GDG
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GEOSOLUTIONS

Illaunbaun Wind Farm - Environmental Impact Assessment Report

Chapter 4: Consideration of Alternatives

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ACRONYMS

BSBI	Botanical Society of Britain and Ireland
CDP	County Development Plan
DECLG	Department of the Environment, Community and Local Government
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
EU	European Union
FWPM	Freshwater pearl mussels
GIS	Geographic Information System
GSI	Geological Survey Ireland
ha	Hectare
NBDC	National Biodiversity Data Centre
NHA	Natural Heritage Area
NPWS	National Parks and Wildlife Service
OSI	Ordnance Survey Ireland
pNHA	Proposed Natural Heritage Area
PRA	Peat Repository Area
SAC	Special Area of Conservation
SPA	Special Protection Area
WFD	Water Framework Directive
WTG	Wind Turbine Generator

4 CONSIDERATION OF REASONABLE ALTERNATIVES

4.1 INTRODUCTION

This chapter of the EIAR outlines the considerations given to reasonable alternatives in relation to the Proposed Development. This is a mandatory requirement of the EIA process, in accordance with Article 5(1)(d) and Annex IV point 2 of the EIA Directive (Directive 2011/92/EU as amended by Directive 2014/52/EU).

Article 5(1) of the EIA Directive states that the developer shall include at least:

> "d) a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment";

Annex IV point 2 expands further:

> "2) A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."

The EU Commission *Guidance on the preparation of the Environmental Impact Assessment Report* (2017) defines alternatives as:

> "Different ways of carrying out the Project in order to meet the agreed objective".

That guidance further states:

> "The number of alternatives to be assessed has to be considered together with the type of alternatives, i.e. the 'Reasonable Alternatives' referred to by the Directive. 'Reasonable Alternatives' must be relevant to the proposed project and its specific characteristics, and resources should only be spent assessing these alternatives. In addition, the selection of alternatives is limited in terms of feasibility. On the one hand, an alternative should not be ruled out simply because it would cause inconvenience or cost to the developer. At the same time, if an alternative is very expensive or technically or legally difficult, it would be unreasonable to consider it to be a feasible alternative."

In summary, alternatives must be able to accomplish the objectives of the project in a satisfactory manner, and should also be feasible in terms of technical, economic, political and other relevant criteria.

The Environmental Protection Agency (EPA) *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (2022) says:

> "It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required."

As stated in the 2022 EPA Guidelines, analysis of high-level or sectoral strategic alternatives cannot reasonably be expected within a project level EIAR. Therefore, the purpose of the analysis of alternatives is to examine the different possibilities for meeting the project's needs and objectives, whilst determining whether or not the project objectives can be met by different means which avoid, minimise or mitigate potential significant environmental effects due to the Proposed Development.

High-level strategic or policy alternatives are not considered relevant to this chapter and are addressed separately in Chapter 2: Policy and Legislation. This chapter focuses specifically on the site selection process and the assessment of alternatives within the developer's control.

4.2 DO-NOTHING SCENARIO

The 'do-nothing' scenario describes the likely environmental conditions in the event that the Proposed Development does not proceed. In line with EPA guidance (EPA, 2022), this scenario considers the continuation of current land use and management regimes, and the natural evolution of existing environmental conditions over time in the absence of the Proposed Development.

Under the 'do-nothing' scenario, the lands at Illaunbaun would remain in their current state, comprising a mix of commercial forestry, marginal agricultural land, and unmanaged upland habitats. Existing forestry operations and low-intensity farming would likely continue, and no new development or associated infrastructure would be introduced.

Aspects of the baseline environment such as water quality, habitat condition, and land cover may continue to evolve over time due to ongoing land management practices and wider environmental trends. However, no additional renewable energy capacity would be delivered at this location, and the site would not contribute to Ireland's national targets for renewable electricity generation.

The 'do-nothing scenario' provides a reference point for comparison with the selected alternative. Its consideration supports the evaluation of reasonable alternatives in accordance with the EIA Directive and ensures that the assessment is based on a robust and transparent understanding of future environmental conditions in the absence of the Proposed Development.

4.3 SITE SELECTION

The Proposed Development underwent a detailed site selection process which assessed a number of possible locations for suitability across multiple counties in Ireland. This site selection process followed a GIS mapping methodology whereby potentially available land areas were identified through overlaying nationwide and county-specific datasets, with appropriate distance buffers, to identify sites for development within selected counties. This included, but was not limited to,

Counties Clare, Cork, Kerry, Kildare, Kilkenny, Leitrim, Meath, Monaghan, Tipperary, Waterford and Wicklow.

A GIS screening exercise was undertaken with a scoring matrix applied to each site based on a number of key human and environmental parameters. This provided an objective ranking of each site based on its potential suitability. The GIS screening exercise comprised the following elements:

- Review of County Development Plan wind energy strategy areas;
- Identifying distances to any planned, consented and/or constructed wind farm developments;
- Assessment of proximity to existing and planned grid infrastructure;
- Review of available ESB grid capacity, both for local substations and regional upstream availability;
- Determining proximity to sites designated for environmental protection (SACs, SPAs, NHAs and pNHAs) and potential connection vectors to critical species (i.e. hen harrier distribution, salmonids, nutrient sensitive areas and freshwater peal mussels (FWPM));
- Assessment of wind resource potential (i.e. weighted average wind speed);
- Presence of restrictive topographical and landscape features;
- Presence of hydrological features such as historical watercourses and Water Framework Directive waterbodies;
- Review of existing land use and anticipated geological conditions across each location;
- Determining proximity to residential properties and settlement boundaries by reviewing census and Eircode datasets;
- Calculation of land area available for each development; and
- Total number of land divisions and forecasted number of landowners using the Land Registry.

The spatial datasets used to inform this screening included publicly available mapping from the NPWS, EPA, Ordnance Survey Ireland (OSI), ESB Networks, and Clare County Council (OSI, 2023; NPWS, 2023; EPA, 2023; Clare County Council, 2023).

Based on the screening outcomes, four candidate sites were identified for further assessment. Each of these sites was subsequently evaluated using a multi-criteria qualitative ranking methodology, as detailed below.

4.3.1 RANKING METHODOLOGY

To support the identification of a preferred location for the Proposed Development, a qualitative multi-criteria ranking system was applied to the four shortlisted sites. Each site was assessed against a set of key planning, environmental, and technical criteria using a colour-based ranking approach.

This ranking system assigns a non-numerical, indicative colour (Green, Orange, or Yellow) to each criterion for each site. The rankings are used to provide a relative indication of constraint or opportunity, as follows:

- Green: Represents a favourable condition for wind energy development under the specific criterion. It indicates low constraint and high compatibility.
- Yellow: Represents a moderate constraint or mixed conditions. Further assessment may be required, or mitigation may be necessary.
- Orange: Represents a potentially significant constraint or sensitivity that may affect feasibility or planning risk.

It is important to note that the colour rankings are not quantitative or proportional, i.e., a Green ranking is not twice as favourable as an Orange ranking, nor are they necessarily equivalent across different criteria, as some factors (e.g. grid connection) relate to technical viability, while others (e.g. proximity to designated ecological sites) reflect environmental screening thresholds.

The rankings are intended to assist in comparative assessment between candidate sites and to inform the overall decision-making process. They are not used to derive a cumulative or aggregated score, and no numerical weighting has been applied.

In some cases, such as proximity to existing wind energy developments, no colour ranking is applied. This is because such factors may be context-dependent, with outcomes varying based on planning precedent, cumulative effects, and Development Plan zoning. In these instances, qualitative commentary is provided to support interpretation of potential constraints or opportunities.

This ranking methodology is summarised in Table 4-1.

Table 4-1: Multi-criteria Qualitative Ranking Methodology

Item	Category	Description	Rank
1	County Development Plan (CDP) Zoning	Strategic	Green
		Preferred / approved in principle	Yellow
		Open to consideration	Orange
2	Grid infrastructure	< 5 km from a substation or 110 kV line	Green
		< 10 km from a substation or 110 kV line	Yellow
		< 15 km from a substation or 110 kV line	Orange
3	Grid capacity	Connection available to < 125% capacity transmission line	Green
		Connection available to < 150% capacity transmission line	Orange
4	Designated sites	Site does not lie between SPAs (to 5 km) or within 1 km of either SPAs & SACs	Yellow

Item	Category	Description	Rank
		Site lies between SPAs (to 5 km) or within 1 km of either SPAs & SACs	Orange
5	Fresh water pearl mussel (*Margaritifera margaritifera*)	Not in a FWPM catchment	Green
		Catchments of other extant populations **or** Catchments with previous records of FWPM, but current status unknown	Yellow
		Catchments of SAC populations listed in S.I. 296 of 2009	Orange
6	Land area	> 700 Acres	Green
		500 - 700 Acres	Yellow
		400 - 500 Acres	Orange
7	Wind resource	Weighted average wind speed > 10 m/s	Green
		Weighted average wind speed > 9 m/s	Yellow
		Weighted average wind speed > 7 m/s	Orange
8	Land division	< 5 land divisions	Green
		5 > land divisions > 10	Yellow
		> 10 land divisions	Orange

Notes: Rankings are qualitative and based on a colour system; Rankings are not proportionate or directly comparable across categories:

Green = favourable
Yellow = moderate constraint
Orange = higher constraint

4.3.2 SITE ONE

Site One was shortlisted following the GIS-based screening exercise, having met the initial requirements for land area, wind resource, and grid proximity. It was then assessed using the multi-criteria qualitative ranking approach outlined in Table 4-1, with the results shown in Table 4-2 and illustrated in Figure 4-1.

Table 4-2: Site One Ranking Results.

Item	Category	Comment	Ranking
1	CDP	Open to consideration	Orange
2	Grid infrastructure	< 5 km from a substation or 110 kV line	Green
3	Grid capacity	Connection available to < 125% capacity transmission line	Green
4	Designated sites	Although site does not lie between SPAs (to 5 km) or within 1 km of either SPAs & SACs, issues with hen harrier have been identified in previous ornithological studies for nearby developments and in upland regions in Clare	Orange
5	Fresh water pearl mussel (*Margaritifera margaritifera*)	Catchments of other extant populations	Yellow
6	Land area	> 700 Acres	Green
7	Wind resource	Weighted average wind speed > 9 m/s	Yellow
8	Land division	> 10 land divisions	Orange

Site One performed well in relation to grid proximity and infrastructure capacity, land availability, and general wind speed. However, it raised significant concerns under environmental and planning constraints.

The site was located between multiple designated conservation areas (SACs and SPAs), and adjacent to a Natural Heritage Area (NHA). Ornithological studies associated with neighbouring wind energy applications have identified the presence of Hen Harrier (*Circus cyaneus*) in nearby areas and the wider uplands of west Clare. These sensitivities raised concerns regarding cumulative impacts and ecological interconnectivity. Furthermore, the site lies within a Freshwater Pearl Mussel catchment, adding hydrological sensitivity.

The local planning context revealed that Site One was adjacent to an existing wind farm, and also that a nearby wind farm was previously refused due to concerns with cumulative noise impacts, suggesting planning saturation in the immediate area.

While zoning under the County Development Plan identifies the site as “open to consideration”, the balance of environmental constraints and planning history indicated a high risk of significant impacts and refusal potential. On this basis, Site One was not progressed further.

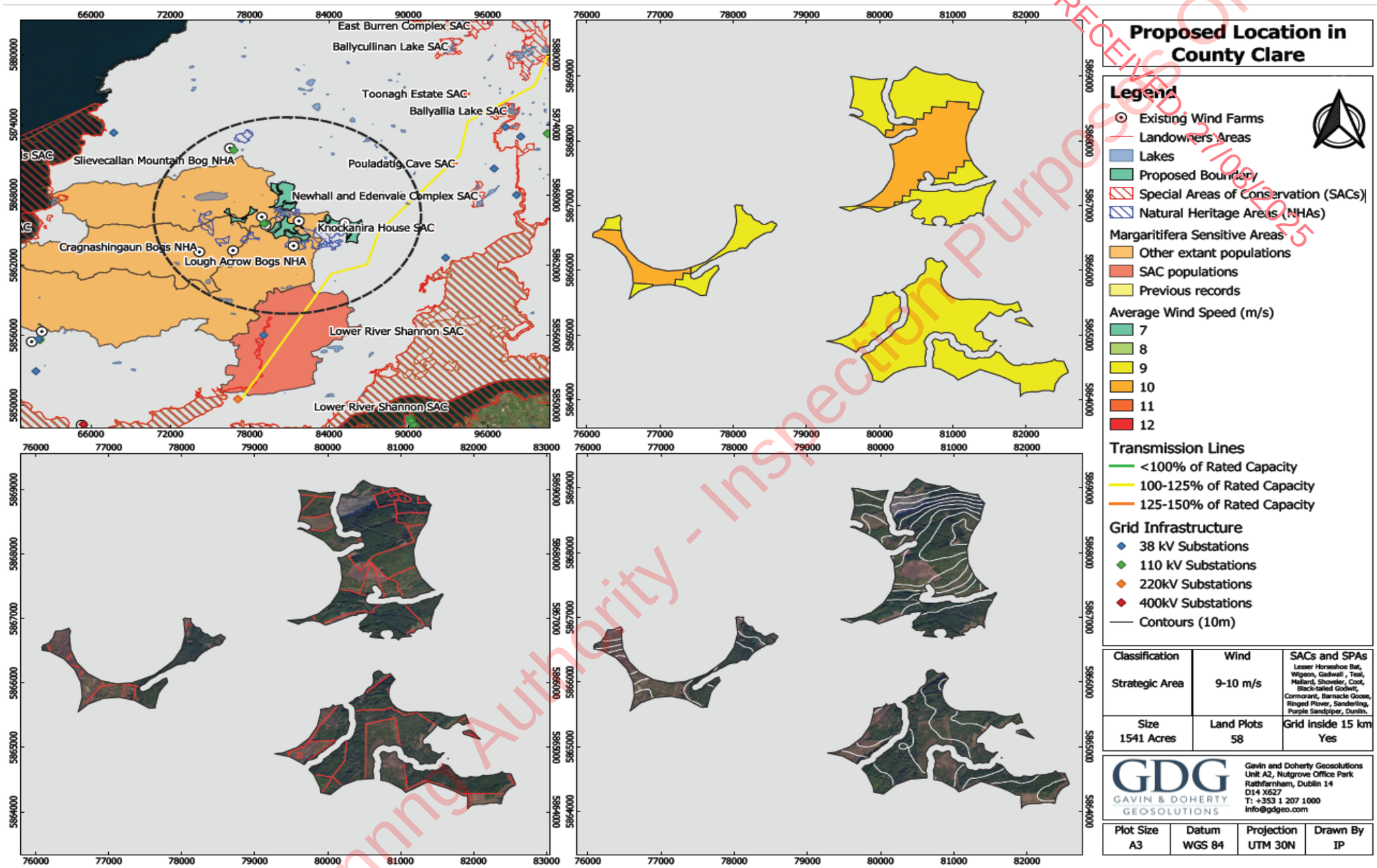

Figure 4-1: Site One site screening mapping exercise

4.3.3 SITE TWO

Site Two was identified as a potential development location following the preliminary GIS-based screening exercise described in Section 4.2. The site met several baseline criteria for wind farm development and it was subsequently assessed using the multi-criteria qualitative ranking methodology described in Section 4.2, with the outcomes presented in Table 4-3 and illustrated in Figure 4-2.

Table 4-3: Site Two Ranking Results.

Item	Category	Comment	Ranking
1	CDP	Open to consideration	Orange
2	Grid infrastructure	< 5 km from a substation or 110 kV line	Green
3	Grid capacity	Connection available to < 125% capacity transmission line	Green
4	Designated sites	Although site does not lie between SPAs (to 5 km) or within 1 km of either SPAs & SACs, issues with hen harrier have been identified in previous ornithological studies for nearby developments and in upland regions in Clare	Orange
5	Fresh water pearl mussel (*Margaritifera margaritifera*)	Not in a FWPM catchment	Green
6	Land area	500 - 700 Acres	Yellow
7	Wind resource	Weighted average wind speed > 9 m/s	Yellow
8	Land division	> 10 land divisions	Orange

Site Two performed well in terms of technical feasibility, with strong access to grid infrastructure and no apparent hydrological constraints from Freshwater Pearl Mussel catchments. The site was also zoned as “open to consideration” under the Clare County Development Plan.

However, similarly to Site One, Site Two presents a number of planning and environmental constraints that significantly reduce its overall suitability. The surrounding area includes multiple designated sites, with SACs and SPAs located on both sides of the site boundary, raising concerns regarding ecological connectivity and interconnection impacts. Previous ornithological studies associated with adjacent developments have identified Hen Harrier (*Circus cyaneus*) activity in the uplands of west Clare, increasing the likelihood of significant effects on sensitive bird species.

In addition, the site lies adjacent to an existing wind farm, and a separate wind energy proposal in the area was previously refused planning permission due to concerns with cumulative noise impacts. This raises concern regarding planning saturation and the potential for future noise-related constraints.

Although the site demonstrated good wind resource and grid connectivity, the combination of ecological sensitivities, cumulative planning risks, and sub-optimal land configuration resulted in Site Two being ruled out at this stage.

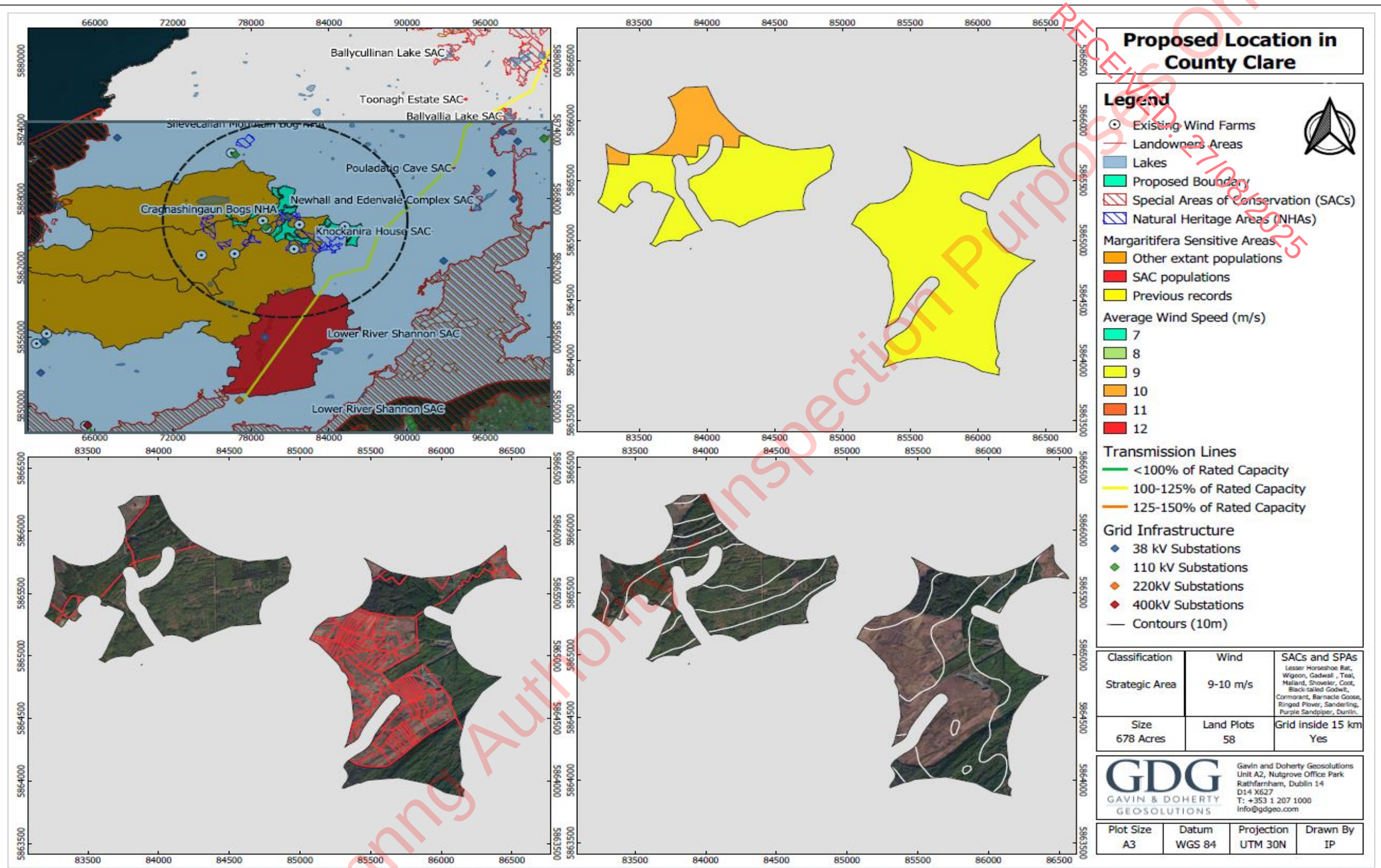

Figure 4-2: Site Two site screening mapping exercise

4.3.4 SITE THREE

Site Three was identified as a potentially suitable location for the Proposed Development following the preliminary GIS-based screening exercise outlined in Section 4.2, and was advanced for further qualitative assessment, using the ranking methodology outlined in Section 4.3.1. The outcomes of this assessment are presented in Table 4-4 and the site location is shown in Figure 4-3.

Table 4-4: Site Three Ranking Results.

Item	Category	Comment	Ranking
1	CDP	Open to consideration	Orange
2	Grid infrastructure	< 10 km from a substation or 110 kV line	Yellow
3	Grid capacity	Connection available to < 125% capacity transmission line	Green
4	Designated sites	Although site does not lie between SPAs (to 5 km) or within 1 km of either SPAs & SACs, issues with hen harrier have been identified in previous ornithological studies for nearby developments and in upland regions in Clare	Orange
5	Fresh water pearl mussel (*Margaritifera margaritifera*)	Not in a FWPM catchment	Green
6	Land area	> 700 Acres	Green
7	Wind resource	Weighted average wind speed > 7 m/s	Orange
8	Land division	> 10 land divisions	Orange

Site Three presented some positive attributes, particularly in terms of its size and the absence of known hydrological constraints linked to Freshwater Pearl Mussel catchments. The site is also zoned as “open to consideration” under the Clare County Development Plan, offering a degree of planning policy alignment.

However, it performed less favourably across a range of technical and environmental criteria. The site is located approximately 10 km from the nearest suitable grid infrastructure, resulting in longer grid connection routing and potentially greater environmental and financial cost. The average wind speed across the site was lower than other candidate areas, at just over 7 m/s, which could reduce the overall energy yield and project viability.

Ecologically, the site is located between multiple sensitive features, including designated SACs, SPAs, and lakes, raising potential concerns about habitat fragmentation and connectivity. Similarly to the shortlisted sites analyses previously, ornithological studies associated with nearby wind energy proposals in this part of County Clare have also highlighted potential Hen Harrier presence. In addition, Site Three lies adjacent to a designated Natural Heritage Area (NHA), adding further constraint from a biodiversity and landscape perspective.

Although the site was initially considered viable, the combined limitations of sub-optimal wind resource, ecological sensitivities, and increased grid distance led to Site Three being discounted from further consideration.

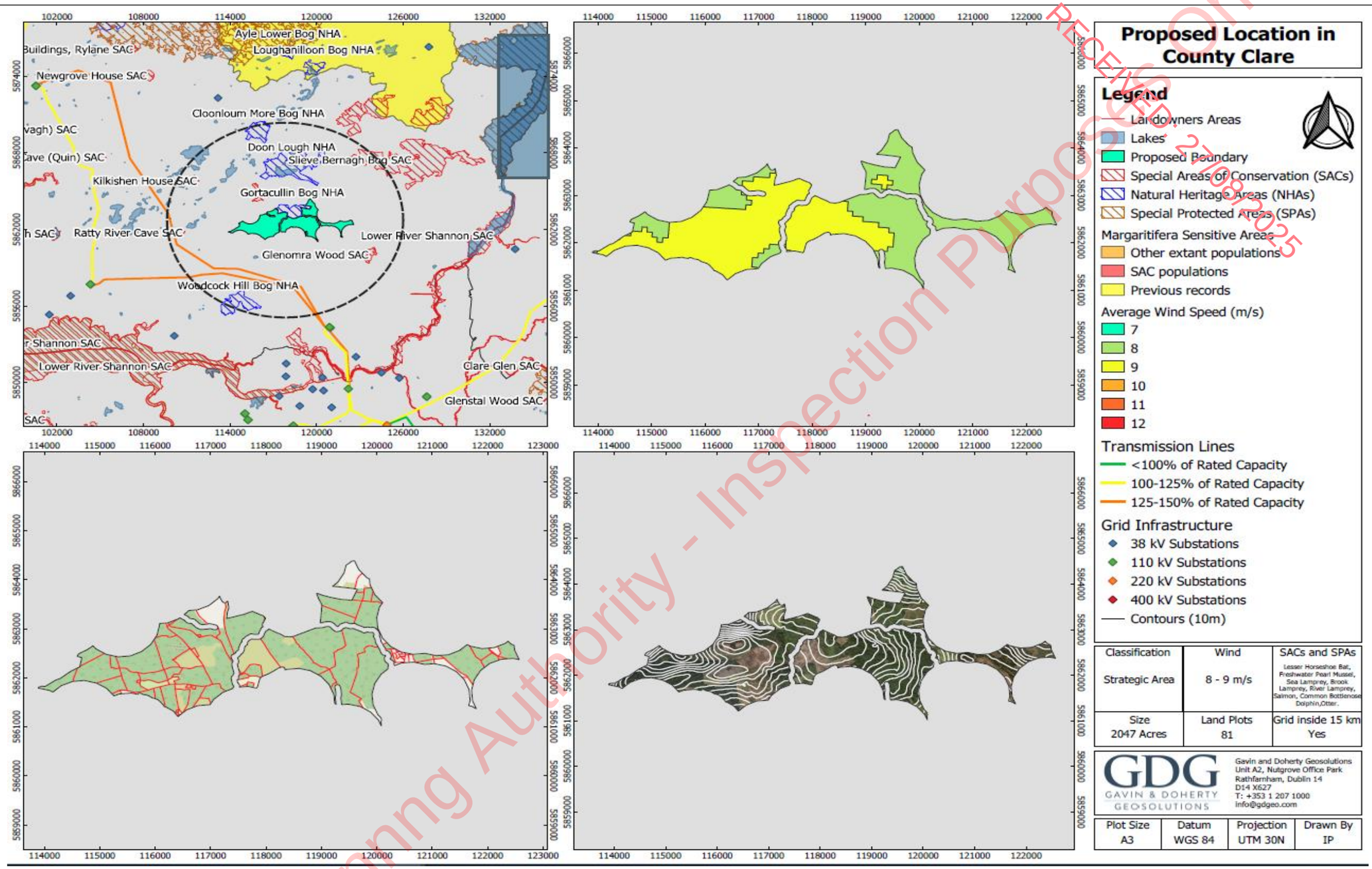

Figure 4-3: Site Three site screening mapping exercise.

4.3.5 SITE FOUR

Site Four was identified as a potential development location following the preliminary GIS-based screening exercise described in Section 4.2. The site met the baseline criteria for wind farm development and it was subsequently assessed using the multi-criteria qualitative ranking methodology described in Section 4.3.1, with the outcomes presented in Table 4-5 and illustrated in Figure 4-4.

Table 4-5: Site Four Ranking Results.

Item	Category	Comment	Ranking
1	CDP	Strategic	Green
2	Grid infrastructure	< 10 km from a substation or 110 kV line	Yellow
3	Grid capacity	Connection available to < 125% capacity transmission line	Green
4	Designated sites	Although site does not lie between SPAs (to 5 km) or within 1 km of either SPAs & SACs, issues with hen harrier have been identified in previous ornithological studies for nearby developments and in upland regions in Clare	Orange
5	Fresh water pearl mussel (*Margaritifera margaritifera*)	Not in a FWPM catchment	Green
6	Land area	> 700 Acres	Green
7	Wind resource	Weighted average wind speed > 9 m/s	Yellow
8	Land division	> 10 land divisions	Orange

Site Four was identified through the GIS-based screening process as a candidate location with strong potential, particularly in terms of planning support and available land area. The site is classified as 'strategic' in the Clare County Development Plan and exceeded the landholding threshold of 700 acres, providing flexibility for turbine siting and infrastructure design. It also benefits from an available connection to a 110 kV transmission line operating at less than 125% capacity.

The site is not located within a Freshwater Pearl Mussel catchment, which removes a significant ecological constraint commonly encountered in upland areas of County Clare. Similarly, although wind speeds on site were slightly lower than the optimal threshold (>9 m/s), they were still within a viable range for large-scale wind development.

Some constraints were identified during the comparative site assessment. The site lies approximately 10 km from the nearest substation or 110 kV line, requiring a longer grid connection route than other options considered. Ecologically, the site is situated between several Natura 2000 sites, including SACs and SPAs, with previous ornithological studies in the wider area indicating the presence of Hen Harrier. While Site Four does not overlap with any designated sites, the potential for hydrological connectivity and use by mobile qualifying species required further ecological review.

In addition, the site comprises more than ten separate land parcels, which increases the complexity of landowner engagement and project assembly.

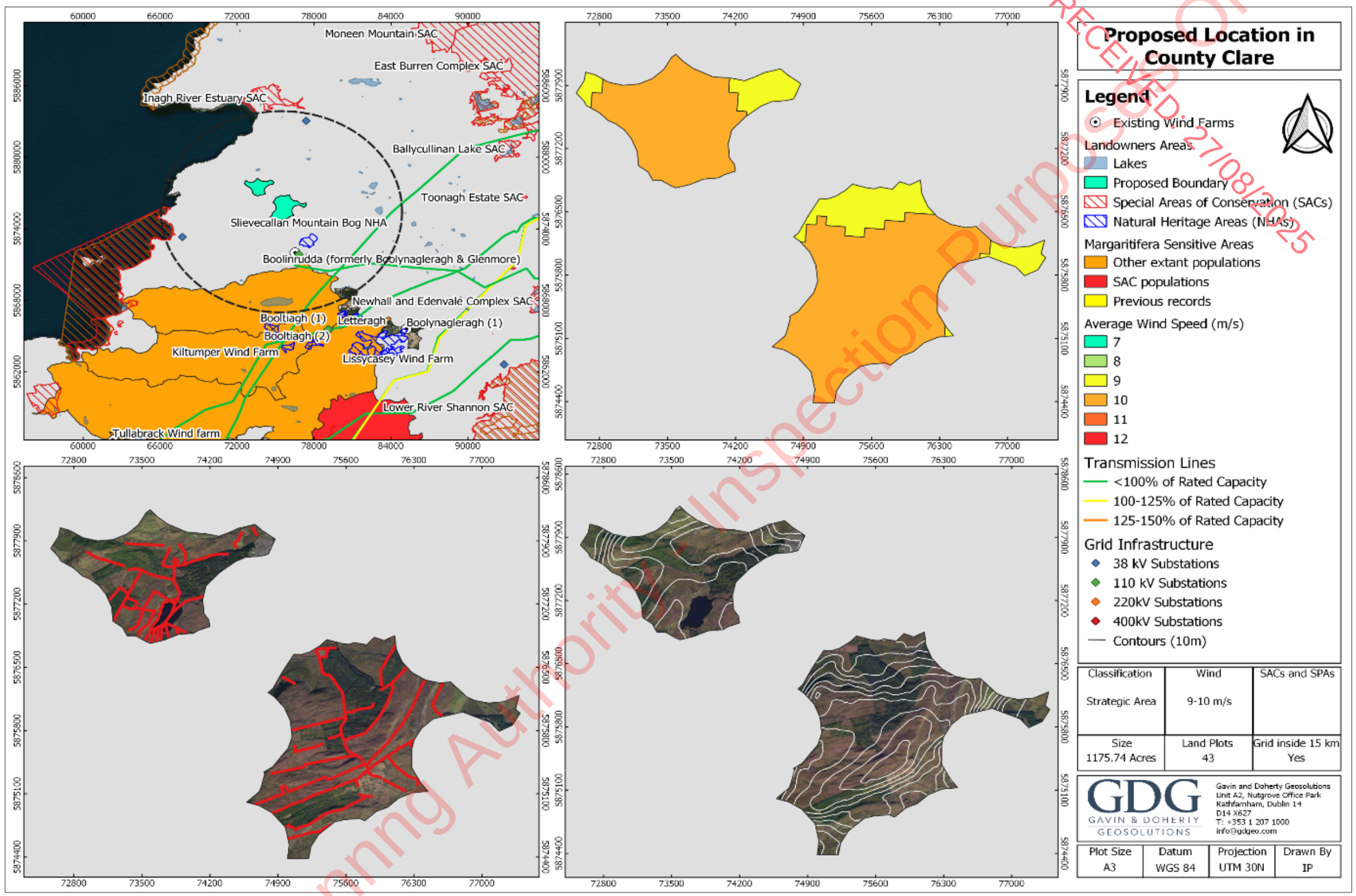

Figure 4-4: Site Four site screening mapping exercise

4.3.6 COMPARATIVE SCORING AND EVALUATION OF CANDIDATE SITES

Table 4-6 compares the results of the ranking methodology across Sites One to Four. These results were discussed with the Developer and Site Four, located at Illaunbaun in County Clare, was selected as the preferred site for the Proposed Development.

Despite presenting moderate constraints, Site Four performed well across most evaluation criteria and was considered the most viable location overall. Its strategic policy alignment, sufficient land area, and manageable environmental sensitivities supported the decision to progress Site Four to further environmental assessment.

Table 4-6: Comparative ranking results for the four shortlisted sites

Item	Category	Site One	Site Two	Site Three	Site Four
1	County Development Plan (CDP) Zoning	Orange	Orange	Orange	Green
2	Grid infrastructure	Green	Green	Yellow	Yellow
3	Grid capacity	Green	Green	Green	Green
4	Designated sites	Orange	Orange	Orange	Orange
5	Fresh water pearl mussel (*Margaritifera margaritifera*)	Yellow	Green	Green	Green
6	Land area	Orange	Yellow	Green	Green
7	Wind resource	Green	Yellow	Orange	Yellow
8	Land division	Yellow	Orange	Orange	Orange

Notes: Rankings are qualitative and based on a colour system; Rankings are not proportionate or directly comparable across categories:

Green = favourable
Yellow = moderate constraint
Orange = higher constraint

4.4 CONSTRAINTS MAPPING

Once Site Four, located at Illaunbaum in County Clare, was identified as the preferred location for the Proposed Development, a dedicated constraints mapping exercise was undertaken to inform the subsequent design strategy. This step was essential to ensure that the layout and infrastructure components could be optimally positioned within areas of lowest environmental and technical risk.

The constraints mapping process was GIS-based, integrating data from multiple national datasets, field observations, and previous site-specific technical assessments. It was structured around the principle of avoidance-first, in line with good practice guidance and national EIA standards. The mapping outputs were not used in isolation but were reviewed alongside ecological field data and engineering feasibility considerations to ensure practical and compliant outcomes.

Key environmental and infrastructural constraints incorporated into the mapping included:

- Ecological exclusion zones, based on designated site boundaries (SACs, SPAs, NHAs, and pNHAs), hydrological connectivity, and known distributions of habitats and species of conservation interest.
- Surface water protection buffers, including a minimum 50 m setback from watercourses, lakes, and drainage features, to mitigate potential effects on aquatic habitats and water quality receptors.
- Telecommunications link corridors, based on correspondence with infrastructure providers, incorporating appropriate clearance zones for Eir and Vodafone microwave paths.
- Residential buffer zones, applying a minimum offset of 600 m (equivalent to four times the maximum turbine tip height), to avoid impacts on residential amenity (DECLG, 2006).
- Peat stability and landform risk, using available GSI quaternary mapping and internal peat probing data to avoid areas of deep peat or known instability (GSI, 2023).
- Non-participating land parcels, reflecting areas where landowner consent for development had not been obtained at the time of design finalisation.

In addition, potential constraints related to aviation safeguarding zones, archaeology, and cumulative wind energy development were also considered as part of the broader environmental and planning context, drawing on available spatial datasets and guidance outlined in the Scoping Report.

The constraints mapping formed a central tool in refining turbine locations, access road alignments, and ancillary infrastructure siting. The exclusion zones and setback areas were treated as hard constraints during the design phase, while other features such as habitat mosaics, slope gradients, and existing forestry were considered as soft constraints to be balanced with engineering and grid access requirements.

The final mapped constraints are illustrated in Figure 4-5, and underpin the design presented in the subsequent sections of this chapter. The outputs of this process are further detailed and cross-referenced in the relevant EIAR chapters, including Chapter 8: Biodiversity and Ornithology, Chapter

9: Land, Soils, Geology and Hydrogeology, Chapter 13: Noise and Vibration, Chapter 14: Shadow Flicker, and Chapter 15: Landscape and Visual Impacts.

Overall, this integrated constraints-led approach supported the delivery of a design that avoids sensitive features wherever possible, complies with statutory requirements, and balances environmental performance with project viability.

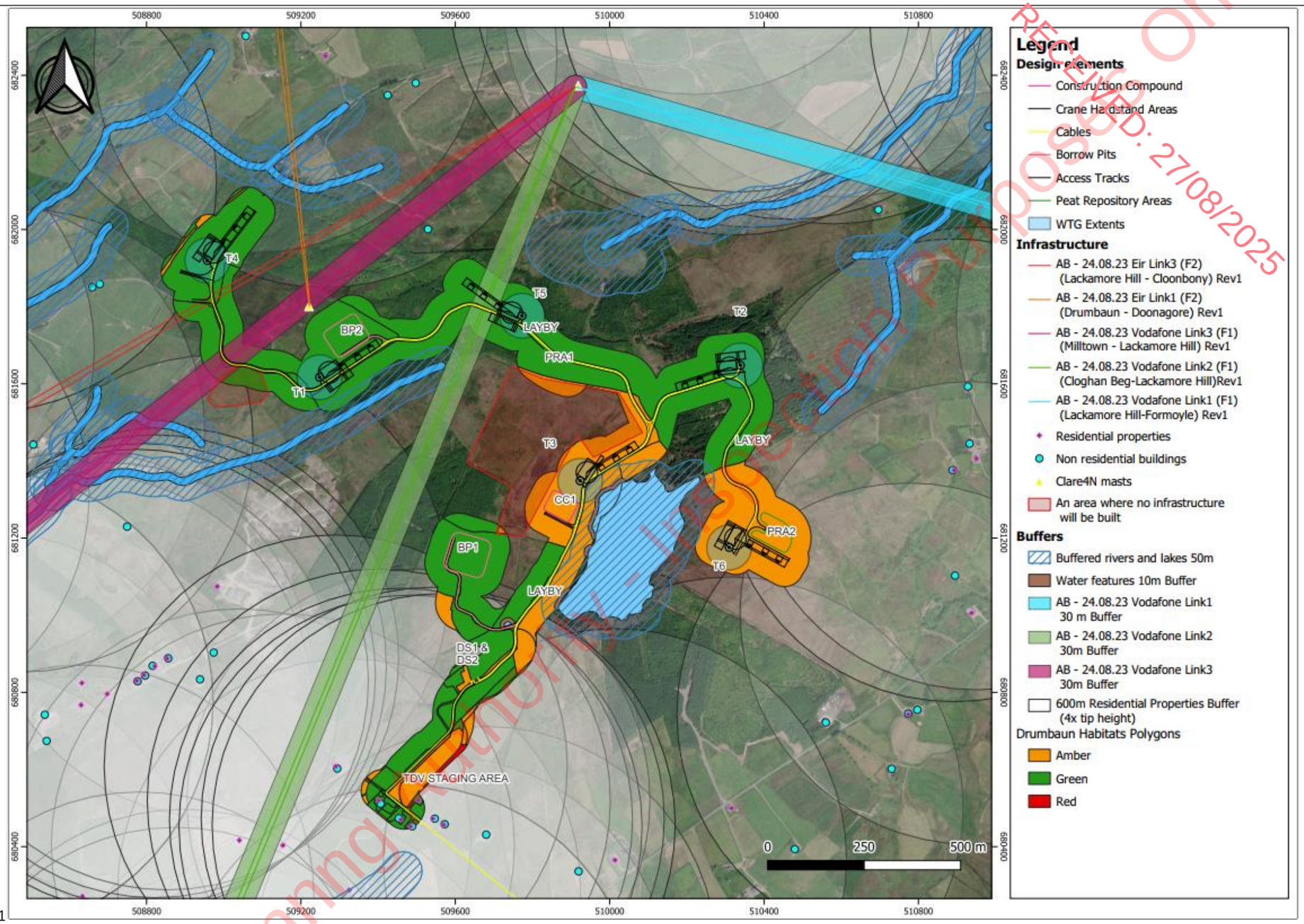

Figure 4-5: Constraint mapping for design elements

4.5 DETAILED SITE ASSESSMENT

Once Site Four, located at Illaunbaun in County Clare, was identified as the preferred site for the Proposed Development, the site was assessed in detail, considering proximity to designated sites (SACs, SPAs, NHAs and pNHAs), hydrology and aquatic ecology, and habitats and species of conservation interest.

4.5.1 EUROPEAN SITES (NATURA 2000 NETWORK)

The site is not located within or directly adjacent to any European site designated under the Birds or Habitats Directives (Figure 4-6). However, it is hydrologically connected to several Natura 2000 sites via the Annagh and Inagh sub-catchments. The following five sites lie within 15 km of the site and were considered in the constraints appraisal:

- Carrowmore Point to Spanish Point and Islands SAC (Site Code: 001021) – 6.2 km
- Inagh River Estuary SAC (Site Code: 000036) – 5.6 km
- Mid-Clare Coast SPA (Site Code: 004182) – 6.7 km
- Cliffs of Moher SPA (Site Code: 004005) – 9.4 km
- Carrowmore Dunes SAC (Site Code: 002250) – 14.9 km

These sites are primarily designated for coastal habitats, such as dunes, salt meadows, coastal lagoons and reefs, and/or Annex I bird species, such as seabirds and wintering waterbirds. While these receptors are generally considered less sensitive to inland hydrological changes than freshwater aquatic habitats, the potential for downstream effects from waterborne pollution, sedimentation, or introduction of invasive species, was recognised during site assessment.

Two additional Natura 2000 sites located beyond the 15 km buffer zone were also considered due to their qualifying interests and ecological connectivity:

- River Shannon and River Fergus Estuaries SPA (Site Code: 002651) – 22 km
- Slieve Aughties SPA (Site Code: 004168) – 29 km

The River Shannon and River Fergus Estuaries SPA, located approximately 22 km east of the site, is an internationally important site that supports an assemblage of over 20,000 wintering waterbirds and forms the largest estuarine complex in Ireland. While the site is located well outside this SPA, the site may be used for foraging or stopover in spring and/or autumn by a variety of migratory species. While no direct disturbance or habitat loss is expected, a small number of individuals from species such as Whooper Swan and Golden Plover may overfly or temporarily use lands within the site.

The Slieve Aughty SPA, located over 29 km northeast of the site, is designated for breeding Hen Harrier (*Circus cyaneus*). The site lies outside the core foraging range for breeding individuals, and there is no direct hydrological or habitat connectivity. However, the wider west Clare uplands, including the vicinity of the site, are known to support wintering and dispersing Hen Harriers. These ornithological sensitivities were weighed in the overall site selection process and contributed to early design considerations to minimise ecological risk.

Overall, the absence of direct overlap with European sites, combined with a manageable level of ecological connectivity, supported the progression of the site to further stages of design and assessment. A full appraisal of potential impacts to European sites, was undertaken as part of the Appropriate Assessment process, which is separate and distinct from the Environmental Impact Assessment process; and an assessment of impacts to habitats and species outside of SPAs and SACs is provided in Chapter 8: Biodiversity and Ornithology and its associated Technical Appendices.

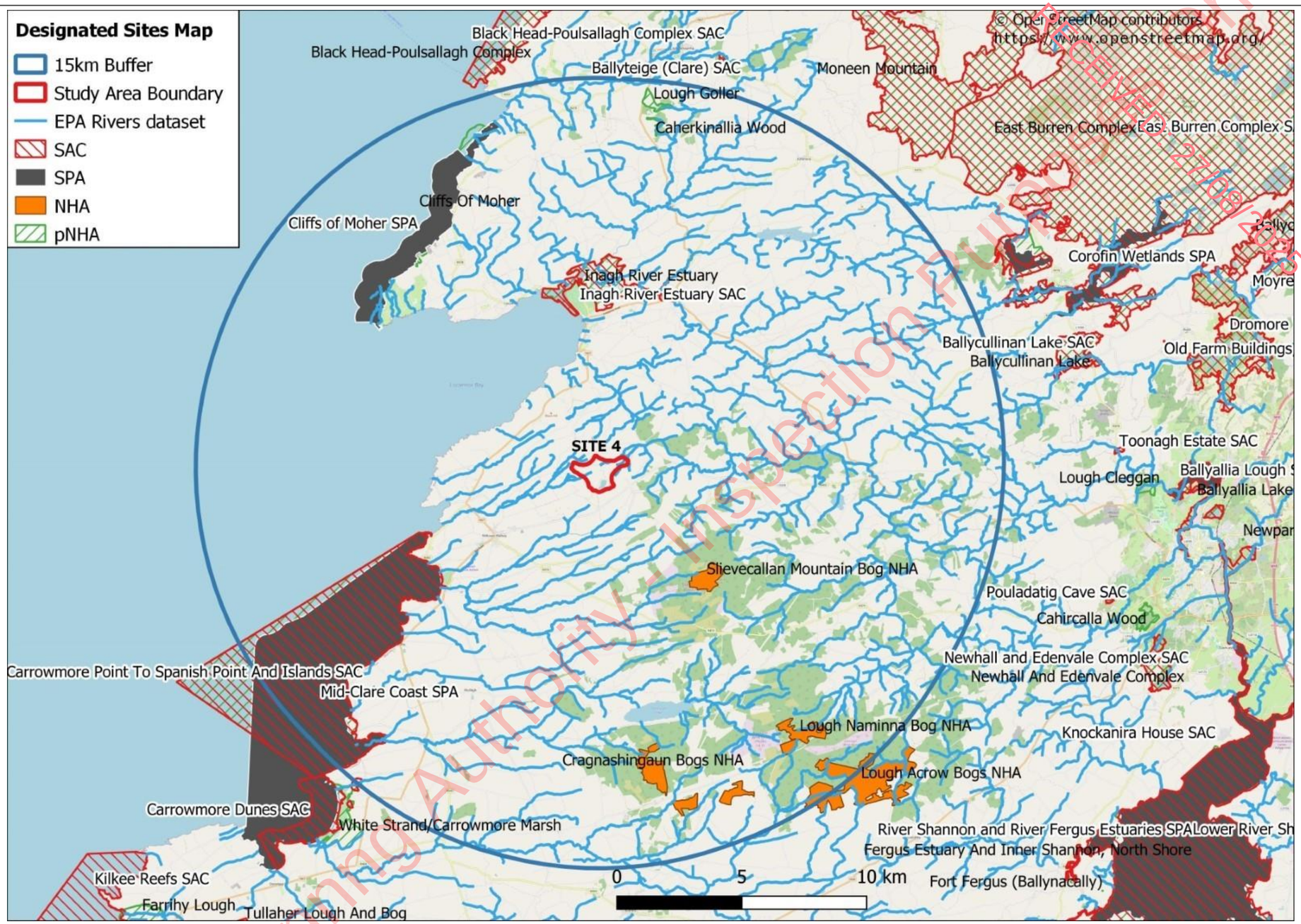

Figure 4-6: Proximity to designated sites.

4.5.2 NATIONALLY DESIGNATED SITES (NHA'S AND PNHA'S)

The site is not located within or immediately adjacent to any NHA or proposed NHA (pNHA) as seen in Figure 4-6. However, a review of available spatial datasets identified ten nationally designated sites within a 15 km radius of the site, and these were considered during the site selection constraints appraisal.

The closest NHA is Slievecallan Bog NHA (Site Code: 002397), located approximately 4.7 km to the southeast, which is designated for its sensitive blanket bog habitat and the species which it supports, including breeding Hen Harrier, an Annex I bird species under the Birds Directive. Other sites within the 15 km buffer include coastal cliff habitats, native woodlands, bogs, lakes, and marshes, many of which provide habitat for sensitive wetland and waterbird species.

A summary of NHAs and pNHAs within the 15 km buffer is provided in Table 4-7.

Table 4-7: List of nationally designated sites within 15 km of the site.

Designated Site	Site Code	Distance (km)	Qualifying Features
Slievecallan Bog NHA	002397	4.7	Blanket bog; Annex I species including Hen Harrier
Cliffs of Moher pNHA	000026	9.9	Coastal cliffs and seabird colonies
Cragnashingaun Bogs NHA	002400	10.2	Blanket bog and peatland habitats
Lough Namina Bog NHA	002367	11.7	Peatland habitats
Carrowmore Point to Spanish Point and the Islands pNHA	001021	11.9	Coastal habitats; waders and Waterbirds
Cahircalla Woods pNHA	001001	12.9	Native woodland on limestone
Lough Acrow Bogs NHA	002421	13.8	Blanquet bog and peatland habitats
Lough Goller pNHA	000048	13.9	Wintering wildfowl & lake habitat
Whitestrand/Carrowmore Marsh pNHA	001007	14.9	Sand Dunes
Fergus Estuary and Inner Shannon, North Shore pNHA*	002048	22	Intertidal habitats; wintering water birds

*Note: Fergus Estuary pNHA lies outside the 15 km buffer but is included due to its ecological relevance

While no overlap with nationally designated sites occurs, their proximity and ecological linkages, particularly via hydrology or species mobility, were factored into the overall site constraints analysis. In particular, sensitivity of peatland habitats and the regional importance of the Hen Harrier were key considerations in selecting a site with manageable levels of potential ecological interaction.

Further assessment of these receptors is provided in Chapter 8: Biodiversity and Ornithology and associated Technical Appendices.

4.5.3 HYDROLOGY AND AQUATIC ECOLOGY

The site is situated within the Mal Bay Water Framework Directive (WFD) catchment (28), which is 848 km^2 in area (EPA, 2018). The site is located across two distinct WFD sub catchments the Annagh in the west, and the Inagh to the east.

The site is drained by five small headwater streams, several of which have hydrological links to a number of Natura 2000 sites further downstream. Two lakes are associated with the boundary of the site: Lough Keagh (6.9 ha) and Lough Abullaunduff (2.6 ha), which appears on historical mapping but is no longer evident in current satellite imagery. It is likely that this waterbody was artificially drained in the past, and it no longer functions as a lake in the present landscape.

Details of the site's watercourses, their WFD status and their downstream linkages are provided in Table 4-8 and illustrated in Figure 4-7.

Table 4-8: Site hydrology and connectivity with Natura 2000 sites.

Watercourse	Sub catchment	Flow Direction	WFD Status	Natura 2000 Linkage
Ballinphonta Stream	Annagh	Westward to the sea north of Spanish Point	Moderate	Carrowmore Point to Spanish Point and Islands SAC; Mid-Clare Coast SPA
Drumbaun Stream (Ballinphonta)	Annagh	Tributary of the Ballinphonta Stream	Moderate	Carrowmore Point to Spanish Point and Islands SAC; Mid-Clare Coast SPA
Kilcorcoran Stream (Glendine)	Annagh	Tributary of the Glendine River	Poor	Carrowmore Point and Spanish Point and Islands SAC Mid Clare Coast SPA
Derrymore Stream	Inagh	Tributary of the River Inagh	Moderate	Inagh River Estuary SAC
Illaunbaun Stream (Derrymore)	Inagh	Tributary of the Derrymore Stream	Moderate	Inagh River Estuary SAC

Lough Keagh is classified by the EPA as having moderate water quality and is identified as "At Risk" of failing to meet its Water Framework Directive (WFD) objectives by 2027, with forestry having been identified as a potentially significant pressure (EPA, 2023).

Although none of the connected Natura 2000 sites are designated for freshwater aquatic habitats or species, the watercourses draining the site are hydrologically connected to several coastal Natura 2000 sites downstream. As such, there is potential for downstream ecological receptors to be indirectly affected by changes in surface water quality, particularly due to run-off, sediment mobilisation, or pollution events during construction — especially in areas underlain by peat.

A hydrological and hydrogeological assessment of the Proposed Development has been undertaken and is presented in Chapter 10: Hydrology, Water Quality and Flood Risk of this EIAR. That chapter also sets out any relevant drainage design measures and mitigation required to ensure that water quality and hydrological connectivity are protected in accordance with WFD.

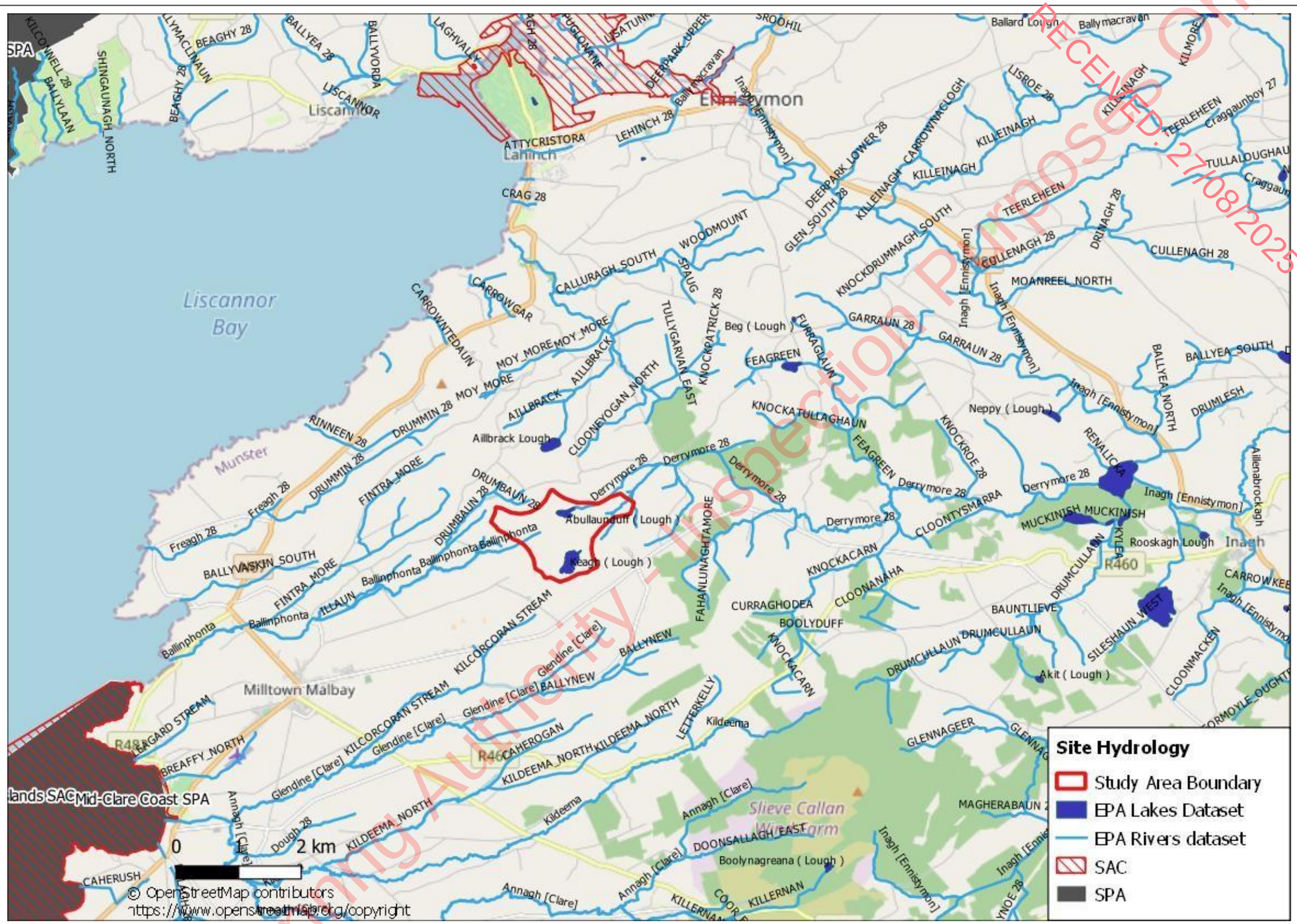

Figure 4-7: Drainage and Hydrology at the site.

4.5.4 INVASIVE NON-NATIVE SPECIES (INNS) AND BIOSECURITY

The potential presence and spread of non-native invasive plant species was considered as part of the site selection and environmental constraints appraisal for the site. Records from the NBDC and the Botanical Society of Britain and Ireland (BSBI) confirm the presence of several invasive plant species within the 10 km grid squares overlapping the site (R18 and R08).

Notably, species such as Japanese Knotweed (*Fallopia japonica*), Rhododendron (*Rhododendron ponticum*), and Himalayan Balsam (*Impatiens glandulifera*) are recorded in the region. Many of these species are legally controlled under the Third Schedule, Part 1 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) and classified as high-risk under national biosecurity guidance. Although their presence has not been confirmed within the site boundary, the potential for introduction or spread was identified as a relevant constraint.

Hydrological connectivity to downstream Natura 2000 sites presents a viable mechanism for the spread of invasive species, particularly via surface water run-off. Similarly, construction-related soil disturbance and vehicle movement could facilitate the introduction or proliferation of these species if appropriate biosecurity protocols are not in place.

As such, biosecurity risk formed part of the broader environmental constraints appraisal, supporting the selection of a site with limited known infestation risk and manageable exposure. The presence of invasive species in the surrounding landscape was therefore a contributing factor in the overall conclusion that the site presented a lower relative risk in terms of invasive species dispersal compared to other candidate areas.

Further detail on species-specific risks and the results of baseline surveys are provided in Chapter 8: Biodiversity and Ornithology of this EIAR and associated Technical Appendices.

4.5.5 HABITATS OF CONSERVATION INTEREST

The terrestrial environment within the site is ecologically diverse, comprising a mosaic of semi-natural, modified, and artificial habitats, shaped by its elevation, land use history, and underlying peat soils. Based on a review of aerial imagery, CORINE Land Cover data and soil classification mapping, the dominant habitat types within the site include (Figure 4-8):

- Commercial coniferous forest plantation
- Blanket bog and cutover bog
- Wet heath
- Rush/wet grassland
- Improved agricultural grasslands
- Scrub and hedgerows
- Two freshwater lakes (Lough Keagh and Lough Abullaunduff)
- Streams and drainage channels

These habitats reflect a typical upland landscape with active and historical land use, including low-intensity agriculture, commercial forestry, and localized peat extraction. The ecological character of the site was an important consideration during the site selection process, particularly given the extent of peat-based soils and the presence of wetland and bog-associated communities.

Although there were no confirmed records of Annex I habitats at the feasibility stage, the dominance of blanket bog, heath, and associated wetland types indicated potential for Annex I and Priority habitats under the EU Habitats Directive. This was treated as a material constraint in site appraisal and layout refinement, ensuring that infrastructure could be directed away from ecologically sensitive areas.

The surrounding land use context also informed site viability. The wider area is dominated by low-intensity cattle and sheep farming, commercial forestry, and small-scale peat cutting, with a disused quarry located at the southwestern edge of the study area. While these areas introduce some localised disturbance, they also reduced potential overlap with sensitive habitats and designated sites, contributing to the site's viability as the preferred site for the Proposed Development. A telecommunications mast is present in the northwestern corner of the site, though it did not represent a constraint to site selection.

A full characterisation of the habitats presents and their conservation value is provided in Chapter 8: Biodiversity and Ornithology of this EIAR, where the potential presence of Annex I habitat types is addressed through detailed field survey and classification.

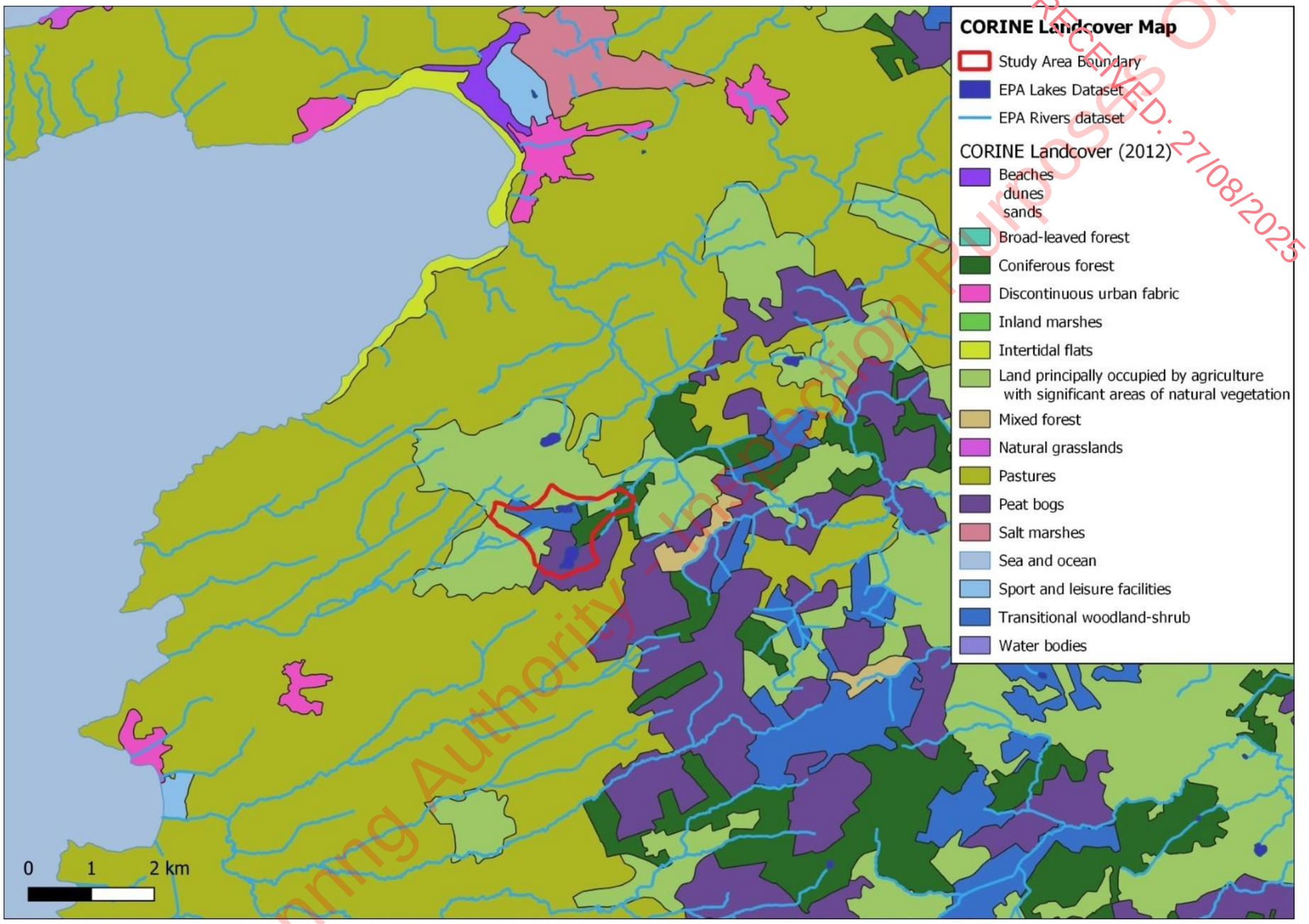

Figure 4-8: CORINE Landcover

4.5.6 SPECIES OF CONSERVATION INTEREST

4.5.6.1 FLORA

A review of the NBDC and Botanical Society of Britain and Ireland (BSBI) databases for the 2 km grid squares which overlap the site (R18A, R18B, R08V, R08W) identified one vascular plant species of conservation concern: Six-stamened Waterwort (*Elatine hexandra*), classified as "near threatened" on the Irish Red List (Wyse-Jackson et al., 2016), historically recorded within the R08V grid square. This aquatic species is associated with the margins of soft-bottomed lakes and could potentially occur in Lough Abullaunduff or Lough Keagh.

No protected bryophyte species listed under the Flora Protection Order were recorded in these grid squares according to NPWS databases.

4.5.6.2 FRESHWATER PEARL MUSSEL (*Margaritifera margaritifera*)

The Freshwater Pearl Mussel (*Margaritifera margaritifera*) is a qualifying interest of several SACs in Ireland and is listed on Annex II of the EU Habitats Directive, protected in Ireland under the European Communities (Birds and Natural Habitats) Regulations 2011, and is considered a key constraint in the site selection of wind energy developments.

The site is not located within, nor hydrologically connected to, any Margaritifera Sensitive Catchment, as defined by the NPWS and EPA. The absence of a direct or indirect linkage to populations of this highly sensitive species removed a significant ecological constraint and was a favourable factor in progressing the site as the preferred location

4.5.6.3 MARSH FRITILLARY (*Euphydryas aurinia*)

The Marsh Fritillary butterfly is a protected Annex II species under the EU Habitats Directive and is considered of high conservation concern in Ireland. Records from the National Biodiversity Data Centre indicate its presence within the 2 km grid square R18A, which overlaps the site. The site also supports habitat types typically associated with the species, including wet grassland and rush-dominated pasture, and contains Devil's-bit Scabious (*Succisa pratensis*), the larval food plant of Marsh Fritillary.

The confirmed presence of this species in the wider area, along with the availability of suitable habitat within the site, was considered a relevant ecological constraint during the site selection process. It contributed to the need for careful appraisal of habitat sensitivities and influenced alternatives in design through the refinement of turbine layout and access infrastructure.

Full ecological baseline data, including habitat mapping and species-specific surveys, have been used to inform the site design presented in this EIAR and will be further detailed in Chapter 8: Biodiversity and Ornithology.

4.5.6.4 HEN HARRIER (*CIRCUS CYANEUS*)

Hen Harrier (*CIrcus cyaneus*) is a key ornithological receptor in the context of wind energy development in Ireland and is listed on Annex I of the EU Birds Directive. While the site lies outside the foraging range of the nearest Hen Harrier SPA (Slieve Aughty Mountains SPA, c. 29 km northeast), the species is known to occur widely in west Clare during both the breeding and non-breeding seasons.

The West Clare uplands, located within 5 - 10 km of the site, support regionally significant Hen Harrier activity, with confirmed nest sites recorded during national surveys (Ruddock et al., 2016), and multiple winter roost sites identified in County Clare (O'Donoghue, 2010). The site contains suitable foraging and nesting habitat types, including peatland, rough grassland, and immature coniferous plantations, which may attract Hen Harriers.

Although no confirmed breeding records exist within the site itself, the potential for use by this Annex I species was a material consideration in the site selection process and was subject to detailed surveys. The impacts are assessed in Chapter 8: Biodiversity and Ornithology of the EIAR.

4.5.6.5 WETLAND AND WATERBIRD SPECIES

The site lies in proximity to several designated coastal and estuarine sites in west Clare that are of international importance for wetland and waterbird species. Although the site itself does not overlap with any SPAs, it is located within the functional range of key species designated under the EU Birds Directive.

Relevant Natura 2000 sites include:

- Mid-Clare Coast SPA (004182), approximately 6.1 km southwest of the site, designated for Whooper Swan, Barnacle Goose, Ringed Plover, Sanderling, Purple Sandpiper, Dunlin, Turnstone, and wetland habitats.
- Cliffs of Moher SPA (004005), located approximately 9.3 km west of the site, supports large colonies of breeding seabirds including Fulmar, Kittiwake, Razorbill, and Puffin.
- Inagh River Estuary SAC (000036), situated approximately 5.6 km north of the site, supports wintering populations of species such as Lapwing and Golden Plover.
- River Shannon and River Fergus Estuaries SPA (004077, at approximately 22 km east of the site, is an internationally important area for migratory waterbirds, including Whooper Swan, Light-bellied Brent Goose, and Black-tailed Godwit.

Although none of these designated sites intersect with the site, many of their qualifying bird species are highly mobile and may forage, roost, or stage within or near the site, particularly during migration or winter. The site's landscape, comprising open bog, wet grassland, and agricultural fields, offers potentially suitable habitat for some of these species.

The presence of these important SPA networks in the wider landscape was a key consideration during site selection, contributing to the decision to avoid more coastal or estuarine locations and to assess inland alternatives such as the site.

Further ornithological evaluation of wetland and waterbird usage is provided in Chapter 8: Biodiversity and Ornithology of this EIAR.

4.5.7 SITE ASSESSMENT OUTCOME

The identification of a suitable site for the Proposed Development followed a systematic and multi-staged process, combining desktop GIS screening, qualitative ranking of candidate areas, and detailed spatial assessment. The initial screening phase applied a broad set of environmental and technical constraints to identify four potential land parcels within the study area, all of which offered

viable baseline conditions in terms of land availability, wind resource, and proximity to grid infrastructure.

Each of these four sites was then assessed using a standardised multi-criteria ranking methodology, developed to reflect both viability and environmental sensitivity. This included considerations such as wind speed, grid access, ecological sensitivity, land division complexity, and planning policy alignment. Following this exercise, the site, located at Illaunbaun, County Clare, emerged as the most favourable option and was selected for detailed appraisal.

The subsequent assessment of the site confirmed its suitability for development. Although some constraints were identified, including proximity to designated Natura 2000 sites, presence of sensitive habitats, and potential use by Annex I bird species such as Hen Harrier, none represented absolute barriers to development. Importantly, the site is not located within or immediately adjacent to any designated site and is not hydrologically connected to any Freshwater Pearl Mussel catchment. The site also presents a manageable invasive species risk profile and benefits from relatively robust physical separation from key ecological receptors.

The assessment further demonstrated that the site provides a large, unbroken land area with suitable topography and wind regime. While environmental sensitivities are present, they were not considered as exclusions for development and were taken into account in the initial design strategy and infrastructure siting. More detailed ecological and technical assessments were carried out as part of the EIA process, as set out in Chapter 8: Biodiversity and Ornithology, Chapter 10: Hydrology, Water Quality and Flood Risk, and other relevant chapters of this EIAR.

For all the above, the site was confirmed as the preferred location for the Proposed Development and has progressed through the next stages of design strategy and evolution, as outlined in the sections below.

4.6 DESIGN STRATEGY

The design strategy for the Proposed Development has been informed by a comprehensive analysis of environmental constraints, engineering feasibility, and wind resource optimisation. Following the site selection process, which identified the Site at Illaunbaun in County Clare as the preferred location, the design team undertook a structured assessment of land use, terrain, geology, ecology, and access to guide the early layout concept.

The main objective of the design strategy was to develop a layout that would maximise energy generation potential while avoiding or minimising environmental impacts and engineering challenges. Design considerations included:

Wind resource and topography

Wind speeds in excess of 9 m/s, along with favourable ridge lines, provided optimal siting conditions for wind turbine generators (WTGs) locations. The micro-siting process focused on positioning turbines to take advantage of prevailing wind directions while respecting setback distances.

Residential areas and properties

During the site screening process, a 500 m residential buffer was applied to all existing properties within the surrounding area to ensure that any WTGs were located at an adequate distance. In order

to minimise any disturbance, a conservative approach was adopted within site design and all WTGs were situated a further 100 m (600 m total) buffer from any properties.

Peat depth and terrain stability:

Peat probing data and walkover observations indicated variable peat depths across the site, with the majority of locations exhibiting less than 1 m of peat. Areas with deeper peat (>2 m), such as near the T5 location, were flagged for caution and further assessment, including peat stability analysis. A preliminary ground investigation was completed in August 2024, and the resulting data, including lab analysis, informed infrastructure placement and design optimisation. Peat Repository Areas (PRAs) were carefully located away from waterbodies to avoid interference with natural drainage patterns and reduce the potential for sediment-laden runoff.

Land cover and existing infrastructure:

The site comprises a mosaic of forestry, bogland, grassland, and scrub. Where feasible, existing roads and tracks, particularly those used by Coillte and local farmers, were incorporated into the layout to reduce the need for new access routes and limit ground disturbance. Site infrastructure and clearance distances were planned to minimise tree felling, particularly within Coillte-managed land. Direct engagement with Coillte ensure understanding of operational constraints and tree removal requirements throughout the design process.

Environmental sensitivities:

Hydrological connectivity to downstream European sites and the presence of sensitive habitats were key design constraints. A minimum 50 m buffer was applied to all mapped watercourses and lake shorelines, including Lough Keagh and the historical location of Lough Abullaunduff, with additional buffers assigned to smaller channels identified during fieldwork. Highly sensitive ecological areas, including Annex I habitat indicators, were avoided in all infrastructure siting. Bat buffers were also applied to inform tree felling calculations, as recommended by NPWS guidance (NPWS, 2019) and following guidance from the project ecology team.

Constructability and access:

Field verification highlighted several logistical constraints, including steep embankments, tight turning radii, and difficult terrain in some forested areas. The design prioritised turbine locations that could be accessed via viable haulage routes and avoided steep slopes or complex crossings. Telecommunications infrastructure was also a constraint, with a mast and beam pathways traversing the site. Consultation with providers ensured sufficient clearance and interference avoidance.

4.7 DESIGN EVOLUTION

The layout and design of the Proposed Development evolved over an extended pre-planning process, shaped by technical investigations, environmental sensitivities, and stakeholder engagement. A number of refinements were made to the turbine layout and associated infrastructure to address site-specific challenges, minimise environmental effects, and respond to feedback from landowners and the local community.

4.7.1 RELOCATION OF TURBINE T5

Following a site walkover and peat probing survey carried out in July 2023, Turbine T5 was identified as requiring relocation due to unfavourable ground conditions. The original location presented a number of geotechnical constraints, namely:

- The turbine and associated hardstand were situated on a steep slope with up to 20 metres of elevation change across the pad area.
- Ground investigations highlighted deep peat and soft ground at the toe of the slope, which would have required extensive excavation and earthworks.
- Potential soil creep features and the need for significant forestry felling raised concerns around slope stability and the overall Factor of Safety.

To address these issues, T5 was relocated approximately 100 m to the southwest and rotated 90° to align with the site contours. This adjustment moved the turbine out of the area of greatest peat risk and reduced the extent of necessary earthworks, thereby improving constructability and reducing environmental impact.

4.7.2 RELOCATION OF TURBINE T4

During community engagement in late 2023, local residents raised concerns about the proximity of Turbine T4 to a nearby school. In response, the project team reviewed the turbine's siting and repositioned T4 further away from the school grounds. The revised location maintained technical viability while increasing the separation distance from sensitive receptors. Supplementary site surveys were undertaken to assess the new location and ensure it remained suitable from an environmental and engineering perspective.

4.7.3 ACCESS TRACK RATIONALISATION

As part of the initial concept layout, a new site access point was proposed from the northeast of the site via Coillte forestry land. This would have required additional wayleaves across two Coillte plots and associated permanent tree felling. During design refinement, the requirement for this access route was eliminated. This change reduced forestry land use and avoided associated clearance and infrastructure impacts.

Similarly, a proposed length of access road connecting Turbine T6 to the public road was removed following the July 2023 walkover. The route was found to traverse areas of steep gradient, which would have made turbine delivery and construction challenging. Alternative routing within the site was prioritised to ensure safer and more efficient access.

4.7.4 PEAT REPOSITORY OPTIMISATION

Three Peat Repository Areas (PRAs) were identified following an integrated assessment of topography, peat depth, hydrology, and ecological constraints. Each PRA is located in an area with gentle slope (less than 5°), and peat depths allowing a Factor of Safety greater than 1.3 for the anticipated peat placement. A 50 m buffer from all watercourses was maintained in accordance with best practice, and the final PRA locations were selected to avoid sensitive habitats or areas with

complex drainage. These areas are designated for the permanent placement of up to 1m of peat material.

4.7.5 BUFFER APPLICATION AND ENVIRONMENTAL SAFEGUARDS

As part of the detailed design process, buffer zones were applied around all key environmental features, including:

- A minimum 600 m separation distance from residential properties for all turbines, exceeding the minimum 500 m screening threshold applied at the outset.
- A 50-metre buffer to all watercourses, with additional buffer applied to seasonal and unmapped channels identified during site walkovers.
- Forestry buffers and micro-siting adjustments to reduce the extent of tree felling within Coillte lands, developed in consultation with Coillte.
- Ecologically sensitive areas, including potential Annex I habitats and Marsh Fritillary grasslands, were avoided through turbine placement and track routing.
- Buffers to accommodate bat foraging areas were applied based on survey recommendations.
- Setbacks from telecommunications infrastructure were applied in consultation with providers to avoid beam path interference.

The culmination of these refinements reflects a design evolution grounded in environmental sensitivity, technical feasibility, and responsiveness to stakeholder input. Each adjustment has contributed to a more robust and deliverable wind energy development that respects both the constraints of the receiving environment and the expectations of the local community. The final site location and layout is presented in Figure 4-9.

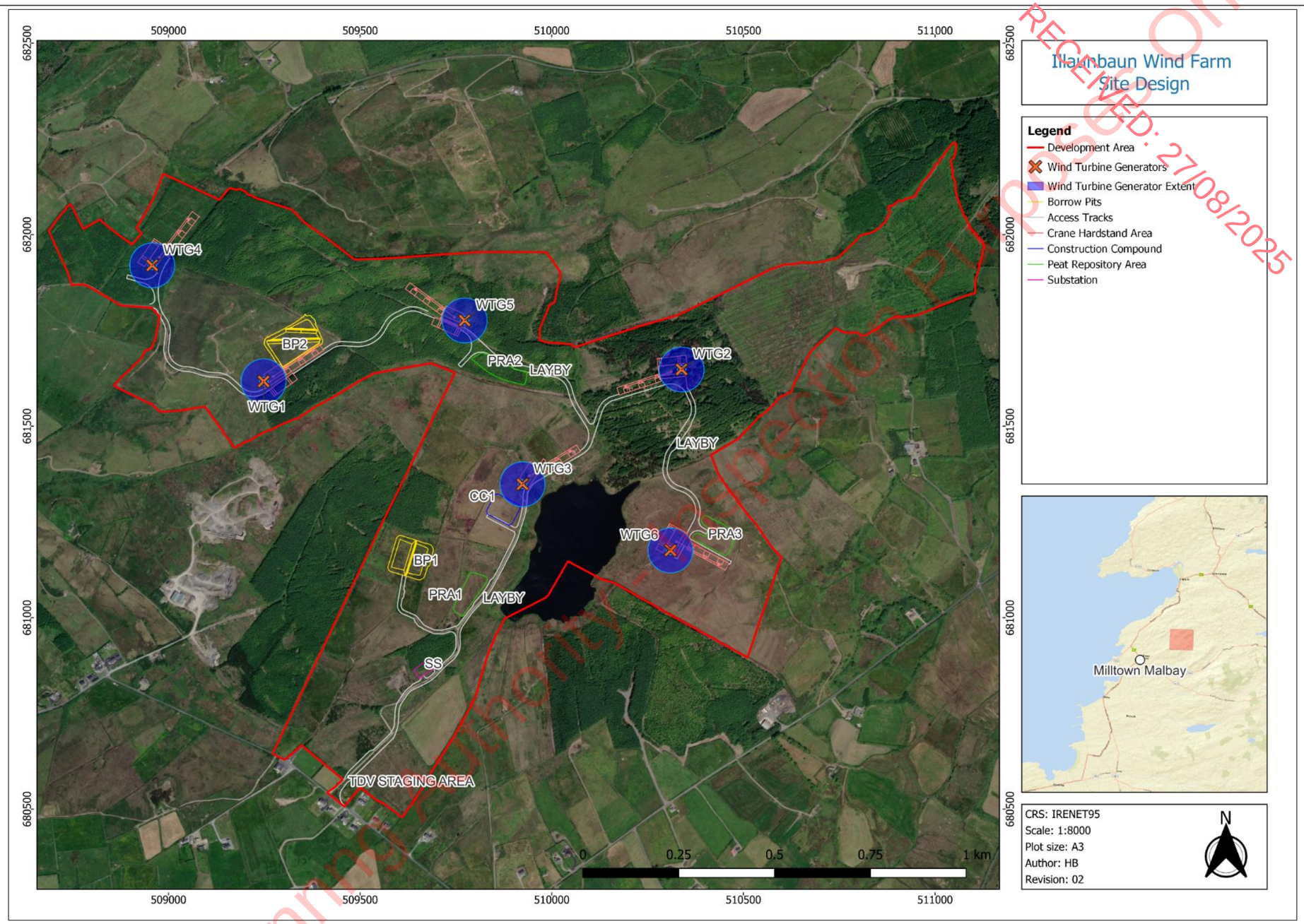

Figure 4-9: Site Layout

4.8 TECHNOLOGY ALTERNATIVES

In accordance with the EIA Directive, consideration was given to alternative technologies that could be used to deliver the project objectives. The focus of this assessment was on wind turbine technology and associated electrical infrastructure.

During the early design phase, a range of wind turbine generator (WTG) models were reviewed to ensure compatibility with the wind regime at the site. The key factors considered in selecting a suitable turbine technology included:

- Rated power output: Larger rotor diameters and hub heights increase energy capture from the wind resource, but must be balanced against planning, visual, noise, and any other mapping constraints.
- Turbine noise profile: Models with lower sound power levels and advanced noise control features were prioritised to ensure compliance with national guidelines and to minimise potential effects on residential amenity.
- Operational efficiency: Turbines with high capacity factors and proven performance in similar wind conditions were favoured.
- Grid compatibility: Consideration was given to grid code compliance and reactive power capabilities to ensure a secure grid connection.
- Availability and supply chain: Only mainstream, bankable technologies with proven reliability and manufacturer support in Ireland were shortlisted.

While the final turbine model has not yet been selected, all options under consideration will conform to a maximum blade tip heigh of 150 m and a hub height of up to 91.5 m, with variations in rotor diameter and other turbine specifications accommodated within these specifications. The ultimate turbine make and model will be confirmed following a competitive procurement process and, as required, specification will remain within the permitted parameters assessed in this EIAR. Compliance with any relevant planning conditions, including re-confirmation of noise and shadow flicker performance, will be demonstrated at the post-consent stage through the appropriate compliance submissions.

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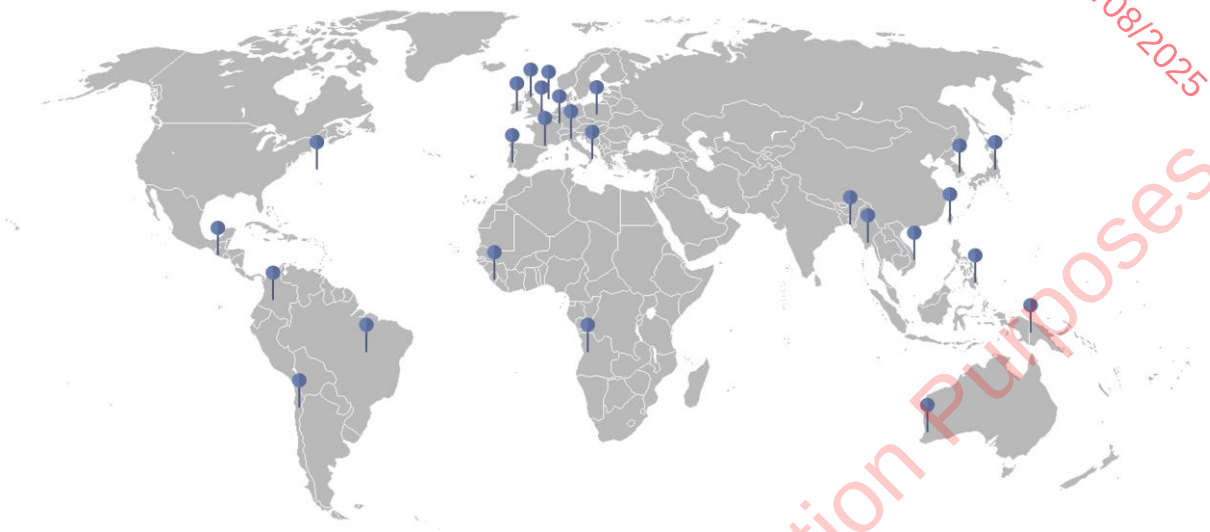
GLOBAL PROJECT REACH



Offices

Dublin (Head Office)
Gavin & Doherty Geosolutions
Unit A2, Nutgrove Office Park
Rathfarnham
Dublin 14, D14 X627
Phone: +353 1 207 1000

Cork
Gavin & Doherty Geosolutions
First Floor, 12 South Mall
Cork
T12 RD43

London
Gavin & Doherty Geosolutions (UK) Limited
85 Great Portland Street, First Floor
London
W1W 7LT

Utrecht
Gavin & Doherty Geosolutions
WTC Utrecht, Stadsplateau 7
3521 AZ Utrecht
The Netherlands

Belfast
Gavin & Doherty Geosolutions (UK) Limited
Scottish Provident Building
7 Donegall Square West
Belfast
BT1 6JH

Edinburgh
Gavin & Doherty Geosolutions (UK) Limited
22 Northumberland Street SW Lane
Edinburgh
EH3 6JD

Rhode Island
Gavin & Doherty Geosolutions Inc.
225 Dyer St, 2nd Floor
Providence, RI 02903
USA

GDG
GAVIN & DOHERTY
GEOSOLUTIONS

Website: www.gdgeo.com
Email: info@gdgeo.com

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