pNHA is unlikely to be impacted from the proposed development site at any geographic scale.

[48] Madders, M. and Whitfield, D. P. (2006). Upland raptors and the assessment of wind farm impacts. *Ibis*, *148*, 43-56.

[49] Refer to Section 7.2.5 for definition and impact assessment methodology

[50] Newpark House Hotel. Available at: https://www.newparkhouse.com

Lough Cleggan Lake pNHA

This national site is located *c.* 4.9km west of the proposed development site and is designated for its diverse range of habitats and plant species. It is also of local importance for wintering waterfowl, including breeding populations of tufted duck and coot. These populations of tufted duck and coot may be connected to the individual coot birds that were recorded using the lands within the proposed development site.

The potential impacts of the proposed development on this pNHA are as outlined above for the SPAs: an accidental pollution event during construction that may affect surface water in the local environment and in turn result in the degradation of habitats that may support these bird species; and, the potential for disturbance and displacement of these bird species from an increase in noise and vibration associated with the construction phase of the development.

These potential impacts could affect species within the pNHA, and therefore, the integrity of the pNHA which could potentially result in a significant negative effect at the national geographic scale.

Durra Castle pNHA

This national site is located *c.* 3.4km north east of the proposed development and is designated for nursery/breeding population of lesser horseshoe bat. This pNHA is within the normal foraging range of lesser horseshoe bats as previously described, and therefore, there is potential for individuals using the proposed development as foraging and/or commuting grounds, to be connected to this pNHA population, and therefore there is potential for this national site to be impacted as a result of the proposed development.

The potential impacts of the proposed development on this pNHA are outlined above in Section 7.5.1.1 for the SACs designated for lesser horseshoe bats, *i.e.* disturbance and displacement impacts from an increase in light levels and from the removal of suitable foraging and/or commuting grounds, and the loss of suitable habitat within the normal foraging range of this species.

These potential impacts could affect species within the pNHA, and therefore, the integrity of the pNHA which could potentially result in a significant negative effect at a national geographic scale.

7.5.1.2 Habitats

Habitat Loss

Construction of the proposed development will result in the loss of habitat area; totalling *c.* 17.7ha. With the exception of the Annex I habitat calcareous grassland [6210] located in the west of site, none of the habitats directly lost by the proposed development are considered to be any greater than of a local biodiversity importance (higher value). The majority of the habitats within the proposed development footprint (*c.*16.4ha) are of local biodiversity importance (lower value) and predominantly comprised:

- Buildings, artificial surfaces and bare ground (c. 1ha to be lost)
- Improved agricultural grassland (c. 11.4ha to be lost),
- Poor quality dry calcareous and neutral grassland (c. 1.0ha to be lost)

- A mosaic of recolonising bare ground, dry meadows and grassy verges, spoil and bare ground, and scrub (c. 2.5ha to be lost)

As these habitats are of a local biodiversity importance (lower value), their loss or modification will not result in a likely significant effect on biodiversity. These habitats will be permanently lost from the subject lands and will largely be replaced by buildings and artificial surfaces including the data centre hall buildings, vertical farm building, substation, energy centre, and associated roads and pathways.

The habitat types that are considered to be of a high local biodiversity value, are the following:

- Hedgerows (WL1), with the total linear length of this habitat being lost is *c.* 2.7km. The loss of this habitat is considered to be significant at a local scale only, due to the common nature of this habitat in the local environs.
- Marsh (GM1) habitat, with a total loss of c. 5m^2 due to the surface water drainage pipe layout in the north west of the site. This loss is considered not to be significant at any geographic scale due to the small amount of this habitat being lost, and availability of this habitat in other areas of the site, and outside the proposed development site in the wider environs;
- Wet grassland (GS4) habitat, with a total loss of c. 1.4ha in the south west of the site. This loss is considered to be significant at a local scale only due to the availability of this habitat in other parts of the site, and outside the proposed development site in the wider environs; and
- Lowland/Depositing Rivers (FW2), with a total loss of 2m^2 in the eastern most bank for implementation of the attenuation drainage outfall pipe and fibre optic cable.

The areas of oak-ash-hazel woodland and immature woodland in the north west, Toureen Lough, the alluvial woodland (*91E0), *Molinea* meadows (6410) and alkaline fen (7230) surrounding Toureen Lough and in the north west, and calcareous grassland (6210) adjacent to the attenuation pond by the M18 Motorway, will be protected under the 'Ecological Buffer Space' as designated by *Clare County Development Plan Variation No. 1*. These areas will be retained, protected from development and will not be directly impacted from the development. Other areas of local importance (higher value) or more that will not be impacted directly from development as they are beyond the footprint are the Alluvial woodland (*91E0), *Cladium* fen (*7210), oak-ash-hazel woodland, immature woodland and reed and large sedge swamp habitat in the east of the site.

The areas of calcareous grassland that will be directly affected by construction works due to the location of the attenuation pond, correspond to the Annex I habitat calcareous grassland [6210] listed under the Habitats Directive. This area of *c.* 0.79ha of the Annex I habitat will be directly impacted by construction works, with the overall habitat within the proposed development totalling c. 0.89ha. In the absence of mitigation, the loss of Annex I habitat calcareous grassland [6210] within the proposed development site will lead to a temporary impact at a national level, due to its location within the favourable reference range, current range, and current distribution of calcareous grassland [6210][51].

[51] NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill

Introducing or spreading non-native invasive plant species

No non-native invasive plant species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011 were present within, or in close proximity to, the proposed development. However, during construction and/or routine maintenance/management work, non-native species could potentially be introduced to terrestrial habitats located within downstream habitats via surface water features. Giant hogweed is typically found in damp places such as riverbanks and spreads via seed dispersal (NBDC, 2013a), while Himalayan balsam and Japanese knotweed are both found in a wider variety of habitats including river banks, roadsides, and urban areas such as waste ground and railways; the former species spreading by seed dispersal, the latter vegetatively (NBDC, 2013b; NBDC, 2013c). Giant hogweed, Himalayan Balsam and Japanese knotweed are all classified as high impact invasive species.

The introduction and/or spread of these invasive species to downstream European sites and sensitive habitats could potentially result in the degradation of existing habitats present, in particular coastal habitats not permanently or regularly inundated by seawater. These species may outcompete other native species present, negatively impacting the species composition, diversity and abundance and the physical structural integrity of the habitat. This in turn could result in a significant effect, at geographic scales ranging from local to international.

Habitat degradation from dust generated during construction

The proposed development has the potential to generate dust during construction works which could affect vegetation in habitat areas within and adjacent to the proposed development boundary. This has the potential to affect highly sensitive and ecologically-important habitat areas (*e.g.* designated area for nature conservation or areas of Annex I habitat) both within and in the surrounding environment and result in a likely significant negative effect, at geographic scales ranging from local to international.

An Accidental Pollution Event during Construction Affecting Surface Water Quality in the Receiving Environment

During construction contaminated surface water runoff and/or an accidental spillage or pollution event into any surface water feature has the potential to have a significant negative impact on water quality and consequently affect aquatic and wetland habitats in the receiving environment. The effects of frequent and/or prolonged pollution events in a river system have the potential to be extensive and far-reaching and could potentially have significant long-term effects. In a worst-case scenario, estuarine and coastal habitats downstream of the proposed development site could also be affected.

However, it is considered unlikely that a pollution event of such a magnitude would occur during construction or be any more than temporary in nature. Particularly considering the environmental protection controls incorporated into the design of the proposed development, the fact that the development footprint is located away from any wetland areas (*i.e.* minimum c. 50m away), and that any works that are near water features will be undertaken in accordance with IFI/NRA guidelines. Nevertheless, a precautionary approach is being taken in assuming a level of risk (albeit low due to the distance between surface water features and the main construction activities) of water quality impacts. Consequently, detailed mitigation measures are required to further minimise the risk of the proposed development having any perceptible effect on water quality during construction.

During construction suspended solids, silt and other harmful materials generated as a result of proposed works could be released into the local drainage infrastructure and travel downstream, including, potentially, into watercourses such as the Spancelhill Stream, River Fergus and wider Fergus Estuary. Cement based products used in the construction phase of the proposed development (*e.g.* concrete and/or bentonite which are highly corrosive and alkaline materials), if released into any watercourse may cause surface water degradation and damage to aquatic fauna. This has the potential to result in significant negative effects on water quality and consequently affect aquatic and wetland habitats in the receiving environment. In a worst-case scenario, the potential to be negatively impacted from other a wide range of pollutants contained within surface water runoff remains. Habitat degradation as a consequence of construction effects on surface water quality has the potential to affect the conservation status of downstream estuarine and coastal habitats in the Fergus Estuary European sites, such as the Lower River Shannon SAC, and therefore, has the potential to result in a significant negative impact at an international scale. The Spancelhill Stream is hydrologically connected to downstream habitats including those which are QI Annex I habitats or SCI supporting wetland habitat which may also be at risk of habitat degradation as a consequence of construction effects on surface water quality.

Habitat Degradation – Groundwater

Any effects on the existing hydrogeological baseline supporting wetland habitats, has the potential to negatively affect habitat extent and distribution, and vegetation structure and composition. The potential effects upon the existing hydrogeological regime are not necessarily limited to habitats within the proposed development boundary but can be far-reaching, with significant negative long-term effects. This is discussed in more detail in Chapter 5 *Land, Soils, Geology & Hydrogeology* of the EIAR.

7.5.1.3 Bats

Roost loss in buildings

Lesser horseshoe bat

There are no lesser horseshoe bat roosts located within the proposed development, with the closest known roost of this species located *c.* 430m south of the proposed development site. There were no suitable roosting sites (*i.e.* old stone buildings or caves) within the proposed development site. Therefore, there is no potential for likely significant effects on the conservation status of lesser horseshoe bats to occur at any geographic scale as a result of this potential direct impact of roost loss (See Section 5.1.3.2 of the NIS, Scott Cawley, 2021).

Soprano pipistrelle bat

There are 17 confirmed soprano pipistrelle roosts within buildings located within the proposed development site. All but one of these are located in residential buildings, with one roost in a cattle shed (BB 1A). 13 of these roosts were small roosts of one to two individuals. BB 3 had one roost of 30 bats, and another roost of 9 bats, BB 8 had a roost of 13 bats, and BB 9 had a roost of seven to eight bats. Overall, this site is considered to be an important site for roosting soprano pipistrelles.

Accidentally destroying a bat roost, in particular if the affected roost was a significant maternity or hibernation roost, would have the potential to have long-term effects on the local bat population of the species concerned. The layout of the proposed

development site has been designed so as to avoid any impacts on bat roosts within the proposed development site. These buildings (BB 1A, BB 2, BB 3, BB 5A, BB 8 and BB 9) will be retained as they are currently, with a 30m dark buffer zone also in place to ensure roosting bats are not disturbed by construction activities, and continue to use the roost buildings. Therefore, there is no potential for likely significant effects on the conservation status of soprano pipistrelle bats to occur at any geographic scale as a result of this potential direct impact of building loss.

Common pipistrelle and brown long-eared bat

One common pipistrelle and one brown long-eared building roost were identified within the proposed development site, both small roosts of two individuals (*i.e.* BB 5A and BB 5B, respectively). These roosts are small, and significant at a local scale only; therefore the loss of these roosts would result in a likely significant effect at a local scale only.

However, as mentioned above, all confirmed bat roosts within buildings in the proposed development site will be retained and protected from development, and consequently will not be impacted by the development. Therefore, there is no potential for likely significant effects on the conservation status of common pipistrelle and brown long-eared bat to occur at any geographic scale as a result of this potential direct impact of building loss.

Myotis sp. and Leisler's bat

There were no *Myotis* sp. or Leisler's bat building roosts identified within the proposed development site. The buildings within the site are suitable for roosting *Myotis* sp. Leisler's bat can also roost in buildings (especially as maternity sites), however evidence has shown that they tend to roost in trees rather than structures or buildings[52]. As there are no buildings with confirmed *Myotis* sp. or Leisler's bat roosts species within the proposed development site there is no potential for likely significant effects on the conservation status of these bat species to occur at any geographic scale as a result of this potential direct impact of building loss.

Buildings that did not have confirmed roosts (*i.e.* BB 1B, BB 4A – D, BB 6A-C, and BB 7) were all negligible - low potential farm buildings, with the exception of BB 7, which was considered to be of moderate potential for roosting bats. These buildings will be removed as part of the development. Although roosts were not identified in any of these buildings, due to the high activity levels and numbers of roosting bats across the site, a precautionary principle will be applied, and subsequent mitigation measures implemented to ensure there are no risks of injury/mortality to local bat species as a result of the proposed development.

Tree roost loss

There were no confirmed bat tree roosts within the proposed development site. However, there were 17 trees identified as having bat roost potential features. These included; one high potential tree, two moderate potential trees, and 14 low potential trees. Therefore there is potential for local bat species to be impacted by the removal of potential tree roosts within the site. Lesser horseshoe bats do not typically use trees for roosting in due to their specific roosting preferences and are therefore excluded

[52] *McAney, K. (2006) A conservation plan for Irish vesper bats.* Irish Wildlife Manuals, No. 20. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

from impacts related to tree roost removal[53]. Soprano and common pipistrelle bat, Leisler's bat, brown long-eared bat, and all species of *Myotis* bat use trees for roosting[54].

The proposed development will not directly, or indirectly, affect any known bat roosts. Trees on site with the potential to support roosting bat, could be occupied at the time of site clearance; and there is therefore the potential that bats on site could be injured or killed. All the bats recorded using the site that roost in trees are common species in Ireland that are classified as being of "least concern" in the *Ireland Red List No. 3: Terrestrial Mammals* (Marnell *et al.*, 2019). The low and moderate potential trees within the proposed development site that have some potential for roosting bats, are not considered to be of significant in size and are unlikely to hold enough space for them to be maternity or hibernation roosts. One high potential tree located within the site could support larger roost sizes due to the size of PRFs identified. The potential effects on bat populations arising from loss of a number of potential small roost sites, and one potentially larger roost side, is considered to be significant, at a local (high) geographic scale only.

Bats, and their breeding and resting places, are strictly protected under the Birds and Habitats Regulations, and under the Wildlife Acts, and it is an offence under that legislation to intentionally kill or injure bats or to interfere with or destroy their breeding or resting places. Therefore, mitigation measures are included to ensure that any tree removal works do not result in the permanent loss of tree roosting sites or result in bats being accidentally killed or injured during construction.

Habitat Loss as a result of fragmentation of foraging/commuting habitat and commuting routes

Bats rely on suitable semi-natural habitats which support the insect prey upon which they feed. The proposed development will result in the loss of such habitats used for feeding by all bat species recorded in the study area.

Suitable habitat for foraging and commuting bats within the footprint of the proposed development includes hedgerows, treelines, scrub, open grassland and farm buildings (foraging on prey within cattle sheds). The area of the habitats which will be lost as a result of the proposed development is significant at a local scale only, considering the quantity of suitable habitat, which will not be impacted, in the local vicinity. The total loss of bat commuting and/or foraging habitat is *c.* 1.38km. Habitat loss for other bat species using the subject lands for foraging and/commuting*, i.e.* soprano and common pipistrelle, Leisler's bat, Daubenton's bat, *Myotis* sp., and brown long-eared bat, is likely to result in a significant effect, at a local (high) geographic scale, due to highly suitable habitat in the surrounding environs, stable populations of these species, and as they are species of 'least concern'. Impacts on lesser horseshoe bats are discussed in Section 6 of the NIS (Scott Cawley, 2021), and above in Section 7.5.1.1 under the heading for Old Domestic Building (Keevagh) SAC and Old Domestic Buildings, Rylane SAC.

[53] *Lesser horseshoe bat Rhinolophus hipposideros,* Bat Conservation Trust (2010).

[54] Bat Roosts, Bat Conservation Ireland. Access here: https://www.batconservationireland.org/irish-bats/bat-roosts

Installation of temporary working and site compound lighting which may cause indirect disturbance of flight patterns

One construction compound is proposed at the location of the proposed Data Centre 1 adjacent to Toureen Laneway in the south of the site. Potential impacts of lighting during construction will be slight and short-term as construction works will generally be confined to daylight hours (07:30-17:30). Where works are required during hours of darkness, portable lighting will be used, which will be pointed downwards at a 45-degree angle and away from any sensitive receptors (hedgerows, treelines, confirmed bat roosts, Toureen Lough, and Spancelhill Stream). Artificial lighting within suitable habitat may result in avoidance behaviour by bats, and could prevent bats from accessing foraging areas or roosts and/or result in bats taking more circuitous routes to get to foraging areas and hence potentially depleting energy reserves and abandonment of nearby roosts. Security lighting will not involve high intensity lighting (*e.g.* floodlighting), therefore the impact of increased artificial lighting at the proposed construction compound on bat species excluding lesser horseshoe bat is considered to be significant at the local level only. The impact of increased lighting during construction on lesser horseshoe bat, is considered to be significant at an international level, which is discussed in Section 6 of the NIS (Scott Cawley, 2021), and above in Section 7.5.1.1 under the heading for Old Domestic Building (Keevagh) SAC and Old Domestic Buildings, Rylane SAC.

Construction works will typically be undertaken during normal daylight working hours, and therefore the requirement for lighting to accommodate construction works during night-time, in areas where existing light levels are low, will be limited and restricted to winter time when sunrise/sunset is later/earlier. Temporary lighting effects associated with the construction of the proposed development on local bat species, is considered to be significant at the local geographic scale only.

7.5.1.4 Otter

Although it cannot be predicted if otter will establish new holt or couch sites within the ZoI of the proposed development before construction works commence, it is a possibility, and this scenario has been taken into account in the mitigation strategy. As the otter populations that utilise the proposed development are considered to be part of European site populations downstream and hydrologically connected to the site (i.e. Lower River Shannon SAC and Dromore Woods and Loughs SAC), any potential impacts predicted on this species are discussed in Section 7.5.1.1 above, and in Section 6 of the NIS produced as part of this planning application (Scott Cawley, 2021).

7.5.1.5 Badger

A total of two confirmed badger setts were recorded across the proposed development site. None of which are located within the footprint of the proposed development and none located within the ZoI of the general construction activities (*i.e.* within 50m) based upon the impact distance bands described in the TII guidance (National Roads Authority, 2006a). All setts are located beyond the 150m of the proposed Project and therefore beyond the ZoI of any potential pile driving or blasting works and any other construction activities.

Although it cannot be predicted if badger will establish new setts within the ZoI of the proposed Project before construction works commence, it is a possibility and this scenario has been taken into account in the mitigation strategy (refer to Section 7.6.1.6).

Loss of foraging habitat and breeding/rest sites.

The proposed development will not result in the permanent loss of any badger sett identified during the surveys and therefore there is no potential for impacts arising from the loss of breeding sites to occur at any geographic scale.

Construction will result in the permanent loss of *c.* 16.7ha of suitable foraging/commuting habitat for badgers (*i.e.* hedgerows, grassland, scrub, and spoil). However, given the lack of evidence of badger using these areas within the site, the availability of suitable badger habitat in the immediate surrounding environment, the proposed development is unlikely to affect the conservation status of the local badger population and will not result in a likely significant negative effect, at any geographic scale.

Disturbance/displacement

Along with any potential displacement effects associated with habitat loss, increased human presence and/or noise and vibration associated with construction works, the proposed development has the potential to displace badgers from foraging habitat located beyond the footprint of the proposed development.

As construction works will typically be undertaken during normal daylight working hours and badgers are nocturnal in habit, the displacement of badgers from the retained areas of suitable foraging habitat (*i.e.* areas located beyond the footprint of the proposed development) is extremely unlikely to affect the local badger population and therefore will not result in a likely significant negative effect, at any geographic scale. In addition, the construction phase of the development is predicted to produce noise levels that are slight-moderate, and short-term in nature, with the construction noise levels predicted to be the same or below the baseline noise levels, at max. 63dB (A) or below**Error! Bookmark not defined.** prior to mitigation. Following initial ground works, construction noise impacts will reduce to not significant at any geographic level. Badgers residing within the wider study area are likely to be habituated to certain level of disturbance within the suburban environment and therefore are likely to be less sensitive to very localised, temporary increases in disturbance.

Disturbance and displacement effects on badger may also arise as a result of increased artificial lighting during construction. Nocturnal mammals, such as badger, are likely to be disturbed by the introduction of artificial light into established breeding and foraging areas (Rich & Longcore, 2005). The majority of the proposed development is currently free from artificial lighting. The proposal may result in the introduction of portable lighting to previously unlit areas, and for the proposed construction compound security lighting for the duration of construction. However, works will normally only be undertaken during daylight hours (07:30-17:30), and any security lighting will be pointed down at a 45-degree angle and away from sensitive receptors. Although the particular location of the proposed compound is not considered to be of any significance for local badger, i.e. in the south of the site where Data Hall 1 will be located, light spill into adjacent suitable areas could render these areas unsuitable for foraging badger. This is unlikely to result in a negative effect on badgers, as it will be temporary in nature and very localised, and there is ample suitable habitat for foraging and breeding badger in the surrounding areas.

7.5.1.6 Other mammals (including pine marten and Irish hare)

Pine marten and Irish hare were the only other mammals identified within the proposed development site during mammal surveys carried out in 2020. The desk study results

also included records of red squirrel, pygmy shrew, hedgehog and Irish stoat within 2km of the proposed development site.

Habitat Loss

The construction of the proposed development will result in the temporary loss of suitable habitat for small mammals located within in the proposed development site. Pine marten were identified within the woodland in the north east of the site, and Irish hare were identified in close proximity to the woodland in the north east. This woodland area is suitable as foraging and/or breeding habitat for all of the aforementioned species, with the exception of Irish hare, which is most typically found in lowland pasture habitat[55]. The habitat that will be temporarily lost as a result of the proposed development is only suitable for commuting and foraging of these species, as the woodland habitat in the north west will be retained. Given the relatively low numbers of individuals of each species that are likely to be affected (*i.e.* pine marten, red squirrel, hedgehog, pygmy shrew and Irish hare), the protection of the woodland in the north east from any development for pine marten, red squirrel, pygmy shrew and hedgehog, and the abundance of alternative suitable habitat available locally, the effects of habitat loss associated with construction works are unlikely to affect the long-term viability of the respective local populations of these species. Therefore, habitat loss is unlikely to affect the species' conservation status or result in a significant negative effect, at any geographic scale.

Mortality Risk

Site clearance works have the potential to result in the mortality of small mammal species. The potential for this impact to occur would be expected to be greater during the breeding season when juveniles would be present in nests, or in the case of hedgehog impacts may be greater during their hibernation period. Furthermore, the potential for direct mortality to small mammals would be greater in the more vegetated areas, as opposed to areas dominated by artificial ground/ grassland habitat, as the former areas would offer more in terms of breeding/ resting habitat for small mammal species. Given the relatively low numbers of individuals of each species that are likely to be affected, and that these species are highly mobile, site clearance is unlikely to result in a level of mortality that would affect the species' conservation status, and result in a significant negative effect, even at a local geographic scale. Nevertheless, there is a risk of small mammals (*e.g.* pygmy shrew and hedgehog) falling into excavations or pits during construction. To ensure no mammals are harmed during the construction of the proposed development site, mitigation is provided for this risk.

Disturbance/displacement

Along with any displacement effects associated with habitat loss, increased human presence and/or noise and vibration associated with construction works, the proposed development has the potential to displace mammals from both breeding/resting places and from foraging habitat. The construction phase of the development is predicted to produce noise levels that are slight-moderate, and short-term in nature**Error! Bookmark not defined.**. Following initial ground works, construction noise impacts will reduce to not significant. The construction phase of the development is predicted to produce noise levels that are slight-moderate, and short-term in nature, the with construction noise

[55] Reid, N., Dingerkus, K., Montgomery, W.I., Marnell, F., Jeffrey, R., Lynn, D., Kingston, N. & McDonald, R.A. (2007) Status of hares in Ireland. *Irish Wildlife Manuals*, **30**. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.

levels predicted to be the same or below the baseline noise levels, at max. 63dB or below prior to mitigation. Following initial ground works, construction noise impacts will reduce to not significant. Mammals (as described in Section 7.3.3.1) residing within the wider area are likely to be habituated to disturbance within the suburban environment from Ennis town, and the M18 Motorway both to the west.

As construction works will typically be undertaken during normal daylight working hours and these small mammal species are nocturnal in habit, the displacement of these small mammal species from retained foraging areas (*i.e.* areas located beyond the footprint of the proposed development) is extremely unlikely to affect the local small mammal populations and therefore will not result in a likely significant negative effect, at any geographic scale.

7.5.1.7 Breeding Birds

Habitat Loss and Loss of Breeding/Resting Sites

The proposed development will result in the loss of breeding bird nesting and foraging habitat within the footprint of the proposed development. The areas of habitat loss within the proposed development boundary are provided in Section 7.5.1.2 and tabulated in Table 7.12 for all KER habitat types. These areas comprise a total linear length of *c.* 1.38km of hedgerows and treelines. In addition, there are areas of scrub, wet grassland, agricultural grassland (*c.* 12.3ha in total area) within the footprint of the proposed development, which are not KERs in their own right due to their limited botanical value, however, may provide nesting and/or foraging habitat for birds. These areas will be removed during construction of the proposed development resulting in an additional loss of breeding bird nesting and/or foraging habitat. There will also be removal of the farm sheds within the proposed development site, and whilst no breeding birds were identified in the buildings for removal (aside from BB 5B was identified as having barn swallow nests, however it will be retained), they have the potential to support breeding bird populations such as barn swallows and house martins.

The primary consequence of habitat loss will be increased competition for resources (*e.g.* nesting habitat and/or prey/food source) both between and amongst breeding bird species. The magnitude of this effect will be largely defined by many unquantifiable factors such future land use changes and whether the local habitat resource has currently reached its carrying capacity or not in terms of breeding bird species. For species with larger home ranges during the breeding season (*i.e.* buzzard) habitat loss at the scale of the proposed development is not likely to have any perceptible effects on breeding success or population dynamics.

The habitat areas that will be lost as a result of the proposed development form a relatively small part of larger expanses of similar habitat types and mosaics in the wider locality. The proposed development is connected to agricultural lands of the same land uses within the proposed site. The hedgerows and treelines that demarcate these boundaries would be important breeding sites for local bird species, including red-listed grey wagtail. The woodland in the north west, and scrub/woodland in the east will be retained and protected as part of the development. None of the habitat areas to be lost are unique to the locality and, either individually or collectively, are not likely to support a significant proportion, or the only population, of any given breeding bird species locally. Although a temporary decline in overall breeding bird abundance could potentially occur at a local level (*i.e.* the footprint of the proposed development), this is unlikely to affect the local range of the breeding bird species present nor is it likely to

affect the ability of these breeding bird populations to maintain their local populations in the long-term.

Mortality Risk

If site clearance works were to be undertaken during the bird breeding season (*i.e.* March to August, inclusive) it is likely that nest sites holding eggs or chicks would be destroyed and birds killed.

Mortality of birds at the scale of the proposed development, over what is likely to be a single breeding bird season in terms of completing site clearance works, will probably have a short-term effect on local breeding bird population abundance.

However, in the longer-term this would be unlikely to affect the ranges of the breeding bird species recorded in the study area nor would it be likely to affect the long-term viability of the local populations. Mortality of birds during site clearance works could result in a short-term significant effect on local breeding bird populations at a local scale only, due to the amount of hedgerows being lost within the footprint of the development (i.e. *c*. 2.7km).

Disturbance/displacement

The noise, vibration, increased human presence and the visual deterrent of construction traffic, associated with site clearance and construction will temporarily disturb breeding bird species and is likely to displace breeding birds from habitat areas adjacent to the footprint of the proposed development. Construction activities will largely involve excavations of the land, construction of buildings, construction of pathways and new road layouts, with piling also proposed at two locations in the west of the site also proposed. The magnitude of the impact will be dependent on the type of construction works and their duration; general construction activities will have a less pronounced affect than blasting, in terms of its ZoI, but will be on-going from a period of between 9-12 months (as well as a 6-month advanced work period) and multiple breeding seasons. The construction phase of the proposed development will be completed on a phased basis, over a period of 6 years.

Although it is not possible to definitively quantify the magnitude of this potential impact (or the potential effect zone) in a worst case scenario it could potentially extend for several hundred metres from the proposed development. As such, the construction works have the potential to affect the conservation status of affected breeding bird species and will result in a likely short-term significant negative effect, at a local geographic scale.

7.5.1.8 Wintering birds

This section of the impact assessment deals with wintering bird species, *i.e.* those bird species which are listed on either the BoCCI Red or Amber lists for their wintering populations or are Annex I species. The assessment carried out in the NIS for the proposed development considered the potential for the proposed development to affect the bird species listed as SCIs of European sites for their wintering populations. That assessment concluded that proposed development would not affect their wintering bird colonies or have any long-term effects on the local wintering populations following implementation of mitigation measures. Therefore, for these species, the proposed development will not affect the conservation status of the SCI wintering bird populations and will not result in a significant adverse effect on the integrity of the

European sites (See Section 7.5.1.1 above and Section 6 of the NIS (Scott Cawley, 2021).

Habitat Loss and/or disturbance/displacement

The development will not involve the removal or alteration of any of the permanent waterbodies within the proposed development site as they are within the ecological protection areas as set out by Clare County Council in the Variation No. 1. The footprint of the development will encroach on a temporary 'pond' wetland feature in the north west of the site, where tufted duck and coot were identified during one of the wintering bird surveys. Other areas within the site that come under the footprint of the proposed development, were not deemed suitable and were confirmed to be not used by any wintering bird species during surveys undertaken on the site.

Moreover, a temporary and/or permanent increase in noise, vibration and/or human activity levels during the construction and/or operation of the proposed development could result in the disturbance to and/or displacement of wintering bird species present within the footprint and/or the vicinity of the proposed development.

Current understanding of construction related noise disturbance to wintering waterbirds is based on the research presented in Cutts *et al.* (2009) and Wright *et al.* (2010). In terms of construction noise, levels below 50dB would not be expected to result in any response from foraging or roosting birds. Noise levels between 50dB and 70dB would provoke a moderate effect/level of response from birds, *i.e.* birds becoming alert and some behavioural changes (*e.g.* reduced feeding activity), but birds would be expected to habituate to noise levels within this range. Noise levels above 70dB would likely result in birds moving out of the affected zone, or leaving the site altogether. At *c.* 300m, typical noise levels associated with construction activity (BS 5228) are generally below 60dB or, in most cases, are approaching the 50dB threshold. As such, disturbance effects for general construction activities across the majority of the proposed development would not be expected to extend beyond a distance of *c.* 300m, as noise levels associated with general construction activities would attenuate to close to background levels at that distance and beyond.

The construction phase of the development is predicted to produce noise levels that are slight, and short-term in nature[Error! Bookmark not defined.]. Following initial ground works, construction noise impacts will reduce to not significant. The construction noise levels predicted to be the same or below the baseline noise levels, at max. 63dB or below.

As the majority of works will be carried out during normal working daylight hours (07:30-17:30), the potential for construction to disturb wintering birds at night, will not arise under normal circumstances. Impacts associated with increased levels of disturbance will likely result in the temporary displacement of these wintering bird species to other suitable available lands in the locality. These impacts will be associated with general construction activities (*e.g.* visual impact of construction workers and machinery and the associated vibration and more constant/continuous noise levels) and impulse noise disturbance from infrequent noise sources with a high noise level, such as piling.

Following the completion of construction, disturbance levels will likely return to baseline conditions and as a result these lands will become available again as foraging and/or roosting habitat for these wintering bird species.

While a good proportion of wintering birds identified in the desk review are typically found in coastal, estuarine and intertidal habitats including the Fergus and Shannon Estuary, and therefore will not be impacted directly during construction, there are large

areas of suitable foraging and/or roosting habitat available for these wintering bird species both adjacent to, and in the wider locality of the proposed development (*i.e.* beyond the 300m study area, from *c.* 300m from these existing sites located within the footprint of the proposed development). Therefore the effect of habitat loss on wintering bird species is considered to result in a potential short-term significant effect, at a local geographic scale only.

Habitat Degradation – Surface Water Quality

During construction, contaminated surface water runoff and/or an accidental spillage or pollution event into any surface water feature has the potential to have a significant negative impact on water quality and consequently an impact on wintering birds; either directly (*e.g.* bird species coming into direct contact with pollutants) or indirectly (*e.g.* acute or sub-lethal toxicity from pollutants affecting their food supply or supporting habitats). The effects of frequent and/or prolonged pollution events in a waterbody have the potential to be extensive and far-reaching and could potentially have significant long-term effects.

However, it is considered unlikely that a pollution event of such a magnitude would occur during construction or be any more than temporary in nature. Nevertheless, a precautionary approach is being taken in assuming a level of risk (albeit low due to the distance between surface water features and the main construction activities) of water quality impacts and detailed mitigation measures are required to further minimise the risk of the proposed development having any perceptible effect on water quality during construction.

During construction suspended solids, silt and other harmful materials generated as a result of proposed works could be released into the local drainage infrastructure and travel downstream via Toureen Lough, Spancelhill Stream, including, potentially, into watercourses such as the River Fergus, Fergus Estuary and wider Shannon Estuary. Cement-based products used in the construction phase of the proposed development (*e.g.* concrete and/or bentonite which are highly corrosive and alkaline materials), if released into any watercourse may cause surface water degradation and damage to aquatic fauna. This has the potential to result in significant negative effects on water quality and could consequently affect aquatic and wetland habitats in the receiving environment. In a worst-case scenario, estuarine/ coastal foraging habitats downstream could also be affected.

Habitat degradation as a result of effects on surface water quality during construction has the potential to affect the species' conservation status and result in a likely significant negative effect, at a local geographic scale. Mitigation measures have been designed to protect water quality during construction (See Chapter 6 Hydrology and Section 7.6 of the CEMP).

Direct injury/mortality

The potential for injury/mortality to SCI bird species from the proposed development is discussed in Section 6.7 of the NIS (Scott Cawley Ltd., 2021), and in Section 7.5.1.1 above under the Ballyallia Lough SPA, River Shannon and River Fergus Estuaries SPA, Corofin Wetlands SPA, and the Slieve Aughty Mountains SPA heading. The impacts described within these sections are also relevant and apply to other wintering bird species (*i.e.* not SCI species).

7.5.1.9 Amphibians

There are records of common frog and smooth newt within *c.* 2km of the proposed development site, and suitable habitat is present for these species within the permanent wetland features and, therefore, it cannot be ruled out that these species occur in the vicinity of the proposed development.

Disturbance & Mortality Risk

Site clearance works have the potential to result in disturbance to, and the direct mortality of amphibians. Given the protection zones of the wetland features within the site, and the distance between the footprint of the site and the availability of other wetland areas outwith the proposed development in the wider area (i.e. Ballymacahill Lough, c. 250 north of the subject lands), the number of individuals that would potentially be at risk is considered to be very low and impacts on such individuals would be unlikely to affect the local populations in the long-term. However, common frog is protected under the Wildlife Acts and it is an offence to hunt, take or kill them, or wilfully to interfere with or destroy their breeding places. Mitigation measures have been provided to ensure adherence to the Wildlife Acts.

Habitat Severance/Barrier Effect

The temporary to short-term physical disruption of the existing landscape during site clearance and construction will not fragment habitat used by amphibians, and the footprint of the development does not overlap with suitable amphibian habitats. Therefore, habitat severance during construction and any associated barrier effect are not likely to affect the species' conservation status and are not predicted to result in a likely significant negative effect to amphibians, at any geographic scale.

Habitat Degradation – Surface Water Quality

During construction, contaminated surface water runoff and/or an accidental spillage or pollution event into any surface water feature have the potential to have a significant negative impact on water quality and, consequently, an impact on amphibian species' either directly (*e.g.* species coming into direct contact with pollutants) or indirectly (*e.g.* acute or sub-lethal toxicity from pollutants affecting their food supply or supporting habitats). The effects of frequent and/or prolonged pollution events in a waterbody have the potential to be extensive and far-reaching and could potentially have significant long-term effects.

However, it is considered unlikely that a pollution event of such magnitude would occur during construction or be any more than temporary in nature. Nevertheless, a precautionary approach is being taken in assuming a level of risk (albeit low due to the distance between surface water features and the main construction activities) of water quality impacts and detailed mitigation measures are required to further minimise the risk of the proposed development having any perceptible effect on water quality during construction.

Habitat degradation as a result of effects on surface water quality during construction has the potential to affect the species' conservation status and result in a likely significant negative effect, at a local geographic scale. Mitigation measures have been designed to protect water quality during construction (see Chapter 6 *Hydrology*, and Section 7.6 of the CEMP).

7.5.1.10 Reptiles

No reptiles were identified within the proposed development during surveys carried out in 2018 and 2020. The NBDC did not return any records of common lizard within the proposed development site, however suitable habitat was identified along the stone walls, and exposed rock habitats within the site. Therefore, it cannot be ruled out that these species do not occur in the wider area.

Disturbance & Mortality Risk

Site clearance works have the potential to result in disturbance to, and the direct mortality of, common lizard. Given the availability of potentially suitable habitat for common lizard in the wider study area and the relatively low number of individuals that would potentially be at risk , it is considered that such impacts are unlikely to affect the local common lizard populations in the long-term. However, given the potential for lizard to be present in a variety of habitats, disturbance and mortality impact could result in a short-term significant negative effect on common lizard, at a local scale.

Habitat Severance/Barrier Effect

The temporary physical disruption of the existing landscape during site clearance and construction will fragment habitat used by common lizard. As a temporary, short-term impact, this is unlikely to present a significant barrier to the movement of the species such that it would affect the local common lizard population in the long-term. Therefore, habitat severance during construction and any associated barrier effect are not likely to affect the species' conservation status and are not predicted to result in a likely short-term significant negative effect to the common lizard, at any geographic scale.

7.5.1.11 Fish

This section only describes fish species in the local waterbodies within the site and that surface water drains to from the site (i.e. Toureen Lough, Spancelhill Stream, M18 Attenuation pond, River Fergus). Impacts on QI species within downstream European sites are described above in Section 7.5.1.1 and in Section 6 of the NIS (Scott Cawley, 2021).

Habitat Degradation – Surface Water Quality

During construction, contaminated or heavily silted surface water runoff, pump discharges and/or an accidental spillage or pollution event into any surface water feature has the potential to have a significant negative impact on water quality and consequently on aquatic habitats and fish species, and potentially also in the marine environment downstream. This could be either directly (e.g. acute or sub-lethal toxicity from pollutants or siltation events damaging spawning habitat downstream) or indirectly (e.g. affecting their food supply or supporting habitats).

The effects of frequent and/or prolonged pollution events in a river system have the potential to be extensive and far-reaching and could potentially have significant long-term effects. It is considered unlikely that a pollution event of such magnitude would occur during construction or if such an event did occur, it would be temporary in nature. Nevertheless, a precautionary approach is being taken in assuming a level of risk (albeit low due to the distance between surface water features and the main construction activities) of water quality impacts and detailed mitigation measures are required to further minimise the risk of the proposed development having any perceptible effect on water quality during construction.

Habitat degradation as a result of effects on surface water quality during construction has the potential to affect the conservation status of affected fish species and result in a likely significant negative effect, at a local geographic scale given the fact that the other fish species in question are common in Irish waters and not of conservation concern.

Habitat Loss

There will be a loss of $2m^2$ of habitat along the banks of the Spancelhill Stream in the south west of the proposed development site, in order to install the grated culvert with headwall and mattress for the surface water drainage pipe. During construction of this, this could result in a loss of habitat if instream works are required to facilitate this. This will be a temporary loss (i.e. 2-3 weeks of construction), which will result in a potential short-term impact on local fish populations, significant at a local geographic scale.

7.5.1.12 Invertebrates

White-clawed crayfish

During construction, contaminated or heavily silted surface water runoff, pump discharges and/or an accidental spillage or pollution event into any surface water feature has the potential to have a significant negative impact on water quality and consequently on aquatic habitats and white-clawed crayfish, and potentially also on the marine environment downstream. This could be either directly (e.g. acute or sub-lethal toxicity from pollutants or siltation events damaging habitat downstream) or indirectly (e.g. affecting their food supply or supporting habitats).

The effects of frequent and/or prolonged pollution events in a river system have the potential to be extensive and far-reaching and could potentially have significant long-term effects. It is considered unlikely that a pollution event of such magnitude would occur during construction or if such an event did occur, it would be temporary in nature. Nevertheless, a precautionary approach is being taken in assuming a level of risk (albeit low due to the distance between surface water features and the main construction activities) of water quality impacts and detailed mitigation measures are required to further minimise the risk of the proposed development having any perceptible effect on water quality during construction.

Habitat degradation as a result of effects on surface water quality during construction has the potential to affect the conservation status of affected white-clawed crayfish species and result in a likely significant negative effect, at a local geographic scale given the fact that this species is not known to occur in the receiving local environment, and there are no records of this species within 2km of the proposed development.

7.5.1.13 Other invertebrates

The majority of suitable habitat for other invertebrate species (as described in Section 7.3.3.7), including butterfly, damselfly and dragonfly species, will not be directly impacted by the development as they are outwith the footprint of the proposed development. These areas include the waterbodies and wetland areas of the site (Toureen Lough, M18 Attenuation pond, and Lough Ardnamurry). There will also be the removal and translocation of 0.79 ha of calcareous grassland to a field to the south east of its current location, at the south western end of DC6. It will therefore continue to be suitable for this species once translocated. Until this habitat is successfully translocated, the translocation of suitable habitat will result in a temporary significant effect, at a local geographic scale. The removal of other suitable habitat, including wet

grassland, and dry meadows and grassy verges habitat, will not result in a likely significant effect, due to the size of the areas that will be removed, availability of these habitats in other areas of the proposed development and outside the site in the wider environs.

7.5.2 Operational Phase

7.5.2.1 European sites

Lower River Shannon SAC

As described in Section 7.1 of the NIS, the proposed development has the potential to affect the qualifying interests and conservation objectives, and therefore the integrity, of the Lower River Shannon SAC because of:

- An accidental pollution event during operation affecting water quality in the Spancelhill Stream and the River Fergus, which drains to the Lower River Shannon SAC, subsequently affecting QI/SCI species as a result of habitat degradation.

During operation, water runoff from the proposed development will discharge following attenuation and passing through an oil interceptor to the Spancelhill Stream. SUDs, including filter drains and bioswales, and oversized pipes fitted with petrol interceptors, are proposed in suitable locations within the proposed development. These systems will allow surface water runoff from the roads, footpaths and cycle lanes to be discharged to ground via treatment systems to reduce the rate of infiltration (e.g. filter drains). The inclusion of these SUDs systems will reduce the volume of surface water runoff discharging to the existing drainage network. The functioning and effectiveness of both elements of the road drainage network are discussed in more detail in Chapter 6, Hydrology. The existing subterranean flow within the karst will not be altered by the development. Measures will be incorporated in the design to ensure this flow regime continues as current and these are outlined in Chapter 5 Hydrogeology.

Affecting the integrity of the Lower River Shannon SAC would result in a likely significant effect at the international geographic scale. However, due to the design measures that will be in place during operation, an accidental pollution event affecting water quality and the QI species within, will not result in a significant effect at any geographic scale.

Dromore Woods and Loughs SAC

As described in Section 7.2 of the NIS, the proposed development has the potential to affect the qualifying interests and conservation objectives, and therefore the integrity, of Dromore Woods and Loughs SAC because of:

Habitat degradation/effects on QI species as a result of hydrological impacts

During operation, water runoff from the proposed development will discharge following attenuation and passing through an oil interceptor to the Spancelhill Stream. SUDs, including filter drains and bioswales, and oversized pipes fitted with petrol interceptors, are proposed in suitable locations within the proposed development. These systems will allow surface water runoff from the roads, footpaths and cycle lanes to be discharged to ground via treatment systems to reduce the rate of infiltration (e.g. filter drains). The inclusion of these SUDs systems will reduce the volume of surface water runoff discharging to the existing drainage network. The functioning and effectiveness of both elements of the road drainage network are discussed in more detail in Chapter

6, Hydrology. The existing subterranean flow within the karst will not be altered by the development. Measures will be incorporated in the design to ensure this flow regime continues as current and these are outlined in Chapter 5 Hydrogeology.

Disturbance and/or displacement

During operation, the strategies in place are to limit the duration of the lighting at night and also limit lux levels wherever possible. However there is potential for light spill from the proposed development on suitable areas of foraging and/or commuting habitats used by lesser horseshoe bats. There will also be the addition of lighting along new pathways on the Tulla Road, which will be turned on during the hours of darkness for safety reasons. A light spill modelling drawing has been used to indicate where any areas of light spill may be within and beyond the proposed development, prior to mitigation[57]. Impacts on lesser horseshoe bats during the operational phase of the development could result in a significant impact at the international scale.

Affecting the integrity of the Dromore Woods and Loughs SAC from disturbance and/or displacement of QI species would result in a likely significant effect at the international geographic scale.

Old Domestic Building (Keevagh) SAC & Old Domestic Buildings, Rylane SAC

As described in Section 7.3 of the NIS, the proposed development has the potential to affect the qualifying interests and conservation objectives, and therefore the integrity, of the Old Domestic Building (Keevagh) SAC, and Old Domestic Buildings, Rylane SAC because of:

- Artificial lighting during construction may disturb and/or displace the QI species, lesser horseshoe bats, from the proposed development site. The potential impacts for this European site are as described above under the heading for Dromore Woods and Loughs SAC.

Affecting the integrity of the Old Domestic Building (Keevagh) SAC and Old Domestic Buildings, Rylane SAC would result in a likely significant effect at the international geographic scale.

Ballyallia Lough SPA, River Shannon and River Fergus Estuaries SPA, and Corofin Wetlands SPA

As described in Section 7.3 of the NIS, the proposed development has the potential to affect the qualifying interests and conservation objectives, and therefore the integrity, of Ballyallia Lough SPA, River Shannon and River Fergus Estuaries SPA, and Corofin Wetlands SPA because of:

- An accidental pollution event during operation affecting water quality in the Spancelhill Stream and the River Fergus, which are hydrologically connected to the proposed development site, and subsequently affecting SCI species as a result of habitat degradation.

During operation, water runoff from the proposed development will discharge following attenuation and passing through an oil interceptor to the Spancelhill Stream. SUDs, including filter drains and bioswales, and oversized pipes fitted with petrol interceptors, are proposed in suitable locations within the proposed development. These systems will allow surface water runoff from the roads, footpaths and cycle lanes to be discharged to ground via treatment systems to reduce the rate of infiltration (e.g. filter

drains). The inclusion of these SUDs systems will reduce the volume of surface water runoff discharging to the existing drainage network. The functioning and effectiveness of both elements of the road drainage network are discussed in more detail in Chapter 6, Hydrology. The existing subterranean flow within the karst will not be altered by the development. Measures will be incorporated in the design to ensure this flow regime continues as current and these are outlined in Chapter 5 Hydrogeology.

Affecting the integrity of the Ballyallia Lough SPA, River Shannon and River Fergus Estuaries SPA, and Corofin Wetlands SPA would result in a likely significant effect at the international geographic scale. However, due to the design measures that will be in place during operation, an accidental pollution event affecting water quality and the QI species within, will not result in a significant effect at any geographic scale.

7.5.2.2 National sites

As previously described in Section 7.5.1.1 above for European sites, the boundaries of a number of National sites overlap with a number of European sites. Therefore, the potential impacts on these National sites during operation would be as previously described above in Section 7.5.1.1 and in the NIS (Scott Cawley, 2021), under their respective headings. These potential impacts could affect habitat and species within the pNHAs, and therefore, the integrity of the pNHAs which could potentially result in a significant negative effect at the national geographic scale.

Newpark House (Ennis) pNHA

The proposed development is not connected to this pNHA, hydrologically or otherwise, and, consequently, the proposed development is unlikely to result in a significant effect at any geographic scale that would affect the integrity of this pNHA .

Lough Cleggan Lake pNHA

The proposed development is upstream of this National site, and therefore, the protected species here are not at risk of habitat degradation as a result of a change in the hydrological regime. Therefore, the risk of downstream effects on this site as a result of hydrological effects does not arise.

A number of bird species also use this pNHA for foraging and breeding. The proposed development site could be an ex-situ site for these bird species and potentially disturb or displace any birds that may be using the proposed development. The impact of this during operation is minimal however, due to the distance between suitable foraging habitat and the proposed development, (i.e. *c.* minimum 50m away) and as the noise produced from the development will be similar to background noise levels.

These potential impacts could however affect species within the pNHA, and therefore, the integrity of the pNHA which could potentially result in a significant negative effect at the national geographic scale.

Durra Castle pNHA

Operational impacts on protected species within Durra Castle pNHA, i.e. lesser horseshoe bat is considered to be the installation of artificial lighting around the development. These potential impacts could affect habitat and species within the pNHA, and therefore, the integrity of the pNHA, which could potentially result in a significant negative effect at a national geographic scale.

7.5.2.3 Habitats

Habitat Degradation- Surface Water Quality

During operation, there will be a total net increase of 17.3 hectares in the impermeable area discharging to the Fergus Estuary. There will be drainage outfalls to the Spancelhill Stream via an attenuation pond. Surface water runoff from the proposed development could contain harmful compounds such as hydrocarbons, heavy metals and particulate matter, which would be derived from the internal combustion engines of vehicles coming in and out of the site. These harmful compounds could affect the water quality of the waterbodies within the ZoI of the proposed development, as well as affecting aquatic flora and fauna located therein.

Where there is an increase in impermeable surface area, the drainage design principles ensure that there will be no net increase in the surface water flow discharged to these receptors (see Section 6 for more detail on drainage design).

Sections of the proposed development that do not have an increase in impermeable surface area will continue to discharge, directly to the receiving surface water network. Watercourses located within the ZoI of the proposed development include Toureen Lough, wetland/pond feature in the north, Spancelhill Stream, and River Fergus, along with waterbodies and wetlands associated with the Fergus Estuary.

During operation, water runoff from the proposed development will discharge following attenuation and passing through an oil interceptor to the Spancelhill Stream. SUDs, including filter drains and bioswales, and oversized pipes fitted with petrol interceptors, are proposed in suitable locations within the proposed development. These systems will allow surface water runoff from the roads, footpaths and cycle lanes to be discharged to ground via treatment systems to reduce the rate of infiltration (*e.g.* filter drains). The inclusion of these SUDs systems will reduce the volume of surface water runoff discharging to the existing drainage network. The functioning and effectiveness of both elements of the road drainage network are discussed in more detail in Chapter 6, Hydrology. The existing subterranean flow within the karst will not be altered by the development. Measures will be incorporated in the design to ensure this flow regime continues as current and these are outlined in Chapter 5 Hydrogeology.

Habitat degradation, as a consequence of operational effects on surface water quality will therefore not result in a significant effect at any geographic scale.

Habitat Degradation – Air Quality

Air quality modelling of NO_x concentration and deposition rates were calculated at receptor points within the proposed development site, including ecological receptors (refer to Chapter 8 *Air Quality & Climate* for details). The Air Quality Standards Regulations (AQS) 2011 (S.I. No. 180 of 2011) have a limit value of 30µg/m3 for the protection of vegetation. The potential impact of habitat degradation as a result of air quality impacts during the operational phase of the proposed development by means of a breach of the ambient air quality standards as a result of air emissions from the data centre back-up diesel generators and the energy centre engines. The back-up diesel generators modelled for the purpose of the air quality assessment will only be used in the event of a power failure at the site and for testing purposes. During normal operations at the facility, the electricity will be supplied by the energy centre on site, which is powered by natural gas.

There are habitats within the proposed development site that are sensitive to changes in air quality including; alkaline fen [7230], *Cladium* fen [*7230], *Molinia* meadows [6410], and calcareous grassland [6210], as described in Section 7.3.2.1 above. Although these habitats are within 5km of both a motorway and the urban townland of Ennis, and as such the NO_x does not exist, the modelling has nonetheless been carried out to demonstrate the change these habitats are predicted to experience due to the proposed development. Emissions from the facility lead to an ambient NO_X concentration (excluding background) which ranges from 43.6 - 56.4 mg/m^3 at the worst-case location within the site over the five years of meteorological data modelled. In addition, modelling results based on conservative assumptions indicate that the proposed development combined with background concentrations lead to an ambient NO_X concentration which ranges from 62.6 - 75.4 mg/m^3 at the worst-case location within the site over the five years of meteorological data modelled

In terms of deposition, the maximum Nitrogen (N) deposition flux for the worst-case year is 10.86 kg/ha/yr. This can be compared to the range of critical loads for the various onsite habitats outlined in the UNECE 2010 Report "Empirical Critical Loads And Dose-Response Relationships". Rich fen critical loads range from 15-30 kg/ha/yr, poor fen critical loads range from 10-15 kg/ha/yr, Molinia meadows ranged from 15-25 kg/ha/yr whilst calcareous grassland ranged from 15-25 kg/ha/yr (UNECE, 2010). Therefore, the maximum critical load of N is below the upper ranges of all habitats onsite and also below most of the lower ranges of the onsite habitats also.

However, as the critical load is above the lower limit for poor fens such as the *Cladium* fen in the east of the site and the alkaline fen beside Toureen Lough, a more detailed analysis has been undertaken at the actual location of these sensitive habitat sites. In terms of deposition, the maximum Nitrogen (N) deposition flux for the worst-case year is 6.33 kg/ha/yr within the onsite poor fens habitat. This can be compared to the range of critical loads for the poor fen habitat outlined in the UNECE 2010 Report "Empirical Critical Loads And Dose-Response Relationship" of 10-15 kg/ha/yr. Thus the maximum critical load of N is below the lower range of the critical load for poor fen habitats.

For the aforementioned reasons, the operational phase impact of the proposed development on designated sites is considered to be not significant at any geographic level.

7.5.2.4 Bats

Indirect Disturbance of Flight Patterns Due to Operational Lighting

High levels of bat activity were recorded across the site. Additional permanent lighting features within areas of suitable habitat may result in avoidance behaviour by bats. Such displacement (which could be a matter of metres) could prevent bats from accessing foraging areas or roosts and / or result in bats taking more circuitous routes to get to foraging areas and hence potentially depleting energy reserves and abandonment of nearby roosts. Given the rural setting of the proposed development site, and the lack of artificial light within the site and in surrounding lands, the effects of displacement as a result of increased lighting along the access roads, and adjacent to buildings, is considered to be significant at a local geographic scale only, for soprano and common pipistrelle bat, brown long-eared bat, *Myotis* sp. (all species) bat, and Leisler's bat. Lesser horseshoe bat, the most light sensitive species using the lands for foraging and/or commuting, is a QI species for nearby European sites, and impacts are described above in Section 7.5.2.1, and in Section 6 of the NIS (Scott Cawley, 2021). A light spill model study has been prepared to identify the requirements to mitigate any

potential light spill, and demonstrate the results of these measures, to ensure there are no effects on local bat species. Mitigation measures for the impacts on bat species can be found in Section 7.6.1.1, Section 7.6.1.4 and Section Section 7.6.2.1 below.

7.5.2.5 Otter

As the otter populations that utilise the proposed development are considered to be part of European site populations downstream and hydrologically connected to the site (i.e. Lower River Shannon SAC and Dromore Woods and Loughs SAC), any potential impacts predicted on this species are discussed in Section 7.5.2.1 above, and in Section 6 of the NIS produced as part of this planning application (Scott Cawley, 2021).

7.5.2.6 Badger

Habitat Severance/ Barrier Effect

Barriers such as road infrastructure within the proposed development site may affect the foraging behaviour of badgers and the commuting corridors they utilise, *e.g.* it may impact on the movement of this species between breeding, foraging and hibernation sites and as a result local populations can become isolated, resulting in long-term effects on genetic diversity and gene flow, at a local geographic scale.

As the proposed development will involve the development of roads and services, buildings, parking areas and pathways, there is potential for the proposed development to act as a barrier to badger movement across the landscape. However, badgers are likely to adjust quickly as their movement to other areas within or beyond the proposed development site will not be restricted; therefore, this potential impact is not considered to be significant at any geographic scale.

Disturbance and displacement impacts from light spill

Nocturnal mammals, such as badger, are likely to be disturbed by the introduction of artificial light into established breeding and foraging areas (Rich & Longcore, 2005). The proposed development is mostly unlit and rural in nature.

The development is largely a ‘dark development’ and light spill on areas outside of the footprint and on important features for wildlife will be less than 0.1Lux. The badger setts and main badger foraging habitat (*i.e.* the woodland in the north west) will be a sufficient distance away from the development and therefore will not be impacted by any level of light spill arising from the proposed development.

Therefore, lighting associated within the proposed development is not predicted to disturb or displace badgers from habitat areas located beyond the footprint of the proposed development, will not affect the species conservation status in that regard and will not result in a likely significant negative effect, at any geographic scale.

7.5.2.7 Other Mammals (including pine marten and Irish hare)

Habitat Severance/ Barrier Effect

Barriers such as road infrastructure within the proposed development site may affect the foraging behaviour of small mammals such as pine marten and Irish hare and the commuting corridors they uilitise, *e.g.* it may impact on the movement of these species between breeding, foraging and hibernation sites and as a result local populations can

become isolated, resulting in long-term effects on genetic diversity and gene flow, at a local geographic scale.

As the proposed development will involve the development of roads and services, buildings, parking areas and pathways, there is potential for the proposed development to act as a barrier to mammal movement across the landscape. However, mammals are likely to adjust quickly as their movement to other areas within or beyond the proposed development site will not be restricted; therefore, this impact is not considered to be significant at any geographic scale.

Mortality Risk

The proposed development will increase the level of traffic moving in and out of the site, which has the potential to result in the mortality of small mammal species. The potential for this impact to occur would be expected to be greater during the breeding season when juveniles would be present in nests, or in the case of hedgehog impacts may be greater during their hibernation period. Furthermore, the potential for direct mortality to small mammals would be greater in more vegetated areas, as opposed to artificial ground/ grassland habitat, as these areas would offer more in terms of breeding/ resting habitat for small mammal species. The planting that will be in place during operation, will screen the development, and encourage movement of mammals around the site. Traffic movements will largely be during the day for workers going to and from the site, and as most of the aforementioned species (*i.e.* pine marten, hedgehog and pygmy shrew) are nocturnal species, the risk is reduced. Given the relatively low numbers of individuals of each species that are likely to be affected, and that these species are highly mobile, an increase in traffic movements around the proposed development is unlikely to result in a level of mortality that would affect the species' conservation status, and result in a significant negative effect, even at a local geographic scale.

Disturbance and displacement impacts from light spill

Nocturnal mammals, such as pine marten, hedgehog and pygmy shrew, are likely to be disturbed by the introduction of artificial light into established breeding and foraging areas (Rich & Longcore, 2005). The proposed development is mostly unlit and rural in nature.

The development is largely a 'dark development' and light spill on areas outside of the footprint and on important features for wildlife will be less than 0.1Lux. The main foraging and breeding habitat (*i.e.* the woodland in the north west), will be a sufficient distance away from the development and therefore will not be impacted by light spill.

Therefore, lighting associated within the proposed development is not predicted to disturb or displace mammal species from habitat areas located beyond the footprint of the proposed development, will not affect the species conservation status in that regard and will not result in a likely significant negative effect, at any geographic scale.

7.5.2.8 Breeding birds

Disturbance/ Displacement

Increases in noise levels, associated with the increased frequency of traffic, as well as increased human presence, owing to the provision of the proposed cycle tracks and pathways, and may also have a negative effect on bird abundance and occurrence in the locality. Operation noise impacts are predicted to be negative, not significant-

moderate, and long-term. With day to day noise levels predicted at max. 35 dB, and emergency noise at max. 50 dB. Increased noise levels, as well as causing disturbance to birds in the locality, may also affect the breeding success of local bird populations as bird calls could become drowned out by traffic noise.

The displacement of breeding birds from the proposed development boundary is likely to result in an increase in competition for resources (*e.g.* nesting habitat or prey/food sources) both between and amongst breeding bird species, which in turn would have negative impacts on local breeding bird populations in the long-term.

Although the proposed development is predicted to have a long-term effect on local breeding bird populations, even at a local level this is not predicted to affect the ability of local breeding bird species to persist within their current ranges or to maintain their populations long-term. Therefore, the proposed development is not likely to affect the conservation status of breeding bird species and will not result in a likely significant negative effect, at any geographic scale.

7.5.2.9 Wintering birds

This section of the impact assessment deals with wintering bird species, *i.e.* those bird species which are listed on either the BoCCI Red or Amber lists for their wintering populations or are Annex I species. The assessment carried out in the NIS for the proposed development considered the potential for the proposed development to affect the bird species listed as SCIs of European sites for their wintering populations. That assessment concluded that proposed development would not affect their wintering bird colonies or have any long-term effects on the local wintering populations following implementation of mitigation measures. Therefore, for these species, the proposed development will not affect the conservation status of the SCI wintering bird populations and will not result in a significant adverse effect on the integrity of the European sites (See Section 6 of the NIS (Scott Cawley, 2021).

Disturbance/ Displacement

During operation, the proposed development has the potential to disturb and displace wintering bird species from habitats near the proposed development footprint due to an increase in noise, human activity and visual disturbance associated with increased human presence and increased traffic flow. Although the operational disturbance/displacement effect cannot be quantified it would be expected to be much less than the 300m ZoI associated with construction works. Noise generated during operation is anticipated to be long-term, imperceptible, and negative**Error! Bookmark not defined.**. Most species of wintering birds are likely to habituate to the increased traffic flows and human presence. There will be no human presence outside of the footprint of the development, due to the buildings being fenced off from the surrounding areas. Any operational noise increases are not likely to alter the existing baseline effect on wintering birds using the habitats locally.

Although there is still likely to be some level of displacement effect, a perceptible effect would be expected to be limited to habitats immediately adjacent to the proposed development, owing to the duration for screening landscape planting to become fully re-established. As any operational noise increases are not likely to alter the existing baseline noise effect on wintering birds in the locality, effects of noise disturbance can also be excluded.

Any displacement of birds from habitat areas during the operation of the proposed development could be expected to be temporary, as a significant amount of planting

will be carried out prior to the development, and will have established for during operation. However, it is not predicted to affect the conservation status of wintering bird species by virtue of the widespread availability of a number of other suitable forage sites nearby and across the wider Fergus Estuary. Thus, the operational impact should not result in a likely significant negative effect, at any geographic scale.

Habitat Degradation – Surface Water

During operation, surface water runoff from the proposed development will discharge to the receiving surface water drainage network. Surface water runoff from the proposed development could contain harmful compounds such as hydrocarbons, and particulate matter, if mitigation is not in place. These harmful compounds could be transferred to waterbodies that support populations of riparian/ estuarine bird species such as the Toureen Lough, wetland/pond feature in the north, Spancelhill Stream, River Fergus, and the Fergus Estuary. This could affect water quality in these areas and therefore have a negative effect on winter bird species as a result of direct contact with pollutants or a reduction in food supply.

The proposed drainage design incorporates pollution control measures to allow surface water runoff from the carriageways, footpaths and cycle lanes to be discharged through a petrol interceptor and through permeable paving in areas of low traffic. The inclusion of SUDs systems and attenuation will reduce the volume of surface water runoff discharging to the existing drainage network. The functioning and effectiveness of both elements of the site drainage network are discussed in more detail in Chapter 6, *Hydrology.*

Habitat degradation because of effects on surface water during operation therefore, does not have the potential to affect the species' conservation status and will not result in a likely significant negative effect, at any geographic scale.

7.5.2.10 Amphibians

Suitable amphibian habitat such as Toureen Lough, the M18 attenuation pond, and the wetland features in the north and east of the site, was identified within the proposed development. The desk study returned records of common frog within c. 2km of the proposed development and therefore impacts on these species cannot be excluded due to suitable habitat on site.

Habitat Severance/ Barrier Effect

Barriers such as road infrastructure within the proposed development site may affect the foraging behaviour of amphibians and the commuting corridors they utilise, *e.g.* it may impact on the movement of amphibian species between breeding and/or hibernation sites, and as a result local populations can become isolated, resulting in long-term effects on genetic diversity and gene flow, at a local geographic scale.

As the proposed development roads will be screened by the use of BERMs and hedgerows, and the permanent wetland features utilised by amphibians within the site will not be impacted directly by the proposed development, the effect of habitat severance/ barrier effect on amphibian species is not considered to be significant at any geographic scale.

Mortality Risk

The proposed development will not result in any increase in terms of mortality risk to amphibians during operation, as no proposed works will be occurring within or adjacent to any of the permanent wetland features within the site. Therefore, the impact of mortality risk to amphibians, as a result of the proposed development is not considered to be significant at any geographic scale.

Habitat Degradation – Surface Water

During operation, surface water runoff from the proposed development will discharge, largely unrestricted, to the receiving surface water drainage network. Surface water runoff from the proposed development could contain harmful compounds such as hydrocarbons, heavy metals and/or particulate matter.

The release of contaminated surface water runoff and/or an accidental spillage or pollution event into any surface water features during operation, has the potential to affect water quality in the receiving aquatic environment. Such a pollution event may include: the release of sediment into receiving waters and the subsequent increase in mobilised suspended solids; and the accidental spillage and/or leaks of containments (*e.g.* fuel, oils, lubricants, paints, bituminous coatings, preservatives, weed killer, lime and concrete) into receiving waters. The associated effects of a reduction of surface water quality could potentially extend for a considerable distance downstream of the location of the accidental pollution event or the discharge. The proposed development is hydrologically connected to the Spancelhill Stream and the River Fergus both of which discharge into the Fergus Estuary.

The proposed drainage design incorporates pollution control measures to allow surface water runoff from the carriageways, footpaths and cycle lanes to be discharged through a petrol interceptor and through permeable paving in areas of low traffic. The inclusion of SUDs systems and attenuation will reduce the volume of surface water runoff discharging to the existing drainage network. The functioning and effectiveness of both elements of the site drainage network are discussed in more detail in Chapter 6, *Hydrology.*

Habitat degradation because of effects on surface water during operation therefore, does not have the potential to affect the species' conservation status and will not result in a likely significant negative effect, at any geographic scale.

7.5.2.11 Reptiles

Habitat Severance/Barrier Effect

The presence of the proposed development will not create any permanent barrier in the landscape to the movement of common lizard. Therefore, habitat severance and barrier effect is not likely to affect the species conservation status and result in a significant effect at any geographic scale.

Mortality Risk

Common lizard are vulnerable to mortality, however the presence of the proposed development will not pose a permanent mortality risk to the species due to lack of large infrastructure that could result in heavy traffic, limited traffic movements confined to the proposed internal road network, and due to the lack of evidence of this species within and surrounding lands.

Therefore, mortality risk is not predicted to affect the species' conservation status or result in a likely significant negative effect to reptiles, at any geographic scale.

7.5.2.12 Fish

Habitat Degradation – Surface Water

There will be a drainage outfall to the Spancelhill Stream following attenuation. Therefore, there is a risk that discharges from the proposed development drainage network could affect water quality, potentially over the long-term, and consequently impact upon aquatic habitats and fish species. In a worst-case-scenario, this could result in a permanent decline in fish species abundance and distribution.

The proposed drainage design incorporates pollution control measures (i.e. petrol interceptors) followed by attenuation ponds (where drainage will be discharged to the existing surface water/storm sewer), as described in detail in Chapter 6.

Those sections of the proposed development drainage that are to be discharged to ground, pose no risk to surface water quality as they are greenfield as current. It is extremely unlikely that the normal operating water quality of the drainage outfalls discharging to the existing surface water/drainage network, even in the unlikely event of a pollution incident, would have any perceptible long-term effect on water quality in receiving watercourses. The functioning and effectiveness of the site drainage network are discussed in more detail in the hydrology chapter (Chapter 6 Hydrology).

Habitat degradation because of effects on surface water during operation, is not predicted to result in a likely significant negative effect, at any geographic scale.

Habitat Severance/Barrier Effect

There will be no permanent structure in place within the Spancelhill Stream as a result of the proposed development, and therefore habitat severance/barrier effect is not considered to be result in a negative effect on fish species, at any geographic scale.

7.5.2.13 Invertebrates

White-clawed crayfish

There will be drainage outfalls to the Spancelhill Stream by the proposed development. Therefore, there is a risk that discharges from the proposed development drainage network could affect water quality, potentially over the long-term, and consequently impact upon aquatic habitats and white-clawed crayfish populations. In a worst-case-scenario, this could result in a permanent decline in white-clawed crayfish abundance and distribution. This is unlikely however due to the lack of local records in the receiving downstream environment.

The proposed drainage design incorporates pollution control measures (i.e. petrol interceptors) followed by attenuation ponds (where drainage will be discharged to the existing surface water/storm sewer), as described in detail in Chapter 6.

Those sections of the proposed development drainage that are to be discharged to ground, pose no risk to surface water quality as they are greenfield as current. It is extremely unlikely that the normal operating water quality of the drainage outfalls discharging to the existing surface water/drainage network, even in the unlikely event of a pollution incident, would have any perceptible long-term effect on water quality in

receiving watercourses. The functioning and effectiveness of the site drainage network are discussed in more detail in the hydrology chapter (Chapter 6 Hydrology).

Habitat degradation because of effects on surface water during operation, is not predicted to result in a likely significant negative effect, at any geographic scale.

7.5.2.14 Other invertebrates

No operational impacts are predicted on this species as areas of suitable habitat are located outside the footprint of the development, and the translocation of suitable calcareous grassland will have been allowed to establish and continue to provide habitat for this species during operation.

7.6 REMEDIAL AND MITIGATION MEASURES

7.6.1 Construction Phase

7.6.1.1 European sites

The mitigation measures that are specifically required to ensure that the proposed development will not adversely affect the integrity of the European sites within the ZoI (*i.e.* Lower River Shannon SAC, Dromore Woods and Loughs SAC, Old Domestic Building (Keevagh) SAC, Old Domestic Buildings, Rylane SAC, River Shannon and River Fergus Estuaries SPA, Ballyallia Lough SPA, and Corofin Wetlands SPA) are presented in the NIS (See Section 7). Following a consideration and assessment of the proposed development on the identified relevant European sites, the following mitigation measures were developed to address potential impacts that were identified:

Measures to Protect Surface Water Quality during Construction

A site-specific Construction Environmental Management Plan (CEMP) is also included with the applicant's planning documentation submitted to Clare County Council. The Principal Contractor and all construction contractorswill implement the mitigation measures specified in the CEMP.

These measures have been developed in consideration of the following standard best international practice including but not limited to:

- Construction Industry Research and Information Association (CIRIA) (2005) Environmental Good Practice on Site (C692)
- CIRIA, (2001) Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (C532)
- CIRIA, (2000) Environmental Handbook for Building and Civil Engineering Projects (C512)
- CIRIA, (2007) The SUDS Manual (C697)
- CIRIA C648: Control of water pollution from linear construction projects: Technical guidance
- CIRIA (2006) Control of water pollution from linear construction projects: Site guide (C648)

- IFI (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters

- UK Pollution Prevention Guidelines (PPG) UK Environment Agency, 2004

- BPGCS005, Oil Storage Guidelines

The construction contractor will be required to implement the following specific mitigation measures as a condition if granted by Clare County Council all of which will be incorporated into the CEMP, for release of hydrocarbons, polluting chemicals, sediment/silt and contaminated waters control:

- Specific measures to prevent the release of sediment over baseline conditions in the downstream receiving water environment, during the construction work. These measures include, but are not limited to, the use of silt fences, silt curtains, settlement lagoons and filter materials.

- Provision of exclusion zones and barriers (e.g. silt fences) between earthworks, stockpiles and temporary surfaces to prevent sediment washing into the existing drainage systems and hence the downstream receiving water environment.

- Provision of temporary construction surface drainage and sediment control measures to be in place before earthworks commence.

- Weather conditions will be taken into account when planning construction activities to minimise risk of run-off from the site.

- Prevailing weather and environmental conditions will be taken into account prior to the pouring of cementitious materials for the works adjacent to any surface water drainage features, or drainage features connected to same. Pumped concrete will be monitored to ensure no accidental discharge. Mixer washings and excess concrete will not be discharged to existing surface water drainage systems. Concrete washout areas will be located remote any surface water drainage features, where feasible, to avoid accidental discharge to watercourses. Washing out of any concrete trucks on site will be avoided.

- Any fuels or chemicals (including hydrocarbons or any polluting chemicals) will be stored in a designated, secure bunded area(s) to prevent any seepage of potential pollutants into the local surface water network. These designated areas will be clearly sign-posted and all personnel on site will be made aware of their locations and associated risks.

- All mobile fuel bowsers shall carry a spill kit and operatives must have spill response training. All fuel containing equipment such as portable generators shall be placed on drip trays. All fuels and chemicals required to be stored on-site will be clearly marked. Care and attention will be taken during refuelling and maintenance operations. Particular attention will be paid to gradient and ground conditions, which could increase risk of discharge to waters.

- A register of all hazardous substances, which will either be used on site or expected to be present (in the form of soil and/or groundwater contamination) will be established and maintained. This register will be available at all times and shall include as a minimum:

    - Valid Safety Data Sheets;

  - Health & Safety, Environmental controls to be implemented when storing, handling, using and in the event of spillage of materials;
  - Emergency response procedures/precautions for each material; and,
  - The Personal Protective Equipment (PPE) required when using the material.

- Implementation of response measures to potential pollution incidents.
- Robust and appropriate Spill Response Plan and Environmental Emergency Plan will be prepared prior to works commencing and they will be communicated, resourced and implemented for the duration of the works. Emergency procedures/precautions and spillage kits will be available and construction staff will be trained and experienced in emergency procedures in the event of accidental fuel spillages.
- All trucks will have a built-on tarpaulin that will cover excavated material as it is being hauled off-site and wheel wash facilities will be provided at all site egress points.
- If groundwater is encountered during the proposed works and temporary pumping at a very localised location is required:
  - An appropriate dewatering system and groundwater management system specific to the site conditions will be designed and maintained. These will include measures to minimise any surface water inflow into the excavation, where possible, and the prolonged exposure of groundwater to the atmosphere will be avoided.
  - Qualitative and quantitative monitoring will be adopted to ensure that the water is of sufficient quality to discharge. The use of silt traps will be adopted if the monitoring indicates the requirement for same with no silt or contaminated water permitted to discharge to the receiving water environment.
- Water supplies shall be recycled for use in the wheel wash. All waters shall be drained through appropriate filter material prior to discharge from the construction sites.
- The removal of any made ground material, which may be contaminated, from the construction site and transportation to an appropriate licensed facility shall be carried out in accordance with the Waste Management Act, best practice and guidelines for same.
- The site investigation did not encounter any contaminated soil. However, If any potentially contaminated material is encountered, it will need to be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled ‘Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous’ using the HazWasteOnline application (or similar approved classification method). The material will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the EC Council Decision 2003/33/EC, which establishes the criteria for the acceptance of waste at landfills.
- In the event that Asbestos containing materials (ACMs) are found during demolition works, the removal will only be carried out by a suitably permitted

waste contractor, in accordance with S.I. No. 386 of 2006 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010. All asbestos will be taken to a suitably licensed or permitted facility.

- Implementation of measures to minimise waste and ensure correct handling, storage and disposal of waste (most notably wet concrete, pile arisings and asphalt).

- All the above measures implemented on site will be monitored throughout the duration of construction to ensure that they are working effectively, to implement maintenance measures if required/applicable and to address any potential issues that may arise.

Measure to prevent the spread of invasive species during construction

Pre-Construction Survey

Invasive plant species were not identified within the proposed development site. A pre-construction invasive species survey must be carried out prior to any construction activities (including enabling works) by a suitably qualified specialist to confirm the presence or absence and extent of any invasive species within the proposed development site prior to the development. Data collected as part of this survey will also include the approximate area of any respective colonies (m2) and a detailed description of the infestations (e.g. approximate total number of stems, pattern of growth and information on other vegetation present), if invasive species are identified. This information will inform calculations of volumes of infested soils to be excavated, as part of the measures outlined below.

General Measures to Avoid Spreading Invasive Species during Construction or Soil Movement

The species noted in Section 6.4 are invasive and are particularly effective at colonising disturbed ground (e.g. construction sites). Some species spread by the re-growth of cut fragments or root material, they can readily re-grow in new areas if the existing stands are disturbed e.g. by machinery, people, livestock etc.

The most common ways that these species can be spread is:

- Site and vegetation clearance, mowing, hedge-cutting or other landscaping activities;

- Spread of plant fragments during the movement or transport of soil;

- Spread of plant fragments through the local surface water and drainage network;

- Contamination of vehicles or equipment with plant fragments which are then transported to other areas; and;

- Importation of soil from off-site sources contaminated with invasive species plant material.

It is preferable to eradicate invasive species prior to the onset of construction of any proposed development in close proximity. If control programmes have not been achieved before construction begins then the affected areas must be fenced off prior to and during construction in order to avoid spreading seeds or plant fragments around

or off the construction site. Earthworks or machinery movement must be avoided in these areas until the relevant species have been eradicated.

If soil is imported to the site for landscaping, infilling or embankments, the contractor must gain documentation from suppliers that the material is free from invasive species.

Disposal of Material if species identified

If any invasive species plant material is collected (e.g. by hand-pulling or mowing), it is important that its disposal does not lead to a risk of further spread. The movement of plant material of any plants listed on the Third Schedule requires a licence from the National Parks and Wildlife Service (NPWS) under Section 49 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended). Invasive species (particularly roots, flower heads or seeds) must be disposed of at licensed waste facilities or composting sites, appropriately buried, or incinerated having regard to relevant legislation, for example; Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; relevant local authority byelaws and any other relevant legislation. All disposals must be carried out in accordance with the relevant Waste Management legislation (as per guidance from NRA, 2008).

It should be noted that some invasive species plant material or soil containing residual herbicides may be classified as either 'hazardous waste' or 'non-hazardous waste' under the terms of the Waste Management Acts, and both categories may require special disposal procedures or permissions. Advice should be sought from a suitably qualified waste expert regarding the classification of waste and the suitability of different disposal measures.

As noted above, additional specific measures for the management of Japanese knotweed cuttings or contaminated soil can be found in the UK Environment Agency document The Knotweed Code of Practice: Managing Japanese Knotweed on development sites (UK Environment Agency, 2013 (withdrawn 2016)).

Measures to be Followed During the Application of Herbicides

The control options for some species will require the use of herbicides, which can pose a risk to human health, to non-target plants or to wildlife. In order to ensure the safety of herbicide applicators and of other public users of the site, a qualified and experienced contractor, and qualified Herbicide Advisor, must be employed to carry out all work.

It is advised that the appointed contractor refer to the following documents, which provide detailed recommendations for the control of invasive species and noxious weeds:

- TII Publication: The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (TII, 2020)

- Managing invasive non-native plants in or near fresh water (Environment Agency, 2010)

These documents include measures to aid the identification of relevant species, with details for the timing, chemicals, methodology for chemical control, and for measures to avoid environmental damage during the use of herbicides.

Measures to Protect Otter from habitat loss/fragmentation and Disturbance/Displacement impacts

This section presents the mitigation measures that will be implemented during construction to avoid the potential impacts of the proposed development on QI otter populations associated with the Lower River Shannon SAC. All of the mitigation measures will be implemented in full. They are in accordance with best practice, and tried and tested, effective control measures to protect otter.

Pre-Construction Survey

- Prior to construction works commencing, the appointed contractor will engage the services of a suitably qualified ecologist to conduct a pre-construction otter survey of the proposed development. The survey will be undertaken within 10 months in advance of construction and supplemented by a further inspection of the proposed development immediately prior to site clearance to ensure that no new holts have been established in the intervening period. These surveys will be carried out in accordance with Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (NRA, 2006).

- Where any new active holts/couches are recorded within 150m of the proposed development the appointed ecologist will ensure that adequate mitigation is provided in accordance with Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (NRA, 2006), and a derogation licence is sought from the NPWS where necessary.

Mitigation measures for new active holts/couches recorded within 150m of the development

Until such time as otters have been successfully evacuated from active holts, the following provisions should apply to all construction works:

- No works should be undertaken within 150m of any holts at which breeding females or cubs are present. Following consultation with NPWS, works closer to such breeding holts may take place - provided appropriate mitigation measures detailed below are in place.

- No wheeled or tracked vehicles (of any kind) should be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance should also not take place within 15m of such holts, except under licence.

- The prohibited working area associated with otter holts should, where appropriate, be fenced with temporary fencing prior to any possibly invasive works. Fencing should be in accordance with Clause 303 of the NRA's Specification for Roadworks (National Roads Authority). Appropriate awareness of the purpose of the enclosure should be conveyed through notification to site staff and sufficient signage should be placed on each exclusion fence. All contractors or operators on site should be made fully aware of the procedures pertaining to each affected holt.

Ecological Clerk of Works/Retained Ecologist

- Were a new holt to be encountered within 150 metres (up and downstream) of watercourse crossing, NPWS consultation will be sought, and the services of an

Ecological Clerk of works or retained Ecologist (both with experience with otter survey/mitigation) would be required.

- The appointed contractor shall employ the services of an Ecological Clerk of Works (EcOW) with experience in otter, to oversee and advise works at watercourse crossings for the proposed development (they may also undertake the preconstruction survey). The EcOW will have the authority to:
  - Review method statements;
  - Oversee works;
  - Provide instruction to the appointed contractor(s); and,
  - Require the temporary cessation of works, where necessary.
- Access to and from the M18 Motorway culvert mammal ledge will be maintained at all times, with no works to be carried out at this location.
- The EcOW will deliver a toolbox talk on biodiversity including otter to the appointed contractor(s). This talk will include instructions on identifying otter and details on the protections afforded to otter under Irish and EU legislation. The EcOW will outline the actions which will be taken by the contractor(s) if otter are noted on or near the Proposed development during construction works.

Measures to Prevent/Reduce Disturbance and Displacement of otters

- Night working within/directly adjacent to watercourses where otter are known to commute will be avoided and will only be permitted with the prior approval of the planning authority.
- Where night-working adjacent to watercourses known to support otter, is required, the advice of a suitably qualified ecologist must be sought and a derogation licence, if necessary, will be sought from NPWS permitting such works.

<u>Measures to prevent disturbance and/or displacement of lamprey species</u>

An Ecological Clerk of Works will supervise the following mitigation strategy at the location of the drainage outfall in the banks of the Spancelhill Stream:

- A silt curtain and spill boom will be put in place across the width of the river immediately downstream of the works location, to capture any sediment which is mobilised during the works and any hydrocarbon escape or spill during construction works;
- The works will be undertaken either by placement of sandbags or cofferdam to ensure working in the dry, or as close to dry conditions as possible. Once in place, water will be pumped out of the sandbagged/cofferdam area.
- Prior to pumping commencing the area will be inspected and hand and net searched by the EcOW to check for any lamprey present. Repeat inspections will be undertaken as water levels are lowered during the course of pumping. A sieve will be placed over the in-take pipe of the pump to prevent any accidental uptake of lamprey that may be present.

- Once the area has been substantially de-watered, if net and manual searches cannot comprehensively exclude the possibility of lamprey remaining, then an excavator located out of the water and on the bankside, will carefully excavate the area small sections at a time and will deposit spoil in excess of 10m from the edge of the river bankside for inspection. The ECoW will manually search these spoil heaps for any lamprey present.

- Any lamprey recovered will be handled with care, temporarily stored in buckets of water and released back to the river at a downstream location within 20 minutes of capture.

- Once the outfill pipe has been fully constructed the ECoW will supervise the removal of the sandbags/cofferdam. The silt curtain and spill boom must remain in place until these have been removed and for a period until silt has settled/been captured.

- There will be no concrete pouring and all materials (i.e. pipe, headwall and mattress) will be pre-cast prior to installation.

- The mitigation measures relating to the protection of surface water quality in receiving watercourses during construction are detailed above in Section 7.1.5 and apply for the works at this location, and will be adhered to at all times.

- The culvert, headwall and mattress have been designed in consultation with IFI and in accordance with the design criteria set out in Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016).

- IFI's guidelines on bio-security measures (IFI, 2010) must be adhered to during works at Spancelhill Stream.

Measures to Protect Lesser Horseshoe bat from habitat loss/fragmentation impacts

Any vegetation (including trees, hedgerows or scrub adjacent to, or within, the proposed development boundary) which is to be retained shall be afforded adequate protection during the construction phase in accordance with the Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes (National Roads Authority, 2006b), as follows:

- All trees along the proposed development boundary that are to be retained, both within and adjacent to the proposed development boundary (where the root protection area of the tree extends into the proposed development boundary), will be fenced off at the outset of works and for the duration of construction to avoid structural damage to the trunk, branches or root systems of the trees. Temporary fencing will be erected at a sufficient distance from the tree so as to enclose the Root Protection Area (RPA) of the tree. The RPA will be defined based upon the recommendation of a qualified arborist

- Where fencing is not feasible due to insufficient space, protection for the tree/hedgerow will be afforded by wrapping hessian sacking (or suitable equivalent) around the trunk of the tree and strapping stout buffer timbers around it

- The area within the RPA will not be used for vehicle parking or the storage of materials (including soils, oils and chemicals). The storage of hazardous

materials (e.g. hydrocarbons) or concrete washout areas will not be undertaken within 10 m of any retained trees, hedgerows and treelines

- A qualified arborist shall assess the condition of, and advise on any repair works necessary to, any trees which are to be retained or that lie outside of the proposed development boundary but whose RPA is impacted by the works. Any remedial works required will be carried out by a qualified arborist

- A buffer zone of at least 5m will be maintained between construction works and retained hedgerows to ensure that the root protection areas are not damaged.

Surveys carried out confirmed that lesser horseshoe bat use the treelines and hedgerows located within the proposed development site as foraging and commuting habitat. The proposed development will result in a total loss of *c.* 2.7km hedgerows, and 30 trees; therefore replacement planting is required to ensure that there will be no net loss of lesser horseshoe bat foraging and commuting habitat as a result of the proposed development. This will comprise of *c.* 4.86km of hedgerow and 57 new trees within the proposed development site (see the Landscape Design Strategy[41], and Chapter *10 Landscape and Visual Impact Assessment*[39] being submitted as part of this application for location map, planting schedule and specific details of proposed species). Native hedgerow planting will include the following species; Alder *Alnus glutinosa*, hazel *Corylus avellana* , hawthorn *Crataegus monogyna*, holly *Ilex aquifolium*, honeysuckle *Lonicera periclymenum*, crab apple *Malus sylvestris*, wild cherry *Prunus avium* , blackthorn *Prunus spinosa*, dog rose *Rosa canina*, elder *Samucus nigris*, and guelder rose *Viburnum opulus*. Tree planting will include semi-mature species such as: Sessile oak *Quercus petraea*, beech *Fagus sylvatica*, strawberry tree *Arbustus unedo*, Scot's pine *Pinus sylvestris,* multistem birch *Betula pendula*, rowan *Sorbus acuparia*, double flowering wild cherry *Prunus avium plena*, and crab apple. This will ensure the proposed development complies with Objective 14.11 of the *Clare County Development Plan 2017-2023 (as varied)*, and the requirement that there is no net loss of lesser horseshoe bat habitat within the proposed development. This proposed planting has been designed to ensure that connectivity for foraging and commuting bats is maintained - *i.e.* along the peripheries of the site, and within the site from the woodland in the north west to suitable foraging habitats such as Toureen Lough, and along hedgerows in the north to woodland and wetland habitats in the east. Existing hedgerows along the southern boundary that are less species rich, will be enhanced through additional planting of native species. The proposed planting will occur in phases, with the earliest planting occurring along important foraging and/or commuting routes in the north, south and east of the site, at pre-construction stage and prior to removal of any habitats. This will ensure that suitable foraging and commuting habitat for lesser horseshoe bat is established prior to the removal of such habitat during the construction of the proposed development; therefore maintaining the site's suitability for lesser horseshoe bat. Cattle grazed fields are known to have higher rates of bat activity than ungrazed grassland (Downs et al. 2010)[56], therefore in addition to the hedgerows and treeline planting, areas of cattle grazed grassland will be maintained as they are currently in the east, north and west of the site with additional hedgerows separating fields, to provide further suitable habitat for lesser horseshoe bat.

<u>Measures to protect lesser horseshoe bats from disturbance/displacement impacts</u>

[56] Downs, N., & Sanderson, L. (2010). Do Bats Forage Over Cattle Dung or Over Cattle?. *Acta Chiropterologica*, *12*(2), 349-358.

A light spill model study was undertaken by Hurley Palmer Flatt (June 2021)[57] to determine the effects of artificial light and Artificial Light At Night (ALAN) on bats as a result of the proposed development and identify how to reduce or eliminate ALAN onsite, based on information from both Eurobats Guideline No.8, the Institution of Lighting Professionals (ILP) Guidance Note No.8. and Bat Conservation Ireland *Guidance Notes for: Planners engineers, architects and developers*[58]*.* Potential impacts of lighting during construction will be slight and short-term as construction works will generally be confined to daylight hours (07:30-17:30). Where works are required during hours of darkness, portable lighting will be used, which will be pointed downwards at a 45-degree angle and away from any sensitive receptors (hedgerows, treelines, confirmed bat roosts, Toureen Lough, and Spancelhill Stream).

7.6.1.2 National sites

The mitigation measures that are specifically required to ensure that the proposed development will not adversely affect the integrity of the national sites within the ZoI, and that overlap with previously described European sites (*i.e.* Fergus Estuary and Inner Shannon, North Shore pNHA, Old Domestic Building (Keevagh) pNHA, Ballyallia Lake pNHA, and Dromore Woods and Loughs pNHA), are presented in the NIS in Section 7 (Scott Cawley, 2021). Therefore, the mitigation measures outlined above in Section 7.6.1.1, and as detailed in the NIS, will prevent the proposed development resulting in a significant negative effect on these pNHA sites at the national geographic scale.

The additional national sites within the ZoI of the proposed development, *i.e.* Newpark House (Ennis pNHA), Lough Cleggan Lake pNHA, and Durra Castle pNHA, and the subsequent mitigation required, are described below.

Lough Cleggan Lake pNHA

The mitigation strategy in relation to potential impacts arising from the proposed development on Lough Cleggan Lake pNHA includes surface water protection measures to prevent surface water quality effects (See Section 7.6.1.1)

Durra Castle pNHA

The mitigation strategy in relation to potential impacts arising from the proposed development on Durra Castle pNHA includes measures to prevent disturbance and displacement impacts of lesser horseshoe bat from suitable foraging and/or commuting grounds, and from the impacts of habitat loss of suitable habitat within the normal foraging range of this species (See Section 7.6.1.1)

7.6.1.3 Habitats

Habitat Loss and Fragmentation

Where possible, habitats of Local Importance (Higher Value), such as tree line and hedgerow habitat types which lie within the footprint, or close to the footprint of the proposed development, that are not directly impacted by the proposed development

[57] Site Lighting Analysis Report and Light Spill Modelling Study, Project Art, produced by Hurley Palmer Flatt (June 2021)

[58] *Guidance Note for: Planners, engineers, architects and developers.* Bat Conservation Ireland (2010)

will be retained. Habitats of higher value are being retained outside the footprint of the development, but within the red line boundary. All proposed works with adhere to the requirements of The BSI Standards Publication: BS 5837:2012 Trees in Relation to Design, Demolition and Construction. These areas will be protected for the duration of construction works and fenced off at an appropriate distance.

Any vegetation (including trees, hedgerows or scrub adjacent to, or within, the proposed development boundary) which is to be retained shall be afforded adequate protection during the construction phase in accordance with the *Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes* (National Roads Authority, 2006b), as follows:

- All trees and hedgerows within the proposed development boundary that are to be retained, both within and adjacent to the proposed development boundary (where the root protection area of the tree extends into the proposed development boundary), will be fenced off at the outset of works and for the duration of construction to avoid structural damage to the trunk, branches or root systems of the trees and hedgerows. Temporary fencing will be erected at a sufficient distance from the tree or hedgerow so as to enclose the Root Protection Area (RPA). The RPA will be defined based upon the recommendation of a qualified arborist.

- Where fencing is not feasible due to insufficient space, protection for the tree/hedgerow will be afforded by wrapping hessian sacking (or suitable equivalent) around the trunk of the tree and strapping stout buffer timbers around it.

- The area within the RPA will not be used for vehicle parking or the storage of materials (including soils, oils and chemicals). The storage of hazardous materials (*e.g.* hydrocarbons) or concrete washout areas will not be undertaken within 10 m of any retained trees, hedgerows and treelines.

- A qualified arborist shall assess the condition of, and advise on any repair works necessary to, any trees which are to be retained or that lie outside of the proposed development boundary but whose RPA is impacted by the works. Any remedial works required will be carried out by a qualified arborist.

- A buffer zone of at least 5m will be maintained between construction works and retained trees and hedgerows to ensure that the root protection areas are not damaged.

The proposed development will result in a total loss of c. 2.7km hedgerows, and 30 trees. Replacement planting will comprise of c. 4.86km of hedgerow and 57 trees within the proposed development site (see the Landscape Design Strategy Report[41] and Associated drawings for location map, planting schedule and specific details of proposed species). Native hedgerow planting will include the following species*; Alnus glutinosa, Corylus avellana , Crataegus monogyna, Ilex aquifolium, Lonicera periclymenum, Malus sylvestris, Prunus avium , Prunus spinosa, Rosa canina, Samucus nigris, and Viburnum opulus.* Tree planting will include semi-mature species such as: *Quercus petraea, Fagus sylvatica, Arbustus unedo, Pinus sylvestris, Betula pendula, Sorbus acuparia, Prunus avium plena*. There will also be woodland structure planting on the peripheries of the site and of the buildings, which will total c. 58,567m^2 of planting, and 3300 trees per/ha (i.e. an equivalent of approx.. 19 trees). This will ensure the proposed development complies with Objective 14.17 of the Clare County Development Plan 2017-2023 (as varied), and the requirement that any tree that will

be felled will be replaced on the basis of a minimum ratio of 10 new native trees per 1 tree felled.

Existing hedgerows along the southern boundary that are less species rich, will be enhanced through additional planting of native species. The proposed planting will occur in phases (See Chapter 10 *Landscape And Visual Impact Assessment* of the EIAR, and the Landscape Design Strategy), with the earliest planting occurring along important foraging and/or commuting routes in the north, south and east of the site, at pre-construction stage and prior to removal of any habitats. This will ensure that suitable foraging and commuting habitat for lesser horseshoe bat is established prior to the removal of such habitat during the construction of the proposed development.

An area of *c.* 0.79ha of Annex I habitat dry calcareous grassland [6210], which occurs within the footprint of the proposed development in the location of the proposed SuDS basin, is to be translocated to the field to the south east, at the south western end of DC6, as shown on Dwg. ADC-L-001, in order to maximise its prospect of successful re-establishment in a new location. The conditions at the new location are suitable for the habitats re-establishment, as the habitat present is currently species poor amenity grassland. A Landscape and Biodiversity Management Plan[40] accompanies this application to advise the developer on the relocation and management of this habitat type within the proposed development.

The proposed methodology for translocation of this area of Annex I grassland habitat will include the following steps:

- Preparation – The area where the habitat is to be relocated will be prepared by stripping the topsoil to a depth of between c. 10-30cm.
- The donor site (*i.e.* location of existing Annex I dry calcareous grassland [6210]) and receptor site (*i.e.* location where habitat will be relocated to)s will be fenced off for the duration of construction works, to minimise any disturbance/ accidental damage to these habitats.
- Translocation - The soils of the grassland which are to be relocated are carefully removed using a suitable excavator, during suitable weather conditions, and laid out on the prepared receptor site.
- Again, the donor (including pre-existing Annex I grassland) and receptor sites will be fenced off for the duration of construction works, to minimise disturbance/ accidental damage to these habitats.
- Its establishment can be aided by following the correct management methods and by sowing the land with Irish wildflower seed mixes, which include positive indicator species for ‘this Annex I grassland. It will be ensured that this seed mix is of Irish origin to avoid planting invasive non-native species that will deteriorate the quality of the existing Annex I grassland.
- Management - Commitment to the Landscape and Biodiversity Management[40] plan will be required to ensure the successful establishment of the Annex I dry calcareous grassland on site. The proposed management will include mowing the grass once a year, and the removal of the cuttings after the plants have seeded. The area under management will be fenced off, to avoid trampling, until the grassland has established.
- Monitoring - The areas of translocated habitat will be monitored annually for three consecutive years, and in addition five years and 10 years following completion. It may take some time for the newly relocated grassland to establish and success cannot be guaranteed.

The above proposed methodology will be included within the Landscape and Biodiversity Management Plan[40] and will need to be agreed with the local authority prior to construction.

Protection of Vegetation from Dust during Construction

To control dust emissions during construction works mitigation measures shall include: spraying of exposed earthwork activities and site haul roads during dry and/or windy conditions; provision of wheel washes at exit points; control of vehicle speeds and speed restrictions (20 km/h on any un-surfaced site road); covering of haulage vehicles; and, sweeping of hard surface roads. These procedures will be strictly monitored and assessed on a daily basis.

Specific mitigation measures to protect sensitive habitats, i.e. habitats of local importance or higher as outlined in Table 7.12, is included in Section 7.2.2 of the CEMP and in more detail in Chapter 8 *Air Quality & Climate*. A summary of these measures include:

- Good site management through good design, planning and effective control strategies by avoiding dust becoming airborne at source.
- Monitoring of dust levels will be carried out frequently, with quick response plans to adverse weather conditions.
- Site routes will be monitored with speed restrictions in place, and frequent use of bowsers during drier periods.
- During periods of dry and windy weather, watering of materials will be carried out to increase stability of soil. Works will be postponed during conditions with very high winds (gales) .
- Materials will be stored in sheltered areas of the site, with regular watering to ensure stability of the soil.
- Materials being transported off site will be enclosed or covered.
- A power washing facility or wheel cleaning facility will be installed near to the site compound for use by vehicles exiting the site when appropriate.

Habitat Degradation – Surface Water Quality

The mitigation measures relating to the protection of water quality in receiving watercourses during construction are outlined above in Section 7.6.1.1, Section 7.6 of the CEMP and the construction Surface Water and Pollution Management plan[59].

Habitat Degradation – Groundwater

There will be no dewatering or alteration to the natural groundwater regime. The mitigation measures relating to the protection of water flow and water quality in karst conduits during construction are outlined in Section 7.6 of the CEMP and the construction Surface Water and Pollution Management Plan. A summary of these measures include:

- No works will be carried out within or within 10m of Toureen Lough, with no oil or subsoil storage in the vicinity of this feature.
- The swallow hole located south of DC56 will be clearly delineated and marked prior to construction and surrounded by a concrete ring with chamber and

[59] *Surface Water and Pollution Management Plan, Art Data Centre*. Clifton Scannell Emerson Associates, June 2021.

manhole cover. The swallow hole will be monitored daily to ensure it is free flowing and that there are no changes to the existing flow regime.
- The spring located north of DC6 will be clearly delineated and marked. No proposed works will occur within this feature, and a buffer zone of at least 10m will apply.
- Provision of exclusion zones and barriers (e.g. silt fences) will be used between earthworks, stockpiles and temporary surfaces to prevent sediment washing into the existing drainage systems and hence protecting the integrity of the features within the site.
- The ponds north of DC4 are in close proximity to the proposed development, however no construction activities will occur within these features. The DC4 structure will be 'built up' using engineered infill material.
- In areas where potential karst conduits are interpreted i.e. at proposed structures DC3 and DC6, additional geophysical surveying and a sufficient number of exploratory boreholes will be undertaken to further delineate areas of inferred conduit/ below ground flows. These building foundations will be piled, and the design of the piling methodology including pile depths/ spacing (m) designed to allow bridging of the existing [identified as potential] karst conduits i.e. ensuring no change to the existing groundwater flow regime across the site.

Measures to prevent the spread of invasive species during construction

The mitigation measures described in Section 7.6.1.1 are relevant for this section and apply here.

7.6.1.4 Bats

Measures to Protect Bats during the Removal of Suitable Roosting Sites

All bat species and their roost sites are strictly protected under both European and Irish legislation including:

- Wildlife Act 1976 and Wildlife (Amendment) Act, 2000 (S.I. No. 38 of 2000)
- Council Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna 1992 (Council Directive 92/43/EEC)
- European Communities (Birds and Natural Habitats) Regulations, 2011

It is an offence under Section 23 of the Wildlife Acts 1976-2017 and under Section 51 of the European Communities (Birds and Natural Habitats) Regulations, 2011 to kill a bat or to damage or destroy the breeding or resting place of any bat species. Under the European Communities (Birds and Natural Habitats) Regulations it is not necessary that the action should be deliberate for on offence to occur. This places an onus of due diligence on anyone proposing to carry out works that might result in such damage or destruction. Under Section 54 of S.I. 477 of 2011, a derogation may be granted by the Minister where there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range. Given that the proposed development will result in the loss of [a confirmed bat roost], a derogation licence under Section 54 of S.I. 477 of 2011 will be required.

The following mitigation measures are proposed in relation to structures considered to have the potential to support roosting bats:

- All structures that were confirmed as having potential for bat roosts will be re-examined immediately prior to demolition to assess whether bats are present at the time of demolition. This will be an all-night survey of these structures undertaken during suitable weather conditions to determine if bats enter the building during the night or early morning. If bats are present, then they will require exclusion from the property over several nights or, if possible, bats present will be physically removed by hand by a licensed bat specialist and placed in a bat box and then released in the evening after capture. The number, type and location of bat boxes to be included can be found in the Landscape and Biodiversity Management Plan[40]. 15 bat boxes are proposed for installation in the proposed development site.
- For structures which have not been confirmed as bat roosts that are due to be demolished but are regarded to have potential for bats, a bat detector survey of the property to be demolished will be carried out. If demolitions are proposed during the period of May to August and a bat roost is confirmed to be present, the proposed demolition will not be permitted. This will be an all-night survey undertaken during suitable weather conditions to determine if bats enter the building during the night or early morning. If bats are present, then they will require exclusion from the property over several nights or if possible bats present will be physically removed by hand by a licensed bat specialist and placed in a bat box and then released in the evening after capture.
- Once structures containing roosts are deemed to be clear of bats, the bat specialist will be on site to supervise the demolition procedure until the structure is no longer deemed able to support a bat roost. This is because bats may re-enter a partially demolished structure overnight.

Measures to Protect Bats during Vegetation Clearance

The following mitigation measures are proposed in relation to those trees identified as having potential to support roosting bats (Figure 7.23). Bats could occupy suitable roosting features at any time prior to the commencement of works. Therefore, there is an inherent risk that bats could be affected by the proposed felling works. Where possible, trees with PRFs should be retained. Where this is not possible, the following mitigation procedures will be followed:

- Felling of confirmed and potential tree roosts will be undertaken during the periods of April to May or September to October as during this period bats are capable of flight and may avoid the risks from tree felling if proper measures are undertaken, but also are neither breeding nor in hibernation
- Use of detectors alone may not be sufficient to record bat emergence and re-entry in darkness. Therefore, prior to felling of confirmed and potential tree roosts, an emergence survey using infra-red illumination and video camera(s) and bat detectors will be carried out on the night immediately preceding the felling operation to determine if bats are present
- Where it is safe and appropriate to do so for both bats and humans, such trees may be felled using heavy plant to push over the tree. In order to ensure the optimum warning for any roosting bats that may still be present, the tree will be pushed lightly two to three times, with a pause of approximately 30 seconds between each nudge to allow bats to become active. The tree should then be pushed to the ground slowly and should remain in place until it is inspected by a bat specialist
- Trees should only be felled “in section” where the sections can be rigged to avoid sudden movements or jarring of the sections

- Where remedial works (*e.g.* pruning of limbs) is to be undertaken to trees deemed to be suitable for bats, the affected sections of the tree will be checked by a bat specialist (using endoscope under a separate derogation licence held by that individual) for potential roost features before removal. For limbs containing potential roost features high in the tree canopy, this will necessitate the rigging and lowering of the limb to the ground (with the potential roost feature intact) for inspection by the bat specialist before it is cut up or mulched. If bats are found to be present, they will be removed by a bat specialist licenced to handle bats and released in the area in the evening following capture
- If any bat tree roosts are confirmed, and will be removed by the proposed felling works, then a derogation licence will be required from the NPWS and appropriate alternative roosting sites will be provided in the form of bat boxes.

Measure to control and reduce light spill during construction

During construction, the use of security lighting such as that around the construction compound could impact on commuting/foraging territory, however night works will not be undertaken during construction. During winter months when days are shorter, there may be a temporary level of light spill from the construction compound either side of sunrise/sunset. This will be during hibernation period for bats however, and impacts will be minimal. Therefore, mitigation is recommended for the temporary impact of light spill of bat species.

Security lighting at construction compounds or in active works areas in close proximity to bat commuting and/or foraging areas will be designed in conjunction with the EcOW/bat ecologist to minimise light spill. Measures to reduce light spill may include the following:

- the use of sensor/timer triggered lighting;
- LED luminaires will be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability;
- column heights will be considered to minimise light spill; and,
- accessories such as baffles, hoods or louvres will be used to reduce light spill and direct it only where needed.

Measures to reduce impacts from habitat loss

The proposed development will result in a total loss of *c.* 2.7km hedgerows, and 30 trees; therefore replacement planting is required to ensure that there will be no net loss of lesser horseshoe bat foraging and commuting habitat as a result of the proposed development, and to ensure there will be no impact on local bat species, See Section 7 of the NIS (Scott Cawley, 2021), and Section 7.6.1.1 above. This will comprise of *c.* 4.86km of hedgerow and 57 trees within the proposed development site (see the Chapter 10 *Landscape and Visual Impact Assessment*[39], and the Landscape Design Strategy[41] for location map, planting schedule and specific details of proposed species). Native hedgerow planting will include the following species; *Alnus glutinosa*, *Corylus avellana*, *Crataegus monogyna*, *Ilex aquifolium*, honeysuckle *Lonicera periclymenum*, *Malus sylvestris*, *Prunus avium* , *Prunus spinosa*, *Rosa canina*, *Samucus nigris*, and *Viburnum opulus*. Tree planting will include semi-mature species such as: *Quercus petraea*, *Fagus sylvatica*, *Arbustus unedo*, *Pinus sylvestris, Betula pendula*, *Sorbus acuparia*, *Prunus avium plena*. There will also be woodland structure planting on the peripheries of the site and of the buildings, which will total c. 58,567m^2

of planting, and 3300 trees per/ha. This will ensure the proposed development compiles with Objective 14.11 of the *Clare County Development Plan 2017-2023 (As varied)*, and the requirement that there is no net loss of lesser horseshoe bat habitat within the proposed development.

This proposed planting has been designed to ensure that connectivity for foraging and commuting bats is maintained - *i.e.* along the peripheries of the site, and within the site from the woodland in the north west to suitable foraging habitats such as Toureen Lough, and along hedgerows in the north to woodland and wetland habitats in the east, also ensuring connectivity is maintained to/from roost buildings.

Existing hedgerows along the southern boundary that are less species rich, will be enhanced through additional planting of native species. The proposed planting will occur in phases. with the earliest planting occurring along important foraging and/or commuting routes in the north, south and east of the site, at pre-construction stage and prior to removal of any habitats. This will ensure that suitable foraging and commuting habitat for bat species is established prior to the removal of such habitat during the construction of the proposed development; therefore maintaining the site's suitability for local bat species. Cattle grazed fields are known to have higher rates of bat activity than ungrazed grassland (Downs et al. 2010)[60]; therefore, in addition to the hedgerows and treeline planting, areas of cattle grazed grassland will be maintained as they are currently in the east, north and west of the site with additional hedgerows separating fields, to provide further suitable habitat for lesser horseshoe bat.

7.6.1.5 Otter

As the otter populations that utilise the proposed development are considered to be part of European site populations downstream and hydrologically connected to the site (i.e. Lower River Shannon SAC and Dromore Woods and Loughs SAC), any mitigation measures required to prevent impacts on this species are discussed in Section 7.6.1.1 above, and in Section 7 of the NIS produced as part of this planning application (Scott Cawley, 2021).

7.6.1.6 Badger

Disturbance/displacement

The mitigation measures described below follow the recommendations set out in the *Guidelines for the Treatment of Badgers during the Construction of National Road Schemes* (National Roads Authority, 2006). These guidelines set out the best practice approach in considering and mitigating impacts on badgers during construction works.

As the usage of setts by badgers can change over time, a pre-construction check of the activity status of all setts will be carried out within 12 months of any construction work commencing within the ZoI of the setts discussed below.

As badgers could potentially establish new setts in the future within the ZoI of the proposed development, a pre-construction check of all suitable habitat within the proposed development boundary will be required within 12 months of any constructions works commencing. Any new badger setts present will be afforded

[60] Downs, N., & Sanderson, L. (2010). Do Bats Forage Over Cattle Dung or Over Cattle?. *Acta Chiropterologica*, *12*(2), 349-358.

protection in line with the requirements set out in the TII/NRA guidance document as follows:

- Badger setts will be clearly marked and the extent of bounds prohibited for vehicles clearly marked by fencing and signage
- No heavy machinery shall be used within 30m of badger setts; lighter machinery (generally wheeled vehicles) shall not be used within 20m of a sett entrance; light work, such as digging by hand or scrub clearance shall not take place within 10m of sett entrances
- During the breeding season (*i.e.* December to June inclusive), none of the above works shall be undertaken within 50m of active setts, nor blasting or pile driving within 150m of active setts
- Works can be undertaken within these zones following consultation with, the approval of and, if required, under the supervision of a badger ecologist

As the proposed development will not result in the loss of any badger setts, there is no requirement to construct any artificial setts as part of the mitigation strategy.

7.6.1.7 Other Mammals (including pine marten and Irish hare)

The construction phase of the proposed development is not deemed to affect the local mammal population and will not result in a likely significant negative effect, at any geographic scale. However, mitigation is provided should small mammals (*e.g.* pygmy shrew and hedgehog) become trapped in excavations or pits required for construction activities. During construction, the use of egress ramps in any pits or holes that have been dug on site is required. This will allow for any mammal species that have fallen in, to allow to escape and be unharmed by construction activities.

7.6.1.8 Breeding birds

Measures to Protect Breeding Birds During Construction from mortality/injury

Where feasible, vegetation (*e.g.* hedgerows, trees, scrub and grassland) will not be removed, between the 1st March and the 31st August, to avoid direct impacts on nesting birds. Where the construction programme does not allow this seasonal restriction to be observed, then these areas will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. Areas found not to contain nests will be cleared within three days of the nest survey, otherwise repeat surveys will be required.

Disturbance/displacement

Similar to the requirements provided above in terms of reducing mortality risk, vegetation clearance undertaken in the appropriate time should ensure that breeding birds have adequate time in which to identify alternative vegetation in which to establish nests.

7.6.1.9 Wintering birds

Measures to Reduce impacts to wintering birds due to vegetation loss

In the absence of any other ecological requirement/constraint, the removal of screening vegetation from adjacent or within/adjacent to inland forage/resting sites used by wintering bird species (i.e. pond features in the north west) shall be undertaken outside the statutory breeding bird season (March 1st to August 31st) and before the

arrival of wintering birds. Thus, vegetation clearance in areas adjacent to or within/adjoining or near feeding sites should be scheduled for September.

Only that vegetation, which is absolutely necessary shall be removed, with very little suitable habitat being removed/altered, the remainder shall be fenced off from works activity (as necessary) in accordance with accepted landscaping protocols.

Measures to prevent Disturbance and Displacement Impacts

The proposed location of the temporary (suggested 2 years) construction compound is in open grassland in the south of the site. Given the proximity of the compound to known feeding sites *i.e*. Toureen Lough, M18 Motorway attenuation pond, within the proposed development site, the following measures should be put in place to minimise disturbance to wintering bird species at this location.

The compound shall be established outside of the wintering bird season (*i.e.* October to March);

- The compound shall be fully screened on all sides for the duration of the works. The screening shall be put in place before the arrival of wintering birds;
- In respect of the physical screening, particular attention should be paid to the west side and additional noise reducing material installed to minimise potential impact on habitat for wintering bird species;
- The normal hours of operation within the compound shall correspond to daylight working hours (8am – 6pm), when background traffic noise on adjacent road may "mask" construction noise within the compound; and
- Outside of work hours during winter months (i.e. 07:30-17:30) shall only be carried out in areas which do not support or impinge on wintering bird species feeding or movement.

Habitat Degradation- Water Quality

The mitigation measures relating to the protection of water quality in receiving watercourses during construction are outlined above in Section 7.6.1.1, in Chapter 6, *Hydrology* and detailed in Section 7.6 of the CEMP.

7.6.1.10 Amphibians

Disturbance & Mortality Risk

If works to clear any of the habitat features suitable to support common frog are to begin during the season where frogspawn or tadpoles may be present (February – mid-summer), a pre-construction survey will be undertaken to determine whether breeding common frogs are present.

Any frog spawn, tadpoles, juvenile or adult frogs present will be captured and removed from affected habitat by hand net and translocated to the nearest area of available suitable habitat, beyond the ZoI of the proposed road development.

Any capture and translocation works shall be undertaken immediately in advance of site clearance/construction works commencing and will require a licence from NPWS.

Habitat Degradation- Water Quality

The mitigation measures relating to the protection of water quality in receiving watercourses during construction are outlined above in Section 7.6.1.1, in Chapter 6, *Hydrology* and detailed in Section 7.6 of the CEMP.

7.6.1.11 Reptiles

Habitat Loss, Disturbance & Mortality Risk during Construction

Given the broad range of habitat types favoured by the common lizard, and that the majority of the proposed development contains mosaics of such habitats, site clearance works at any time of year in suitable habitat are highly likely to encounter the species, cause disturbance and have the potential to kill or injure individuals.

In order to minimise the risk of site clearance and construction works disturbing, or causing the mortality of, common lizard the following schedule of site clearance works will be followed in any areas of suitable habitat that will be removed (*i.e.* scrub, stone walls, exposed rock, dead wood):

- Grass or scrub vegetation will be removed during the winter period, where possible, avoiding potential common lizard hibernacula sites (dry sites which provide frost-free conditions *e.g.* stone walls, underground small mammal burrows, piles of dead wood or rubble).
- Where this is not possible and clearance will be undertaken during the active season (*i.e.* March through to September, inclusive), vegetation will be cut first to approximately 15cm, and then to the ground, under supervision of an ecologist. This will allow the opportunity for lizards to be displaced by the disturbance and leave the affected area.
- Stone walls (or other potential hibernacula sites) will be removed during the active season (*i.e.* March through to September, inclusive) under the supervision of an ecologist, when they are less likely to be in use by torpid lizards.

7.6.1.12 Fish

Habitat Degradation – Surface Water Quality

The mitigation measures relating to the protection of water quality in receiving watercourses during construction are outlined in above in Section 7.6.1.1, in Chapter 6 *Hydrology* and detailed in Section 7.6 of the CEMP.

Habitat loss

The culvert and headwall and mattress have been designed in consultation with IFI and in accordance with the design criteria set out in *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016).

To minimise the effects of habitat loss on fish species, all sections of river/stream channel within the proposed development boundary, but not within the footprint of the proposed Project and associated infrastructure, will be protected from site clearance and construction works. Rivers/streams will be fenced off at a minimum distance of 5m from the riverbank and within this zone the natural riparian vegetation will be retained.

7.6.1.13 Invertebrates

White-clawed crayfish

The mitigation measures relating to the protection of water quality and to reduce the impact of habitat loss in receiving watercourses during construction are outlined above in Section 7.6.1.1 and detailed in Section 7.6 of the CEMP.

7.6.2 Operational Phase

7.6.2.1 European sites

The mitigation measures that are specifically required to ensure that the proposed development will not adversely affect the integrity of the European sites within the ZoI (*i.e.* Lower River Shannon SAC, Dromore Woods and Loughs SAC, Old Domestic Building (Keevagh) SAC, Old Domestic Buildings, Rylane SAC, River Shannon and River Fergus Estuaries SPA, Ballyallia Lough SPA, and Corofin Wetlands SPA) are presented in the NIS and below. Following a consideration and assessment of the proposed development on the identified relevant European sites, the following mitigation measures were development to address potential impacts that were identified:

Measures to protect surface water quality during operation and prevent impacts on SCI/QI species

Foul water

A temporary trench excavation along the Tulla road will be undertaken to facilitate pipe laying for connection with the existing public wastewater sewer and mains water supply.

There is no trade effluent proposed for this development. Foul sewage will be collected from site (i.e. from the data storage facility, offices and energy centre washroom facilities and canteen) and discharged through a new pumping station which will be constructed as part of this proposed development, to the foul drainage network which runs along the Tulla Road and ultimately discharges to Ennis North (Clonroadmore) WWTP Reg D0048. Ennis North WWTP has no capacity issues and consultation with Clare County Council has confirmed that sufficient wastewater capacity is available and a pre-connection enquiry PCE application form has been submitted to Irish Water (IW).

Surface water

The proposed surface water drainage service to the development comprises various drainage components including positive stormwater networks, attenuation systems and several Sustainable Drainage System (SuDS) elements. Stormwater will be attenuated on site for the 1:1,000 year flood event. An over flow subsurface pipeline will discharge at current discharge rates (greenfield) to the Spancelhill Stream (Ballymacahill River).

The roofs, yards and internal access roads proposed throughout and within the footprint of the proposed development will be drained through a sealed drainage system that will ultimately be collected by gullies and conveyed through a series of proposed storm water pipes prior to discharging into a proposed open attenuation basin. The proposed stormwater drainage networks will range from 225mm to 1050mm

pipe diameter depending on the required flow capacity. It is proposed to drain the site using a network of SuDS swales along the edge of the internal road network where possible. Reinforced grass-crete or similar will also be used along parts of the road network to increase infiltration on less heavily trafficked access roads. These drains and swales will discharge to a surface water retention pond/attenuation pond where the discharge will be controlled using a vortex flow control to limit the maximum discharge for the 0.1% Annual Exceedance Pollution event (1:1000-year return period). The attenuation pond to be constructed to retain a constant volume of water to promote settling and reduce conveyance of suspended solids and other particles to the receiving waters. An attenuation volume of 6864 m^3 is designed as part of the proposed development. Further details are provided in Chapter 7 of the EIAR and within the CSEA engineering report prepared for planning.

Measures to prevent disturbance and displacement of lesser horseshoe bats

During operation, the strategies in place are to limit the duration of the lighting at night and also limit lux levels wherever possible. However, there is potential for light spill from the proposed development on suitable areas of foraging and/or commuting habitats used by lesser horseshoe bats. There will also be the addition of lighting along new pathways on the Tulla Road, which will be turned on during the hours of darkness for safety reasons. A light spill modelling drawing has been used to indicate where any areas of light spill may be within and beyond the proposed development, prior to mitigation[57]. The following mitigation measures will be in place to ensure the habitats on site remain suitable for lesser horseshoe bats:

- Street lighting within the development is required for safety and will not be operational at night unless in an emergency and site evacuation, and will consist of minimal number of light fixtures and installed on short poles with the use of shields to restrict beam angles and avoid light spillage where illuminance is not required;
- Tree and hedgerow planting will be implemented around the buildings and along the access roads to screen the development, planted at pre-construction to ensure sufficient screening is in place to prevent any light spill on areas of sensitivity for bats within the proposed development;
- The use of berms along adjacent to the main entrance of the site will further screen any lighting on Tulla Road, by increasing the height of initial planting carried out;
- Office lighting will be controlled to avoid light spill to the outdoors through the glass windows, using black-out blinds from dusk until dawn;
- External lighting for pedestrian pathways and low-traffic roads will be controlled and dimmed and will only be at higher Lux levels when required, i.e. during emergencies, and with the use of shields to limit the light emitted to above or to the sides;
- LED luminaries will be used to ensure light pollution is kept to a minimum and to avoid uplighting. Where practical, directional luminaries will be utilised to enable precise projection of light;
- External lighting will normally be turned off, and internal building lighting will be controlled by PIR switching;
- The light spill model demonstrates that prior to mitigation light spill from the Tulla Road lighting will be more than 0.1 Lux in areas of bat sensitivity, this does not take into account the planting that will be in place, which will develop over time, reducing any light spill onto adjoining areas used by local bat species to negligible levels (0.1 Lux or lower);
- During night-time hours, lighting will only be provided for circulation areas with no lighting on surrounding areas, including protected important foraging and/or commuting areas for bats; and

- There will be no light trespass over 0.1 Lux on surrounding areas beyond the buildings by the use of shielded luminaries, lighting beam angles, low height street lighting columns, and minimal numbers of luminaries used.

7.6.2.2 National sites

The mitigation measures that are specifically required to ensure that the proposed delopment will not adversely affect the integrity of the National sites within the ZoI, and that overlap with previously described European sites (*i.e.* Fergus Estuary and Inner Shannon, North Shore pNHA, Old Domestic Building (Keevagh) pNHA, Ballyallia Lake pNHA, and Dromore Woods and Loughs pNHA), are presented in the NIS and summarised above in 7.5.1.1. Therefore, the mitigation measures outlined above in Section 7.6.2.1, and as detailed in the NIS, will prevent the proposed development resulting in a significant negative effect on these pNHA sites at the national geographic scale.

Durra Castle pNHA

The mitigation strategy in relation to potential impacts arising from the proposed development on Durra Castle pNHA includes mitigation to prevent disturbance and displacement impacts on lesser horseshoe bats on suitable foraging and/or commuting grounds, within the normal foraging range of this species (See Section 7.6.2.1)

7.6.2.3 Habitats

Measures to Protect Surface Water Quality during Operation

Mitigation measures to protect surface water in the receiving local environment during operation are detailed above in Section 7.6.2.1, in Chapter 6: Hydrology, and in the Construction Environmental Management Plan (CEMP), and include: -

- Continued management, monitoring and maintenance of the waste water pumping system in accordance with Irish Water requirements.

- Runoff from the site will be attenuated within the on-site attenuation tanks, swales, and a hydrobrake will also be employed to control the rate of discharge. In combination, these SuDS measures significantly reduce the volume and rate of surface water discharging from the site.

- The SuDS treatment train will pre-treat the surface water discharging to the Spancelhill Stream, removing pollutants and hydrocarbons from the surface water runoff.

- There will be no direct run-off from hard stand areas to the karst conduit systems or Toureen lough.

These mitigation measures are for the protection of the water quality within Toureen Lough, Spancelhill Stream, River Fergus, and for the protection of European Sites downstream as there are significant effects likely to arise on European sites as a result of water quality impacts associated with the proposed development, as discussed above in Section 7.5.1.

Habitat Degradation- Air Quality

A described in Section 7.5.2.3, the operational phase impact of the proposed development on designated sites is considered to be not significant at any geographic level, and therefore requires no mitigation measures.

7.6.2.4 Bats

Measures to Control and Reduce Light Spill During Operation

A light spill model study of the proposed development site was undertaken by Hurley Palmer Flatt (June 2021) to determine the effects of artificial light and Artificial Light At Night (ALAN) on bats as a result of the proposed development and identify how to reduce or eliminate ALAN onsite, based on information from both Eurobats Guideline No.8, the Institution of Lighting Professionals (ILP) Guidance Note No.8. and Bat Conservation Ireland Guidance Notes for: Planners engineers, architects and developers. The mitigation as described above in Section 7.6.2.1, also applies for all bat species using the proposed development site.

To ensure important bat corridors are maintained throughout the site before, during and after construction, a 30m dark zone buffer will be in place along hedgerows and treelines within the site wherever possible, and along the Clare County Council Ecological buffer zones (Figure 7.24).

7.6.2.5 Otter

As the otter populations that utilise the proposed development are considered to be part of European site populations downstream and hydrologically connected to the site (i.e. Lower River Shannon SAC and Dromore Woods and Loughs SAC), any mitigation measures required to prevent impacts on this species are discussed in Section 7.6.2.1 above, and in Section 7of the NIS produced as part of this planning application (Scott Cawley, 2021).

7.6.2.6 Badgers

The operation of the proposed development is not predicted to result in any significant effects to populations of badger in the vicinity of the proposed development. Therefore, no mitigation is proposed.

7.6.2.7 Other Mammals (including pine marten and Irish hare)

The operation phase of the proposed development is not deemed to affect the local mammal population and will not result in a likely significant negative effect, at any geographic scale. As such, no mitigation is proposed.

7.6.2.8 Breeding Birds

Habitat Loss and Loss of Breeding / Resting Sites

Re-planting of treeline, hedgerow and scrub habitats within/alongside the proposed project boundary as detailed in the landscape drawings will over time provide suitable compensatory habitat for the breeding bird species to expand, and disturbance/displacement impacts occurring during the construction phase should reduce.

To further minimise the effects of breeding habitat loss, a total of 15 nest boxes will be erected by a qualified ecologist. The siting and type of nest boxes will be decided on by an ecologist at locations adjacent to where new trees will be planted or at suitable retained vegetation along the proposed development. More detail on location, and type of bird box can be found in the Landscape and Biodiversity Management Plan[40] submitted as part of this development.

7.6.2.9 Wintering birds

Habitat Degradation- Surface Water

In areas where the proposed development will result in an increase in the impermeable surface area, SuDS measures in the form of bioretention areas, swales, filter drains, rain gardens/ bioswales, tree pits oversized pipes and flow control devices, will be installed. These SuDS systems will reduce both the volume and rate of surface waters discharging into the existing surface water drainage network, as well as improving the environmental quality of any such discharges.

Measures to prevent to Disturbance and Displacement Impacts to Wintering Bird species

As part of the landscape plan and following on from completion of works in particularly sensitive and areas of suitable habitat, namely Toureen Lough, the M18 attenuation pond in the western boundary, and wetlands in the east and north of the site; the re-establishment of vegetation in a timely manner will be critical. It will be done outside of the wintering bird season, and will be done during the early stages of the phasing of the development. This early planting will screen off the development from important features and areas of suitable habitat for wintering birds, and there will not be any significant impact on wintering birds as a result of disturbance and displacement impacts, at any geographic scale.

7.6.2.10 Amphibians

In areas where the proposed development will result in an increase in the impermeable surface area, SuDS measures in the form of bioretention areas, swales, filter drains, rain gardens/ bioswales, tree pits oversized pipes and flow control devices, will be installed. These SuDS systems will reduce both the volume and rate of surface waters discharging into the existing surface water drainage network, as well as improving the environmental quality of any such discharges.

7.6.2.11 Fish

Habitat Degradation – Surface Water

The mitigation measures relating to the protection of water quality in receiving watercourses during operation are detailed above in Section 7.6.2.1 and in Section 7.6 of the CEMP.

Habitat Severance/Barrier Effect

The culvert with headwall and mattress have been designed in consultation with IFI and the design criteria set out in the Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016). This will maintain fish passage during the operation of the proposed development and therefore, will result in a neutral impact to fish species.

7.7 COMPENSATION

There are a number of compensation measures that will be utilised as part of the proposed development site, that will ensure that habitats and biodiversity found within the site are maintained and enhanced where possible, and additional measures proposed as part of the mitigation strategy provided above in Section 7.6 will be implemented in full and in accordance with best practice guidelines.

Hedgerows are a key habitat within the proposed development site, valued as being of local (higher) importance, and forming a key network of green corridors across the site. The retention of as many of these corridors as possible and the enhancement of the existing green network through new additional corridors has been a key consideration in the design of the landscape around the Data Centres. New woodland belts and hedgerows that provide new and replacement connections across the site are utilised, with 4.86km of new native hedgerow planting proposed, as well as c. 58,567m² of woodland planting. Only native species, and species that are already found within the site, will be planted. The retention and enhancement of existing hedgerows, with additional planting of native hedgerows will provide commuting and foraging routes for local bat species across the site, and will maintain access to/from roost sites and particularly active foraging areas of the site (Toureen Lough, woodland in the north west, hedgerows in the east). These hedgerows will also provide commuting corridors, foraging areas and suitable habitat for a range of other mammals, birds, invertebrates, and reptiles.

There will be a loss of dry meadows and grassy verges within the footprint of the proposed development. Whilst this habitat is valued as being of local (lower) importance based on the common species found here and availability of this habitat in the wider environs, compensation for the loss of this habitat is included. Meadow grasslands are proposed around the edges of the Data Centres, with c. 5.5ha proposed. These grasslands will include wildflowers such as *Lotus corniculatus, Medicago lupulina, Hypochaeris radicata, Lythrum salicaria, Silene flos-cuculi, Trifolium pratense, Agrostemma githago, and Succisa pratensis* (full list of species can be found in the Landscape Design Strategy Report[41]. These meadow grasslands will provide opportunities for a range of pollinators and other invertebrates, in addition to provide habitat for foraging birds, bats and other mammals. Feature trees and smaller tree species are also proposed within this habitat, the majority of which are seed or fruit bearing, which will offer foraging habitat for birds and mammal species.

The proposal also includes the implementation of woodland embankments, planted up with a mixture of native woodland trees, of varying ages, and structure. The embankment ground beneath the trees will be left bare to provide a suitable attractive habitat for solitary bees, further contributing to the biodiversity of the site.

A SuDS basin is proposed in the west of the site, with a swale proposed along the new road network to the south of DC3. These two features will be seeded with meadow grassland and will form part of the wider meadow grassland landscape. The base of the SuDS basin will be seeded with a wetland meadow mix that is tolerant of flooding. The SuDS basin will add to the wetland areas around the site further contributing to the biodiversity and wildlife of the area.

A Landscape and Biodiversity Management Plan[40] has been produced as part of this planning application *'to provide landscape, visual and environmental screening and enhancement measures through planting and design' (Clare County Council, 2019).* This plan will provide a practical and comprehensive guide that can be referred to and

consulted by the local authority, the developer, and their appointed contractors, and the future operator of the Data Centres.

7.8 CUMULATIVE IMPACTS

This section of the report presents the assessment carried out to examine whether any other plans or projects have the potential to act in combination with the proposed development to to give rise to likely significant effects on biodiversity.

The majority of the immediately surrounding lands are not zoned currently. However the area described as 'Buffer Space' by Clare County Council (2019), is currently designated as an ecological protection area and free from development. The lands to the north of the proposed development site are zoned as *O2 – General*; to the immediate east is the substation, *zoned* as N3.2 – Electricity; and further east towards Ennis is mainly zoned as *R2 - Existing residential.* To the south east, there is a site zoned as *C2.1 - Industrial, enterprise, employment,* and to the west, there is a site also zoned for *O2 – General.* Beyond the residential zoning south east of the site, is a large area of land zones as *G3 - Conservation, amenity or buffer space, corridor/belt, landscape.* The most likely cumulative effect of other future development with the proposed development on the receiving environment is the potential for other pollution sources within the Fergus River sub-catchment, the Shannon Estuary North catchment and the River Shannon Catchment, and any other catchments that also drain to the Shannon Estuary to cumulatively affect water quality in the receiving surface water, estuarine and marine environments (See Chapter 6 *Hydrology*).

There are a number of granted planning permissions, and appealed planning permissions, for residential or other small-scale developments, such as construction of housing developments, sporting facilities, renovation of a school, telecommunications services and residential renovations *etc.* in the vicinity of the proposed development site, as well as larger scale developments in close proximity to the proposed development site, some of which may be in construction at the same time as the proposed development. A list of these projects considered in the cumulative impacts assessment is included in Chapter 3, Appendix 3.1.

Potential cumulative impacts may arise during construction and operation, as a consequence of the proposed development acting in-combination with other plans and projects, on water quality in the downstream surface water environment, disturbance to birds, bats, small mammals and badger, otter as well as loss of potentially important habitats and subsequently habitat loss to bats, birds, small mammals, otters and badger.

There is potential for cumulative impacts to arise with other local developments that would also result in increased noise, vibration, human presence and lighting. However, as any disturbance effects from other such local developments are likely to be or a minor nature, temporary, localised and over a short-duration, they are not likely to cumulatively affect the local badger, small mammal, breeding bird, otter or bat populations in conjunction with the proposed development.

This NIS has examined and analysed the potential impact sources and pathways from the proposed development on European sites, and how these could impact on European sites' qualifying interests/special conservation interests and whether the predicted impacts would adversely affect the integrity of; Lower River Shannon SAC, Dromore Woods and Loughs SAC, Old Domestic Building (Keevagh) SAC, Old Domestic Buildings, Rylane SAC, River Shannon and River Fergus Estuaries SPA, Ballyallia Lough SPA, Slieve Aughty Mountains SPA, and Corofin Wetlands SPA. This is in light of the best scientific knowledge, and with respect to those European sites

within the zone of influence of the proposed development. There are no other European sites at risk of effects from the proposed development.

Avoidance, design requirements and mitigation measures are set out within the NIS [and its appendices] and they ensure that any impacts on the conservation objectives of European sites will be avoided during the construction and operation of the proposed development such that there will be no risk of adverse effects on these European sites.

It has been objectively concluded by Scott Cawley Ltd., following an examination, analysis and evaluation of the relevant information, including in particular the nature of the predicted impacts from the proposed development, that the proposed development, either alone or in combination with other plans or projects, will not adversely affect (either directly or indirectly) the integrity of any European site.

There is the potential for other pollution sources within the Spancellhill Stream, the River Fergus, the Shannon Estuary North WFD catchment and any other catchments that also drain to the Fergus Estuary to cumulatively affect water quality in the receiving estuarine and marine environments.

The potential for in combination effects to arise in Fergus Estuary from any existing or proposed land use plans or developments is regulated and controlled by the environmental protective policies and objectives of the *Clare County Development Plan 2017-2023*. Any existing/proposed plan or project that could potentially affect Lower River Shannon SAC, Dromore Woods and Loughs SAC, Old Domestic Building (Keevagh) SAC, Old Domestic Buildings, Rylane SAC, River Shannon and River Fergus Estuaries SPA, and Ballyallia Lough SPA, or any other European site, in combination with the proposed development, must adhere to these overarching environmental protective policies and objectives. These policies and objectives will ensure the protection of the European site within the zone of influence of the proposed development, and include the requirement for any future plans or projects to undergo Screening for Appropriate Assessment and/or Appropriate Assessment to examine and assess their effects on European sites, alone and in combination with other plans and projects.

There are specific objectives and policies in the *Clare County Development Plan 2017-2023 Variation no. I* to protect biodiversity, and specifically European sites. Policies CDP2.1 , CDP14.2 , CDP14.3, relate to the protection of European sites, AA and commitments to not permitting projects giving rise to adverse effects on the integrity of European sites without demonstrating there are no alternatives, there are imperative reasons of overriding public interest, and undertaking all compensation measures necessary to ensure the overall coherence of the network of European sites. The *Limerick County Development Plan 2010-2016* also includes policies to protect (from risk of pollution), manage and enhance the counties' surface water and groundwater resources, protect, conserve and enhance habitats, species and areas of European and national importance (CP 10, SE 01, ED P7, EH 01, EH 02, EH 03, EH 04, CP 10, SE 01, IN P11).

The environmental protective policies and objectives set out in the *Clare County Development Plan 2017-23* are mirrored in the Shannon Town and Environs Local Area Plan 2012-2018 in terms of the protection of European sites (policy B2) and the protection of County Clare's surface water and groundwater resources (policy W1, W2, W4, W5, W7).

Land use plans for the other local authorities (*e.g.* Galway County Council and Kerry County Council) whose functional areas include surface water features which drain to

Fergus and Shannon Estuaries, were examined and analysed and those land use plans also include protective environmental policies to protect European sites (Policy NHB 1 in Galway, and Policies NE-2, NE-11, NE-12 and NE-30 in Kerry) and the receiving surface water environments (i.e. policies FL 1, WW 1, WS 5, and NHB 4 in Galway, and Policies NE-18, NE-19, NE-20, NE-22, NE-23, NE-24 and NE-26 in Kerry).

7.9 RESIDUAL IMPACTS

The assessment, presented in the NIS, of the potential for the proposed development to impact upon the Lower River Shannon SAC, Dromore Woods and Loughs SAC, Old Domestic Buildings (Keevagh) SAC, Old Domestic Buildings, Rylane SAC, Ballyallia Lough SPA, River Shannon and River Fergus SPA, Sieve Aughty Mountains SPA and Corofin Wetlands SPA concluded that, with the implementation of the mitigation measures proposed, the proposed development, either on its own or in combination with other plans or projects, does not pose a risk of adversely affecting (either directly or indirectly) the integrity of these, or any other, European sites.

As discussed above, the proposed development has the potential to affect nationally designated areas for nature conservation downstream of the proposed development site due to the potential for effects on the receiving aquatic environment prior to mitigation. The proposed development will result in some habitat loss within the proposed development site. The proposed development has the potential to affect habitats indirectly as a result of habitat loss, hydrological, air quality, and disturbance and displacement impacts. It also has the potential to result in likely significant effects on amphibians, breeding birds, bats, badgers, wintering birds, other mammals, invertebrate, fish and reptiles at a local level, and the lesser horseshoe bat, otter, QI fish species, and SCI wintering birds at the international level.

The above impacts will not result in any significant residual negative effects on biodiversity, following the implementation of mitigation measures that will be undertaken. The landscape plan will ensure that the biodiversity value of the habitats to be retained and created as part of the proposed development are maximised in support of their important functions. A comprehensive suite of mitigation measures is proposed, in addition to the extensive and stringent environmental control measures that have been incorporated into the design of the proposed development. The development has been designed by an iterative process, to ensure that potential impacts are minimised and mitigated by design. These measures are included in Section 7.4. All of the mitigation measures will be implemented in full and are best practice, and tried and tested, effective control measures to protect biodiversity and the receiving environment.

Considering the elements included within the design of the proposed development (as described in the Project Description), and the implementation of the mitigation measures proposed in the EIAR and the associated planning application documents, to avoid or minimise the effects of the proposed development on the receiving environment, no likely significant residual effects on biodiversity are predicted. See Table 7.13 below for summary of potential impacts, mitigation, compensation and enhancement measures, and residual impacts of the proposed development.

Table 7.13 Summary of potential impacts, mitigation, compensation and enhancement measures, and residual impacts of the proposed development

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
Designated Sites					
Lower River Shannon SAC	International	Accidental pollution event during construction draining to watercourses and degrading habitats/QI species Otter habitat loss/fragmentation in the Spancelhill Stream Disturbance and/or displacement of otter Habitat degradation as a result of introducing non-native invasive species	International	Water protection measures on water quality for downstream QI habitats and species Pre-construction checks of Spancelhill Stream No night working adjacent to suitable otter habitat Measures to prevent introduction of non-native invasive species	None
Dromore Woods and Loughs SAC	International	Otter/lesser horseshoe bat habitat loss/fragmentation Accidental pollution event during construction draining to watercourses and degrading habitats for QI species (otter) Disturbance and/or displacement of QI species (otter/lesser horseshoe bat)	International	Water protection measures on water quality for downstream QI species Pre-construction checks of Spancelhill Stream Replacement planting of native hedgerows. Planting will be carried out in the first phase of construction, prior to any removal of vegetation. No lighting is permitted during night time construction works, and lighting for operation has been designed to result in no light spill on surrounding features used by lesser horseshoe bats. Lighting will be off in normal	None

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
				circumstances and only used during emergencies	
Old Domestic Building (Keevagh) SAC	International	Lesser horseshoe bat habitat loss/fragmentation Disturbance and/or displacement of QI species (lesser horseshoe bat)	International	Replacement planting of native hedgerows. Planting will be carried out in the first phase of construction, prior to any removal of vegetation. No lighting is permitted during night time construction works, and lighting for operation has been designed to result in no light spill on surrounding features used by lesser horseshoe bats. Lighting will be off in normal circumstances and only used during emergencies	None
Old Domestic Buildings, Rylane SAC	International	Lesser horseshoe bat habitat loss/fragmentation Disturbance and/or displacement of QI species (lesser horseshoe bat)	International	Replacement planting of native hedgerows. Planting will be carried out in the first phase of construction, prior to any removal of vegetation. No lighting is permitted during night time construction works, and lighting for operation has been designed to result in no light spill on surrounding features used by lesser horseshoe bats. Lighting will be off in normal circumstances and only used during emergencies	None
River Shannon and River Fergus Estuaries SPA	International	Accidental pollution event during construction draining to watercourses and degrading habitats for SCI species	International	Water protection measures on water quality for downstream QI habitats and species	None

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
		Disturbance/displacement of SCI species using the proposed development as ex-situ sites			
Ballyallia Lough SPA	International	Accidental pollution event during construction draining to watercourses and degrading habitats for SCI species Disturbance/displacement of SCI species using the proposed development as ex-situ sites	International	Water protection measures on water quality for downstream QI habitats and species	None
Slieve Aughty Mountains SPA	International	Accidental pollution event during construction draining to watercourses and degrading habitats for SCI species Disturbance/displacement of SCI species using the proposed development as ex-situ sites	International	N/A	None
Corofin Wetlands SPA	International	Accidental pollution event during construction draining to watercourses and degrading habitats for SCI species Disturbance/displacement of SCI species using the proposed development as ex-situ sites	International	Water protection measures on water quality for downstream QI habitats and species	None
Fergus Estuary and Inner Shannon, North Shore pNHA	National	Accidental pollution event during construction draining to watercourses and degrading habitats and supporting habitats for designated species	National	Water protection measures on water quality for downstream habitats and species Pre-construction checks of Spancelhill Stream	None

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
		Otter habitat loss/fragmentation in the Spancelhill Stream Disturbance and/or displacement of otter/bird species Habitat degradation as a result of introducing non-native invasive species		No night working adjacent to suitable otter habitat Measures to prevent introduction of non-native invasive species	
Old Domestic Building (Keevagh) pNHA	National	Lesser horseshoe bat habitat loss/fragmentation Disturbance and/or displacement of QI species (lesser horseshoe bat)	National	Replacement planting of native hedgerows. Planting will be carried out in the first phase of construction, prior to any removal of vegetation. No lighting is permitted during night time construction works, and lighting for operation has been designed to result in no light spill on surrounding features used by lesser horseshoe bats. Lighting will be off in normal circumstances and only used during emergencies	None
Ballyallia Lake pNHA	National	Accidental pollution event during construction draining to watercourses and degrading habitats for bird species Disturbance/displacement of bird species using the proposed development as ex-situ sites	National	Water protection measures on water quality for designated bird species of this pNHA using downstream watercourses as ex situ sites	None
Dromore Woods and Loughs pNHA	National	Otter/lesser horseshoe bat habitat loss/fragmentation	National	Water protection measures on water quality for otter using downstream	None

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
		Accidental pollution event during construction draining to watercourses and degrading habitats for otter Disturbance and/or displacement of otter/lesser horseshoe bat		watercourses to which the proposed development drains to Pre-construction checks of Spancelhill Stream Replacement planting of native hedgerows. Planting will be carried out in the first phase of construction, prior to any removal of vegetation. No lighting is permitted during night time construction works, and lighting for operation has been designed to result in no light spill on surrounding features used by lesser horseshoe bats. Lighting will be off in normal circumstances and only used during emergencies	
Newpark House (Ennis) pNHA	National	N/A	N/A	N/A	N/A
Lough Cleggan pNHA	National	Accidental pollution event during construction draining to watercourses and degrading habitats for bird species Disturbance/displacement of bird species using the proposed development as ex-situ sites	National	Water protection measures on water quality for designated bird species of this pNHA using downstream watercourses as ex situ sites	None
Durra Castle pNHA	National	Lesser horseshoe bat habitat loss/fragmentation Disturbance and/or displacement of designated species (lesser horseshoe bat)	National	Replacement planting of native hedgerows. Planting will be carried out in the first phase of construction, prior to any removal of vegetation.	None

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
				No lighting is permitted during night time construction works, and lighting for operation has been designed to result in no light spill on surrounding features used by lesser horseshoe bats. Lighting will be off in normal circumstances and only used during emergencies	
Habitats					
Hedgerows (WL1)	Local (High)	Loss of habitat (c. 2.7km) Degradation of habitat from dust emissions	Local (High)	Replacement planting of 4.86km of native hedgerow Root Protection Zones Protection from dust emissions and construction activities by dust screens and fencing Landscape and Biodiversity Management Plan Enhancement of existing hedgerows	None
Marsh (GM1)	Local (High)	Degradation of habitat from runoff from construction activities	Local (High)	N/A	None
Wet grassland (GS4) including the Annex I habitat *Molinia* Meadows [6410]	Local (High) - National	Loss of habitat (c. 1.4ha) Degradation of habitat from runoff from construction activities Degradation of habitats dependent on groundwater and	Local (High)	Additional planting of swale above attenuation pond with plant species that are typically associated with seasonally flooded habitats Protection from dust emissions and construction activities by dust screens and fencing	None

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
		subsequently degradation on groundwater regime Degradation of habitats due to changes in air quality from dust		Surface water and groundwater protection measures Non-native invasive species prevention measures	
Lowland/Depositing Rivers (FW2)	Local (High)	Loss of habitat ($2m^2$) Degradation of habitat from runoff from construction activities	Local (High)	Surface water protection measures Protection from dust emissions and construction activities by dust screens and fencing	None
Annex I habitat 'semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites) (6210)'	National	Relocation of habitat (c. 0.79ha) Degradation of habitats due to changes in air quality from dust emissions	National	Retention of habitat outside the development footprint Relocation and restoration of habitat Protection from dust emissions and construction activities by dust screens and fencing Landscape and Biodiversity Management Plan Planting of native wildflower meadows elsewhere in the site	None
Mesotrophic Lake (FL4)	Local (High)	Degradation of habitat from runoff from construction activities Degradation of habitat from dust emissions	Local (High)	Protection from dust emissions and construction activities by dust screens and fencing Surface water protection measures	None
Other Artificial Lakes and Ponds (FL8)	Local (High)	Degradation of habitat from runoff from construction activities		Protection from dust emissions and construction activities by dust screens and fencing	

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
		Degradation of habitat from dust emissions		Surface water protection measures	
Reed and Large Sedge Swamps (FS1) including the Annex I habitat *Cladium* Fens [*7210]	Local (High) - International	Degradation of habitat from runoff from construction activities Degradation of habitat from dust Degradation of habitats dependent on groundwater and subsequently degradation on groundwater regime	International	Protection from dust emissions and construction activities by dust screens and fencing Surface and ground water protection measures	None
Rich Fen and Flush (PF1) including the Annex I habitat Alkaline Fens [7230]	National	Degradation of habitat from runoff from construction activities Degradation of habitat from dust emissions	National	Protection from dust emissions and construction activities by dust screens and fencing Surface water protection measures	None
Riparian Woodland (WN5) including the Annex I habitat Alluvial Woodland [*91E0]	International	Degradation of habitat from runoff from construction activities Degradation of habitat from dust emissions Degradation of habitats dependent on groundwater and subsequently degradation of groundwater regime		Protection from dust emissions and construction activities by dust screens and fencing Surface and ground water protection measures	
Wet Willow-Alder-Ash Woodland (WN6) including the Annex I habitat Alluvial Woodland [*91E0]	International	Degradation of habitat from runoff from construction activities		Protection from dust emissions and construction activities by dust screens and fencing	

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
		Degradation of habitat from dust emissions Degradation of habitats dependent on groundwater and subsequently degradation of groundwater regime		Surface and ground water protection measures	
Fauna Species					
Bats	Local (High) - International	Tree roost loss Habitat loss Disturbance from lighting	Local (High) - International	Layout designed to protect and retain confirmed bat roost buildings Demolition of structures/felling of trees following seasonal restrictions Roost presence/absence surveys prior to demolition of structures/felling of suitable bat roost trees Soft felling of suitable bat roost trees No night works will be normally undertaken during construction. Any lighting required during construction will be minimal and will avoid suitable foraging/roosting areas. Lighting will be off in normal circumstances and only used during emergencies Planting of native hedgerows and woodlands prior to any removal of vegetation to ensure commuting and/or foraging areas are retained throughout development and operation	None

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
				Lighting during operation designed to be as close to 0 Lux as possible on sensitive bat foraging and/or commuting routes, with lighting only used for emergencies at night and for egress through the site using torches/headlights.	
Otter	International	Otter habitat loss/fragmentation Accidental pollution event during construction draining to watercourses and degrading otter habitat Disturbance and/or displacement of otter	International	Surface water protection measures Pre-construction checks of Spancelhill Stream No night works adjacent to Spancelhill Stream	None
Badgers	Local (High)	Habitat loss Disturbance/Displacement	Local (High)	Pre-construction checks for new setts	None
Other mammal species	Local (High)	Habitat loss Disturbance and displacement	Local (High)	Planting of meadows and woodlands providing additional habitat for commuting and foraging mammal species Inclusion of ramps in excavation pits and/or covering of pits for small mammal egress	None
Breeding Birds	Local (High)	Disturbance and mortality during breeding season Habitat loss	Local (High)	Seasonal vegetation clearance Landscape planting of hedgerows and woodland areas	None

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
		Disturbance and displacement		Buildings with confirmed nests are being retained within the design of the development Nest boxes placed in areas of suitable habitat away from the development	
Wintering birds	Local (High) - International	Habitat loss Habitat degradation (surface water quality)	Local (High) - International	Seasonal vegetation clearance Surface water quality protection measures Construction compound situated away from suitable wintering bird habitat	None
Amphibians	Local (High)	Disturbance and Mortality Habitat degradation (Surface water quality)	Local (High)	Surface water protection measures Pre-construction checks of any suitable habitat features	None
Reptiles	Local (High)	Mortality during vegetation clearance	Local (High)	Seasonal clearance of vegetation ECoW supervision of vegetation clearance	None
Fish	Local (High) - International	Habitat degradation from an accidental pollution event Habitat loss Direct Injury/Mortality	Local (High)	Surface water protection measures Culvert and headwall and mattress designed in consultation with IFI Fencing off of surface water features from construction	None

Ecological Receptor	Ecological Valuation	Impacts with Potentially Significant Effects	Potential Significance of Effects	Mitigation, Compensation and Enhancement Measures	Significance of Residual Effects
				Specific measures to protect lamprey within the Spancelhill Stream by use of silt curtain and spill boom	
White-clawed crayfish	Local (High)	Habitat degradation from an accidental pollution event	Local (High)	Surface water protection measures ECoW supervision of any instream works, and silt curtain and spill boom	None
Other Invertebrates	Local (High)	Habitat loss	Local (High)	Protection from dust emissions and construction activities by dust screens and fencing off of calcareous grassland Relocation of calcareous grassland Wildflower meadows and swale species planted in regard to pollinator species Woodland embankments with bare ground for solitary bee species	None

7.10 INTERACTIONS

The most significant interactions for the Biodiversity Chapter are with the Hydrology Chapter (Chapter 6), the Land, Soils, Geology & Hydrogeology Chapter (Chapter 5), the Air Quality and Climate Chapter (Chapter 8), The Landscape and Visual Chapter (Chapter 10) and the Noise and Vibration Chapter (Chapter 9). The Hydrology Chapter was reviewed in terms of effects on water quality in the local and downstream receiving environment, and the ensure that there is no change in the overall water regime at water dependent habitats on site. The Land, Soils, Geology and Hydrogeology Chapter was reviewed in terms of the groundwater depended habitats on site, and to ensure there is no change in the overall groundwater regime within and outwith the proposed development site. The Air Quality and Climate Chapter and the assessment of NO_X and SO_2 levels in the nearby sensitive ecological areas and the resultant deposition levels presented in the chapter have been reviewed and assessed. The Landscape and Visual Chapter details the removal and addition of the planting regime proposed within the proposed development, this has been reviewed to ensure there will be no impact on the habitats and species within the proposed development site. The Noise and Vibration Chapter was assessed to determine and quantify the likely effects on sensitive species within the proposed development site, and propose suitable mitigation measures to reduce this potential impact.

References

Arroyo, B., Leckie, F., Amar, A., McCluskie, A., & Redpath, S. (2014) *Ranging behaviour of Hen Harriers breeding in Special Protection Areas in Scotland, Bird Study*, 61:1, 48-55.

Atherton, I., Bosanquet, S. & Lawley, M. (2010) *Mosses and Liverworts of Britain and Ireland: A Field Guide*. Latimer Trend & Co., Plymouth.

Aughney, T & Roche, N. (2008) *Brown long-eared bat Plecotus auritus Roost Monitoring 2007, Irish Bat Monitoring Programme.* Bat Conservation Ireland www.batconservationireland.org.

Aughney, T., Langton, S. & Roche, N. (2011) *Brown long-eared bat roost monitoring scheme for the Republic of Ireland: synthesis report 2007-2010*. Irish Wildlife Manuals, No. 56. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Bailey, M. and Rochford J. (2006) *Otter Survey of Ireland 2004/2005.* Irish Wildlife Manuals, No. 23. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Barton, C., Pollock, C., Norriss, D.W., Nagle, T., Oliver, G.A. & Newton, S. (2006). *The second national survey of breeding hen harriers Circus cyaneus in Ireland 2005.* Irish Birds 8: 1-20.

Biggane, S. (2003) *The lesser horseshoe bat Rhinolophus hipposideros (Bechstein 1800) at Dromore, Co. Clare: diet, foraging activity, habitat selection and nocturnal behaviour.* Ph.D. Thesis, National University of Ireland, Galway, Ireland.

Bontadina, F., Schofield, H. and Naef-Daenzer, B. (2002) *Radio-tracking reveals that lesser horseshoe bats (Rhinolophus hipposideros) forage in woodland.* Journal of Zoology 258: 281–290.

Chartered Institute of Ecology and Environmental Management (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland*.

Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.)* The Bat Consevation Trust, London.

Downs, N., & Sanderson, L. (2010). *Do Bats Forage Over Cattle Dung or Over Cattle?*. *Acta Chiropterologica*, *12*(2), 349-358.

Environmental Protection Agency. (2017) *Guidelines on the information to be contained in Environmental Impact Assessment Reports.* Draft, August 2017. (refer to Table 3.3)

Fossitt, J.A. (2000) *A Guide to Habitats in Ireland*. Heritage Council, Kilkenny.

Gilbert, G., Gibbons, D.W. & Evans, J. (1998) *Bird Monitoring Methods - A Manual of Techniques for Key UK Species*. RSPB: Sandy

Hardey J, Crick H, Wernham C, Riley H, Etheridge B and Thompson D (2009) *Raptors: A Field Guide to Survey and Monitoring, 2nd Edition.* TSO, Edinburgh.

Jones, G., Rydell, J. (1994) *Foraging strategy and predation risk as factors influencing emergence time in echolocating bats.* Philosophical Transactions Of The Royal Society Of London. Series B: Biological Sciences, *346*(1318), 445-455.

Kelleher, C. (2006). *Summer Roost Preferences of Lesser Horseshoe bat Rhinolophus hipposideros in Ireland.* The Irish Naturalists' Journal, Vol. 18, No.6, pp. 229-231.

Lusby, J., Corkery, I., McGuiness, S., Fernández-Bellon, D., Toal, L., & Norriss, D. et al. (2017*).* *Breeding ecology and habitat selection of Merlin Falco columbarius in forested landscapes. Bird Study*, *64*(4), 445-454.

Marsh, JE, Lauridsen, RB, Gregory, SD, (2019*)* *Above parr: Lowland river habitat characteristics associated with higher juvenile Atlantic salmon (Salmo salar) and brown trout (S. trutta) densities.* Ecol Freshw Fish; 00: 1– 15.

McAney, K. (2006) *A conservation plan for Irish vesper bats.* Irish Wildlife Manuals, No. 20. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

McAney, K. (2014) *An overview of Rhinolophus hipposideros in Ireland (1994–2014)* Vespertilio 17: 115–125, 2014

Norriss, D.W., Marsh, J., McMahon, D. & Oliver, G.A. (2002). A national survey of breeding hen harriers Circus cyaneus in Ireland 1998-2000. Irish Birds 7: 1–10.

NPWS (2018) *Conservation objectives supporting document – lesser horseshoe bat (Rhinolophus hipposideros) Version 1*. Conservation Objectives Supporting Document Series. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland.

NPWS (2019). *The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview.* Unpublished NPWS report.

NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill

NPWS (2019) *The Status of EU Protected Habitats and Species in Ireland. Volumes 1-3*. Unpublished report for National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

NRA (2006) *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes.*

NRA (2009) *Guidelines for Assessment of Ecological Impacts of National Roads Schemes: Revision 2. National Roads Authority.*

NRA (2011) *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes.*

Ó Néill L. (2008) *Population dynamics of the Eurasian otter in Ireland. Integrating density and demography into conservation planning.* PhD thesis. Trinity College, Dublin.

O'Neill, F.H. & Barron, S.J. (2013) *Results of monitoring survey of old sessile oak woods and alluvial forests*. Irish Wildlife Manuals, No. 71. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland

Perrin, P., Martin, J., Barron, S., O'Neill, F., McNutt, K., and Delaney, A. (2008) *National Survey of Native Woodlands 2003-2008*. Unpublished report submitted to National Parks and Wildlife Service, Dublin.

Reid, N., Dingerkus, K., Montgomery, W.I., Marnell, F., Jeffrey, R., Lynn, D., Kingston, N. & McDonald, R.A. (2007) Status of hares in Ireland. *Irish Wildlife Manuals*, **30**. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.

Reid, N., Hayden, B., Lundy, M.G., Pietravalle, S., McDonald, R.A. & Montgomery, W.I. (2013) *National Otter Survey of Ireland 2010/12.* Irish Wildlife Manuals No. 76. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland

Reynolds, J.D., O'Connor, W., O'Keeffe, C. & Lynn, D. (2010) A technical manual for monitoring white-clawed crayfish Austropotamobius pallipes in Irish lakes. Irish Wildlife Manuals, No 45, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ruddock, M., Mee, A., Lusby, J., Nagle, A., O'Neill, S. & O'Toole, L. (2016). The 2015 National Survey of Breeding Hen Harrier in Ireland. Irish Wildlife Manuals, No. 93. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland.

Rush, T., Billington, G. (2014). *Galway bat radio-tracking project. Radio tracking studies of lesser horseshoe and vesper bat species, August and September 2014.* Greena Ecological Consultancy. Witham Friary, 2014.

Smith, G.F., O'Donoghue, P., O'Hora, K. & Delaney, E. (2011) *Best Practice Guidance for Habitat Survey and Mapping*. The Heritage Council Church Lane, Kilkenny, Ireland.

Stace, C. (2019) *New Flora of the British Isles*. *4th Edition*. C&M Floristics.

The Environment Agency (2010). *Fifth otter survey of England 2009-2010.* Environment Agency, Almondsbury, Bristol, England

United Nations Economic Commission for Europe (UNECE) (2010) *Empirical Critical Loads & Dose-Response Relationships*

Weekes, L.C. & FitzPatrick, Ú. (2010) *The National Vegetation Database: Guidelines and Standards for the Collection and Storage of Vegetation Data in Ireland.* Version 1.0. Irish Wildlife Manuals, No. 49. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Wilson, S. & Fernández, F. (2013) National survey of limestone pavement and associated habitats in Ireland. *Irish Wildlife Manuals, No. 73.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.

8.0 AIR QUALITY & CLIMATE

8.1 INTRODUCTION

This chapter evaluates the impacts which the Proposed Development may have on Air Quality & Climate during the construction, operational and decommissioning stages as defined in the Environmental Protection Agency (EPA) documents Draft Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2017) and Draft Advice Notes for Preparing Environmental Impact Statements (EPA, 2015), as well as in line with Article 94 and Schedule 6 of the Planning and Development Regulations 2001 (as amended) and Article 5 and Annex IV of the EIA Directive (2011/92/EU, as amended).

An assessment of the likely dust related impacts as a result of construction activities and decommissioning activities was undertaken and used to inform a series of mitigation measures presented in this chapter. Air dispersion modelling of operational stage emissions from the diesel-powered emergency backup generators was carried out using the United States Environmental Protection Agency's regulated model AERMOD as recommended by the EPA (EPA, 2020a). The modelling of air emissions from the site was carried out to assess concentrations of nitrogen dioxide (NO_2) at a variety of locations beyond the site boundary. The modelling was undertaken to assess the impact to ambient air quality from scheduled testing of the data centre standby generators and the energy centre engines when fuelled by diesel oil, and the infrequent emergency operation of the data centre standby generators.

The back-up diesel generators will have emissions of NO_2, CO, SO_2 and particulate matter (PM_{10}/$PM_{2.5}$). Odour is not considered relevant for the Proposed Development. Modelling for NO_2 was undertaken in detail. In relation to CO, SO_2, PM_{10} and $PM_{2.5}$ no detailed modelling was undertaken. Emissions of these pollutants are significantly lower than the NO_X emissions from the generators relative to their ambient air quality standards and thus ensuring compliance with the NO_2 ambient limit value will ensure compliance for all other pollutants. For example, the emission of CO from the generators is at least eight times lower than NO_X whilst the CO ambient air quality standard is 10,000 µg/m^3 compared to the 1-hour NO_2 standard of 200 µg/m^3. Similarly, levels of PM_{10}/$PM_{2.5}$ emitted from the generators will be 90 times lower whilst the ambient air quality standards are comparable. Emissions of SO_2 are approximately 55 times lower than emissions of NO_X.

As discussed in Chapter 2, the Proposed Development will have 84 no. back-up generators for the data centre and 18 no. lean-burn natural gas engines for the energy centre. A review of licensed facilities in the surrounding area has been conducted and none have been identified with the potential for cumulative impact with the Proposed Development. Consideration of all developments identified in Chapter 3 Appendix 3.1 was also undertaken and no potential for cumulative impact with the Proposed Development was identified as the planned developments have no or negligible potential for NO_2 emissions.

8.2 METHODOLOGY

8.2.1 Criteria for Rating of Impacts

8.2.1.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, the Department of the Environment, Heritage and Local Government in Ireland and the European Parliament and Council of the European Union have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 8.1).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which give effect to European Commission Directive 2008/50/EC which has set limit values for the pollutants NO_2, PM_{10}, and $PM_{2.5}$ relevant to this assessment. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive (96/62/EC) and its subsequent daughter directives (including 1999/30/EC and 2000/69/EC) and also includes ambient limit values relating to $PM_{2.5}$.

Table 8.1 *Air Quality Standards Regulations 2011 (based on EU Council Directive 2008/50/EC)*

Pollutant	Regulation (Note 1)	Limit Type	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m3 NO2
		Annual limit for protection of human health	40 µg/m3 NO2
Particulate Matter (as PM10)	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m3 PM10
		Annual limit for protection of human health	40 µg/m3 PM10
PM2.5	2008/50/EC	Annual limit for protection of human health	25 µg/m3 PM2.5

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

8.2.1.2 Dust Deposition Guidelines

The concern from a health perspective is focused on particles of dust which are less than 10 microns and the EU ambient air quality standards outlined in the previous section have set ambient air quality limit values for PM_{10} and $PM_{2.5}$.

With regard to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction and decommissioning phases of a development in Ireland.

With regard to dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/(m^2*day) averaged over a one-year period at any receptors outside the site boundary. The TA-Luft standard has been applied for the purpose of this assessment based on recommendations from the EPA in Ireland in the document titled *'Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals)'* (EPA, 2006). The document recommends that the Bergerhoff limit of 350 mg/(m^2*day) be applied to the site boundary of quarries. This limit value shall be implemented with regard to dust impacts from construction of the Proposed Development.

8.2.1.3 Gothenburg Protocol

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. In 2012, the Gothenburg Protocol was revised to include national emission reduction commitments for the main air pollutants to be achieved in 2020 and beyond and to include emission reduction commitments for $PM_{2.5}$. In relation to Ireland, 2020 emission targets are 25 kt for SO_2 (65% below 2005 levels), 65 kt for NO_X (49% reduction), 43 kt for VOCs (25% reduction), 108 kt for NH_3 (1% reduction) and 10 kt for $PM_{2.5}$ (18% reduction).

European Commission Directive 2001/81/EC National Emissions Ceiling Directive (NECD), prescribes the same emission limits as the 1999 Gothenburg Protocol. A National EPA Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005 (DEHLG, 2004; 2007). The data available from the EU in 2020 (EPA, 2020b) indicated that Ireland complied with the emissions ceilings for SO_2 in recent years but failed to comply with the ceilings for NMVOCs, NH_3 and NO_X. Directive (EU) 2016/2284 *"On the Reduction of National Emissions of Certain Atmospheric Pollutants and Amending Directive 2003/35/EC and Repealing Directive 2001/81/EC"* was published in December 2016. The Directive applies the 2010 NECD limits until 2020 and establish new national emission reduction commitments which will be applicable from 2020 and 2030 for SO_2, NO_X, NMVOC, NH_3, $PM_{2.5}$ and CH_4. In relation to Ireland, emission targets applicable from 2020 are 25 kt for SO_2 (65% on 2005 levels), 65 kt for NO_X (49% reduction on 2005 levels), 43 kt for VOCs (25% reduction on 2005 levels), 108 kt for NH_3 (1% reduction on 2005 levels) and 10 kt for $PM_{2.5}$ (18% reduction on 2005 levels). In relation to 2030, Ireland's emission targets are 10.9 kt (85% below 2005 levels) for SO_2, 40.7 kt (69% reduction) for NO_X, 51.6 kt (32% reduction) for NMVOCs, 107.5 kt (5% reduction) for NH_3 and 11.2 kt (41% reduction) for $PM_{2.5}$.

8.2.1.4 Climate Agreements

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

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

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

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

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

Following on from Ireland declaring a climate and biodiversity emergency in May 2019 and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme for the Climate Action (Amendment) Bill 2019 in December 2019 (Government of Ireland, 2020a). The General Scheme was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP. The Climate Action and Low Carbon Development (Amendment) Bill 2021 (the Bill) was published in March 2021.

The purpose of the 2021 Climate Bill is to provide for the approval of plans '*for the purpose of pursuing the transition to a climate resilient and climate neutral economy by the end of the year 2050'*. The 2021 Climate Bill will also '*provide for carbon budgets and a decarbonisation target range for certain sectors of the economy'*. The 2021 Climate Bill removes any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority. The Bill has set a target of a 51% reduction in the total amount of greenhouse gases over the course of the first two carbon periods ending 31 December 2030 relative to 2018 annual emissions. The 2021 Climate Bill defines the carbon budget as 'the total amount of greenhouse gas emissions that are permitted during the budget period'.

Individual county councils in Ireland have also published their own Climate Change Strategies which outline the specific climate objectives for that local authority and associated actions to achieve the objectives. Clare County Council's Climate Change Adaptation Strategy 2019 -2024 was published by Clare County Council in 2019 and includes the following two goals and associated objectives which relate to the Built Environment and Development:

- Theme 2 Infrastructure and Built Environment – Objective 2: "To promote County Clare as a Low Carbon County and support the development of low carbon and green technology businesses and industries throughout the County.";
- Theme 3 Land-use and Development – Objective 2: "To integrate climate action consideration into land-use planning policy and influence positive behaviour."; and
- Theme 5 Natural Resources and Cultural Infrastructure – Objective 4: "To promote and facilitate the provision of high quality, secure, efficient and reliable renewable energy sources along with appropriate energy storage facilities in order to assist in the creation of a low carbon County Clare."

8.2.2 Construction Phase

8.2.2.1 Air Quality

The current assessment focused firstly on identifying the existing baseline levels of NO_2, PM_{10} and $PM_{2.5}$ in the region of the Proposed Development by an assessment of EPA monitoring data. Thereafter, the impact of the construction phase on air quality was determined by a qualitative assessment of the nature and scale of dust generating construction activities associated with the Proposed Development.

8.2.2.2 Climate

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

8.2.3 Operational Phase

8.2.3.1 Air Quality

Air dispersion modelling was carried out by AWN Consulting Ltd. using the United States Environmental Protection Agency's regulated model AERMOD (Version 19191). AERMOD is recommended as an appropriate model for assessing the impact of air emissions from industrial facilities in the EPA Guidance document *"Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)"* (2020a).

The modelling of air emissions from the site was carried out to assess the concentrations of nitrogen dioxide (NO_2) beyond the site boundary and the consequent impact on human health.

The assessment was undertaken in order to quantify the impact of the Proposed Development and the existing baseline level of pollutants on ambient air quality concentrations.

To obtain all the meteorological information required for use in the model, data collected during 2016 – 2020 from the Met Éireann meteorological station at Shannon

Airport has been incorporated into the modelling. The air dispersion modelling input data consisted of information on the physical environment, design details for all emission points on-site and five full years of meteorological data. Using this input data, the model predicted ambient concentrations beyond the site boundary for each hour of the meteorological year. This study adopted a conservative approach which will lead to an over-estimation of the actual levels that will arise.

AERMOD is a “new-generation” steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources. The model is an enhancement of the Industrial Source Complex-Short Term 3 (ISCST3) model which has been widely used for emissions from industrial sources. Details of the model are given in Appendix 8.1. Fundamentally, the model has made significant advances in simulating the dispersion process in the boundary layer. This will lead to a more accurate reflection of real-world processes and thus considerably enhance the reliability and accuracy of the model particularly under those scenarios which give rise to the highest ambient concentrations.

Due to the proximity to surrounding buildings, the PRIME Building Downwash Program (BPIP Prime) has been incorporated into the model to determine the influence (wake effects) of these buildings on dispersion in each direction considered.

The AERMOD model incorporated the following features.

A receptor grid and discrete receptors were identified at which concentrations would be modelled. Receptors were mapped with sufficient resolution to ensure all localised “hot-spots” were identified without adding unduly to processing time. The receptor grids were based on a Cartesian grid with the site at the centre. The outer grid measured 20 x 20 km with the site at the centre and with concentrations calculated at 1000 m intervals. A middle grid measured 10 x 10 km with the site at the centre and with concentrations calculated at 500 m intervals. The inner grid measured 5 x 5 km with the site at the centre and with concentrations calculated at 125 m intervals. Boundary receptor locations were also placed along the boundary of the site, at 100 m intervals, giving a total of 2,800 calculation points for the model. The impact of the data centre back-up diesel generators and the energy centre gas/diesel engine was also measured at nearby residential receptors which were added to the model as discrete receptors.

All on-site buildings and significant process structures were mapped into the computer to create a three-dimensional visualisation of the site and its emission points. Buildings and process structures can influence the passage of airflow over the emission stacks and draw plumes down towards the ground (termed building downwash). The stacks themselves can influence airflow in the same way as buildings by causing low pressure regions behind them (termed stack tip downwash). Both building and stack tip downwash were incorporated into the modelling.

Hourly-sequenced meteorological information has been used in the model covering the years 2016 – 2020 from the Met Éireann meteorological station at Shannon Airport as shown in Figure 8.1 (www.met.ie). AERMOD incorporates a meteorological pre-processor AERMET which allows AERMOD to account for changes in the plume behaviour with height using information on the surface characteristics of the site. AERMET calculates hourly boundary layer parameters for use by AERMOD, including friction velocity, Monin-Obukhov length, convective velocity scale, temperature scale, convective boundary layer (CBL) height, stable boundary layer (SBL) height, and surface heat flux (see Appendix 8.2).

Terrain has been mapped out in the model as using SRTM (Shuttle Radar Topography Mission) data with 30m resolution. All terrain features have been mapped in detail into the model using the terrain pre-processor AERMAP.

8.2.3.2 Process Emissions

The Proposed Development (Data Centre and Energy Centre) will have six data centres with a total of 84 no. back-up generators with associated stacks which will be built to a height of 8 m above ground level. The energy centre will have 18 no. lean-burn natural gas engines, with the associated stacks built to a height of 25 m above ground level. All modelling scenarios assumed all six data halls and all 18 energy centre engines are operational simultaneously. In reality the Proposed Development will become operational in phases over a period of 4 – 5 years, with two data centre halls and six energy centre engines in operation for each phase.

The natural gas engines may also be powered by diesel fuel oil as back-up to the normal gas supply. This has been scoped out of this air modelling assessment as it is not expected that this operation mode would cause any significant impacts on ambient air quality considering the infrequent and unpredictable usage of this back-up fuel; the worst availability performance for disruption to natural gas supply is 22 hours in 5 years (Gas Networks Ireland, 2017). This potential level of disruption is also applicable to the data centre back-up generators, as the data centres are supplied by the energy centre.

In order for the data centre generators to be kept in good condition, ready to be started at full load during an emergency power failure, it is necessary to carry out a scheduled maintenance programme, which includes periodic testing. The diesel mode for the energy centre engines will also be tested. All testing is assumed to only occur between 8am and 5pm, Monday to Friday. The maintenance plan for the proposed development comprises the following two tests:

- Test 1: testing once per month of all 84 no. data centre back-up generators at up to 100% load for a maximum of one hour each, two generators at a time, sequentially;
- Test 2: testing once per month of all 18 no. energy centre engines powered by fuel oil at up to 100% load for a maximum of one hour each, one engine at a time, sequentially.

USEPA Guidance suggests that for emergency operations, an average hourly emission rate should be used rather than the maximum hourly rate (USEPA, 2011). For modelling purposes only, a worst case/conservative figure of 100 hours in total per year of operation has been applied to the Proposed Development. However, in reality, and based on recent experience over the past number of years, generators are rarely used other than during testing and maintenance described above. As a result, the maximum hourly emission rates from all the back-up generators were reduced by a factor of (100/8760) to give an average hourly emission rate (in line with USEPA protocol) and the generators were modelled over a period of one full year.

A second methodology for modelling back-up generators has been published by the UK Environment Agency. The consultation document is entitled “Diesel Generator Short-Term NO_2 Impact Assessment” (UK EA, 2016). The methodology is based on considering the statistical likelihood of an exceedance of the NO_2 hourly limit value (18 exceedances are allowable per year before the air standard is deemed to have been exceeded). The assessment assumes a hypergeometric distribution to assess the likelihood of exceedance hours coinciding with the operational hours of the back- up generators. The cumulative hypergeometric distribution of 19 and more hours per year

is computed and the probability of an exceedance determined. The guidance suggests that the 95th percentile confidence level should be used to indicate if an exceedance is likely. More recent guidance (UK EA, 2019) has recommended this probability should be multiplied by a factor of 2.5 and therefore, the 98th percentile confidence level should be used to indicate if an exceedance is likely. The guidance suggests that the assessment should be conducted at the nearest residential receptor or at locations where people are likely to be exposed and that there should be no running time restrictions on these generators when providing power on site during an emergency.

Both the methodology advised in the USEPA guidance as well as the approach described in the UK EA guidance have been applied in this study to ensure a robust assessment of predicted air quality impacts from the back-up generators. The methodology for converting NO_X to NO_2 was based on the ozone limiting method (OLM) approach based on an initial NO_2/NO_X ratio of 0.1 and a background ozone level of 55 µg/m^3 based on a review of EPA data for similar Zone C locations.

The modelling was undertaken to assess the impact to ambient air quality from the following operations scenario:

- **Proposed Development (Worst-Case) Scenario:** This comprises the emission points associated with the Proposed Development (Data Centre and Energy Centre). This scenario involves the emergency operation of 84 no. data centre diesel generators and the continuous operation of 18 no. energy centre natural gas engines. The scenario also includes testing for all 84 data centre generators and all 18 energy centre engines. Application of selective catalytic reduction (SCR) has been assumed to reduce energy centre emissions for gas operation by 63% and by 87% for diesel operation to meet emission limits. Selective catalytic reduction is an abatement technique where ammonia or urea is injected into the gas stream to convert nitrogen oxides to nitrogen and water. The process emissions used for the Proposed Development Scenario are outlined in Table 8.2.
- **Proposed Development (Likely Average Operation) Scenario:** This comprises the emission points associated with the Proposed Development (Data Centre and Energy Centre). This scenario involved the emergency operation of 84 no. data centre diesel generators and the continuous operation of 18 no. energy centre natural gas engines. The scenario also included testing for all 84 data centre generators and all 18 energy centre engines. Application of SCR has been assumed to reduce energy centre emissions by 95% for both gas and diesel operation to meet emission limits. The process emissions used for the Proposed Development Scenario are outlined in Table 8.3.

Table 8.2 *Summary of Process Emission Information for Data Centre and Energy Centre –Proposed Development (Worst-Case) Scenario*

Stack Reference	Grid Reference (ITM, m)	Stack Height Above Ground Level (m)	Exit Diameter (m)	Cross-Sectional Area (m^2)	Temp (K)	Volume Flow (Nm^3/hr at 15% Ref. O2)	Exit Velocity (m/sec actual)	NO_X	
								Concentration (mg/Nm^3 at 15% Ref. O2)	Mass Emission (g/s)
Data Centre Emergency Operation for Back-up Diesel Generators (100% load)	505597, 5857039 – 504857, 5857040	8 m	0.6 m	0.28	755.15	24,900	39.7	2,362	0.14 Note 1
Data Centre Test 1 for Back-up Diesel Generators (100% load)	505597, 5857039 – 504857, 5857040	8 m	0.6 m	0.28	755.15	24,900	39.7	2,362	6.06 Note 2
Energy Centre Continuous Operation for Natural Gas Engines (100% load)	505027, 5857343 – 505081, 5857341	25 m	0.9 m	0.64	649.15	31,212	22.1	95	0.82
Energy Centre Test 2 for Back-up Diesel Powered Engines (100% load)	505027, 5857343 – 505081, 5857341	25 m	0.9 m	0.64	628.15	38,160	28.9	190	2.01 Note 2

Note 1 Reduced emission rates based on USEPA protocol (assuming 100 hours / annum) used to model emissions during emergency operation of generators (100% load)

Note 2 Emission rates used to model emissions during testing at 100% load assumed to occur once per month, per generator

Table 8.3 Summary of Process Emission Information for Data Centre and Energy Centre –Proposed Development (Likely Average Operation) Scenario

Stack Reference	Grid Reference (ITM, m)	Stack Height Above Ground Level (m)	Exit Diameter (m)	Cross-Sectional Area (m^2)	Temp (K)	Volume Flow (Nm^3/hr at 15% Ref. O2)	Exit Velocity (m/sec actual)	NO_X	
								Concentration (mg/Nm^3 at 15% Ref. O2)	Mass Emission (g/s)
Data Centre Emergency Operation for Back-up Diesel Generators (100% load)	505597, 5857039 – 504857, 5857040	8 m	0.6 m	0.28	755.15	24,900	39.7	2,362	0.14 Note 1
Data Centre Test 1 for Back-up Diesel Generators (100% load)	505597, 5857039 – 504857, 5857040	8 m	0.6 m	0.28	755.15	24,900	39.7	2,362	6.06 Note 2
Energy Centre Continuous Operation for Natural Gas Engines (100% load)	505027, 5857343 – 505081, 5857341	25 m	0.9 m	0.64	649.15	31,212	22.1	13	0.11
Energy Centre Test 2 for Back-up Diesel Powered Engines (100% load)	505027, 5857343 – 505081, 5857341	25 m	0.9 m	0.64	628.15	38,160	28.9	73	0.77 Note 2

Note 1 Reduced emission rates based on USEPA protocol (assuming 100 hours / annum) used to model emissions during emergency operation of generators (100% load)

Note 2 Emission rates used to model emissions during testing at 100% load assumed to occur once per month, per generator

8.2.3.3 Climate & Transboundary Pollution

The back-up diesel generators modelled for the purpose of this assessment will only be used in the event of a power failure at the site. In reality and based on recent experience over the past number of years, generators are rarely used other than during testing and maintenance described in the previous section. During normal operations at the facility, the electricity will be supplied from the national grid so there will be no direct emissions of CO_2 or transboundary pollutants from the site.

The impact of the operational phase of the Proposed Development on climate was determined by an assessment of the indirect CO_2 emissions associated with the electricity supplied from the national grid. The details and results of the assessment are provided in section 8.7.2.2.

8.3 RECEIVING ENVIRONMENT

8.3.1 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality *'Air Quality in Ireland 2019'* (EPA 2020c) details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes as outlined within the EPA document titled *'Air Quality Monitoring Report 2018'* (EPA 2020c). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000 is defined as Zone D. In terms of air monitoring, the Proposed Development is within Zone C, as defined in Scheule 19 of the Air Quality Standards Regulations 2011. As the Proposed Development is considered a Zone C environment, the baseline air quality for NO_2, PM_{10} and $PM_{2.5}$ is reviewed for all Zone C monitoring locations in the following sections.

8.3.1.1 NO_2

With regard to NO_2, continuous monitoring data from the EPA (2020c; 2021) from all Zone C locations of Dundalk, Kilkenny and Portlaoise in 2019 show that levels of NO_2 are below both the annual and 1-hour limit values (see Table 8.3). Average long-term concentrations at the three sites range from 5 – 14 µg/m^3 for the period 2015 – 2019; suggesting an upper average over the five-year period of no more than 14 µg/m^3. There were no exceedances of the maximum 1-hour limit of 200 µg/m^3 in any year (18 exceedances are allowed per year). Based on these results an estimate of the background NO_2 concentration in the region of the development is 14 µg/m^3. It is expected that this background concentration will remain at this level or decrease slightly over the operational lifetime of the project.

In relation to the annual average background, the ambient background concentration was added directly to the process concentration with the short-term peaks assumed to have an ambient background concentration of twice the annual mean background concentration.

Table 8.3 *Trends In Zone C Air Quality - Nitrogen Dioxide (µg/m^3)*

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

8.3.1.2 PM_{10}

Continuous PM_{10} monitoring carried out at three Zone C locations in 2019 showed annual mean concentrations ranging from 13 to 18 µg/m^3, with at most 12 exceedances (in Ennis) of the 24 hour limit value of 50 µg/m^3 (35 exceedances are permitted per year) (EPA, 2020c). Long-term data for the period 2015 – 2019 for Ennis and Portlaoise shows that concentrations range from 10 – 18 µg/m^3, suggesting an upper average concentration over the five-year period of no more than 17 µg/m^3. Based on this EPA data, an estimate of the background PM_{10} concentration in the region of the development is 17 µg/m^3. It is expected that this background concentration will remain at this level or decrease slightly over the operational lifetime of the project.

8.3.1.3 $PM_{2.5}$

Continuous $PM_{2.5}$ monitoring carried out at two Zone C locations at Ennis and Bray in 2019 showed annual mean concentrations ranging from 7 to 14 µg/m^3. Long-term data for the period 2015 – 2019 for Bray and Ennis shows that concentrations range from 5 – 14 µg/m^3. The $PM_{2.5}/PM_{10}$ ratio in Ennis ranged from 0.63 – 0.78 over the five year period. Based on this information, a conservative ratio of 0.8 was used to generate a background $PM_{2.5}$ concentration in the region of the Proposed Development of 13.6 µg/m^3. It is expected that this background concentration will remain at this level or decrease slightly over the operational lifetime of the project.

8.3.1.4 Climate Baseline

Anthropogenic emissions of greenhouse gases in Ireland included in the EU 2020 strategy are outlined in the most recent review by the EPA which details provisional emissions up to 2019 (EPA, 2020d). The data published in 2020 states that Ireland will exceed its 2019 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC by an estimated 6.98 Mt. For 2019, total national greenhouse gas emissions are estimated to be 59.90 million tonnes carbon dioxide equivalent (Mt CO2eq) with 45.71 MtCO2eq of emissions associated with the ESD sectors for which compliance with the EU targets must be met. Agriculture is the largest contributor in 2019 at 35.3% of the total, with the transport sector accounting for 20.3% of emissions of CO_2.

GHG emissions for 2019 are estimated to be 4.5% lower than those recorded in 2018. Emission reductions have been recorded in 6 of the last 10 years. However, compliance with the annual EU targets has not been met for four years in a row. Emissions from 2016 – 2019 exceeded the annual EU targets by 0.29 MtCO2eq, 2.94 MtCO2eq, 5.57 MtCO2eq and 6.98 MtCO2eq respectively. Agriculture is consistently

the largest contributor to emissions with emissions from the transport and energy sectors being the second and third largest contributors respectively in recent years.

The EPA 2020 GHG Emissions Projections Report for 2019 – 2040 (EPA, 2020e) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018. Implementation of these are classed as a *"With Additional Measures scenario"* for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the period 2013 – 2020 Ireland is projected to cumulatively exceed its compliance obligations with the EU's Effort Sharing Decision (Decision No. 406/2009/EC) 2020 targets by approximately 10 Mt CO2eq under the *"With Existing Measures"* scenario and 9 Mt CO2eq under the *"With Additional Measures"* scenario (EPA, 2020e).

8.4 CHARACTERISTICS OF THE DEVELOPMENT

The proposed development is described in further detail in Chapter 2 (Description of the Proposed Development). The details of the construction and operation of the development in terms of air quality and climate are discussed below.

8.4.1 Construction Phase

The Proposed Development will comprise construction of a six data storage facilities, a gas powered energy centre and associated ancillary development. The key civil engineering works which will have a potential impact on air quality and climate during construction are summarised below:

(i) During construction, an amount of soil will be generated as part of the site preparation works and during excavation for construction of roads, car parking areas, foundations, installation of drainage services and ancillary infrastructure;

(ii) Following completion of the building shell, commissioning of the mechanical and electrical equipment is undertaken;

(iii) Infilling and landscaping will be undertaken. Spoil generated during site preparation will be re-used where possible;

(iv) Temporary storage of construction materials; and

(v) Construction traffic accessing the site will emit air pollutants and greenhouse gases during transport.

As outlined in Section 8.6, a dust minimisation plan will be formulated for the construction phase of the Proposed Development to ensure no dust nuisance occurs at nearby sensitive receptors.

8.4.2 Operational Phase

The key works which will have a potential impact on air quality and climate during operation of the Proposed Development are summarised below:

(i) The scheduled testing for maintenance of the back-up diesel generators in the data storage facility will release air pollutant emissions (primarily NO_X emissions);

(ii) The infrequent emergency operation of the back-up diesel generators for the data storage facility in the event of a power outage would release air pollutant emissions (primarily NO_X emissions). A review of operational data from similar operational data storage facilities in Ireland indicates that that standby generators are rarely used other than during the scheduled maintenance and testing.

(iii) Road traffic accessing the site will emit air pollutants and greenhouse gases. However, the operational phase of the Proposed Development is not expected to contribute a significant volume of additional traffic on the local road network (see Chapter 12 (Traffic & Transportation)). Therefore, no local air quality assessment of the traffic impact is required for this development; and

(iv) The indirect impact of emissions from electricity to operate the data storage facilities will have an impact on climate and regional air quality. However, it is predicted that these will not be significant in relation to Ireland's national emission ceiling limits for CO_2, NO_X, SO_2 and NMVOCs.

8.4.3 Decommissioning Phase

The Proposed Development may be decommissioned at some stage in the future. At that time a dust minimisation plan will be formulated for the decommissioning phase of the Proposed Development to ensure no dust nuisance occurs at nearby sensitive receptors.

8.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

8.5.1 Construction Phase

8.5.1.1 Air Quality & Climate

The greatest potential impact on air quality during the construction phase of the Proposed Development is from construction dust emissions as a result of excavation works, infilling and landscaping activities and storage of soil in stockpiles. This leads to the potential for nuisance dust. While construction dust tends to be deposited within 350 m of a construction site, the majority of the deposition occurs within the first 50 m (IAQM, 2014). The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. Sensitive receptors include residential properties within 350m of the site boundary on the R352 Tulla Rd and unnamed local roads.

Construction traffic is expected to be the dominant source of greenhouse gas emissions as a result of the Proposed Development. Construction vehicles and machinery will give rise to CO_2 and N_2O emissions during construction of the Proposed Development. The Institute of Air Quality Management document *'Guidance on the Assessment of Dust from Demolition and Construction'* (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate.

Initial commissioning activities will involve testing of the data centre back-up generators and energy centre engines with fuel oil on site in a similar manner to the operational phase testing, i.e. the first testing sequence will be commissioning of the standby generators. The operational modelling has considered testing of the generators on a monthly basis and this does not result in a significant impact to air quality. Therefore, it is predicted that the initial commissioning tests will result in an ***imperceptible*** impact to air quality in the ***short-term***.

It is important to note that the potential impacts associated with the construction phase of the Proposed Development are short-term in nature. When the dust minimisation measures detailed in the mitigation section (see Section 8.6) of this chapter are implemented, fugitive emissions of dust from the site will not be significant and will pose no nuisance at nearby receptors. Due to the duration and nature of the construction activities, CO_2 and N_2O emissions from construction vehicles and machinery will have a ***short-term*** and ***imperceptible*** impact on climate.

8.5.2 Operational Phase

8.5.2.1 Air Quality

The potential impact to air quality during the operational phase of the Proposed Development is a breach of the ambient air quality standards as a result of air emissions from the data centre back-up diesel generators and the energy centre engines. However, as outlined in Section 8.6, an iterative stack height determination was undertaken as part of the air dispersion modelling study to ensure that an adequate release height was selected for all emission points to aid dispersion of the plume and ensure compliance with the ambient air quality limit values beyond the site boundary.

8.5.2.2 Climate

The back-up diesel generators modelled for the purpose of this assessment will only be used in the event of a power failure at the site and for testing purposes. During normal operations at the facility, the electricity will be supplied by the energy centre on site, which is powered by natural gas. The predicted impact is stated in section 8.7.2.2.

8.5.3 Decommissioning Phase

8.5.3.1 Air Quality & Climate

The greatest potential impact on air quality during the decommissioning phase of the Proposed Development is from dust emissions as a result of demolition works and associated landscaping activities and truck movements to and from the facility. This leads to the potential for nuisance dust.

Traffic associated with decommissioning is expected to be the dominant source of greenhouse gas emissions as a result of the decommissioning phase of the Proposed Development. Vehicles and machinery will give rise to CO_2 and N_2O emissions during decommissioning of the Proposed Development. The Institute of Air Quality Management document *'Guidance on the Assessment of Dust from Demolition and Construction'* (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate.

It is important to note that the potential impacts associated with the decommissioning phase of the Proposed Development are short-term in nature. When the dust

minimisation measures detailed in the mitigation section (see Section 8.6) of this chapter are implemented, fugitive emissions of dust from the site will not be significant and will pose no nuisance at nearby receptors. Due to the duration and nature of the decommissioning activities, CO_2 and N_2O emissions from construction vehicles and machinery will have a ***short-term*** and ***imperceptible*** impact on climate.

8.6 REMEDIAL AND MITIGATION MEASURES

8.6.1 Construction Phase

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from Ireland, the UK and the USA based on the following publications:

- 'Guidance on the Assessment of Dust from Demolition and Construction' (IAQM, 2014);
- 'Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings' (The Scottish Office, 1996);
- 'Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance' (UK Office of Deputy Prime Minister, 2002);
- 'Controlling Particles, Vapours & Noise Pollution From Construction Sites' (BRE, 2003);
- 'Fugitive Dust Technical Information Document for the Best Available Control Measures' (USEPA, 1997); and
- 'Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition' (periodically updated) (USEPA, 1986).

8.6.1.1 Site Management

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies.

At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see Figure 8.1 for the windrose for Shannon Airport). As the prevailing wind is predominantly westerly to south-westerly, locating construction compounds and storage piles downwind (to the east or north-east) of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2 mm/day, dust generation is generally suppressed (UK Office of Deputy Prime Minister (2002), BRE (2003)). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7 m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favourable in general for the

suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods where care will be needed to ensure that dust nuisance does not occur. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent will monitor all subcontractors' performance to ensure that the proposed mitigation measures are implemented, and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board will also include head/regional office contact details;
- Community engagement shall be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;
- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein; and
- The procedures put in place will be reviewed at regular intervals and monitoring conducted and recorded by the principal contractor. It is recommended that reviews are conducted on a monthly basis as a minimum.

The dust minimisation measures will be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

8.6.1.2 Site Roads / Haulage Routes

Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK Office of Deputy Prime Minister, 2002). The following measures shall be taken in order to avoid dust nuisance occurring:

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;
- Access gates to the site will be located at least 10m from sensitive receptors where possible;
- Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use; and
- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.

8.6.1.3 Land Clearing / Earth Moving

Land clearing/earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust. The following measures shall be taken in order to avoid dust nuisance occurring:

- During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust; and
- During periods of very high winds (gales), activities likely to generate significant dust emissions shall be postponed until the gale has subsided.

8.6.1.4 Storage Piles

The location and moisture content of storage piles are important factors which determine their potential for dust emissions. The following measures will be implemented to minimise dust formation from storage piles:

- Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles will be located downwind of sensitive receptors;
- Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK Office of Deputy Prime Minister, 2002); and
- Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.

8.6.1.5 Site Traffic on Public Roads

Spillage and blow-off of debris, aggregates and fine material onto public roads will be reduced to a minimum by employing the following measures:

- Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust; and
- At the main site traffic exits, a wheel wash facility shall be installed. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.

8.6.1.6 Summary of Dust Mitigation Measures

The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;
- The development of a documented system for managing site practices with regard to dust control;

- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and
- The specification of effective measures to deal with any complaints received.

8.6.2 Operational Phase

The stack heights of the data centre back-up diesel generators and energy centre engines for the Proposed Development have been designed in an iterative fashion to ensure that an adequate height has been selected to aid dispersion of the emissions and achieve compliance with the EU ambient air quality standards beyond the site boundary (including background concentrations). No additional mitigation measures are proposed for the operational phase of the Proposed Development.

In terms of climate, the opportunity to export heat from the data halls to a proposed Vertical Farm is considered. These farms require heating to the soil to promote growth internally, and so the heat from the data centres would be ideal and would not require the temperatures to be elevated any further, so no additional energy input.

8.6.3 Decommissioning Phase

The objective of dust control at the site during the decommissioning phase is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, a dust minimisation plan will be formulated for the decommissioning phase of the Proposed Development to ensure no dust nuisance occurs at nearby sensitive receptors.

8.7 PREDICTED IMPACTS OF THE DEVELOPMENT

8.7.1 Construction Phase

8.7.1.1 Air Quality

When the dust mitigation measures detailed in the mitigation section (section 8.6.1) of this report are implemented, fugitive emissions of dust and particulate matter from the site will be ***negative***, ***short-term*** and ***imperceptible*** in nature, posing no nuisance at nearby receptors.

8.7.1.2 Climate

The Institute of Air Quality Management *document 'Guidance on the Assessment of Dust from Demolition and Construction'* (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate. Based on the scale and temporary nature of the construction works and the intermittent use of equipment, the potential impact on climate change and transboundary pollution from the Proposed Development is deemed to be ***short-term***, ***negative*** and ***imperceptible*** in relation to Ireland's obligations under the EU 2030 target.

8.7.1.3 Human Health

Best practice mitigation measures are proposed for the construction phase of the Proposed Development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the Proposed Development will ensure that the impact of the development complies with all EU ambient air quality legislative limit

values which are based on the protection of human health. Therefore, the impact of construction of the Proposed Development is likely to be ***neutral***, ***short-term*** and ***imperceptible*** with respect to human health.

8.7.2 Operational Phase

8.7.2.1 Air Quality

Proposed Development (Worst-Case) Scenario (USEPA Methodology)

The NO_2 modelling results at the worst-case location at and beyond the site boundary are detailed in Table 8.5 using the USEPA methodology outlined within the guidance document titled *'Additional Clarification Regarding Application of Appendix W Modelling Guidance for the 1-Hour National Ambient Air Quality Standard'* (USEPA, 2011). This scenario involved the continuous operation of the energy centre gas engines, using SCR to reduce mass emissions to meet limits. It also included the emergency operation of 84 no. data centre back-up diesel generations associated the Proposed Development for 100 hours per year as well as considering scheduled testing for all 84 no. data centre back-up generators and 18 no. energy centre engines using back-up fuel oil. This is considered a worst-case assessment as historical data suggests that back-up diesel generators would typically only be required for 22 hours over a five-year period.

The results indicate that the ambient ground level concentrations are in compliance with the relevant air quality standards for NO_2. For the worst-case year modelled, emissions from the site lead to an ambient NO_2 concentration (including background) which is 72% of the maximum ambient 1-hour limit value (measured as a 99.8th percentile) and 92% of the annual limit value at the worst-case off-site receptor. Concentrations decrease with distance from the site boundary. The geographical variations in the 1 hour mean (99.8th percentile) and annual mean NO_2 ground level concentrations for the Proposed Development Scenario are illustrated as concentration contours in Figures 8.2 and 8.3.

Table 8.5 *NO_2 Dispersion Model Results – Proposed Development (Worst-Case) Scenario*

Pollutant/ Year	Averaging Period	Process Contribution NO_2 (µg/m^3)	Background Concentration (µg/m^3)	Predicted Environmental Concentration NO_2 (µg/m^3)	Limit Value (µg/m^3)	PEC as a % of Limit Value
NO_2 / 2016	Annual mean	19.6	14	33.6	40	84%
	99.8th%ile of 1-hr Means	112.2	28	140.2	200	70%
NO_2 / 2017	Annual mean	22.7	14	36.7	40	92%
	99.8th%ile of 1-hr Means	111.5	28	139.5	200	70%
NO_2 / 2018	Annual mean	21.1	14	35.1	40	88%
	99.8th%ile of 1-hr Means	108.3	28	136.3	200	68%
NO_2 / 2019	Annual mean	20.7	14	34.7	40	87%
	99.8th%ile of 1-hr Means	113.8	28	141.8	200	71%
NO_2 / 2020	Annual mean	22.2	14	36.2	40	91%
	99.8th%ile of 1-hr Means	116.1	28	144.1	200	72%

For this scenario the emissions of continuous operations and non-continuous operations have also been modelled separately. Table 8.6 details the NO_2 modelling results for the continuous operation of the energy centre gas engines. Table 8.7 details the NO_2 modelling results for the emergency operation and testing of the data centre backup generators and the testing of the energy centre engines in diesel mode.

The results indicate that the ambient ground level concentrations are in compliance with the relevant air quality standards for NO_2. For the worst-case year modelled, emissions from the continuous operation of the energy centre gas engines lead to an ambient NO_2 concentration (including background) which is 50% of the maximum ambient 1-hour limit value (measured as a 99.8th percentile) and 72% of the annual limit value at the worst-case off-site receptor. Emissions from the emergency and testing operations lead to an ambient NO_2 concentration (including background) which is 86% of the maximum ambient 1-hour limit value (measured as a 99.8th percentile) and 72% of the annual limit value at the worst-case off-site receptor.

Table 8.6 *NO_2 Dispersion Model Results – Proposed Development (Worst-Case) Scenario: Continuous Operation of Energy Centre Gas Engines*

Pollutant/ Year	Averaging Period	Process Contribution NO_2 ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Predicted Environmental Concentration NO_2 ($\mu g/m^3$)	Limit Value ($\mu g/m^3$)	PEC as a % of Limit Value
NO_2 / 2016	Annual mean	13.2	14	27.2	40	68%
	99.8th%ile of 1-hr Means	71.3	28	99.3	200	50%
NO_2 / 2017	Annual mean	15.0	14	29.0	40	72%
	99.8th%ile of 1-hr Means	71.0	28	99.0	200	50%
NO_2 / 2018	Annual mean	14.0	14	28.0	40	70%
	99.8th%ile of 1-hr Means	70.8	28	98.8	200	49%
NO_2 / 2019	Annual mean	13.4	14	27.4	40	69%
	99.8th%ile of 1-hr Means	71.0	28	99.0	200	50%
NO_2 / 2020	Annual mean	15.4	14	29.4	40	73%
	99.8th%ile of 1-hr Means	71.1	28	99.1	200	50%

Table 8.7 *NO_2 Dispersion Model Results – Proposed Development (Worst-Case) Scenario: Emergency Operation and Testing*

Pollutant/ Year	Averaging Period	Process Contribution NO2 (µg/m3)	Background Concentration (µg/m3)	Predicted Environmental Concentration NO2 (µg/m3)	Limit Value (µg/m3)	PEC as a % of Limit Value
NO2 / 2016	Annual mean	17.8	14	31.8	40	79%
	99.8th%ile of 1-hr Means	111.7	28	139.7	200	70%
NO2 / 2017	Annual mean	20.3	14	34.3	40	86%
	99.8th%ile of 1-hr Means	111.0	28	139.0	200	69%
NO2 / 2018	Annual mean	19.2	14	33.2	40	83%
	99.8th%ile of 1-hr Means	107.8	28	135.8	200	68%
NO2 / 2019	Annual mean	19.3	14	33.3	40	83%
	99.8th%ile of 1-hr Means	113.8	28	141.8	200	71%
NO2 / 2020	Annual mean	19.7	14	33.7	40	84%
	99.8th%ile of 1-hr Means	115.8	28	143.8	200	72%

This scenarios assumed all six data halls and all 18 energy centre engines are operational simultaneously. In reality the Proposed Development will become

operational in phases over a period of 4 – 5 years, with two data centre halls and six energy centre engines in operation for each phase. Initial emissions will therefore be lower than those reported here. Overall, the operational phase impact of the Proposed Development is considered ***long-term***, ***localised***, ***negative*** and ***slight***.

Proposed Development (Likely Average Operation) Scenario (USEPA Methodology)

This scenario involved the continuous operation of the energy centre gas engines, using SCR to reduce mass emissions by 95%. It also included the emergency operation of 84 no. data centre back-up diesel generations associated the Proposed Development for 100 hours per year as well as considering scheduled testing for all 84 no. data centre back-up generators and 18 no. energy centre engines using back-up fuel oil. The NO_2 modelling results at the worst-case location at and beyond the site boundary are detailed in Table 8.8.

The results indicate that the ambient ground level concentrations are in compliance with the relevant air quality standards for NO_2. For the worst-case year modelled, emissions from the site lead to an ambient NO_2 concentration (including background) which is 72% of the maximum ambient 1-hour limit value (measured as a 99.8th percentile) and 86% of the annual limit value at the worst-case off-site receptor. Concentrations decrease with distance from the site boundary.

Table 8.8 NO_2 Dispersion Model Results – Proposed Development (Likely Average Operation) Scenario

Pollutant/ Year	Averaging Period	Process Contribution NO_2 (µg/m^3)	Background Concentration (µg/m^3)	Predicted Environmental Concentration NO_2 (µg/m^3)	Limit Value (µg/m^3)	PEC as a % of Limit Value
NO_2 / 2016	Annual mean	18.1	14	32.1	40	80%
	99.8th%ile of 1-hr Means	112.1	28	140.1	200	70%
NO_2 / 2017	Annual mean	20.6	14	34.6	40	86%
	99.8th%ile of 1-hr Means	111.2	28	139.2	200	70%
NO_2 / 2018	Annual mean	19.6	14	33.6	40	84%
	99.8th%ile of 1-hr Means	108.1	28	136.1	200	68%
NO_2 / 2019	Annual mean	19.6	14	33.6	40	84%
	99.8th%ile of 1-hr Means	113.8	28	141.8	200	71%
NO_2 / 2020	Annual mean	20.1	14	34.1	40	85%
	99.8th%ile of 1-hr Means	115.8	28	143.8	200	72%

For this scenario the emissions of continuous operations and non-continuous operations have also been modelled separately. Table 8.9 details the NO_2 modelling results for the continuous operation of the energy centre gas engines. Table 8.10 details the NO_2 modelling results for the emergency operation and testing of the data centre backup generators and the testing of the energy centre engines in diesel mode.

The results indicate that the ambient ground level concentrations are in compliance with the relevant air quality standards for NO_2. For the worst-case year modelled, emissions from the continuous operation of the energy centre gas engines lead to an ambient NO_2 concentration (including background) which is 27% of the maximum ambient 1-hour limit value (measured as a 99.8th percentile) and 44% of the annual limit value at the worst-case off-site receptor. Emissions from the emergency and testing operations lead to an ambient NO_2 concentration (including background) which is 72% of the maximum ambient 1-hour limit value (measured as a 99.8th percentile) and 86% of the annual limit value at the worst-case off-site receptor.

Table 8.9 *NO_2 Dispersion Model Results – Proposed Development (Likely Average Operation) Scenario: Continuous Operation of Energy Centre Gas Engines*

Pollutant/ Year	Averaging Period	Process Contribution NO_2 (µg/m^3)	Background Concentration (µg/m^3)	Predicted Environmental Concentration NO_2 (µg/m^3)	Limit Value (µg/m^3)	PEC as a % of Limit Value
NO_2 / 2016	Annual mean	2.9	14	16.9	40	42%
	99.8th%ile of 1-hr Means	25.6	28	53.6	200	27%
NO_2 / 2017	Annual mean	3.5	14	17.5	40	44%
	99.8th%ile of 1-hr Means	26.4	28	54.4	200	27%
NO_2 / 2018	Annual mean	3.1	14	17.1	40	43%
	99.8th%ile of 1-hr Means	26.2	28	54.2	200	27%
NO_2 / 2019	Annual mean	3.1	14	17.1	40	43%
	99.8th%ile of 1-hr Means	26.2	28	54.2	200	27%
NO_2 / 2020	Annual mean	3.3	14	17.3	40	43%
	99.8th%ile of 1-hr Means	26.0	28	54.0	200	27%

Table 8.10 *NO_2 Dispersion Model Results – Proposed Development (Likely Average Operation) Scenario: Emergency Operation and Testing*

Pollutant/ Year	Averaging Period	Process Contribution NO_2 (µg/m^3)	Background Concentration (µg/m^3)	Predicted Environmental Concentration NO_2 (µg/m^3)	Limit Value (µg/m^3)	PEC as a % of Limit Value
NO_2 / 2016	Annual mean	17.9	14	31.9	40	80%
	99.8th%ile of 1-hr Means	112.0	28	140.0	200	70%
NO_2 / 2017	Annual mean	20.4	14	34.4	40	86%
	99.8th%ile of 1-hr Means	111.2	28	139.2	200	70%
NO_2 / 2018	Annual mean	19.3	14	33.3	40	83%
	99.8th%ile of 1-hr Means	108.0	28	136.0	200	68%
NO_2 / 2019	Annual mean	19.4	14	33.4	40	83%
	99.8th%ile of 1-hr Means	113.8	28	141.8	200	71%
NO_2 / 2020	Annual mean	19.8	14	33.8	40	84%
	99.8th%ile of 1-hr Means	115.8	28	143.8	200	72%

This scenarios assumed all six data halls and all 18 energy centre engines are operational simultaneously. In reality the Proposed Development will become operational in phases over a period of 4 – 5 years, with two data centre halls and six energy centre engines in operation for each phase. Initial emissions will therefore be lower than those reported here. Overall, the operational phase impact of the Proposed Development on human health is considered ***long-term***, ***localised***, ***negative*** and ***slight***.

Proposed Development (Worst-Case) Scenario (UK Environment Agency Methodology)

The methodology, based on considering the statistical likelihood of an exceedance of the NO_2 hourly limit value assuming a hypergeometric distribution and which identifies the number of hours the back-up generators can operate before there is a likelihood of an exceedance, has been undertaken at the worst-case residential receptor for the Proposed Development Scenario. This scenario involved the emergency operation of 84 no. data centre back-up generators on the site. This methodology allows a comparison to be made between the maximum number of hours which the back-up generators can operate without exceeding the ambient air quality standards and the historical frequency of power outage. As outlined below the maximum number of hours the back-up generators can operate is 99 hours per year whilst the historical data suggests that back-up operation of the generators is only likely to be required for 22 hours overs a five-year period. Thus, the assessment shows there is adequate flexibility to allow for the operation of the back-up generators during any foreseeable power outages.

The cumulative hypergeometric distribution of 19 and more hours per year is computed and the probability of an exceedance determined as outlined in Table 8.11. The results have been compared to the 98th percentile confidence level to indicate if an

exceedance is likely at various operational hours for the back-up diesel generators. The results indicate that in the worst-case year, the emergency generators for the Proposed Development can operate for up to 99 hours per year before there is a likelihood of an exceedance of the ambient air quality standard (at a 98th percentile confidence level). Figure 8.4 shows the statistical distribution predicted for the 98th percentile (based on 99 hours of operation per year). However, the UK guidance recommends that there should be no running time restrictions placed on back-up generators which provide power on site only during an emergency power outage.

Table 8.11 Hypergeometric Statistical Results at Worst-Case Residential Receptor – NO_2 Proposed Development (Worst-Case) Scenario

Pollutant/ Year	Hours of operation (Hours) (98th%ile) Allowed Prior To Exceedance Of Limit Value	UK Guidance – Probability Value = 0.02 (98th%ile) Note 1
NO_2 / 2016	133	0.02
NO_2 / 2017	99	
NO_2 / 2018	123	
NO_2 / 2019	119	
NO_2 / 2020	128	

Note 1 Guidance Outlined In UK EA publication "Diesel Generator Short-term NO_2 Impact Assessment" (EA, 2016)

8.7.2.2 Climate

Climate change has the potential to alter weather patterns and increase the frequency of rainfall in future years. As a result of this there is the potential for flooding related impacts on site in future years. A detailed flood risk assessment has been undertaken as part of this planning application and adequate attenuation and drainage have been provided for to account for increased rainfall in future years. Therefore, the impact will be ***imperceptible***.

Electricity providers form part of the EU-wide Emission Trading Scheme (ETS) and thus greenhouse gas emissions from these electricity generators are not included when determining compliance with the targeted 30% reduction in the non-ETS sector i.e. electricity associated greenhouse gas emissions will not count towards the Effort Sharing Decision target. Thus, any necessary increase in electricity generation due to data centre demand will have no impact on Ireland's obligation to meet the EU Effort Sharing Decision. Under this scenario, as outlined in the Regulation, the new electricity provider will be treated as a "new entrant" under Phase IV of the ETS (i.e. an electricity generator obtaining a greenhouse gas emissions permit for the first time after 30th June 2018). The new electricity provider will be required to purchase allocations in the same manner as existing players in the market using the European Energy Exchange. EU leaders have also decided that during Phase IV (2021-2030) 90% of the revenue from the auctions will be allocated to the Member States on the basis of their share of verified emissions with 10% allocated to the least wealthy EU member states. The revised EU ETS Directive has enshrined in law the requirement that at least 50% of the auctioning revenues or the equivalent in financial value should be used for climate and energy related purposes.

In 2018, the market reported a fall of 4.1% (73 million tonnes CO_2eq) from 2017, the EU noted that much of the revenue raised by the cap and trade scheme is going towards climate and energy objectives (European Commission, 2019):

"In 2018, a strengthened carbon price signal led to a record amount of revenues for Member States from the selling of ETS allowances. The generated amount equalled some EUR 14 billion - more than doubling the revenues generated in 2017. Member States spent or planned to spend close to 70% of these revenues on advancing climate and energy objectives - well above the 50% required in the legislation"

In terms of the Proposed Development, as the facility generates over the threshold of 20 MW, a greenhouse gas emission permit will be required which will be regulated under the ETS scheme also. Thus, whether the facility is operated by electricity or gas engines onsite, the emissions are not included when determining compliance with the targeted 30% reduction in the non-ETS sector. In addition, on a EU-wide basis, where the ETS market in 2018 is approximately 1,655 million tonnes CO_2eq, the impact of the emissions associated with the proposed development will be less than 0.040% of the total EU-wide ETS market which is imperceptible.

In terms of wider energy policy, as outlined in the EPA publication "*Ireland's Greenhouse Gas Projections 2019-2040"* (EPA, 2020e) under the With Additional Measures scenario, emissions from the energy industries sector are projected to decrease by 34% to 7 Mt CO_2eq over the period 2019 to 2030 including the proposed increase in renewable energy generation to approximately 70% of electricity consumption:

- "*In this scenario it is assumed that for 2020 there is a 36.3% share of renewable energy in electricity generation. In 2030 it is estimated that renewable energy generation increases to approximately 70% of electricity consumption. This is mainly a result of further expansion in wind energy (comprising 3.5 GW offshore and approximately 8.2 GW onshore). Expansion of other renewables (e.g. solar photovoltaics) also occurs under this scenario;*
- *Under the With Additional Measures scenario two peat stations are assumed to run on 100% peat to the end of 2020 but PSO support finishes at the end of 2019. For 2020 the operation of the peat plants is determined by the electricity market. The third peat station operates to the end of 2023 with 30% co-firing;*
- *In this scenario the Moneypoint power station is assumed to operate in the market up to end 2024 at which point it no longer generates electricity from coal as set out in the Climate Action Plan; and*
- *In terms of inter-connection, it is assumed that the Greenlink 500MW interconnector to the UK to come on stream in 2025 and the Celtic 700MW interconnector to France to come on stream in 2026*". (EPA, 2020e)

Data centres are typically 84% more efficient than on-premises servers and the GHG savings associated with this are not included in the GHG emissions total. In addition, in terms of total forecasted capacity, it is predicted that 1,700MW of data centres capacity will be operational by 2025 in Ireland. However, the carbon intensity of electricity is predicted to decrease from 331 gCO_2/kWh in 2019 to 100 gCO_2/kWh in 2030 as a result of the increase in renewables to 70% of the electricity market by 2030. Overall, it is predicted that data centres will peak at 2.2% of total GHG emissions in 2024 and will fall or level off after this date.

The indirect CO_2 emissions from electricity to operate the facility will not be significant in relation to Ireland's national annual CO_2 emissions. A Report titled *'Energy Related CO_2 Emissions In Ireland 2005 – 2018 (2019 Report)'* published by the Sustainable Energy Authority of Ireland (SEAI, 2020) states the average CO_2 emission factor for electricity generated in Ireland was 375 gCO_2/kWh in 2018. This average CO_2 emission factor is based on the national power generating portfolio. On the basis that the Proposed Development will consume 200 MW of power this equates to 1752 GWh

annually based on the assumption of the national fuel mix. This translates to approximately 657,000 tonnes of CO_2eq per year. This will have an ***indirect***, ***long-term***, ***negative*** and ***slight*** impact on climate.

In terms of air quality it is appropriate to limit the cumulative assessment to regions where there will be significant overlap between the facilities and thus the cumulative assessment was limited to the site. In terms of climate, again it is appropriate to review the facility. As emissions from the onsite energy centre and electricity purchased will both form part of the EU-wide ETS scheme, the relevant cumulative impact would be the EU as a whole rather than Ireland. However, as highlighted above, the facility's impact will be less than 0.040% of the total EU-wide ETS market thus the cumulative impact will lead to an ***indirect***, ***long-term***, ***negative*** and ***slight*** impact on climate.

In addition, in terms of total forecasted capacity, it is predicted that 1,700MW of data centres capacity will be operational by 2025. However, the carbon intensity of electricity is predicted to decrease from 331 gCO_2/kWh in 2019 to 100 gCO_2/kWh in 2030 as a result of the increase in renewables to 70% of the electricity market by 2030. Overall, it is predicted that data centres will peak at 2.2% of total GHG emissions in 2024 and will fall or level off after this date (Host In Ireland, 2020).

8.7.2.3 Regional Air Quality

Directive (EU) 2016/2284 *"On The Reduction Of National Emissions Of Certain Atmospheric Pollutants And Amending Directive 2003/35/EC And Repealing Directive 2001/81/EC"* was published in December 2016. The Directive will apply the 2010 National Emission Ceiling Directive limits until 2020 and establish new national emission reduction commitments which will be applicable from 2020 and 2030 for SO_2, NO_X, NMVOC, NH_3 and $PM_{2.5}$ as detailed in Section 8.2.1.3.

Assuming that 200 MW is generated using the national fuel mix for the data centre, the NO_X emissions associated with this electricity over the course of one year (i.e. 1,752 GWh based on 200MW for 8,760 hours per annum) will equate to 584 tonnes per annum which is 0.90% of the National Emission Ceiling limit for Ireland from 2020 onwards. Similarly, SO_2 emissions associated this electricity over the course of one year (1,752 GWh) will equate to 221 tonnes per annum which is 0.53% of the National Emission Ceiling limit for Ireland from 2020. Additionally, NMVOC emissions associated this electricity over the course of one year (1,752 GWh) will equate to 664 tonnes per annum which is 1.21% of the National Emission Ceiling limit for Ireland from 2020. This range of increases (0.5 – 1.2%) in concentrations of NO_X, SO_2 and NMVOC indirect emissions associated with the operation of the Proposed Development is considered ***indirect***, ***long-term***, ***negative*** and ***slight*** with regards to regional air quality.

As discussed in Chapter 2 of this EIA Report, the Proposed Development's energy sources also consist of energy from solar panels to be installed where feasible on data centre buildings and heat pumps serving both the energy and data centres, as well as the main supply of natural gas. With these sources the Proposed Development is in compliance with the Building Regulations Technical Guidance Document (TGD) Part L 2017 (NZEB) Part L 2017 - Conservation of Fuel and Energy – 'Buildings other than Dwellings'.

8.7.2.4 Human Health

Air dispersion modelling was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of

human health. The construction and decommissioning phases of the development will not lead to exceedances of the relevant ambient air quality standards and thus will not have a significant effect on human health.

In terms of the operational phase, as demonstrated by the dispersion modelling results, emissions from the site, assuming scheduled testing as well as emergency operation of the back-up generators, are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health. In relation to the spatial extent of air quality impacts from the site, ambient concentrations will decrease significantly with distance from the site boundary. Further details of the potential impacts on human health associated with the Proposed Development are discussed in Chapter 4 of this EIA Report.

8.7.2.5 Impact of NO_X on Designated Habitat Sites

The impact of emissions of NO_X within 20 km of the Proposed Development and existing emission points on ambient ground level concentrations within the following designated habitat sites was assessed using AERMOD. The 20km distance was selected based on maximum extent of the impact zone from the air emissions onsite. After 20km, the ambient air concentration of NO_X due to emissions from the facility are imperceptible.

- **Proposed Natural Heritage Areas (pNHA) –** Ballycar Lough pNHA, Cahircalla Wood pNHA, Dromoland Lough pNHA, Durra Castle pNHA, Fergus Estuary And Inner Shannon pNHA, North Shore pNHA, Fin Lough (Clare) pNHA, Inchicronan Lough pNHA, Lough Cleggan pNHA, Lough Cullaunyheeda pNHA, Newpark House (Ennis) pNHA, Poulnagordon Cave (Quin) pNHA, Rosroe Lough pNHA;
- **Natural Heritage Areas (NHA) –** Maghere Mountain Bogs NHA, Oysterman's Marsh NHA;
- **Special Areas of Conservation (SAC) –** Ballyallia Lake SAC/pNHA, Ballycullinan Lake SAC/pNHA, Ballycullinan Old Domestic Building SAC, Dromore Woods And Loughs SAC/pNHA, East Burren Complex SAC/pNHA, Knockanira House SAC, Lower River Shannon SAC, Moyree River System SAC/pNHA, Newgrove House SAC, Newhall And Edenvale Complex SAC/pNHA, Old Domestic Building (Keevagh) SAC/pNHA, Old Domestic Buildings, Rylane SAC, Old Farm Buildings, Ballymacrogan SAC, Pouladatig Cave SAC/pNHA, Poulnagordon Cave (Quin) SAC, Toonagh Estate SAC; and
- **Special Protection Area (SPA) –** Ballyallia Lough SPA, Corofin Wetlands SPA, River Shannon and River Fergus Estuaries SPA, and Slieve Aughty Mountains SPA.

An annual limit value of 30 µg/m^3 for NO_X is specified within EU Directive 2008/50/EC for the protection of ecosystems. The NO_X limit value is applicable only in highly rural areas away from major sources of NO_X such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex III of EU Directive 2008/50/EC identifies that monitoring to demonstrate compliance with the NO_X limit value for the protection of vegetation should be carried out distances greater than:

- 5 km from the nearest motorway or dual carriageway;
- 5 km from the nearest major industrial installation;
- 20 km from a major urban conurbation.

There are sections of designated sites which are near the Proposed Development that are within an urban setting, so the limit value for NO_X for the protection of ecosystems

is not technically applicable at these sites. Regardless, the annual average concentrations for NO_X from all emission points at the Proposed Development were predicted at receptors within the designated sites for all five years of meteorological data modelled (2016 – 2020). The receptor spacing ranged from 25 m to 100 m with 2,486 discrete receptors modelled in total within the sensitive ecosystems.

The NO_X modelling results are detailed in Table 8.12. Emissions from the facility lead to an ambient NO_X concentration (excluding background) which ranges from 6 – 7% of the annual limit value at the worst-case location within the designated sites over the five years of meteorological data modelled. In addition, modelling results based on conservative assumptions indicate that the Proposed Development combined with background concentrations will have an slight impact on NO_X concentrations within the sensitive ecosystems contributing at most 70% of the limit value at the worst-case location in the worst-case year modelled.

Table 8.12 *Modelled NO_X Concentrations ($\mu g/m^3$) Within the Modelled Ecological Receptors for all Emission Points at the Proposed Development*

Pollutant/ Year	Averaging Period	Process Contribution NO_X ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Predicted Environmental Concentration NO_X ($\mu g/m^3$)	Limit Value ($\mu g/m3$) Note 1	PEC as a % of Limit Value
NO_X / 2016	Annual mean	2.0	19	21.0	30	70%
NO_X / 2017	Annual mean	1.9	19	20.9	30	70%
NO_X / 2018	Annual mean	1.8	19	20.8	30	69%
NO_X / 2019	Annual mean	1.8	19	20.8	30	69%
NO_X / 2020	Annual mean	1.5	19	19.0	30	68%

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC and S.I. 180 of 2011).

In order to consider the effects of nitrogen deposition owing to emissions from the Proposed Development on the designated habitat sites, the NO_X concentrations determined above in Table 8.12 must be converted firstly into a dry deposition flux using the equation below which is taken from UK Environment Agency publication "AGTAG06 – Technical Guidance On Detailed Modelling Approach For An Appropriate Assessment For Emissions To Air" (EA, 2014):

Dry deposition flux ($\mu g/m^2/s$) = ground-level concentration ($\mu g/m^3$) x deposition velocity (m/s)

The deposition velocities for NO_X are outlined in AQTAG06 (EA, 2014). A deposition velocity of 0.0015 m/s for grassland has been used. The dry deposition flux is then multiplied by a conversion factor of 95.9 (taken from AQTAG06 (EA, 2014)) to convert it to a nitrogen (N) deposition flux (kg/ha/yr).

The N deposition flux for the worst-case year is 3.02 kg/ha/yr and is below the range in worst-case critical loads for the various vegetation types of 5-10 kg/ha/yr (UNECE, 2010). Consultation with the ecologist confirms that the effects of nitrogen deposition on designated sites due to the Proposed Scheme are not significant.

Overall, the operational phase impact of the Proposed Development on designated habitat sites is considered ***long-term***, ***localised***, ***negative*** and ***imperceptible***.

8.7.2.6 Impact of NO_X on Onsite Sensitive Habitats

There are also sensitive habitats without National or European designations within the site boundary. As outlined above, the annual limit value of 30 µg/m^3 for NO_X is specified within EU Directive 2008/50/EC for the protection of ecosystems. However, this standard should not be applied to areas which fall into the following categories:

- 5 km from the nearest motorway or dual carriageway;
- 5 km from the nearest major industrial installation;
- 20 km from a major urban conurbation.

Thus, onsite levels of NO_X are exempt from the application of the EU standard for the protection of ecosystems. Nevertheless, the results from the assessment are outlined below.

The NO_X modelling results are detailed in Table 8.13, to demonstrate the worst-case change in ambient concentration of NO_X these habitats are predicted to experience due to the Proposed Development. Emissions from the facility lead to an ambient NO_X concentration (excluding background) which ranges from 43.6 - 56.4 µg/m^3 at the worst-case location within the site over the five years of meteorological data modelled. In addition, modelling results based on conservative assumptions indicate that the Proposed Development combined with background concentrations lead to an ambient NO_X concentration which ranges from 62.6 - 75.4 µg/m^3 at the worst-case location within the site over the five years of meteorological data modelled

In terms of deposition, the habitat onsite includes rich fen (including Alkaline fens), wet grassland (including Molinia meadows), poor fens (including cladium fen) and calcareous grassland (see Chapter 7 (Biodiversity) for further details). The maximum Nitrogen (N) deposition flux for the worst-case year is 10.86 kg/ha/yr. This can be compared to the range of critical loads for the various onsite habitats outlined in the UNECE 2010 Report "Empirical Critical Loads And Dose-Response Relationships". Rich fen critical loads range from 15-30 kg/ha/yr, poor fen critical loads range from 10-15 kg/ha/yr, Molinia meadows ranged from 15-25 kg/ha/yr whilst calcareous grassland ranged from 15-25 kg/ha/yr (UNECE, 2010).

Table 8.13 *Modelled NO_X Concentrations (µg/m^3) Within the On-Site Modelled Ecological Receptors for all Emission Points at the Proposed Development*

Pollutant/ Year	Averaging Period	Process Contribution NO_X (µg/m^3)	Background Concentration (µg/m^3)	Predicted Environmental Concentration NO_X (µg/m^3)
NO_X / 2016	Annual mean	55.3	19	74.3
NO_X / 2017	Annual mean	44.5	19	63.5
NO_X / 2018	Annual mean	48.0	19	67.0
NO_X / 2019	Annual mean	56.4	19	75.4
NO_X / 2020	Annual mean	43.6	19	62.6

The maximum critical load of N is below the upper ranges of all habitats onsite and also below most of the lower ranges of the onsite habitat sites also.

However, as the critical load is above the lower limit for poor fens such as the cladium fen in the east of the site and the alkaline fen beside the toureen lough, a more detailed analysis has been undertaken at the actual location of these sensitive habitat sites.

8.7.2.7 Impact of NO_X on Onsite Poor Fens

The NO_X modelling results are detailed in Table 8.14 at the location of the onsite poor fens such as the cladium fen in the east of the site and the alkaline fen beside the toureen lough. Emissions from the facility lead to an ambient NO_X concentration (excluding background) which ranges from 20.1 – 24.9 $\mu g/m^3$ at the worst-case location within the onsite poor fens habitat over the five years of meteorological data modelled. In addition, modelling results based on conservative assumptions indicate that the Proposed Development combined with background concentrations lead to an ambient NO_X concentration which ranges from 39.1 – 43.9 $\mu g/m^3$ at the worst-case location within the onsite poor fens habitat over the five years of meteorological data modelled

In terms of deposition, the maximum Nitrogen (N) deposition flux for the worst-case year is 6.33 kg/ha/yr within the onsite poor fens habitat. This can be compared to the range of critical loads for the poor fen habitat outlined in the UNECE 2010 Report "Empirical Critical Loads And Dose-Response Relationship" of 10-15 kg/ha/yr. Thus the maximum critical load of N is below the lower range of the critical load for poor fen habitats.

Table 8.14 *Modelled NO_X Concentrations ($\mu g/m^3$) At the On-Site Poor Fens Habitat for all Emission Points at the Proposed Development*

Pollutant/ Year	Averaging Period	Process Contribution NO_X ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Predicted Environmental Concentration NO_X ($\mu g/m^3$)
NO_X / 2016	Annual mean	20.6	19	39.6
NO_X / 2017	Annual mean	20.1	19	39.1
NO_X / 2018	Annual mean	22.4	19	41.4
NO_X / 2019	Annual mean	21.2	19	40.2
NO_X / 2020	Annual mean	24.9	19	43.9

In relation to NO_X critical levels, the Chartered Institute of Ecology and Environmental Management (CIEEM) guidance document "Advisory Note: Ecological Assessment of Air Quality Impacts" (CIEEM, 2021) states that:

"The predominant role of NO_X regarding vegetation is as a source of nitrogen (which can in turn result in growth stimulation, growth inhibition and changes to chlorophyll), although it is possible that at high concentrations it may also affect lipid biosynthesis and cell acidity. For example, a study undertaken for Countryside Council for Wales (now part of Natural Resources Wales) reviewed the effects of atmospheric nitrogen deposition on saltmarsh, including the relative importance of NOx concentrations as distinct from nitrogen deposition rates. The review concluded that:

'… the robustness of the salt marsh nutrient system might suggest that the application of the critical load limits [as opposed to critical level] may afford sufficient protection … it seems likely that the cumulative effects of these short term impacts [of elevated NOx] would, in general, be adequately covered by the application of the critical load approach'. In other words, for this habitat it is likely that a focus on nitrogen deposition will adequately address the effect of elevated NO_X, without a need to separately consider other effects of the gas unrelated to its role in increasing available nitrogen."

Thus, in relation to all onsite sensitive habitats, including the poor fens habitat, full compliance with the appropriate NO_X critical loads is predicted based on worst-case operational assumptions.

Overall, the operational phase impact of the Proposed Development on the onsite poor fens is considered ***long-term***, ***localised***, ***negative*** and ***imperceptible***.

8.8 CUMULATIVE IMPACTS

A review of licensed facilities in the surrounding area has been conducted and none have been identified with the potential for cumulative impact with the Proposed Development. Consideration of all developments identified in Chapter 3 Appendix 3.1 was also undertaken and no potential for cumulative impact with the Proposed Development was identified as the planned developments have no or negligible potential for NO_2 emissions.

In terms of climate, emissions from the onsite energy centre and electricity purchased will both form part of the EU-wide ETS scheme, the relevant cumulative impact would be the EU as a whole rather than Ireland. However, the facility's impact will be less than 0.040% of the total EU-wide ETS market thus the cumulative impact will lead to an ***indirect***, ***long-term***, ***negative*** and ***slight*** impact on climate.

8.9 RESIDUAL IMPACTS

Once the mitigation measures outlined in Section 8.6 are implemented, the residual impacts on air quality or climate from the construction of the Proposed Development will be ***short-term*** and ***imperceptible***. In terms of human health, the operational phases of the Proposed Development will be ***long-term***, ***negative*** and ***slight***. In relation to designated habitat sites, the construction and operational phase impacts of the Proposed Development on designated habitat sites is considered ***long-term***, ***localised***, ***negative*** and ***imperceptible***.

Interactions are presented in Chapter 15.

.

8.10 REFERENCES

BRE (2003) Controlling Particles, Vapours & Noise Pollution From Construction Sites

CIEEM (2021) Advisory Note: Ecological Assessment of Air Quality Impacts

DEHLG (2004) National Programme for Ireland under Article 6 of Directive 2001/81/EC for the Progressive Reduction of National Emissions of Transboundary Pollutants by 2010

DEHLG (2007) Update and Revision of the National Programme for Ireland under Article 6 of Directive 2001/81/EC for the Progressive Reduction of National Emissions of Transboundary Pollutants by 2010

Environmental Protection Agency (2006) Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals)

Environmental Protection Agency (2015) Advice Notes for Preparing Environmental Impact Statements – Draft September 2015

Environmental Protection Agency (2017) Guidelines on the Information to be contained in Environmental Impact Statements - Draft August 2017

Environmental Protection Agency (2020a) Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)

Environmental Protection Agency (2020b) Ireland's Air Pollutant Emissions 1990 – 2030

Environmental Protection Agency (2020c) Air Quality Monitoring Report 2018 (& previous annual reports)

Environmental Protection Agency (2020d) Ireland's Provisional Greenhouse Gas emissions 1990 – 2019

Environmental Protection Agency (2020e) GHG Emissions Projections Report - Ireland's Greenhouse Gas Emissions Projections 2019 – 2040

Environmental Protection Agency (2021) EPA Website: http://www.epa.ie/whatwedo/monitoring/air/

European Commission (2019) website:

https://ec.europa.eu/clima/news/carbon-market-report-emissions-eu-ets-stationary-installations-fall-more-4_en

European Parliament & European Council (2018) Regulation On Binding Annual Greenhouse Gas Emission Reductions By Member States From 2021 To 2030 Contributing To Climate Action To Meet Commitments Under The Paris Agreement And Amending Regulation (EU) No 525/2013, 2018/842

Gas Networks Ireland (2017) Systems Performance Report 2017

German VDI (2002) Technical Guidelines on Air Quality Control – TA Luft

Government of Ireland (2001) Planning and Development Regulations 2001

Government of Ireland (2015) Climate Action and Low Carbon Development Act

Government of Ireland (2019) Climate Action Plan 2019

Government of Ireland (2020a) Draft General Scheme of the Climate Action (Amendment) Bill 2019

Government of Ireland (2020b) Climate Action and Low Carbon Development (Amendment) Bill 2020

Host In Ireland (May 2020) Ireland's Data Hosting industry 2020 Q1 Update

IAQM (2014) Guidance on the Assessment of Dust from Demolition and Construction

Met Éireann (2021) Met Eireann website: https://www.met.ie/

SEAI, (2020) Energy Related CO_2 Emissions In Ireland 2005 – 2018 (2019 Report)

The Scottish Office (1996) Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings

UK Environment Agency (2014) AGTAG06 – Technical Guidance On Detailed Modelling Approach For An Appropriate Assessment For Emissions To Air

UK Environment Agency (2016) Diesel Generator Short-term NO2 Impact Assessment (Consultation Draft)

UK Environment Agency (2019) Emissions from specified generators - Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators

UNECE (2010) Empirical Critical Loads & Dose-Response Relationships

USEPA (1999) Comparison of Regulatory Design Concentrations: AERMOD vs. ISCST3 vs. CTDM PLUS

USEPA (2017) AERMOD Description of Model Formulation and Evaluation

USEPA (2004) User's Guide to the AERMOD Meteorological Preprocessor (AERMET)

USEPA (2005) Guidelines on Air Quality Models, Appendix W to Part 51, 40 CFR Ch.1

USEPA (2011) Additional Clarification Regarding Application of Appendix W Modelling Guidance for the 1-Hour National Ambient Air Quality Standard

UK Office of Deputy Prime Minister (2002) Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance

USEPA (1997) Fugitive Dust Technical Information Document for the Best Available Control Measures

USEPA (1986) Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition (periodically updated)

FIGURES

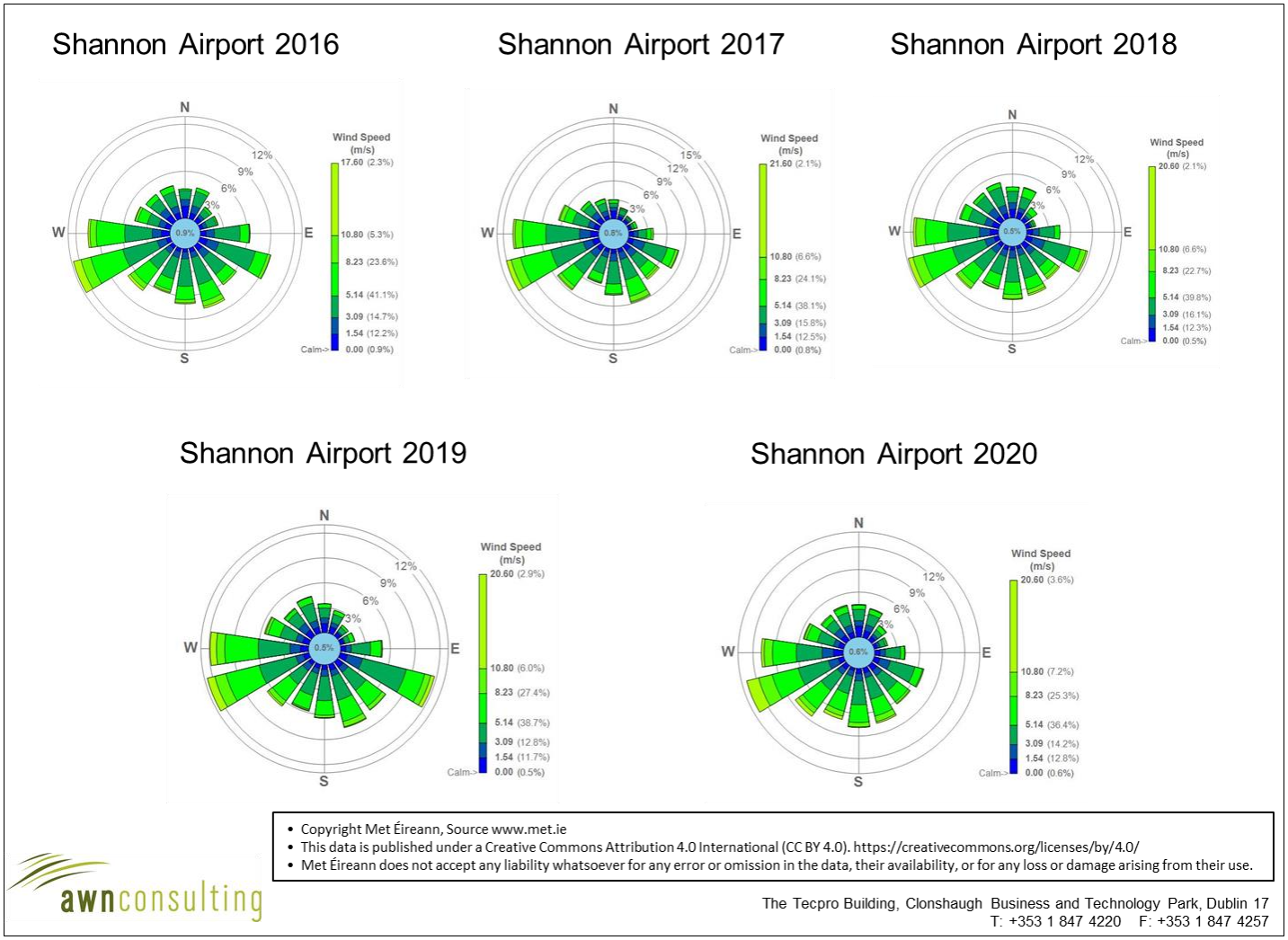

Figure 8.1 *Shannon Airport Windrose 2016 – 2020*

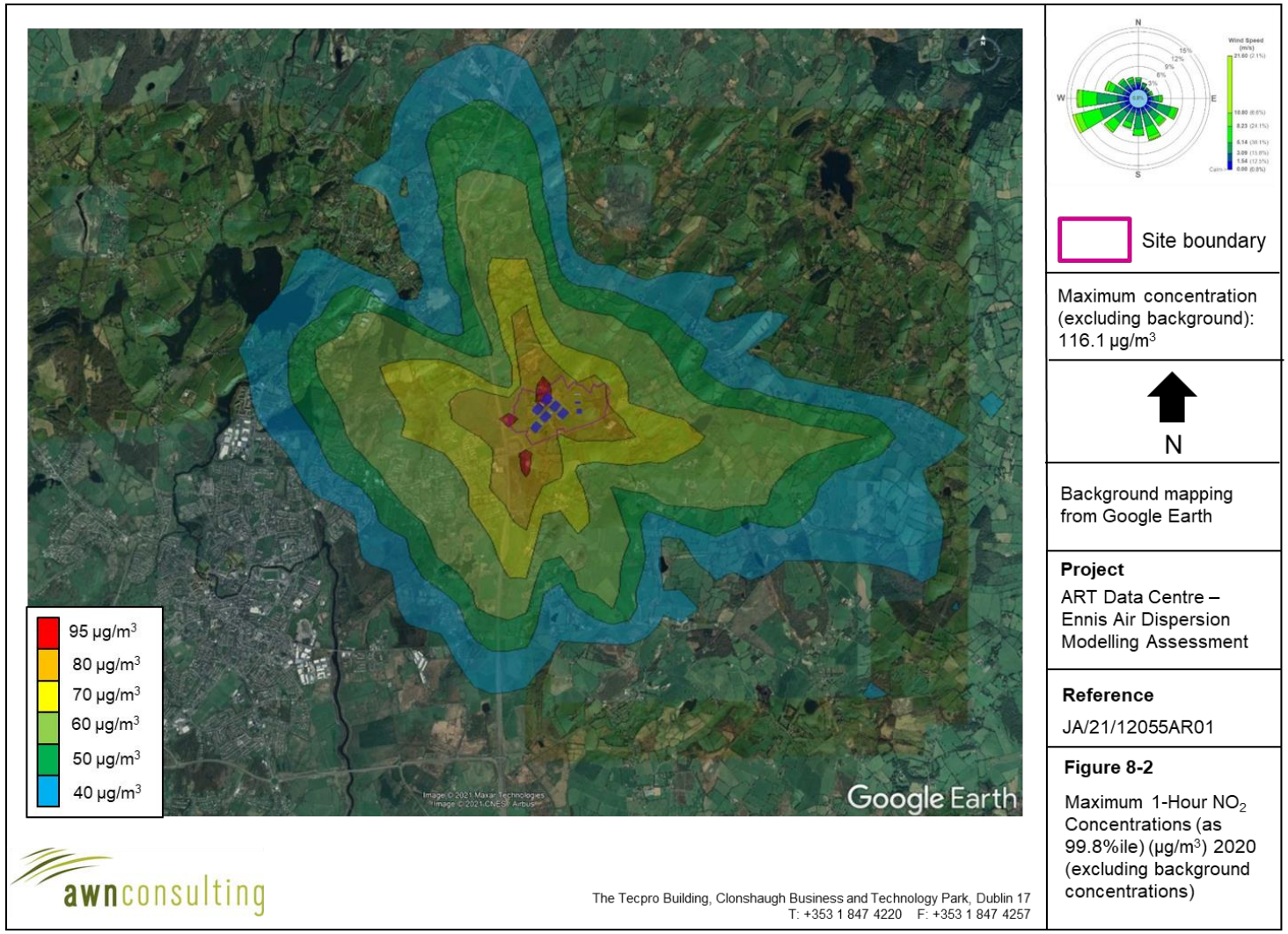

Figure 8.2 *Maximum 1-Hour NO_2 Concentrations (as 99.8%ile) ($\mu g/m^3$) 2020 (excluding background concentrations)*

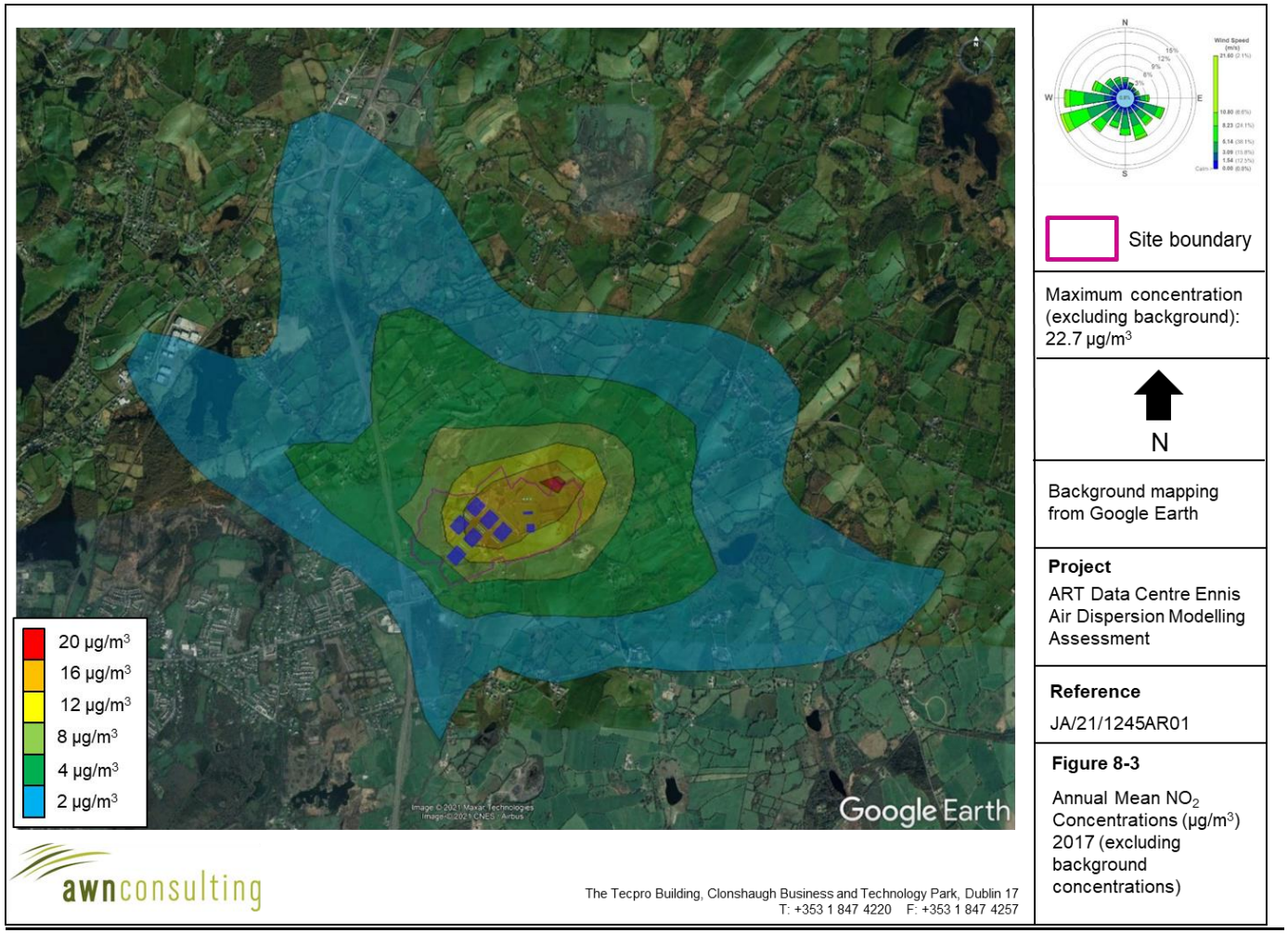

Figure 8.2 *Annual Mean NO_2 Concentrations (µg/m^3) 2017 (excluding background concentrations)j*

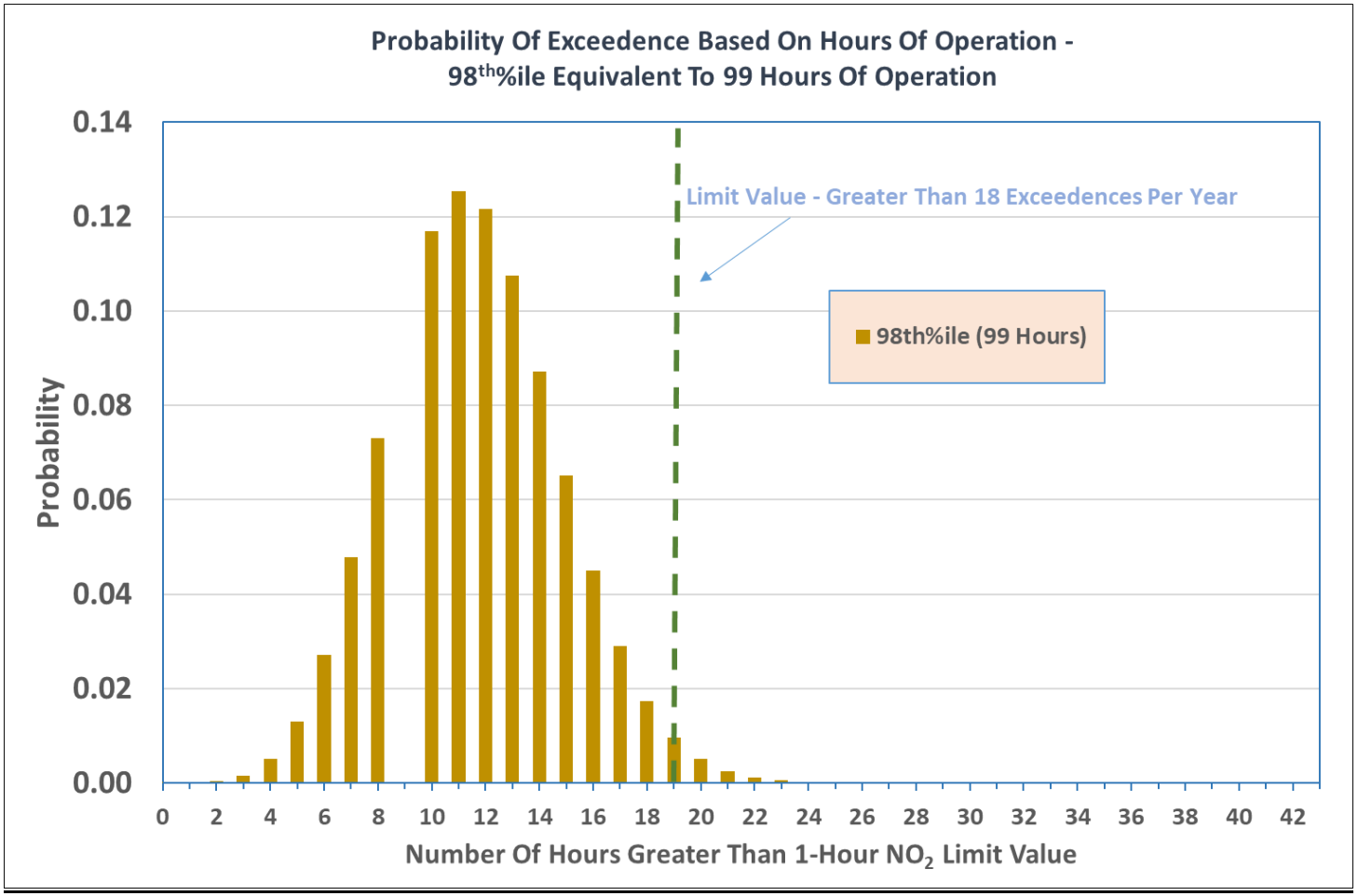

Figure 8.4 *Probability of Exceedance of 1-Hour NO_2 Ambient Air Quality Limit Value based on Hours of Operation for Emergency Generators for Proposed Development*