



Hornsea Project Four

Predator eradication island suitability assessment: Bailiwick of Guernsey

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Glossary

Term	Definition
Compensation/compensatory measures	If an Adverse Effect on the Integrity on a designated site is determined during the Secretary of State's Appropriate Assessment, compensatory measures for the impacted site (and relevant features) will be required. The term compensatory measures is not defined in the Habitats Regulations. Compensatory measures are however, considered to comprise those measures which are independent of the project, including any associated mitigation measures, and are intended to offset the negative effects of the plan or project so that the overall ecological coherence of the national site network is maintained.
DCO (Development Consent Order)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Impact Assessment (EIA) Report.
Habitat Regulations	The Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017.
Habitats Regulations Assessment (HRA)	A process which helps determine likely significant effects and (where appropriate) assesses adverse impacts on the integrity of European/national site network sites. The process consists of up to four stages: screening, appropriate assessment, assessment of alternative solutions and assessment of imperative reasons of over-riding public interest (IROPI) and compensatory measures.
Hornsea Four/ Hornsea Project Four Offshore Wind Farm	The term covers all elements of the project (i.e. both the offshore and onshore). Hornsea Four infrastructure will include offshore generating stations (wind turbines), electrical export cables to landfall, and connection to the electricity transmission network.

Acronyms

Term	Definition
AEoI	Adverse Effect on Integrity
DCO	Development Consent Order
EIA	Environmental Impact Assessment
ES	Environmental Statement
FFC	Flamborough and Filey Coast
HRA	Habitats Regulations Assessment
IROPI	Imperative reasons of overriding public interest
NSIP	Nationally Significant Infrastructure Projects
PINS	Planning Inspectorate
RIAA	Report to Inform Appropriate Assessment
SPA	Special Protection Area

Units

Unit	Definition
km	Kilometre
km ²	Square-kilometre
m	Metre
m ²	Square-metre

1 Background

- 1.1.1.1 Orsted Hornsea Project Four Limited (hereafter the 'Applicant') is proposing to develop Hornsea Project Four Offshore Wind Farm (hereafter 'Hornsea Four'). Hornsea Four will be located approximately 69 km offshore of East Riding of Yorkshire in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone.
- 1.1.1.2 The Applicant has submitted an application for a Development Consent Order (DCO) to the Planning Inspectorate (PINS), supported by a range of plans and documents including an Environmental Statement (ES) which sets out the results of the Environmental Impact Assessment (EIA). The Applicant has also submitted a Report to Inform Appropriate Assessment (RIAA) (**B2.2: Report to Inform Appropriate Assessment**) which sets out the information necessary for the competent authority to undertake a Habitats Regulations Assessment (HRA) to determine if there is any Adverse Effect on Integrity (AEol) of the national site network.
- 1.1.1.3 The Habitats Regulations¹ acknowledges that there may be imperative reasons of overriding public interest for some plans and projects to proceed, i.e., the public gain from the plan or project can outweigh the possible harm to a European site, provided that harm is adequately compensated. The Regulations provides a derogation under Article 6(4) that allows projects that may have an AEol to be consented ("the HRA Derogation Provisions").
- 1.1.1.4 Hornsea Four have submitted a "without prejudice derogation case" which forms part of the Application. Its purpose is to provide, without prejudice, information to demonstrate that the derogation tests could be met for Hornsea Four if it is necessary to apply them to authorise the project.
- 1.1.1.5 The Gannet, Guillemot and Razorbill Compensation Plan (B2.8.3 Gannet, Guillemot and Razorbill Compensation Plan) sets out 'without prejudice' compensation measures for Hornsea Four for common guillemot *Uria aalge* (hereafter referred to as guillemot), razorbill *Alca torda* and northern gannet *Morus bassanus* associated with the Flamborough and Filey Coast (FFC) Special Protection Area (SPA). One of the proposed compensation measures is the removal of invasive predators at chosen sites to achieve an improvement in guillemot and/or razorbill population numbers through the removal or reduction of predation pressures.
- 1.1.1.6 The Compensation measure for FFC SPA: Overview document (Volume B2, Chapter 6: Compensation measures for FFC SPA: Overview) presents the Applicant's estimated impact for guillemot and razorbill. For guillemot, 35.05 adult birds (per annum) are predicted to suffer mortality as a result of displacement for the Hornsea Four. For razorbill, the impact is estimated to be 1.5 adult birds (per annum). The compensation population (in pairs of birds) required to compensate for the effect 162 pairs and 11 pairs for guillemot and razorbill respectively².
- 1.1.1.7 The ecological evidence and plans for predator eradication are discussed in detail in B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence of the Applicant's DCO submission. An internal short-listing of candidate sites for predator eradication was undertaken in quarter three 2021 where 63 UK candidate sites were identified. Sites unsuitable for predator eradication were not considered further. Reasons for removing islands from the list included lack of stakeholder support, predators not being present, eradication programmes already having been planned or undertaken, large

¹ <https://www.legislation.gov.uk/uksi/2017/1012/contents/made>

² Compensation population determined by Orsted in-preparation report entitled: Calculation Methods of Hornsea Four's Proposed Compensation Measures for Features of the FFC SPA.

human populations, and predators not being considered a limiting factor to guillemot and razorbill populations. The following locations made the short list and were consulted on as part of the pre-application compensation measures consultation:

- Channel Islands – Bailiwick of Guernsey:
 - Alderney: A number of islands/ islets around the main island;
 - Herm: Including Herm, The Humps and Jethou (plus other smaller islets); and
 - Sark: A number of islands/ islets around the main island.
- Isles of Scilly: A number of islands/ islets.
- Rathlin Island.
- Several islands/ islets along the south coast of England.

1.1.1.8 Following preliminary site visits, further refinement and short-listing has taken place.. Rathlin Island has secured partial LIFE funding for an eradication project and is therefore not being considered further at this time. There was a lack of available evidence in support of an eradication on the Isles of Scilly for the benefit of guillemot and razorbill. Therefore, this location was also removed from further consideration at this time. The Bailiwick of Guernsey (Alderney, The Humps, Sark and associated islands and islets of each) is the preferred location for predator eradication and therefore the focus of this document.

1.1.1.9 Next steps for the implementation of predator eradication and/ or control, as a 'without prejudice' compensation measure for Hornsea Four, are outlined in [B2.8.4 Compensation Measures for FFC SPA: Predator Eradication: Roadmap](#). In summary, site selection (which this work forms part of), predator surveys and habitat surveys are scheduled during 2021 and will continue into 2022, with anticipated granting of the Hornsea Four DCO in 2023, and implementation of compensation from 2023/2024 onwards.

1.1.1.10 Following the production of the roadmap and [B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence](#), initial site visits and stakeholder engagement have been carried out and plans for feasibility studies have been developed (for the Bailiwick of Guernsey (Alderney, The Humps, Sark and associated islands and islets of each)).

1.1.1.11 This document provides a summary of relevant work on the predator eradication compensation measure, completed since the production of [B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence](#) of the Applicant's DCO submission. Specifically, this document:

- Provides background on guillemot nesting requirements (noting that due to the difficulty in determining nesting services from photographs and the low number of razorbill required (11 pairs) it has been assumed with confidence that the compensation population of both species can easily be achieved at Alderney. Further detail is provided in the following sections).
- Discusses follow-on work, including a summary of preliminary site visits, carried out by the Applicant to select suitable candidate islands for predator eradication to benefit guillemot.
- Provides a preliminary well-informed estimate of nesting space available to guillemot following a predator eradication project in the Bailiwick of Guernsey.
- Outlines the feasibility studies which will form the next step in the process of delivering predator eradication to benefit guillemot and razorbill.

1.1.1.12 This report focuses on the suitability of selected islands/islets for predator eradication to benefit guillemot. Whilst razorbill is not included explicitly here, they are also a target

species for 'without prejudice' compensation through predator eradication. Guillemot and razorbill nest in broadly similar habitat types and share colony space (Harris and Wanless, 1987), although razorbill show a preference for nesting in cavities and crevices as well as nesting on ledges (Plumb, 1965; Hipfner and Dussureault, 2001). This makes the visual estimation of full potential nest-site availability from whole-island photographs, as conducted in this report, unfeasible for razorbill (as the current images do not allow crevices to be identified). However, as low numbers are required for razorbill compensation (11 pairs), and a multitude of cavities and crevices will be available in addition to the guillemot/razorbill ledges identified in this report, it is reasonable to assume that any sites identified as potential candidate breeding sites for guillemot will also provide more than sufficient additional cavity/crevice breeding space for the required razorbill compensation.

2 Guillemot nest habitat requirements

- 2.1.1.1 The guillemot (*Uria aalge*) is a colonial, sea-cliff nesting species found in the North Atlantic and Pacific (Harris and Birkhead, 1985). The species is widespread along the British and Irish coasts (Balmer *et al.*, 2013).
- 2.1.1.2 Guillemot breed at varying, often high, densities on ledges, in cliff niches, among boulders or on rock platforms (Harris *et al.*, 1996). Densities as high as 46 pairs/m² have been reported (Harris and Wanless, 1987). In the book "The Atlantic Alcidae", Harris and Birkhead (1985) state that guillemot breed at densities of around 20 pairs/m².
- 2.1.1.3 Guillemots nest from the top of cliffs down to two meters above wave height at high tide and appear to show a preference for sites further away from cliff tops, sites that slope inwards and sites that have walls (Harris *et al.*, 1997).
- 2.1.1.4 They can nest on ledges that are substantially sloped, with slopes recorded to vary "from +50° (sloping down, outwards) to -30° (sloping inwards)", but generally place their eggs on spots that are almost completely level (+5° to -5°) (Harris *et al.*, 1997). Birds show a preference for breeding next to conspecifics, and new breeders generally join existing sub-colonies (Birkhead, 1977; Harris *et al.*, 1997).
- 2.1.1.5 On seabird islands, Heaney and St Pierre (2017) noted that guillemot were also found to nest under boulders and on ledges in cavities, potentially related to high predation pressure and/or the absence of preferred ledges.

3 Candidate locations for predator eradication

- 3.1.1.1 The following locations within the Bailiwick of Guernsey were identified as being potentially suitable for a predator eradication project:
 - Alderney: A number of islands/ islets around the main island;
 - Herm: Including Herm, The Humps and Grande Fauconniere (near Jethou); and
 - Sark: A number of islands/ islets around the main island.
- 3.1.1.2 Below, habitat suitability, potential predator presence and local guillemot populations are discussed for the Bailiwick of Guernsey. Where preliminary site visits were carried out during August 2021, summary findings from those visits are also included. Estimates of potential nesting space availability after rat eradication for those islands for which sufficient photographic evidence was available has also been presented.

3.2 Bailiwick of Guernsey

- 3.2.1.1 The Bailiwick of Guernsey is part of the Channel Islands, located in the English Channel, off the coast of Normandy. The Channel Islands are comprised of seven inhabited islands in

the Bailiwick of Jersey (Jersey) and the Bailiwick of Guernsey (Guernsey, Herm, Jethou, Sark, Alderney, and Brecqhou), as well as a range of smaller uninhabited islands/ islets. The two Bailiwicks are separate institutions, this document focuses on the Bailiwick of Guernsey only.

- 3.2.1.2 Many of the islands in the Bailiwick of Guernsey have some suitable nesting habitats for seabirds, although evidence collected to date suggests it is lacking in availability for guillemot and razorbill. Unpublished data from the Alderney Wildlife Trust and Bailiwick of Guernsey (*pers. comm.*, 2021) show that guillemot nest on Longue Pierre (Herm – The Humps), Les Autelets (Sark) and Little Sark (Sark), as well as on Coque Lihou, Fourquie, La Nache and Les Etacs (all islets around Alderney). As guillemot and razorbill already breed on islands within the Bailiwick of Guernsey this suggest that there is a nearby potential source population from which birds could be recruited from nearby islands following rat eradication.

3.2.2 Preliminary site visits

- 3.2.2.1 Preliminary site visits to the Bailiwick of Guernsey were carried out in August 2021 to identify the feasibility of a rat eradication exercise for the potential benefits to guillemot and razorbill breeding populations ([Figure 1](#) and [Figure 2](#)). The aim of the site visits was to see and assess the following locations, as they contain potentially suitable guillemot and razorbill breeding habitats, and have vegetation to support rats over winter:

- Herm: southwest of the island.
- Jethou: Grande Fauconniere.
- The Humps
- Sark: Les Autelets, Grand Moie, Little Sark (South Sark) and L'Etac de Sark.

- 3.2.2.2 However, weather restrictions and logistical issues meant that The Humps, Les Autelets, SW Herm and Little Sark were not visited on foot or photographed by boat.

- 3.2.2.3 Alderney was not included in the preliminary site visits, but images of the following selected candidate sites were obtained from the Alderney Wildlife Trust:

- La Nache
- Fourquie
- L'Etac de la Quoire.

- 3.2.2.4 For those islands, Alderney Wildlife Trust provided their expert opinion on areas deemed suitable for guillemot and razorbill nesting by highlighting potential breeding areas on the provided images (see [Appendix A](#)). In addition, information was provided by Alderney Wildlife Trust regarding rats and rat eradication on the islands and stacks of Burhou, Coque Lihou, Le Puits Jervais, Hanaine Bay stack and Rousset. Whilst insufficient data were available to provide nest estimates from photographs, the sites are discussed in [Section 3.4](#) with estimates of potential nesting space provided by Alderney Wildlife Trust (*pers. comm.* 2021) where possible.

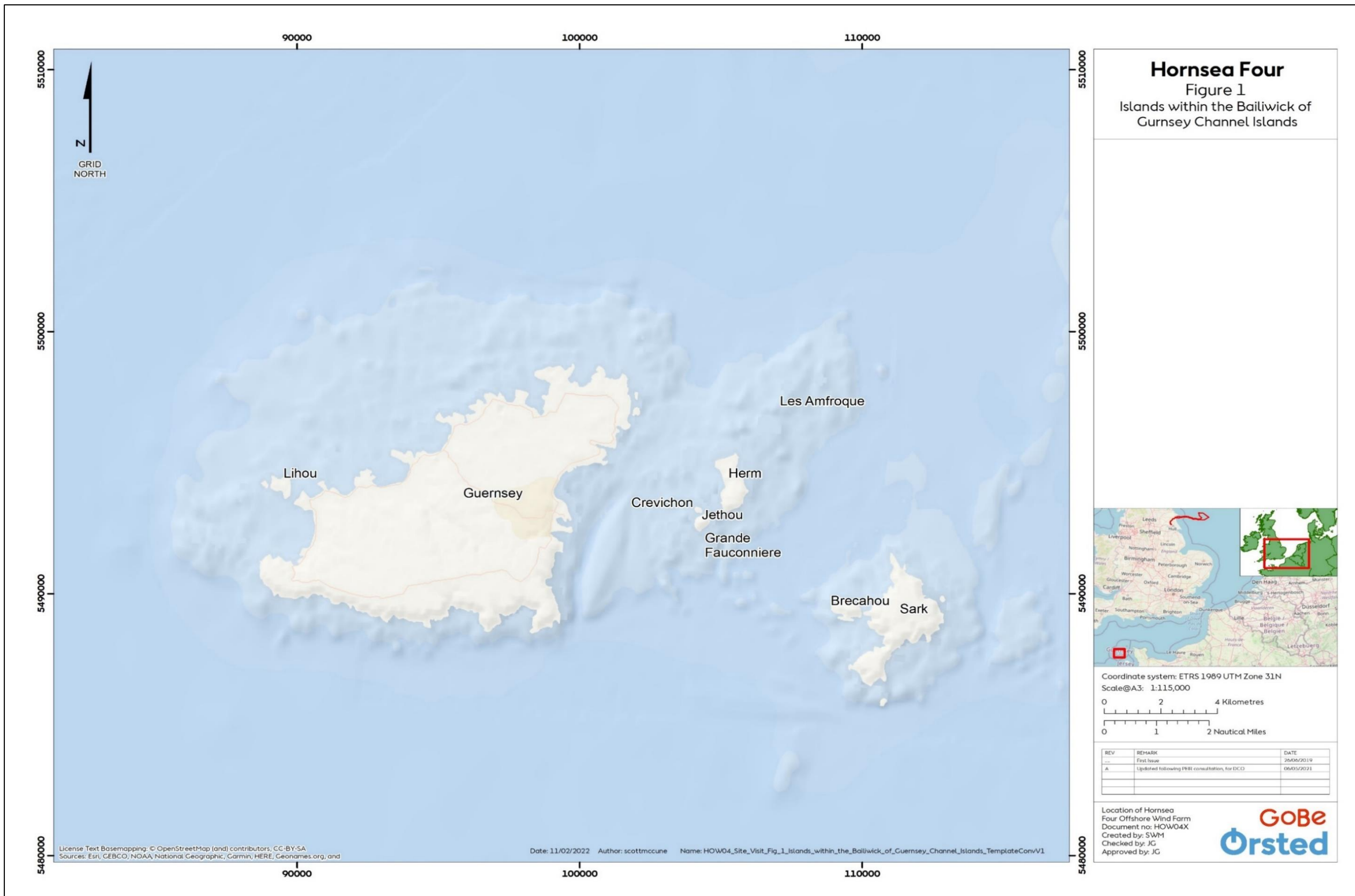
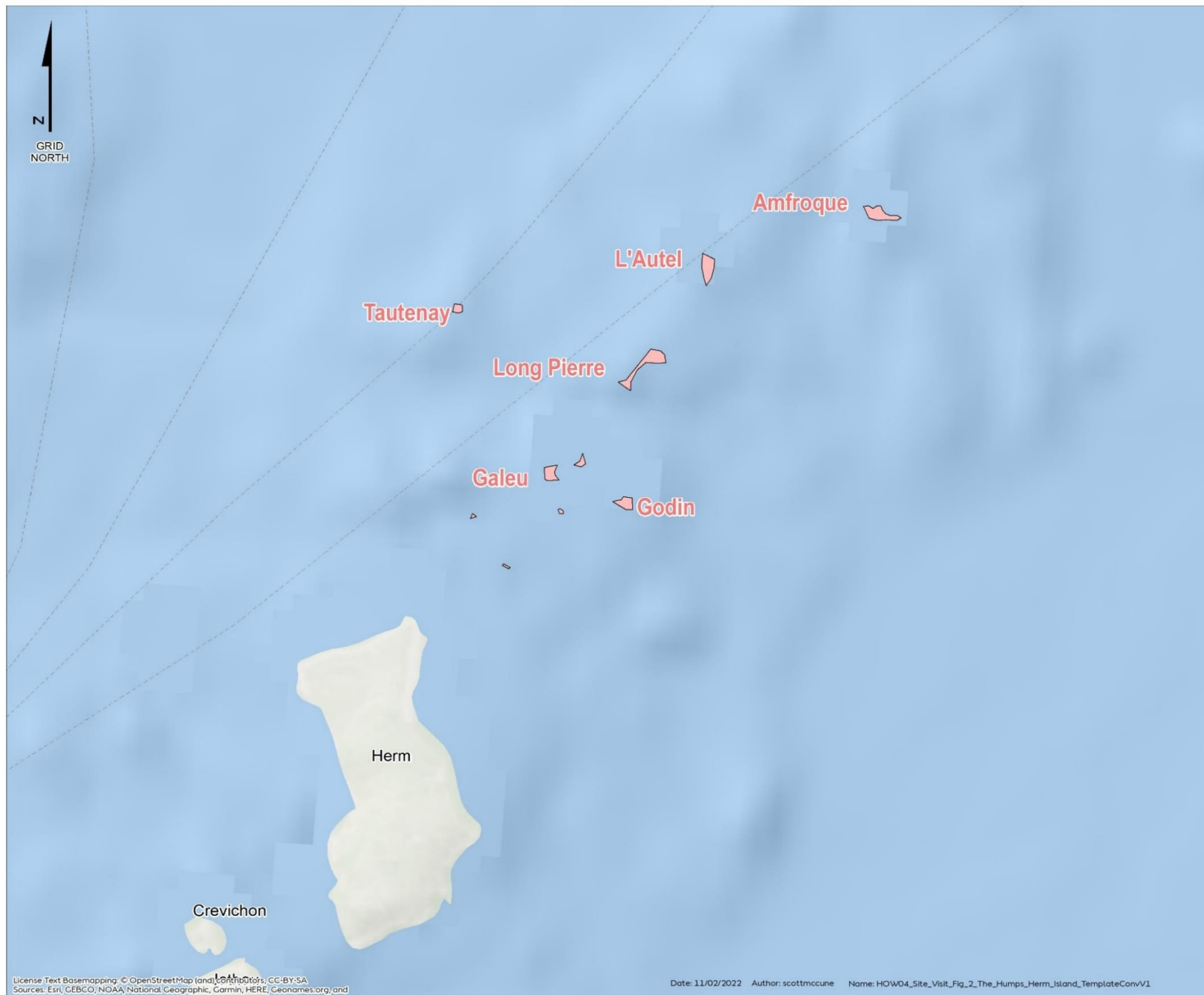


Figure 1: Islands of the Bailiwick of Guernsey.



License Text Basemapping: © OpenStreetMap (and contributors), CC-BY-SA
Sources: Esri, CEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and

Date: 11/02/2022 Author: scottmccune Name: HOW04_Site_Visit_Fig_2_The_Humps_Herm_Island_TemplateConvV1

Hornsea Four Figure 2 The Humps Archipelago Herm Island

■ The Humps Archipelago

Coordinate system: ETRS 1989 UTM Zone 31N
Scale@A3: 1:25,000

0 0.5 1 Kilometres
0 0.25 0.5 Nautical Miles

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...	First Issue	26/06/2019
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Location of Hornsea Four Offshore Wind Farm
Document no: HOW04X
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Figure 2: The Humps, Herm.

3.2.2.5 To summarise, based on the collated information from preliminary site visits and communications with Alderney Wildlife Trust (see [Sections 3.2.2.1 to 3.2.2.4](#)), the final list of islands considered in this report is:

- Alderney
 - Burhou
 - Coque Lihou
 - Fourquie
 - La Nache
 - Le Puits Jervais
 - Hanaine Bay stack
 - Rousset
 - L'Etac de la Quoire
- Guernsey
 - Grande Fauconniere
 - Herm (SW)
 - The Humps
- Sark
 - Grand Moie
 - Les Autelets
 - L'Etac de Sark
 - Little Sark

3.3 Potential nesting space following eradication

3.3.1.1 An estimate of nest-site availability following predator eradication was calculated for those islands and islets of interest for which photographs of the full island were taken (see [Section 3.3](#)) during the site visits or provided by the Alderney Wildlife Trust. These islands are:

- Alderney - L'Etac de la Quoire.
- Alderney - Fourquie.
- Alderney - La Nache.
- Guernsey - Grande Fauconniere.

3.3.1.2 Whilst Grand Moie and L'Etac de Sark (both islands off Sark) were photographed, island height data could not be obtained for these sites. As island elevation data is needed to provide scale and information on the vertical area available for nesting (see methodology in [Section 3.3.2](#)), available nest habitat could not be calculated for these islands. Instead, [Section 3.3.2](#) provides an initial estimate, with island photographs included to show potentially suitable ledges.

3.3.1.3 For the remainder of the islands, no photographs were available to estimate nest site availability. For those sites, nest site suitability is discussed in [Section 3.4](#).

3.3.2 Methodology

3.3.2.1 Nest site availability was estimated using the following methodology:

- 1) Harris *et al.* 1997 found that guillemot breed from "*the top of the cliff down to 2 m above normal wave height at high tide*". The height from the bottom of the cliff unavailable for

- 6) Island height information (highest point on each island in meters above sea level, [Table 3](#)) was obtained, and the height of the island visible in the photograph was then calculated by subtracting the tide height at the time the photograph was taken. Island heights for the Bailiwick of Guernsey were therefore obtained, where available, from various sources through an internet search (sources detailed in [Table 4](#)).

Table 3: Total island height (highest point in metres above sea level), tide height at time of photograph (shown as meters above mean sea level), and height visible when island photographs were taken, taken into account the vertical area covered by the tide at the time of photographing.

Island	Height (m)	Tide height (m) at time of photograph	Visible height of island (m)
Alderney – L’Etac de la Quoire*	NA	NA	21
Alderney – Fourquie	37.9	5.75	32.2
Alderney – La Nache	49.9	8.45	41.5
Jethou – Grande Fauconniere	36	-2.1	38.1

*For L’Etac de la Quoire island height was derived directly from height markers provided on photos by the Alderney Wildlife Trust.

Table 4: Island height and their sources for selected islets within the Bailiwick of Guernsey. Heights were assumed to be above sea level unless otherwise stated in the source.

Island	Height (m)	Source
L’Etac de la Quoire	21	Estimated visually from Alderney Wildlife Trust photographs
Fourquie*	37.9	https://www.ukclimbing.com/logbook/crags/sister_rocks-11952/
La Nache*	49.9	https://www.ukclimbing.com/logbook/crags/sister_rocks-11952/
Grande Fauconniere	36	https://www.mudandrout.es/su mmit/grand-fauconniere/

*Fourquie and La Nache were stated to be 43 and 55 m respectively at high tide, so the tide height of 5.1 m calculated in [Table 1](#) was subtracted to provide estimated height above sea level.

- 7) Based on the visible island height obtained in [Table 3](#), a 5 m measurement grid was superimposed over the photo (see [Figure 3](#) for an example). Using the measurement grid, the photograph was then cropped to remove the area calculated as unsuitable for nesting (see [Figure 4](#) for an example).

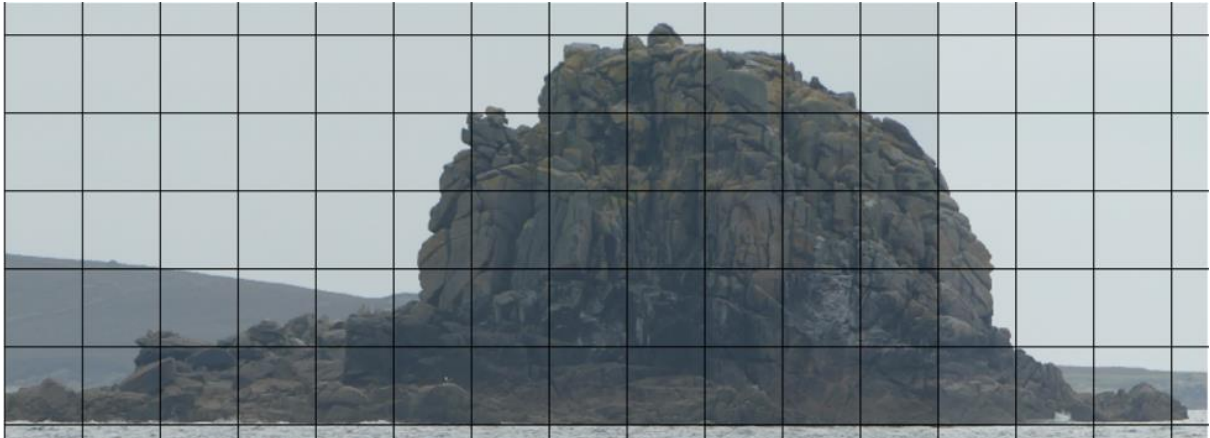


Figure 3: Example of island photograph with superimposed 5 m grid.



Figure 4: Example of island photograph with superimposed 5 m grid - cropped to show only the area suitable for breeding. The area unsuitable for breeding due to tide and waves (in this example 6.1 m in height) was cropped from the image.

- 8) Areas visually deemed to match known guillemot nesting preferences were marked on the image of the section of the island accessible for nesting (as obtained in step 6 above). See [Figure 5](#) for an example. Only horizontal ledges clearly visible on either the whole-island photographs or any higher-resolution close-ups were selected. This is a conservative estimate, as short ledges and small rocky areas can also be used, and inclined ledges can be used if flat areas for egg placement are present (Harris *et al.* 1997, see [Section 2](#)).



Figure 5: Example of ledges marked as potentially suitable nesting space (pink). 5m measurement grid shown in black.

- 9) A visual estimate of the total length of the marked areas (total ledge length) was made.
- 10) Based on the topography of the cliffs and the width/depth of the ledges as observed during the preliminary site visits, a conservative estimate of an average 0.3 m ledge depth was assumed. This width also aligns well with the published literature, with Birkhead (1977) recording a 0.29 m mean width for ledges occupied by guillemot. Where photographs showed large, flat rock areas (here referred to as platforms), depth was estimated as 0.6 m.
- 11) Whilst guillemot have been known to breed at densities as high as 46 pairs/m² (Harris and Wanless, 1987), a conservative estimate of 20 pairs/m² (as reported in Harris and Birkhead, 1985) was used. See [Section 2.1.1.1](#) for more information on breeding densities.
- 12) A preliminary estimate of potential number of pairs which could be accommodated by the island following predator eradication was calculated as:

Potential nesting space (nr of pairs) on photograph = Total ledge length (m) x ledge depth (0.3 m) and/or platform depth (0.6 m) x bird density (20 pairs/m²)

- 13) This number was then multiplied by two, on the crude assumption that the remaining areas of the island which are not photographed provide the same amount of nesting habitat as that estimated above:

Potential nesting space (nr of pairs) on island = Total ledge length on photograph (m) x ledge depth (0.3 m) and/or platform depth (0.6 m) x bird density (20 pairs/m²) x 2

For example, potential nest space for the example image above was estimated as 120 pairs, based on a visual estimate of 10 meters of suitable ledge length (see [Figure 3](#)) and the formula outlined in the methodology ([Section 3.3.2](#)) above:

Total ledge length on photograph (m) x ledge depth (0.3 m) and/or platform depth (0.6 m) x bird density (20 pairs/m²) x 2

i.e. $10 \times 0.3 \times 20 \times 2$

For Forquie and La Nache, photographs of two faces of the cliff were unavailable. For these sites, the estimates were therefore not multiplied by two, i.e. only the formula in [Section 3.3.2.1](#) step 11 was used.

3.3.3 Nesting space estimates

3.3.3.1 Conservative nesting space estimates for the assessed islets within the Bailiwick of Guernsey are shown in [Table 5](#). Images with measurement grids and visual nesting space estimates for the islands can be found in [Appendix A](#).

Table 5: Nesting space estimates for the Channel Islands which were photographed during preliminary site visits. These estimates do not take potential competition with other breeding seabirds into consideration.

Island	Estimated ledge length (m)	Estimated platform length (m)	Estimated available nesting space (pairs)
<i>Channel Islands</i>			
Alderney – L'Étac de la Quoire	7.5	NA ²	90
Alderney – Fourquie ¹	19	NA ²	114
Alderney – La Nache ¹	14	NA ²	84
Jethou – Grande Fauconniere	2.5	2	78

¹For Forquie and La Nache, photos of two faces of the cliff were available. For these sites, the estimates were therefore not multiplied by 2, i.e. only the formula in [Section 3.4.3](#) step 11 was used.

²No platforms identified in photographs.

3.3.4 Assumptions and limitations

3.3.4.1 It is important to note that the numbers above are a preliminary estimate of potentially suitable nesting space. It is based on the information available to date, using visual estimates based on approximate measurement grids, and conservative assumptions on ledge length, width, and available nesting space on the sides of the island not photographed. The dimensions of ledges, platforms and cliffs may, if possible, be recorded with precision, for example by using laser rangefinders.

3.3.4.2 Current use by guillemot and other species could be assessed to understand potential competition for nest sites, as competition could reduce the availability of suitable breeding spaces. However, this is mitigated by the fact that the total number of suitable breeding sites is expected to be significantly higher than the conservative estimates calculated in this report.

3.3.4.3 Many smaller niches and short sections of ledge, not clearly distinguishable on whole-island images, are likely to be available and could provide substantial additional nest habitat. Such sites can be identified as part of on-site visits during follow-up work and are likely to result in an increased nest habitat availability calculation. In addition, Heaney and St Pierre (2017) found that guillemot on the Isles of Scilly can also nest in concealed sites under boulders and on ledges in cavities. Guillemots in the Bailiwick of Guernsey also show this habit (for example, on The Humps), and as a result, substantial additional habitat is likely to be available. The estimates on nest site suitability presented therefore represent

a conservative estimate, and the true number of suitable breeding locations is likely to be substantially higher.

- 3.3.4.4 Any outward (to sea) or inward (into cliff) slope could be considered, and flat areas on sloping ledges identified, as guillemots are less likely to nest on sites that slope outward but will nest on sloping ledges where flat areas for egg placement are available (Harris *et al.*, 1997). Only (near-) horizontal ledges from the photographs are included in this estimate; numerous additional nest sites are likely to be available on sloping ledges with horizontal areas for egg placement.
- 3.3.4.5 In addition, further habitat may be available in areas covered by vegetation. Whilst this work focuses on rocky cliff habitat only, there is evidence for guillemot nesting under vegetation cover (Parrish and Paine, 1996). If guillemot nest under vegetation in the Bailiwick of Guernsey, large amounts of additional nesting sites will be available, but further study is needed to confirm whether such nest sites are selected there.
- 3.3.4.6 The estimate of the vertical area of the cliff accessible for nesting is based on nesting preferences on the Isle of May, Scotland (Harris *et al.*, 1997). Additionally, tidal height information was obtained from publicly available data from tidal gauges located at St Helier (Jersey), rather than recorded at the islands of interest. Local tidal height and nesting preferences may differ, so where possible site-specific information on tides and guillemot cliff use could be collected to further improve estimates.
- 3.3.4.7 During the preliminary site visits, some islands were photographed from a moving vessel. When merging photographs from parts of larger islands into a larger full-island pictures, some issues with picture alignment and merging means that some small sections of larger islands were lost from the merged photo.
- 3.3.4.8 This report provides preliminary estimates. A full feasibility study (see [Section 5](#)) with site visits will be undertaken in 2022 to confirm, and where necessary refine, the assessments presented in this report.

3.4 Location discussions

- 3.4.1.1 This section discusses each of the candidate islands to help compare the characteristics of each potential eradication location. The habitat is described, and information on current breeding seabirds provided. Where calculated, the nest site availability estimate is included. Any information on past eradication is also given.

3.4.2 Alderney – Burhou

- 3.4.2.1 Burhou Island (18 hectares) is the most northerly Channel Island (Sanders, 2008). It lies approximately 2.3 km northeast of Alderney. It has low rocky habitat and large amounts of short vegetation. Alderney Wildlife Trust using non-toxic bait boxes to help detect any incursions and has reported possible rat presence (Alderney Wildlife Trust, *pers. comm.*, 2021).
- 3.4.2.2 Burhou is an important site for seabirds. It supports large numbers of breeding puffin, lesser black-backed gull, shag, herring gull and storm petrel. Guillemot are not currently known to be breeding on the island (Alderney Wildlife Trust, *pers. comm.* 2021).
- 3.4.2.3 It is currently unknown whether Burhou can support breeding guillemot.

3.4.3 Alderney – Coque Lihou

- 3.4.3.1 Coque Lihou is an islet south of Alderney. It is a rocky islet with vegetation which could in theory support rats over winter. However, Coque Lihou is currently rat-free, with Alderney

Wildlife Trust using non-toxic bait boxes to help detect any incursions (Alderney Wildlife Trust, *pers. comm.*, 2021).

- 3.4.3.2 Coque Lihou is home to several breeding seabird species, including northern fulmar, shag and razorbill. Guillemot are known to breed on Coque Lihou. Exact numbers are not available, but a count of 138 guillemot rafting around the island in 2019 was assumed to provide "a fair estimate of the colony size".⁶
- 3.4.3.3 Further work is needed to establish whether Coque Lihou could support additional breeding guillemot.

3.4.4 Alderney – Fourquie

- 3.4.4.1 Forquie is a sea stack directly off the south coast of Alderney. Alderney Wildlife Trust confirmed that rats are present on Fourquie, and that rat eradication is currently being undertaken (Alderney Wildlife Trust, *pers. comm.*, 2021).
- 3.4.4.2 Exact number of guillemot and razorbill breeding on Fourquie are unknown (Alderney Wildlife Trust, *pers. comm.*), but a 2019 survey found that the highest number of guillemots around the Twin Sisters (i.e. Fourquie and La Nache) was three birds⁶. Alderney Wildlife Trust has identified currently unused habitat that is potentially suitable for guillemot that is currently being accessed by rats (*pers. comm.*).
- 3.4.4.3 Nest site estimates suggest suitable habitat for 114 guillemot on the identified ledges.

3.4.5 Alderney – La Nache

- 3.4.5.1 La Nache is a sea stack directly off the south coast of Alderney. Alderney Wildlife Trust confirmed that black rats are present on La Nache, and that rat eradication is currently being carried out (Alderney Wildlife Trust, *pers. comm.*, 2021).
- 3.4.5.2 Exact number of guillemot and razorbill breeding on Fourquie are unknown (Alderney Wildlife Trust, *pers. comm.*), but a 2019 survey found that the highest number of guillemots around the Twin Sisters (i.e. Fourquie and La Nache) was three birds⁶. Alderney Wildlife

⁶ Alderney Wildlife Trust 2019 Seabird Summary, <https://www.alderneywildlife.org/sites/default/files/2020-05/2019%20Seabird%20Summary.pdf>, accessed November 2021

Trust has identified currently unused habitat that is potentially suitable for guillemot which is currently being accessed by rats (*pers. comm.*).

- 3.4.5.3 Suitable habitat for approximately 84 guillemot may be available on La Nache, based on the nest site estimates provided in this report.

3.4.6 Alderney – Le Puits Jervais

- 3.4.6.1 Le Puits Jervais is a small rocky islet directly off the coast of Alderney. It is not currently known whether rats are present on Le Puits Jervais, but the island has suitable habitat to support rats.
- 3.4.6.2 It is currently unknown whether guillemot and razorbill breed on Le Puits Jervais, however both species nested at this location historically.
- 3.4.6.3 Nest site estimates could not be provided due to the lack of suitable island photographs, but Alderney Wildlife Trust (*pers. comm.* 2021) provided a preliminary estimate of space for 10 pairs of guillemot.

3.4.7 Alderney – Hanaine Bay stack

- 3.4.7.1 Hanaine Bay stack is a rock stack off the Alderney coast. Rats are confirmed to be present on Hanaine Bay stack⁷.
- 3.4.7.2 It is unknown whether guillemot and razorbill currently breed on Hanaine Bay Stack, but there is evidence of auks having bred there in the past (Alderney Wildlife trust, *pers. comm.*, 2021).
- 3.4.7.3 Nest site estimates could not be provided due to a lack of information; further work is needed to establish the potential number of available breeding sites for guillemot on Hanaine Bay stack.

3.4.8 Alderney – Rousset

- 3.4.8.1 Rousset is an islet off the Alderney coast. Rats are not thought to be currently present (Alderney Wildlife Trust, *pers. comm.*).
- 3.4.8.2 It is currently unknown whether guillemot and razorbill breed on Rousset.
- 3.4.8.3 Nest site estimates could not be provided due to the lack of suitable island photographs, but Alderney Wildlife Trust (*pers. comm.* 2021) provided a preliminary estimate of space for 20 pairs.

3.4.9 Alderney – L'Etac de la Quoire

- 3.4.9.1 L'Etac de la Quoire is a steep rocky island near the southeast coast of Alderney. Although the islet has vegetation and could therefore support rats over winter, Quoire is currently

⁷ Alderney West Coast and Burhou Islands Ramsar Site Annual Review: 2018.

rat-free and is under a preventative eradication control programme (Alderney Wildlife Trust, *pers. comm.*, 2021).

3.4.9.2 Razorbill currently breed on L'Etac de la Quoire (Alderney Wildlife Trust, *pers. comm.*), exact numbers are not reported. No guillemot have been recorded to nest here.

3.4.9.3 Ledge space for 90 guillemot was calculated to be available in the nest site estimates.

3.4.10 Guernsey – Grande Fauconniere

3.4.10.1 Grande Fauconniere is a small islet just off the south coast of Jethou. It has vegetation, suggesting the island could support rats over winter. Due to its proximity to Jethou as well as Herm (within 1 km), there is potential for rats to move between these islands and Grande Fauconniere. Any eradication programme would therefore likely have to target these islands together.

3.4.10.2 No public seabird survey data is available for Grande Fauconniere, but the following anecdotal evidence suggests the presence of at least these species:

- One razorbill (in 2020 survey, Bailiwick of Guernsey ecology team, *pers. comm.*).
- Over 30 shag (in 2010).⁸
- Low numbers of herring gull (in 2012).⁸

3.4.10.3 The August 2021 preliminary site visits identified a number of ledges suitable for guillemot nesting. Nest site estimates suggest potential space for 78 guillemot across these ledges.

3.4.11 Guernsey - Herm (SW)

3.4.11.1 Herm is the largest island within the Bailiwick of Guernsey. It is 199 hectares in size, and home to approximately 62 people. Herm lies within 1 km of Jethou and Grande Fauconniere; due to their proximity any eradication programme would therefore likely have to target these islands together. The study by Stanbury *et al.* (2017), prioritised UK islands according to the benefits that invasive mammal eradication would bring to 66 of the most significant and threatened species, including guillemot and razorbill, vulnerable to invasive species impacts. and Herm was ranked 25th out of 9688 considered islands.

3.4.11.2 Weather restrictions and logistical issues meant that Herm was not visited and photographed by boat. Nest site estimates using the methodology in [Section 3.3.2](#) could therefore not be completed for this site. Some potentially suitable rocky cliff habitat for guillemot appears to present on the southwest of Herm ([Figure 6](#)); the full feasibility study ([Section 5](#)) will need to determine whether additional sites for guillemot and razorbill are likely to be present.

⁸ Guernsey Gulls blog, [REDACTED] accessed November 2021.



Figure 6: Southwest Herm.

3.4.12 Guernsey – The Humps

- 3.4.12.1 The Humps consist of small rocky islets and several sandbanks located northeast of Herm (Figure 7). Several of the islets have vegetation to support rats over winter. No information on recent rat presence on the Humps was found. Rat presence would therefore need to be assessed as part of a full feasibility study. Stanbury *et al.* (2017) stated that both brown and black rats are present on nearby Herm.
- 3.4.12.2 Full seabird survey data for The Humps was not available, but Auk species are known to breed on several of the islets; Godin, Galeu, Longue Pierre and Grande Amfroque have breeding razorbill, and Long Pierre supports a population of 50-70 guillemot (Channel Islands Gov, *pers. comm.*). Other seabirds, such as cormorant, shag and great black-backed gull also breed on the islets^{9,10}.
- 3.4.12.3 Weather restrictions and logistical issues meant that The Humps could not be visited and photographed by boat during the visit in summer 2021. Nest site estimates using the methodology in Section 3.3.2 could therefore not be completed for this site. Additional space for guillemot on The Humps will be surveyed in the full feasibility study in 2022 (Section 5).

⁹ Guernsey Gull ringing [redacted] Accessed December 2021.

¹⁰ Guernsey Gull ringing news [redacted], Accessed December 2021.



Figure 7: Islets within The Humps.

3.4.13 Sark – Grand Moie

3.4.13.1 Grand Moie is located off the east coast of Sark. It has vegetation which could support rats over winter. No information on current rat presence on Grand Moie could be found, but anecdotal online evidence suggests the presence of rats on Sark¹¹, which is less than 200 m away from Grand Moie.

3.4.13.2 No public seabird survey data is available for Grand Moie so bird diversity and abundance on the island is not known, but the following anecdotal evidence suggests the presence of:

- 45 razorbill and no guillemot (2020 survey, Bailiwick of Guernsey ecology team, *pers. comm.*).
- Low numbers of lesser black-backed and herring gull¹².

3.4.13.3 The August 2021 preliminary site visit showed availability of cliff habitat potentially suitable for nesting guillemot. Due to a lack of data on island height, nest site availability could not be quantified, but 11 potentially suitable ledges were identified (Figure 8). If it were crudely assumed that these ledges are on average 1 m long, this would suggest breeding space for approximately 132 individuals (see Section 3.3.2.1 for calculation methodology). However, Grand Moie is made up of several stacks and islets (Figure 9), suggesting there is large amounts of rocky cliff habitats not visible on the photo, so more breeding space may well be available. This could be confirmed in a full feasibility study.

¹¹ Small Mammal Group – Black Rat, [REDACTED], accessed November 2021.

¹² Gull Breeding Sites in the Bailiwick of Guernsey, [REDACTED] (archived site accessed November 2021).



Figure 8: Potentially suitable Guillemot breeding sites (pink) on Grand Moie.



Figure 9: Grand Moie. Source: Google Earth [Accessed November 2021].

3.4.14 Sark – Les Autelets

3.4.14.1 Les Autelets (Figure 10) is a steep rock stack Northwest of Sark. It has only a small patch of vegetation. Whilst nearby Sark is thought to support rats¹¹, it is uncertain whether Les Autelets can support a rat population due to its steep topography.

3.4.14.2 Les Autelets has the largest guillemot population of the Channel Islands, estimated at 235 guillemot in 2015¹³¹⁴. The presence and numbers of other bird species on Les Autelets is unknown.

3.4.14.3 Weather restrictions and logistical issues meant that Les Autelets was not visited and photographed by boat. Nest site estimates using the methodology in Section 3.3.2 could

¹³ [REDACTED]

therefore not be completed for this site. As Les Autelets already supports large populations of seabirds it is currently unknown how much additional space for guillemot may be present. A full breeding bird survey and nest site availability assessment will be needed to establish this.



Figure 10: Les Autelets.

3.4.15 Sark - L'Etac de Sark

3.4.15.1 L'Etac de Sark is a small islet situated several hundred meters south of Sark. It consists of a mix of steep grassy slopes and rocky boulders. It has vegetation which could support rats over winter. No information could be found on rat presence on L'Etac de Sark, but rats are present on nearby Sark¹¹.

3.4.15.2 Comprehensive breeding bird data is not available for L'Etac de Sark, but anecdotal evidence suggests the island is home to breeding guillemot as well as razorbill, shag, puffin and small numbers of great black-backed, lesser black-backed and herring gull^{12,14}.

3.4.15.3 The site visit showed the availability of cliff habitat potentially suitable for nesting guillemot. Due to a lack of data on island height, nest site availability could not be quantified, but three small potential ledges were identified (Figure 11). If it were crudely assumed that these ledges are on average 0.5m long, this would suggest breeding space for approximately 18 guillemot (see Section 3.3.2 for calculation methodology). A full feasibility study will be needed to quantify the exact number of breeding guillemot that could breed across the island.

¹⁴ The Sark Society – [REDACTED], accessed November 2021



Figure 11: Potentially suitable guillemot breeding sites (denoted by the pink lines) on L'Etac de Sark.

3.4.16 Sark - Little Sark

3.4.16.1 Little Sark is not a separate island, but rather a peninsula at the southern section of Sark. Sark is 545 hectares in total. Little Sark is joined to the larger part of the island by a narrow isthmus (a ridge 80 m high, 3 m wide), therefore there is the potential for rats to easily move between. Sark and Little Sark have large amounts of vegetation to support rats, and rats were confirmed to be present.¹¹ No record of past eradication projects was found.

3.4.16.2 Surveys in 2015 recorded 16 guillemot and seven razorbill on Little Sark. The area also supports large numbers of herring gull and lesser black-backed gull (210 and 74 birds recorded respectively). Smaller numbers of shag, petrel, great black-backed gull and puffin.

3.4.16.3 Weather restrictions and logistical issues meant that Little Sark was not visited and photographed by boat. Nest site estimates using the methodology in [Section 3.3.2](#) could therefore not be completed for this site. The full feasibility study ([Section 5](#)) will need to investigate whether additional guillemot breeding space is available.

3.4.17 Summary table

3.4.17.1 [Table 6](#) below summarises the relevant information for predator eradication site selection from the habitat suitability analysis ([Section 3.3.3](#)) and location discussions ([Section 3.4](#)). The table provides an overview of the following: Location: island or islet of interest, Guillemot (Guil.) habitat: whether the site contains rocky cliff habitat seemingly suitable for nesting guillemot, Vegetation: whether the island contains vegetation to support rats over winter, Eradication history: any past or current eradication projects (when "yes", most recent available information was from 2017, see Heaney and St Pierre 2017), rats confirmed present: whether rats have been recorded on the island (TBC if uncertainty

remains and will be surveyed in the feasibility study), could support rats: whether the island is deemed likely to be able to support rats (sources added as footnotes); Guil. no: current numbers of guillemot (see main text for sources) (HE: historic evidence of species nesting at location, TBC: To be confirmed as part of the feasibility study); Guil. nest site estimate (pairs): potential available nesting space estimated in this report (see main text for details) (TBC: To be confirmed as part of the feasibility study).

Table 6: Table summarising island characteristics relevant for predator eradication site selection.

Location	Guil. habitat	Vegetation	Eradication history	Rats confirmed present	Could support rats	Guil. no. (INDV)	Guil. Nest site estimate (pairs)
<i>Alderney</i>							
Burhou	✓	✓	Ongoing	✓ ¹⁵	✓ ¹⁵	0	TBC ¹⁶
Coque Lihou	✓	✓	Ongoing	X ¹⁵	✓ ¹⁵	138	TBC ¹⁶
Fourquie	✓	✓	Ongoing	✓ ¹⁵	✓ ¹⁵	3	114
La Nache	✓	✓	Ongoing	✓ ¹⁵	✓ ¹⁵		84
Le Puits Jervais	✓	✓	None	TBC ¹⁶	✓ ¹⁵	HE	10*
Hanaine Bay stack	✓	✓	Ongoing	✓ ^{15,17}	✓ ¹⁵	TBC ¹⁶	TBC ¹⁶
Rousset	✓	✓	Ongoing	X ¹⁵	✓ ¹⁵	TBC ¹⁶	20*
L'Etac de la Quoire	✓	✓	Ongoing	X ¹⁵	✓ ¹⁵	0	90
<i>Guernsey</i>							
Grande Fauconniere	✓	✓	None	X	✓ ¹⁸	0	78
Herm (SW)	✓	✓	None	✓	✓	TBC	TBC
The Humps	✓	✓	None	X	✓	50+ ¹⁹	TBC
<i>Sark</i>							
Grand Moie	✓	✓	None	X	✓	0	132 ²⁰
Les Autelets	✓	✓	None	X	? ²¹	235	TBC
L'Etac de Sark	✓	✓	None	X ²²	✓	TBC	18 ²³
Little Sark	✓	✓	None	✓	✓	16	TBC

*Estimate provided by Alderney Wildlife Trust where high resolution photographs of the islets were not available.

¹⁵ Alderney Wildlife Trust, *pers. comm.* (2021)

¹⁶ Currently unknown. Work planned by Orsted and the Alderney Wildlife Trust to gather evidence

¹⁷ Alderney West Coast and Burhou Islands Ramsar Site Annual Review: 2018

¹⁸ Ratcliffe *et al.* (2009) stated that rats are present on Herm and Jethou, it is therefore here assumed that rat presence is likely on nearby Grande Fauconniere

¹⁹ 50-70 guillemot nest on Longue Pierre, numbers unknown for other islets within The Humps

²⁰ Likely to be an underestimate, see [Section 3.4.13](#)

²¹ It is uncertain whether Les Autelets can support rats due to its steep topography

²² Anecdotal evidence suggests rats are present on nearby Sark (Small Mammal Group – Black Rat, [redacted], accessed November 2021)

²³ Estimate only, see [Section 3.4.15](#)

4 Improving predator eradication success

4.1.1.1 A wide range of factors may affect guillemot recruitment and success following predator eradication. Various techniques could be considered as part of an eradication package as adaptive management to further improve breeding numbers.

4.2 Artificial ground cover

4.2.1.1 Guillemot nests are susceptible to avian predation. In a study on a breeding colony in California, Parrish and Paine (1996) showed that areas with artificial covers installed over the cliff tops produced nearly twice as many eggs. Artificial ground cover could thus be considered as an additional measure following predator eradication, to further increase breeding performance at potential cliff-top breeding sites.

4.3 Decoys and playbacks

4.3.1.1 Social attraction methods, such as playbacks and decoys, can be used to increase the likelihood of recruitment, and has shown to be highly effective in a past study by Parker *et al.* (2007). Breeding guillemot were lost from a colony in California following an oil spill in 1986 and did not naturally recolonise over the following eight years. In January 1996, Parker *et al.* (2007) installed guillemot decoys, playbacks and mirrors to attempt to attract guillemot. No guillemot were observed before these social attraction techniques were installed. Following social attraction installation, birds were seen on all but two days (observations were carried out until the post-fledging period in August). Over 90% of 68,332 guillemot observations was in decoy plots vs. less than 10% in control plots and outside of study plots. Guillemot started breeding on the site during the 1996 breeding season, and numbers increased from 1996 (6 pairs) to 2004 (190 pairs) with continued but decreased use of the social attraction techniques (Parker *et al.* 2007).

4.4 Simulated guano

4.4.1.1 In other seabird species, white paint has been used to simulate guano at potential breeding sites (Gummer, 2003; Sawyer and Fogle, 2013). This could be used for guillemot, potentially alongside the use of decoys and playbacks, with the aim of increasing colonization rates following rat eradication.

4.5 Invasive plant removal

4.5.1.1 Several of the islands have sour fig *Carpobrotus edulis*, an invasive creeping succulent which grows over boulders, providing habitat for rats and potentially reducing available nesting space for breeding seabirds. Removal of sour fig could increase breeding habitat availability for guillemot (and razorbill) and could therefore be considered alongside predator eradication to maximise gains.

5 Next steps – feasibility study

5.1.1.1 A full feasibility study including surveys will be initiated in early 2022. This work will include:

- Surveying of all candidate islands for the presence of invasive mammalian predators, including abundance estimates.
- Collecting evidence of predation pressures, such as egg caches and gnawed carcasses. This survey could also include collecting camera evidence and stable isotope testing of predator tissues.
- Assessing the amount of potential nest habitat for each island, including data on current colony usage and potential nesting space.

- Full guillemot and razorbill census for each island, providing a baseline for future population and productivity assessments.

5.1.1.2 For Guernsey and Sark, this feasibility study will be undertaken by international eradication experts and in 2022 will also report on these feasibility criteria following the UK Rodent Eradication Best Practice Toolkit (Thomas *et al.* (2017):

- Technically feasible;
- Sustainable;
- Socially acceptable;
- Politically and legally acceptable;
- Environmentally acceptable;
- Capacity; and
- Affordable

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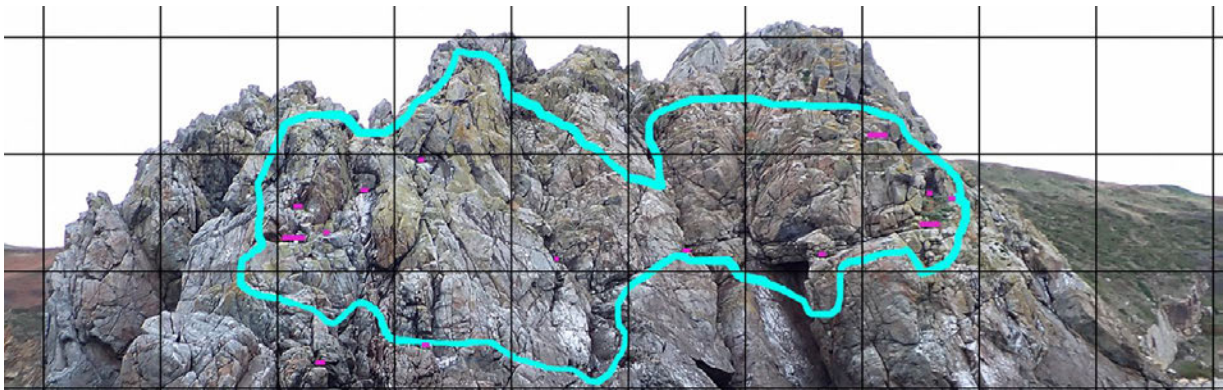
Appendix A Nesting space images

1 Introduction

1.1.1.1 The photographs below show the areas of the assessed islands deemed potentially available for Guillemot nesting. Suitable nesting ledges and platforms are marked in pink and blue respectively. A 5 m measurement grid is superimposed on each image. Where the image had to be split to fit on the page, a yellow dashed line denotes where the image has been split.

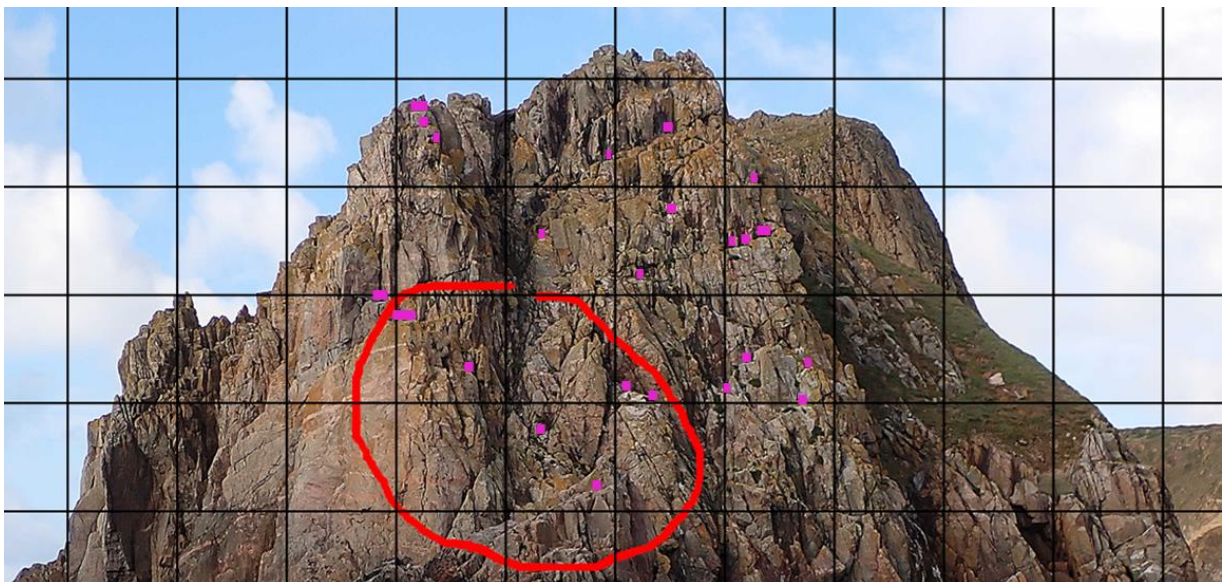
2 Alderney – L'Étac de la Quoire

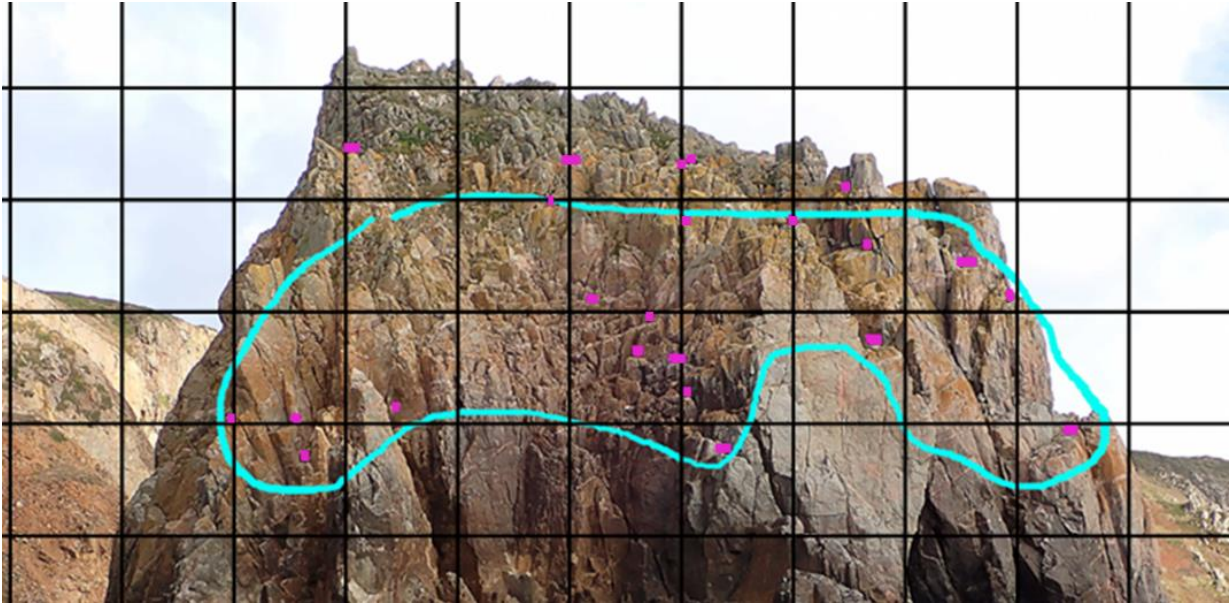
2.1.1.1 Suitable nesting ledges are marked in pink. The area circled in blue was highlighted by Alderney Wildlife Trust as suitable nesting habitat for guillemot and razorbill (*pers. comm.*) prior to the detailed habitat analysis.



3 Alderney – Forquie

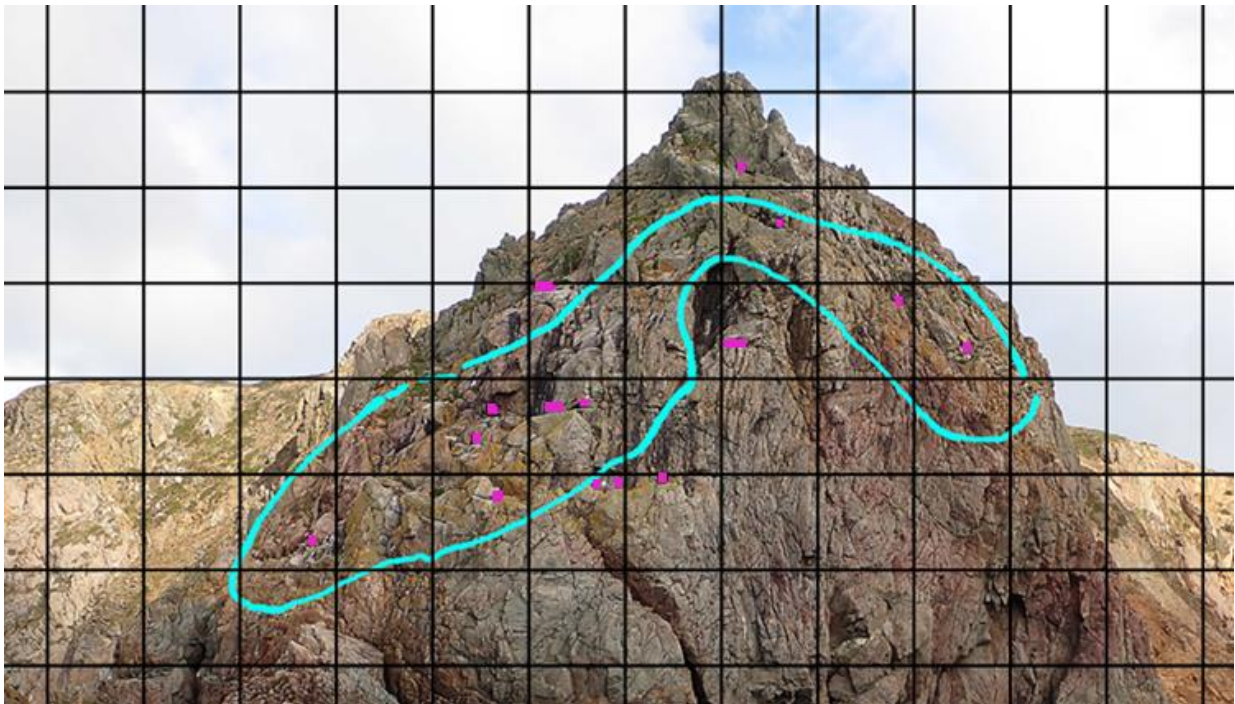
3.1.1.1 Suitable nesting ledges are marked in pink. Razorbill are thought to use the area marked in red (Alderney Wildlife Trust, *pers. comm.*). The area circled in blue was highlighted by Alderney Wildlife Trust as suitable nesting habitat for guillemot and razorbill (*pers. comm.*) prior to the detailed habitat analysis.





4 Alderney – La Nache

- 4.1.1.1 Suitable nesting ledges are marked in pink. The areas circled in blue were highlighted by Alderney Wildlife Trust as suitable nesting habitat for guillemot and razorbill (*pers. comm.*) prior to the detailed habitat analysis.





5 Grande Fauconniere

5.1.1.1 Suitable nesting ledges and platforms are marked in pink and blue respectively.

