Code: UKCAL-CWF-CON-EIA-RPT-00008-1019

Volume 8 Additional Information

Appendix 19: Moray Firth SPA Assessment (Disturbance/Displacement) for Vessel Traffic (O&M)

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Volume 8 Appendix 19: Moray Firth SPA Assessment (Disturbance/Displacement) for Vessel Traffic (O&M)

Code	UKCAL-CWF-CON-EIA-RPT-00008-1019
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Acronyms and Abbreviations

AEoSI	Adverse Effect on Site Integrity
BPUE	Bycatch Per Unit Effort
IMP	Implementation and Monitoring Plan
MD-LOT	Marine Directorate - Licensing Operations Team
MoU	Memorandum of Understanding
OWF	Offshore Wind Farm
PVA	Population Viability Analysis
RIAA	Report to Inform Appropriate Assessment
NTS	National Trust for Scotland
RSPB	Royal Society for the Protection of Birds
SPA	Special Protection Area

1 Introduction

1.1.1.1 This appendix considers the potential for an Adverse Effect on Site Integrity (AEoSI) of the following non-breeding qualifying features of the Moray Firth Special Protection Area (SPA) due to disturbance and displacement by vessel traffic during the Operations and Maintenance (O&M) phase of the Proposed Development (Offshore):

- Common scoter;
- Eider;
- Goldeneye;
- Great northern diver;
- Long-tailed duck;
- Red-breasted merganser;
- Red-throated diver;
- Scaup;
- Slavonian grebe;
- Velvet scoter; and
- Shag.

1.1.1.2 During the O&M phase of the Proposed Development (Offshore), there will be vessel traffic between the O&M base and the Proposed Development (Offshore) which could lead to the disturbance, and possibly displacement, of Moray Firth SPA qualifying features during the non-breeding season (defined as September to March inclusive).

1.1.1.3 The effect of distributional responses from the presence of vessels will be limited spatially to the area between the O&M base and the Proposed Development (Offshore) which overlaps the Moray Firth SPA. Effects will also be temporally limited, with impacts occurring when vessels approach an area and pass through it, and for a period following the passage of vessels, after which it is expected that birds would move back into disturbed areas. The O&M vessels associated with the Proposed Development (Offshore) will be active in an area of sea which is already in use by a range of other vessels not associated with the Proposed Development (Offshore). This is an important consideration when attempting to predict potential impacts of this nature and has been incorporated into the assessment through consideration of Automatic Identification System (AIS) data, along with assessment of O&M vessel data held by Moray West Offshore Wind Farm (OWF).

1.1.1.4 The Offshore Ornithology Environmental Impact Assessment (EIA) chapter for the Proposed Development (Offshore) states that an annual maximum of 938 round trips of O&M vessels through the Moray Firth are anticipated between the O&M base and the Proposed Development (Offshore). This equates to an average of 2.6 round trips, or 5.1 one-way trips, per day and remains the maximum scenario considered by the assessment.

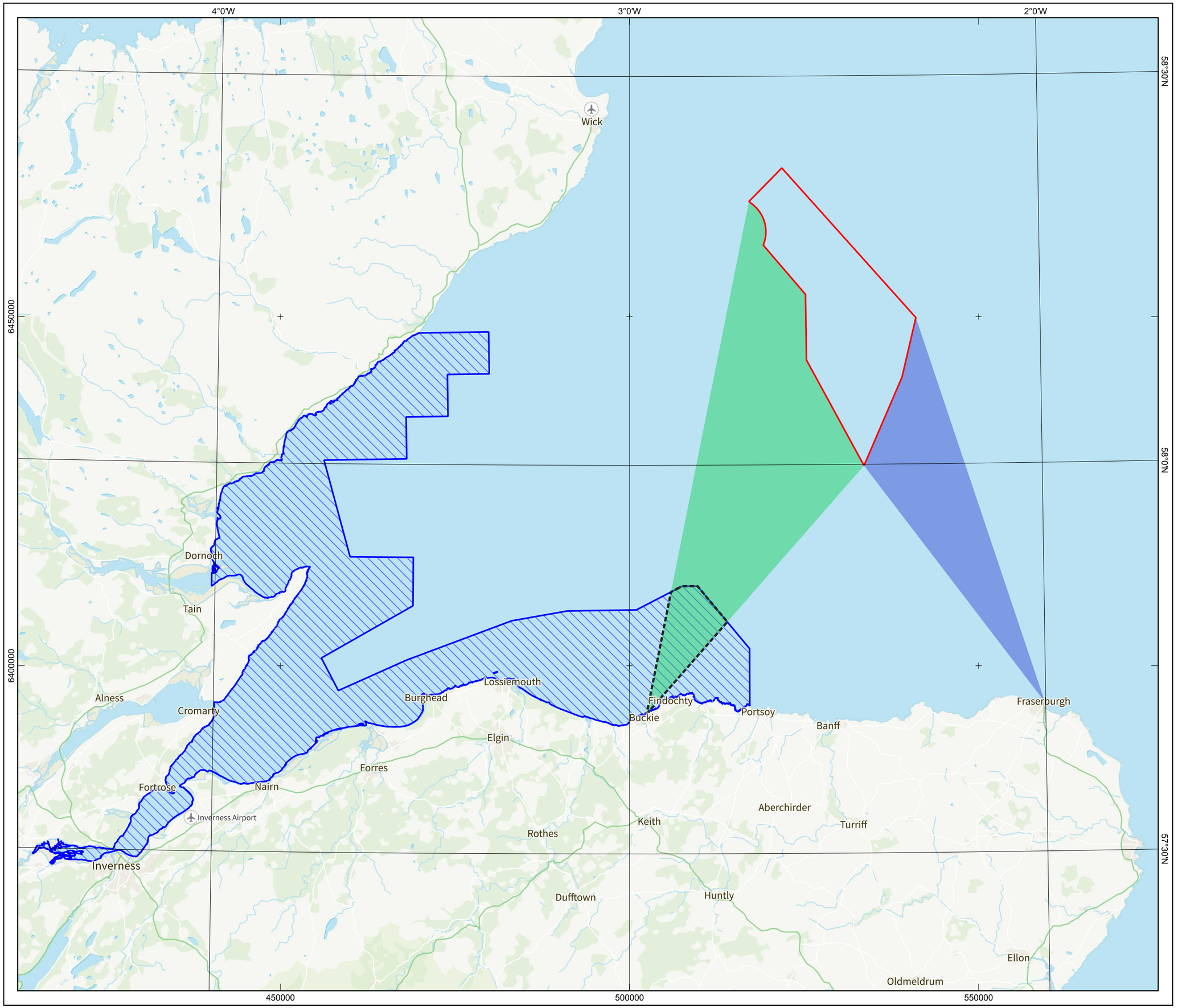
2 Methodology

2.1 Definition of Area of Search

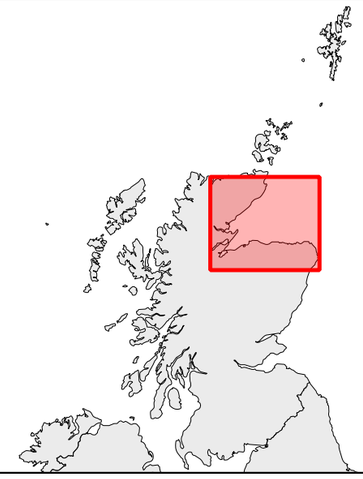
2.1.1.1 The location of the O&M base (from which vessels servicing the OWF will operate during the operational phase), and therefore the specific vessel transit routes, are yet to be determined. The locations under consideration for the O&M base are Fraserburgh and Buckie. Other listed ports in Table 9-5 of Part 3 of the RIAA are under consideration during the construction phase only, and as such are not considered further within this O&M phase assessment.

2.1.1.2 An "area of search" for this potential impact pathway was defined by drawing a polygon from potential O&M base locations that would require vessels to cross the Moray Firth SPA (i.e., the port of Buckie), to the extents of the Proposed Development (Offshore) (Figure 2–1). The port of Fraserburgh is situated to the east of the Moray Firth SPA, and therefore no O&M vessel traffic, or AEoSI due to this impact, would occur within the Moray Firth SPA if that location was selected for the O&M base for the Proposed Development (Offshore) (Figure 2–1). The focus of the remainder of this assessment is therefore the area of search overlapping the Moray Firth SPA between the port of Buckie and the Proposed Development (Offshore).

2.1.1.3 The JNCC's 2025 UK Atlas of Seabed Habitats (JNCC, 2025[1]) provides an overview of the types of habitats that occur within the area of search (Figure 2–2). These are predominantly littoral and muddy sand, with habitats furthest from the shore consisting of muddier habitats. These habitats all have the potential to support waterbird populations associated with the Moray Firth SPA, although none of them are considered unique to the area of search, and can be found in other areas within the Moray Firth SPA.



Caledonia Array Area
Area of Search
Buckie Transit Area
Fraserburgh Transit Area
Moray Firth Special Protection Area (SPA)



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CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

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Figure 2-1: Location of “area of search” relative to the Proposed Development (Offshore) and the Moray Firth SPA

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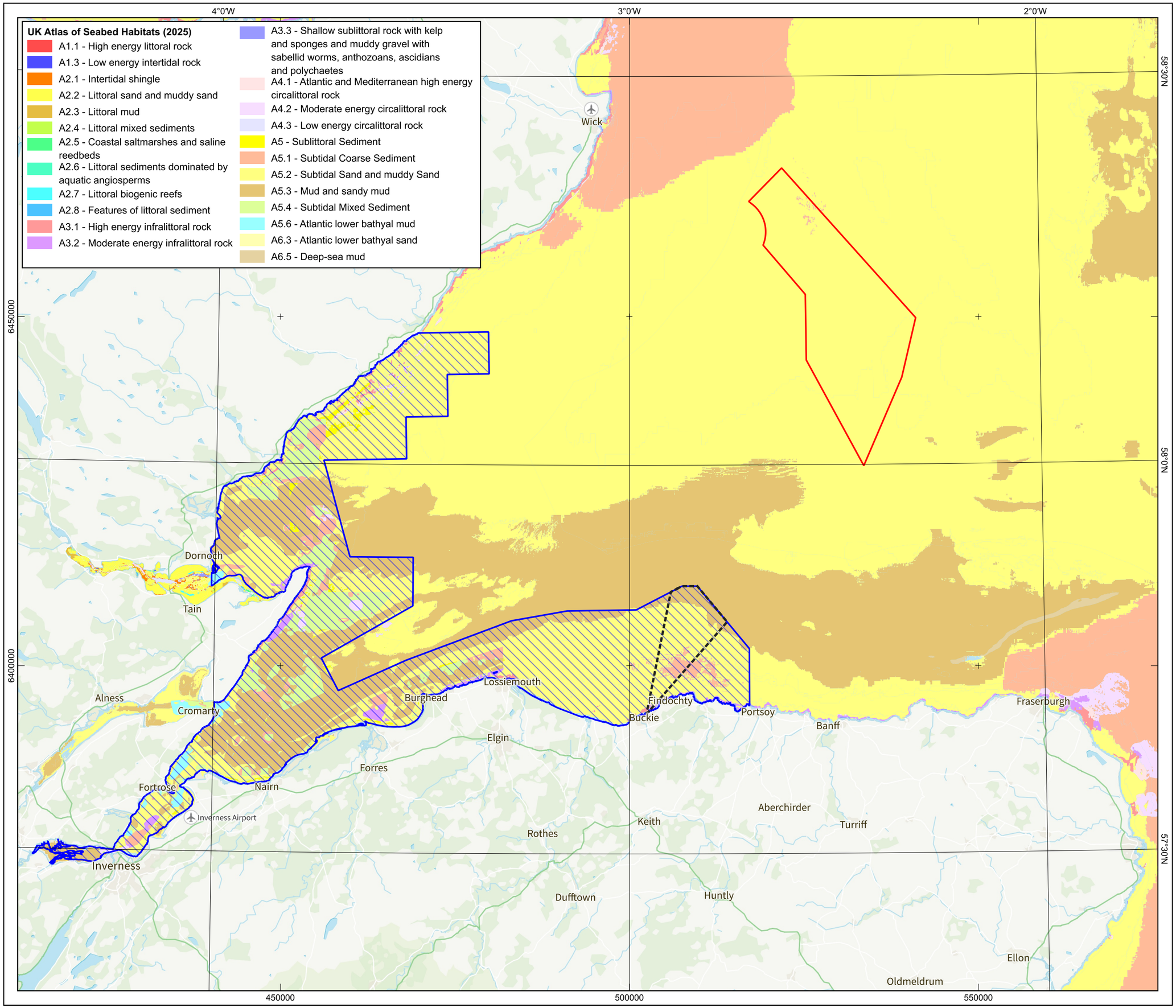
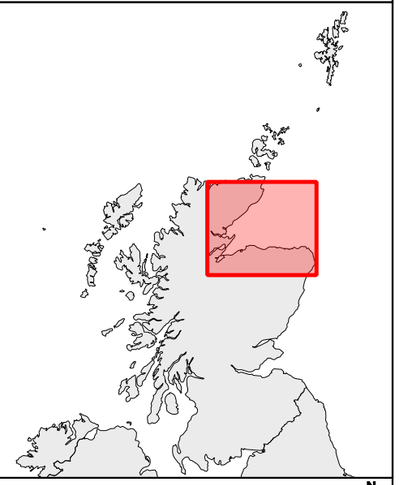


Caledonia Array Area

Area of Search

Moray Firth Special Protection Area (SPA)



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CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
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Figure 2-2: Habitat types distributed across the Moray Firth SPA, based on published JNCC data

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2.2 Establishing Ornithological Baseline

2.2.1.1 The ornithological baseline for this assessment was principally informed by Scott *et al*. (2023[2]), which reports the outputs of two Digital Aerial Surveys (DAS) carried out in January 2020 and March 2020. This is the most recently collected ornithological data at the Moray Firth SPA level and therefore represents the best available evidence to inform this assessment.

2.2.1.2 The outputs of the 2020 DAS were used to provide modelled density and abundance estimates for both the Moray Firth SPA and the area of search for all Moray Firth SPA qualifying features, and insight into population distributions throughout the Moray Firth SPA. This enabled comment to be made on the relative importance of the area of search to each qualifying feature, including whether preferred foraging areas for each qualifying feature fell within the area of search.

2.2.1.3 To supplement the findings of the 2020 DAS, Conservation Advice for the Moray Firth SPA was used (NatureScot, 2022[3]), along with the findings of previous surveys of the Moray Firth SPA (Lawson *et al*., 2015[4]). Figures showing modelled distributions predicted by other surveys which were presented by MacArthur Green (2024[5]) were also referred to.

2.3 Potential Disturbance and Displacement Distances

2.3.1.1 To estimate the areas in which disturbance and displacement of each qualifying feature of the Moray Firth SPA could occur, precautionary displacement buffers have been selected for each qualifying feature individually. These were selected based on published information referred to in the species accounts. Displacement buffers represent a maximum distance at which birds could be disturbed due to the presence of an O&M vessel, and do not assume that all birds within that distances are disturbed and/or displaced by every vessel movement.

2.4 Establishing Vessel Activity Baseline

2.4.1.1 The Moray Firth is an area within which relatively high shipping activity occurs, with a broad mixture of commercial and recreational vessels utilising the multiple ports located across its coastline and the waters across the wider area. In order to ensure that the potential impacts occurring as a result of O&M vessel activity due to the Proposed Development (Offshore) are appropriately placed in the context of existing shipping activities, an assessment of existing shipping activity across the Moray Firth has been carried out.

2.4.1.2 AIS data within the Moray Firth Special Protected Area (SPA) was collated (Volume 8, Appendix 31: Moray Firth Special Protected Area Long-Term Vessel Traffic Assessment). The sections of this assessment discussing vessel activity should be read in conjunction with this report. In particular, it should be noted that that AIS data is not comprehensive, with fishing vessels less than 15m in length, and recreational vessels, are not required to use it. It is therefore considered that the vessel activity estimates presented in this report are an underestimate of true vessel activity in both the area of search, and the wider Moray Firth SPA.

2.4.1.3 Two AIS datasets comprising of different date ranges were evaluated to provide context to the impact assessment.

2.4.1.4 The first dataset comprised all AIS data collected within the Moray Firth SPA plus a 2km buffer for a 12-month period, collected between 1st October 2023 and 30th September 2024. This dataset was used to define the recent baseline levels of shipping activity present in the area of search during the non-breeding season (September to March inclusive), which is when the qualifying features of the Moray Firth SPA are expected to be present in their highest numbers, and the time that effects at the site level are the most likely to occur. This dataset was also used to characterise vessel activity across the Moray Firth SPA as a whole.

2.4.1.5 To provide further information on the timing and frequency of O&M vessel traffic already associated with the port of Buckie, data on daily O&M vessel movements (consisting of the number of vessel trips each day) were obtained from Moray West OWF for non-breeding season months during late 2024 (i.e., September to December 2024), and in early 2025. Later dates were selected relative to the AIS data to ensure that O&M vessel activity rates that accurately reflect the O&M phase were captured, as this would not have been the case in 2023, when the construction of the OWF was ongoing.

2.4.1.6 The second AIS dataset comprised of vessel tracks collected across the Moray Firth SPA in the week prior to each of the Digital Aerial Surveys (DAS) detailed within Scott *et al*. (2023[2]), which is a key source of ornithological distribution and abundance data for this assessment. The date ranges considered were 05 to 19 January 2020, and 23 February to 08 March 2020. This dataset was qualitatively compared with the 2023/24 dataset to enable comment to be made on whether vessel activity in the week leading up to each of the 2020 DAS was similar in distribution and intensity to the activity recorded in 2023/24.

2.5 Assessment of Potential Effects

2.5.1 Conservation Objectives

2.5.1.1 Potential impacts by disturbance and displacement due to O&M vessel traffic associated with the Proposed Development (Offshore) have been separately assessed for each qualifying feature of the Moray Firth SPA against the conservation objectives:

- 1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.
- 2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:
  - 2a. The populations of qualifying features are viable components of the site.
  - 2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.
  - 2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.

2.5.1.2 Conclusions relating to each conservation objective have been made with reference to the latest published Conservation Advice document for the Moray Firth SPA (NatureScot, 2022[3]). The site condition for all qualifying species was assessed by this review as "Favourable".

2.5.2 Assessment Approach

2.5.2.1 The first level of assessment for each species was to assign an appropriate displacement buffer distance, which was added to the area of search described above to create a species-specific area of search.

2.5.2.2 For this area of search, density and abundance estimates were calculated using data generated from the block bootstrap estimation methods presented in Scott *et al*. (2023[2]). This provided an indication of the number of birds that could potentially be directly impacted by disturbance and displacement due to O&M vessel traffic. Area of search abundances were compared against the total observed population across the entire Moray Firth SPA from the same survey to establish the relative importance of the area of search to the Moray Firth SPA population.

2.5.2.3 Other literature was also used to identify areas of the Moray Firth favoured by particular species, and qualitative assessment of the availability of habitats for birds to occupy within the SPA as an alternative to the area of search, in the event of displacement occurring was carried out.

2.5.2.4 For many of the qualifying features of the Moray Firth SPA, these comparisons were sufficient to demonstrate that AEoSI could be ruled out due to disturbance and displacement by O&M vessel traffic by virtue of a low number of birds being present in the area of search during the 2020 DAS, and other data sources corroborating that the observations were consistent with previous observations.

2.5.2.5 For qualifying features for which AEoSI could not be ruled out using the above approach, a second level of assessment was undertaken using other evidence to further examine the magnitude of potential impacts. These were:

- AIS data presented describing vessel activity in the run up to the 2020 DAS was used to assess whether birds were occupying habitats where vessel activity was high in the run up to the DAS (Volume 8, Appendix 31: Moray Firth Special Protected Area Long-Term Vessel Traffic Assessment). This provided a basis for inferring the level of potential vessel-related impacts occurring prior to these surveys. These findings were used to refine conclusions on potential effects that might occur as a result of additional vessel traffic.
- Quantitative assessment of the potential displacement impacts due to O&M vessel activity in the area of search.
- Qualitative assessment of potential direct effects of displacement on impacted individuals, and indirect effects of displacement of birds from the area of search on birds using receiving habitats.

3 Baseline Assessment of Vessel Activity

3.1 Non-breeding Season – Moray Firth SPA 2023/24

3.1.1.1 A summary of the number of tracks and vessel type (by month) recorded in the Moray Firth SPA and 2km buffer between October 2023 to March 2024, and in September 2024 is presented in Table 3-1, and the distribution of vessel tracks by type across the Moray Firth SPA is presented in Figure 3–1. Totals and average tracks per day with and without Moray West vessels (which will have predominantly been construction vessels during this time period) are presented.

3.1.1.2 In total, 28,820 vessel tracks were recorded across the Moray Firth SPA plus 2km buffer during this time period; an average of 135 unique vessel tracks daily, with the minimum and maximum monthly mean values varying between 120 and 166. If Moray West OWF vessel activity is excluded, 25,299 vessel tracks were recorded across the Moray Firth SPA plus 2km buffer; an average of 119 unique vessel tracks daily, with the minimum and maximum monthly mean values varying between 107 and 134.

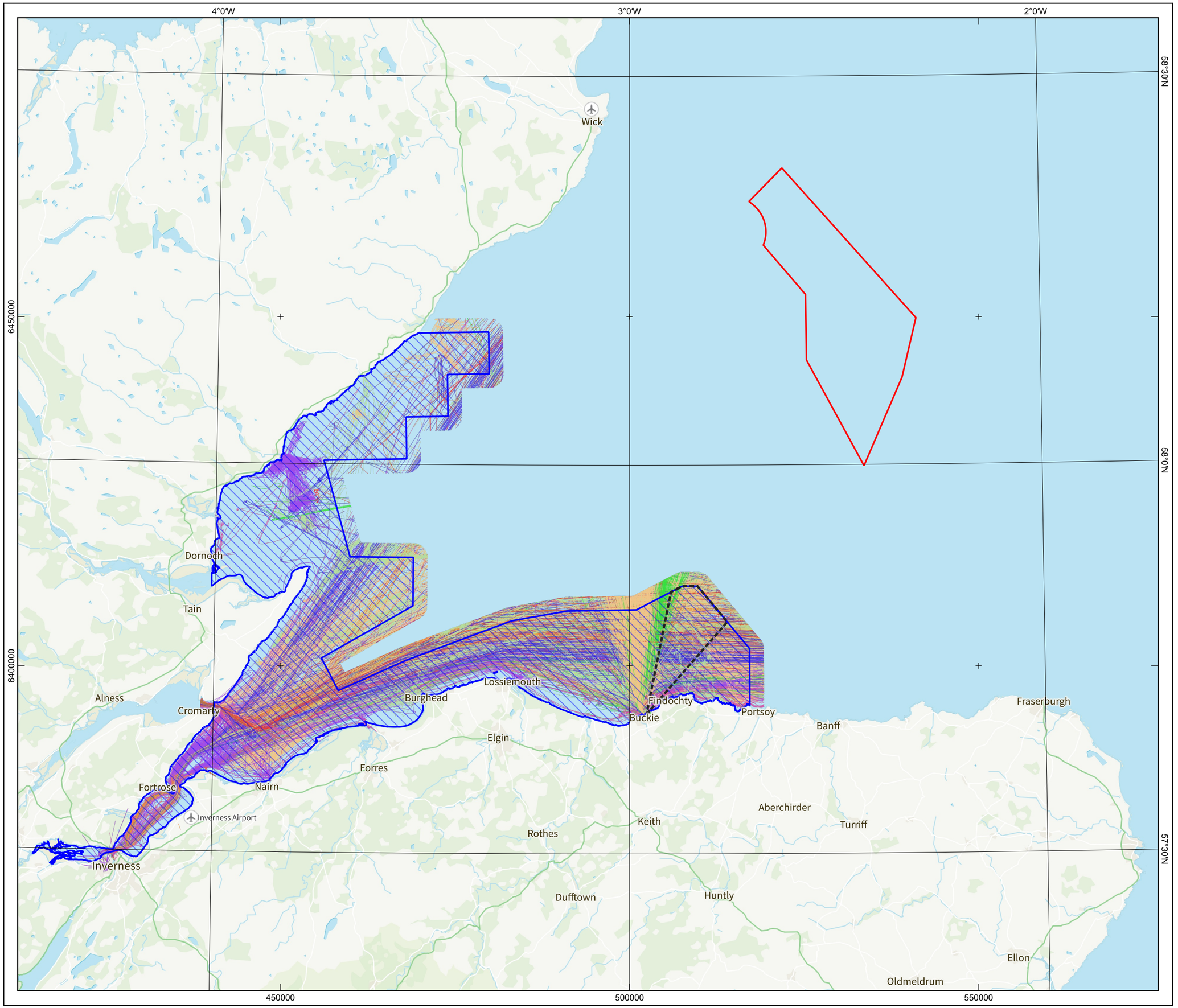
3.1.1.3 The distribution of vessel tracks (Figure 3–1) was strongly correlated with the locations of the busy ports and harbours throughout the Moray Firth, with areas of high vessel usage located (from southeast to northwest) near Cullen, Buckie, Lossiemouth, Burghead, Nairn, the inner Moray Firth, Cromarty and Brora. With the exception of the Brora area, the southern portion of the Moray Firth SPA saw a much greater level of vessel activity than the area between the Dornoch Firth and the Helmsdale coast, which reflects the distribution of ports across the area.

3.1.1.4 Much of the recorded vessel traffic around the wider Buckie area was categorised as being associated with OWFs. This consisted of vessels predominantly travelling in an approximate north/south direction between Buckie and the OWFs situated in the Moray Firth, and also vessels associated with construction activities within the Moray West OWF export cable corridor to the north and east of Buckie.

3.1.1.5 Whilst OWF-associated vessel tracks were also commonly recorded in other areas within the Moray Firth, a greater proportion of traffic within the Nairn, Cromarty and inner Moray Firth areas was categorised as cargo or passenger vessels, with the Brora area also supporting relatively high levels of vessel activity. Fishing vessel activity was also widespread across the Moray Firth SPA.

Table 3-1: Summary of number and type of vessel tracks across the Moray Firth SPA plus 2km buffer between October 2023 and March 2024, plus September 2024, based on AIS data.

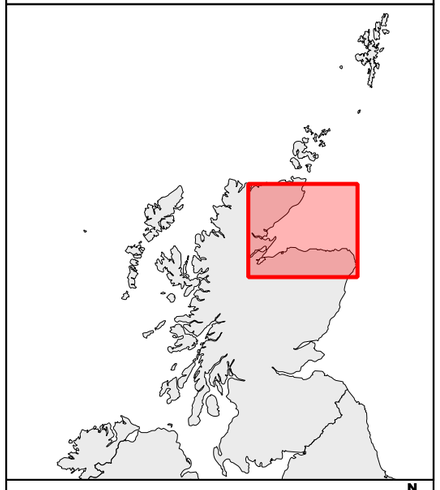
Vessel Type	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	Sep 24	Total
Cargo	245	193	238	294	285	383	219	1857
Dredging / Underwater Ops	143	104	37	105	121	229	228	967
Fishing	312	277	229	316	263	92	427	1916
Military	17	65					7	89
Moray West	201	188	394	404	524	850	960	3521
Oil and Gas	82	48	39	60	66	42	42	379
Other	240	301	204	232	287	495	405	2164
Passenger	111	48	42	47	45	119	326	738
Recreational	1642	1437	1294	1144	1179	1384	1303	9383
Survey	47	25	26	65	25	35	4	227
Tanker	76	78	59	82	75	43	39	452
Tug	38	40	143	98	62	78	722	1181
Wind Farm	793	905	1017	1130	1291	510	300	5946
Total (with Moray West)	3947	3709	3722	3977	4223	4260	4982	28820
Movements per day (with Moray West)	**127**	**124**	**120**	**128**	**146**	**137**	**166**	**135**
Total (without Moray West)	**3746**	**3521**	**3328**	**3573**	**3699**	**3410**	**4022**	**25299**
Movements per day (without Moray West)	**121**	**117**	**107**	**115**	**128**	**110**	**134**	**119**



Caledonia Array Area
Area of Search
Moray Firth Special Protection Area (SPA)

AIS (Oct-23 to Mar-24 and Sep-24)

- Cargo
- Dredging/Underwater Ops
- Fishing
- Military
- Moray West
- Oil and Gas
- Other
- Passenger
- Recreational
- Survey
- Tanker
- Tug
- Wind Farm



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01	01/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 3-1: AIS data showing vessel traffic across the Moray Firth SPA and area of search between October 2023 to March 2024, and September 2024, by vessel type

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3.2 Non-breeding Season – Area of Search 2023/24

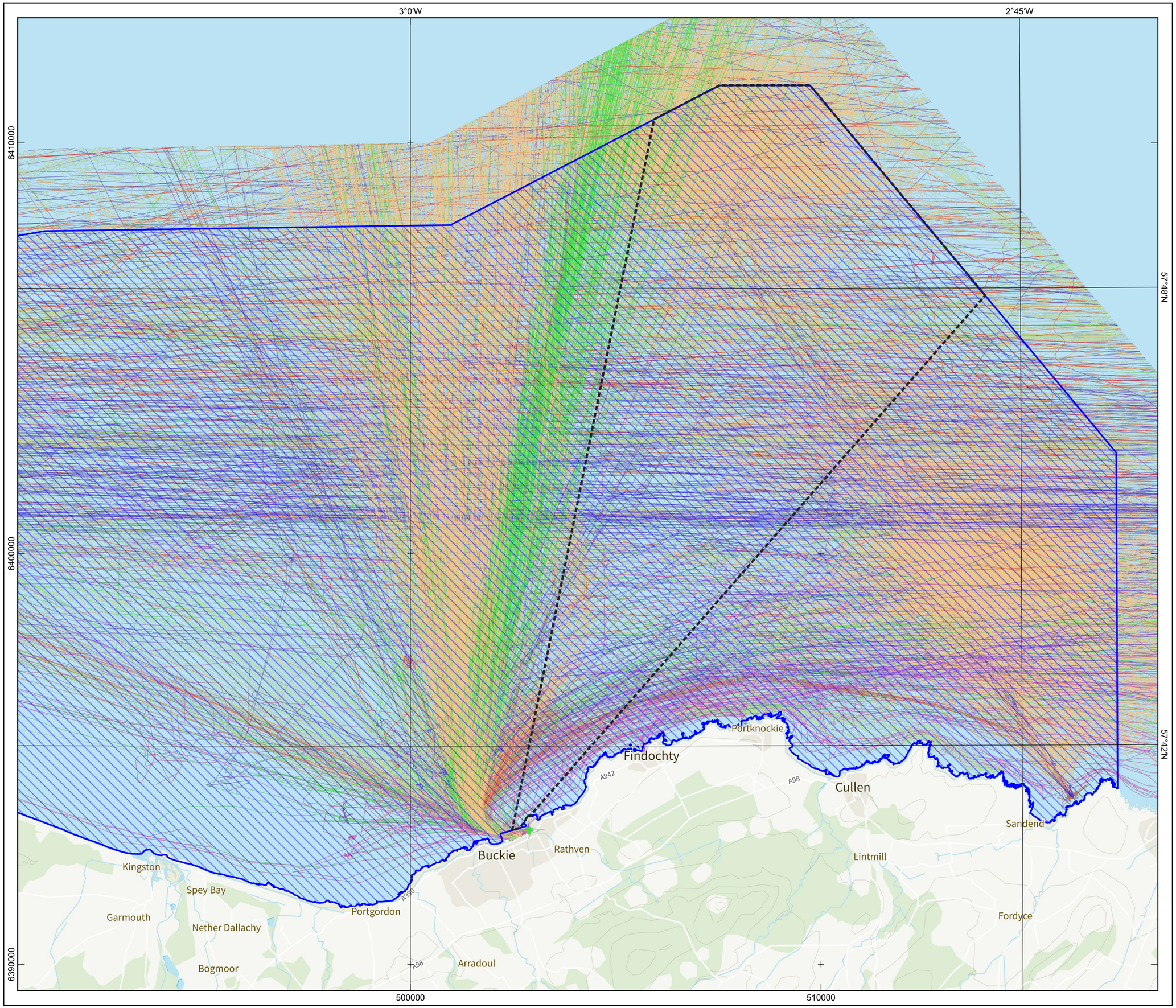
3.2.1.1 A summary of the number of tracks and vessel type (by month) recorded in the area of search between October 2023 to March 2024, and in September 2024 is presented in Table 3-2, and the distribution of vessel tracks by type and month across the area of search is presented in Figure 3–2. Totals and average tracks per day with and without Moray West vessels (which will have predominantly been construction vessels during this time period) are presented.

3.2.1.2 In total, 1,539 vessel tracks were recorded across the area of search during this time period; an average of 7 vessel tracks daily, with the minimum and maximum monthly mean values varying between 6 and 8. If Moray West OWF vessel activity is excluded, 1,124 vessel tracks were recorded across the area of search; an average of 5 unique vessel tracks daily, with the minimum and maximum monthly mean values varying between 4 and 7.

3.2.1.3 Vessel activity within the area of search broadly fell into two categories (Figure 3–2). The first was vessel traffic associated with the construction of the Moray West OWF, which was particularly prevalent in the northern half of the area of search. The second category of activity was a range of vessel types, the tracks of which were orientated in an east to west direction, with tracks present across the entire extent of the area of search. It is assumed that these tracks are vessels transiting from the North Sea to ports situated to the west of the area of search (or vice versa).

Table 3-2: Summary of number and type of vessel tracks across the area of search between October 2023 and March 2024, plus September 2024.

Vessel Type	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	Sep 24	Total
Cargo	45	37	50	34	46	42	40	294
Dredging / Underwater Ops	8	11	1		3	6	7	36
Fishing	55	14	15	24	26	13	49	196
Military	3	1					1	5
Moray West	41	66	95	83	80	46	4	415
Oil and Gas	19	9	14	21	17	14	11	105
Other	14	15	8	10	6	18	27	98
Passenger	5	1		1		3	20	30
Recreational	16	3		1	1	4	18	43
Survey	3		6	6	2	6	1	24
Tanker	19	21	21	21	19	13	14	128
Tug	6	2	19	8	2	8	4	49
Wind Farm	9	15	22	12	17	19	22	116
Total (with Moray West)	**243**	**195**	**251**	**221**	**219**	**192**	**218**	**1539**
Movements per day (with Moray West)	**8**	**7**	**8**	**7**	**8**	**6**	**7**	**7**
Total (without Moray West)	**202**	**129**	**156**	**138**	**139**	**146**	**214**	**1124**
Movements per day (without Moray West)	**7**	**4**	**5**	**4**	**5**	**5**	**7**	**5**

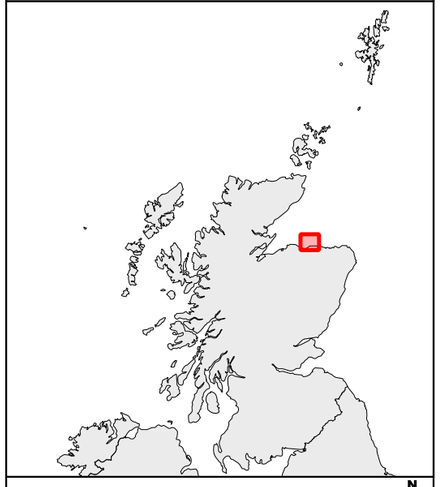


Area of Search

Moray Firth Special Protection Area (SPA)

AIS (Oct-23 to Mar-24 and Sep-24)

- Cargo
- Dredging/Underwater Ops
- Fishing
- Military
- Moray West
- Oil and Gas
- Other
- Passenger
- Recreational
- Survey
- Tanker
- Tug
- Wind Farm



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REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	01/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 3-2: AIS data showing vessel traffic across the area of search between October 2023 to March 2024, and September 2024, by vessel type

STATUS	SCALE	
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3.3 Non-breeding Season – Moray West O&M Traffic in 2024/25

3.3.1.1 A summary of the number of vessel trips from the port of Buckie associated with the Moray West OWF between September 2024 and March 2025 (by month) is presented in Table 3-3. In total, 719 vessel trips associated with the Moray West OWF were recorded from the port of Buckie during this time period. Considerably more trips were recorded in September than any other month, with trip numbers particularly low during the winter months (December to February).

3.3.1.2 Table 3-4 presents the number of days, by month, in which a particular number of Moray West OWF O&M vessel trips were recorded. Days with larger numbers of trips (more than five) were more frequent in September, October and November. No vessel activity occurred on approximately 26% of days between September 2024 and March 2025. This increased to between 32% to 42% between December and February.

3.4 Non-breeding Season – Lead up to 2020 DAS

3.4.1.1 During the day on which each 2020 DAS was conducted, and the preceding week, 648 (13th to 19th January) and 724 (2nd to 8th March) vessel tracks were recorded across the Moray Firth SPA and 2km buffer; an average of 93 and 103 unique vessel tracks per day. This is a lower level of activity than was recorded in the 2023/24 non-breeding season, when a daily average of 135 vessel movements was recorded (Table 3-1). The differences in vessel activity may be explained by the more recent AIS dataset coinciding with the ”peak” construction phase of the Moray West OWF. The 2020 AIS data coincided with some construction activity at the Moray East OWF, but this was not during the “peak “ construction period. The distributions of vessel tracks by type and time period across the Moray Firth SPA are presented in Figure 3–3 and Figure 3–4.

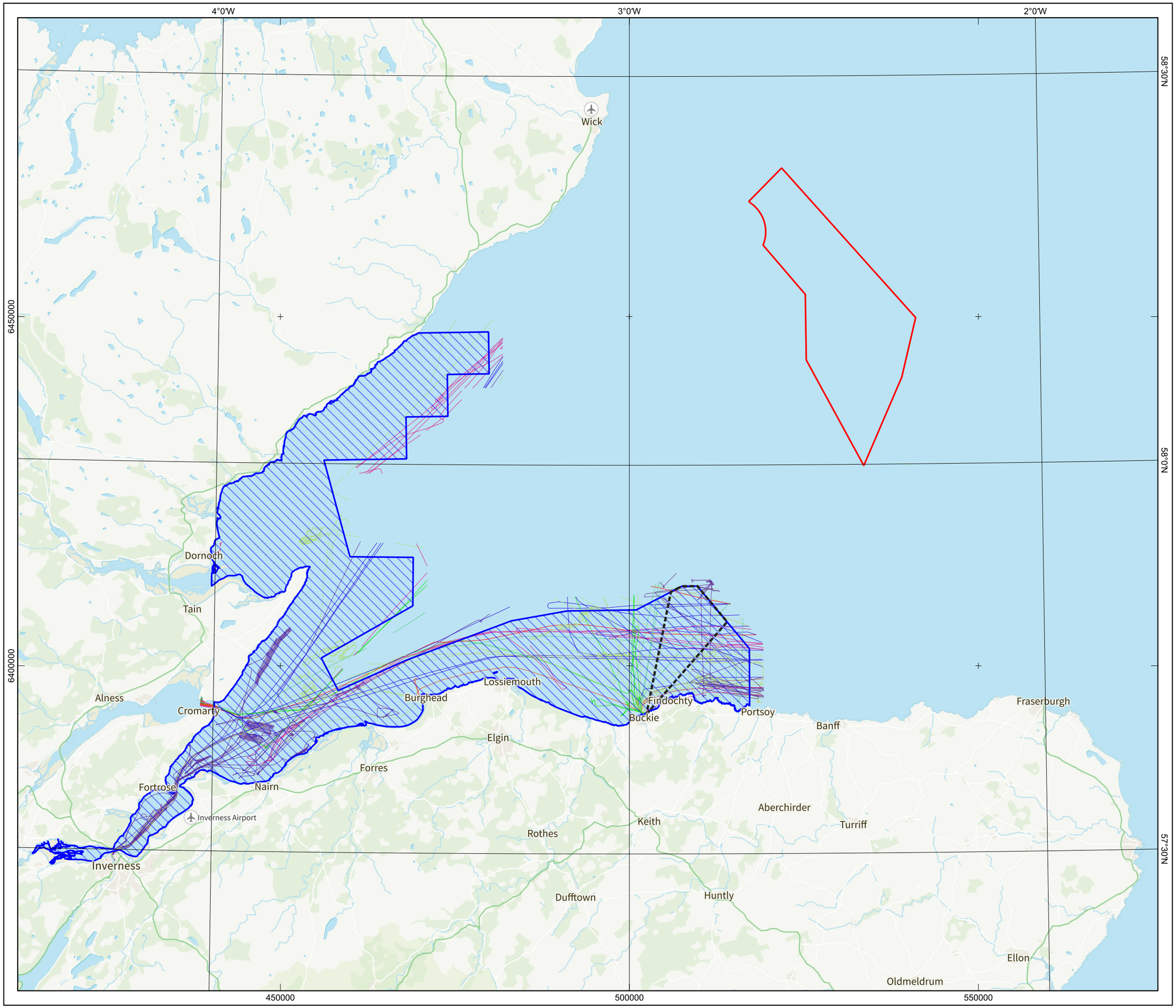
3.4.1.2 During the day on which each 2020 DAS was conducted, and the preceding week, 45 (13 to 19 January) and 47 (02 to 08 March) vessel tracks were recorded across the area of search; an average of 6 and 7 unique vessel tracks per day. This is a very similar level of activity than was recorded in the 2023/24 non-breeding season, when a daily average of 7 vessel movements was recorded (Table 3-2). The distributions of vessel tracks by type and time period across the area of search are presented in Figure 3–5.

Table 3-3: Number of O&M vessel movements associated with the Moray West OWF from the port of Buckie between September 2024 and March 2025, presented by month.

Vessel Type	Sep 24	Oct 24	Nov 24	Dec 24	Jan 25	Feb 25	Mar 25	Total
Moray West O&M	191	137	106	78	78	52	77	719
Movements per day	6	4	4	3	3	2	2	3

Table 3-4: Frequency distribution of O&M vessel movements associated with the Moray West OWF from the port of Buckie between September 2024 and March 2025, presented by month.

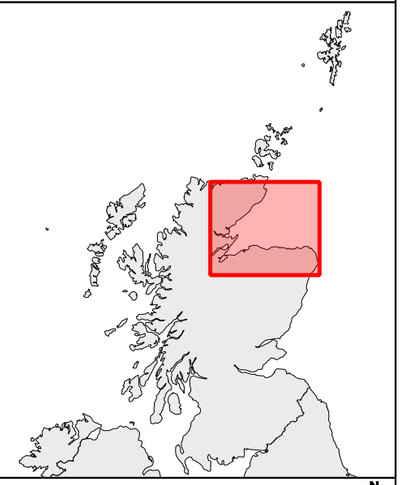
Number of Daily Vessel Movements	Sep 24	Oct 24	Nov 24	Dec 24	Jan 25	Feb 25	Mar 25	Total
0	2	6	9	13	10	10	6	56
1		5			2	1	3	11
2	3	1	2	2	1	4	4	17
3	1		1	1	3	9	10	25
4			2	4	10	4	4	24
5	2	1	8	11	5		4	31
6	2	7	5					14
7	5	5	3					13
8	10	6						16
9	5							5
Total	**30**	**31**	**30**	**31**	**31**	**28**	**31**	**212**



Caledonia Array Area
Area of Search
Moray Firth Special Protection Area (SPA)

AIS (13 Jan-20 to 19 Jan-20)

- Cargo
- Dredging/Underwater Ops
- Fishing
- Oil and Gas
- Other
- Passenger
- Recreational
- Survey
- Tanker
- Tug
- Wind Farm



0 5 10 15 20 25 km

N

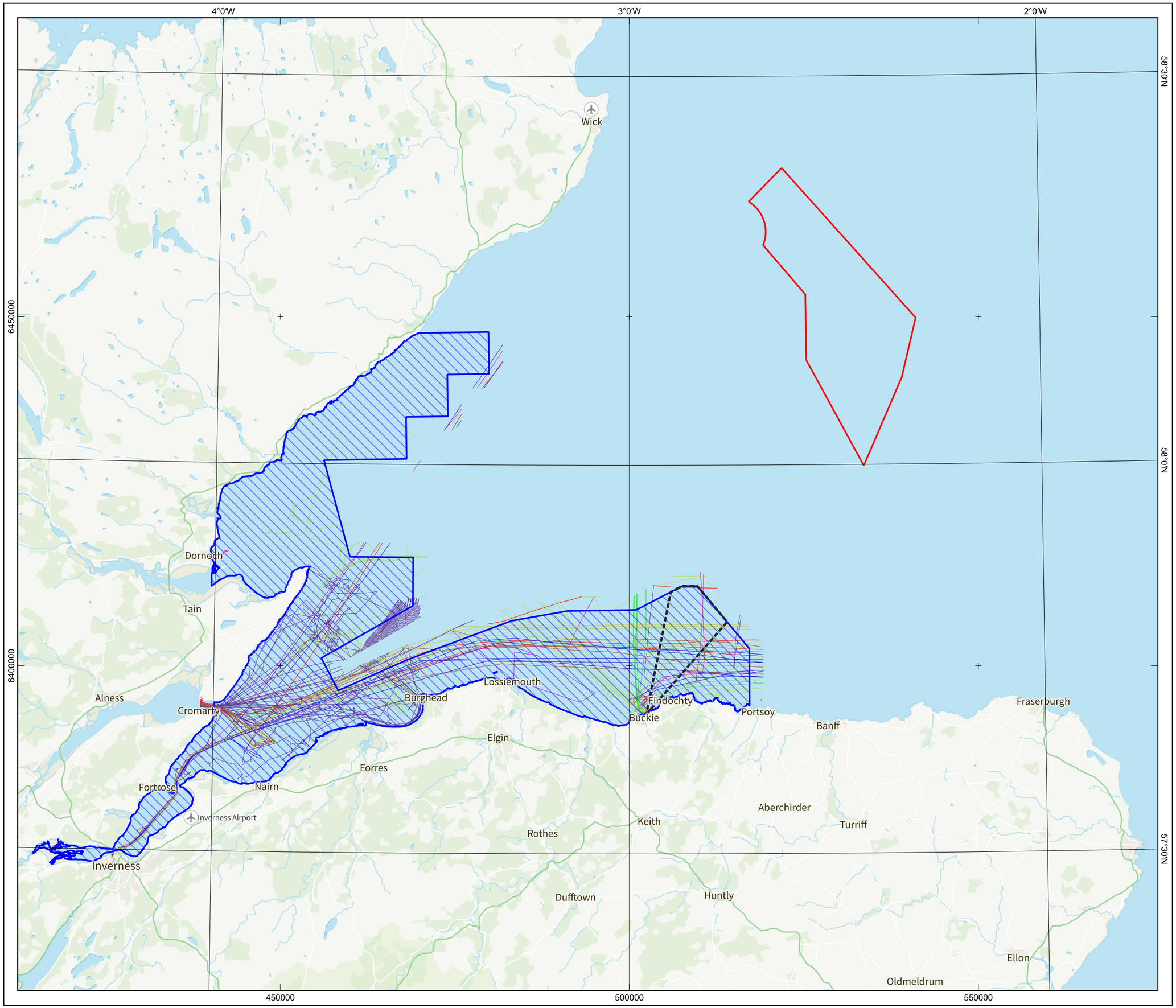
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

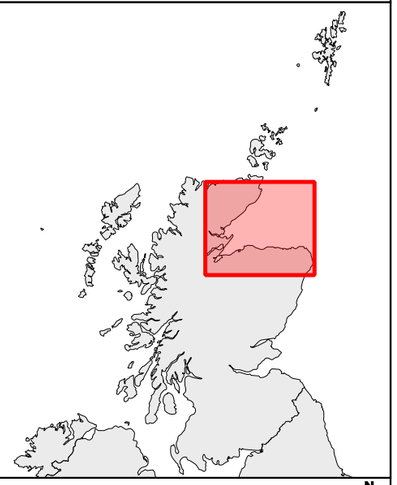
CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 3-3: AIS data showing vessel traffic across the Moray Firth SPA and area of search between 13th to 19th January 2020, by vessel type

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00017	01 of 01	01





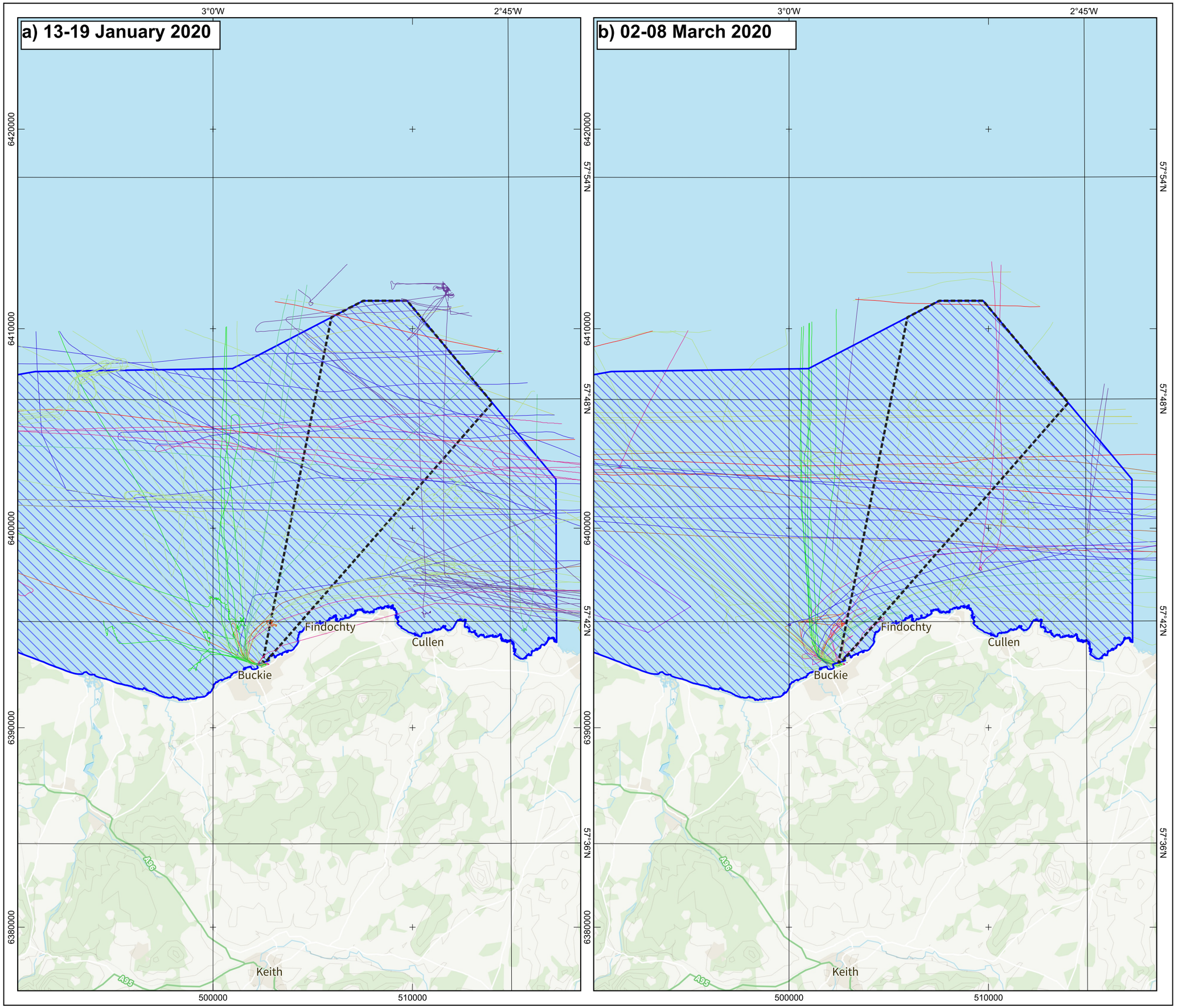
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 3-4: AIS data showing vessel traffic across the Moray Firth SPA and area of search between 2nd to 8th March 2020, by vessel type

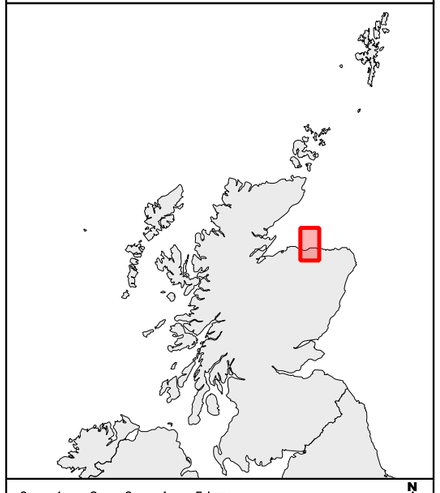
STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00019	01 of 01	01



Area of Search
Buckie Transit Area
Moray Firth Special Protection Area (SPA)

AIS

- Cargo
- Dredging/Underwater Ops
- Fishing
- Military
- Moray West
- Oil and Gas
- Other
- Passenger
- Recreational
- Survey
- Tanker
- Tug
- Wind Farm



0 1 2 3 4 5 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 3-5: AIS data showing vessel traffic across the area of search between 13th to 19th January 2020 (a) and 2nd to 8th March 2020 (b) by vessel type

STATUS	SCALE	
Information	1:175,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00018	01 of 01	01

3.5 Summary and Discussion

3.5.1.1 During the non-breeding season, it is estimated that around 120 daily unique vessel movements occur across the Moray Firth SPA depending on the month, when a nearby OWF is not in its "peak" construction period (Table 3-1). Within the area of search, an average of seven daily vessel movements occur daily depending on the month (Table 3-2). These estimates will under report the true levels of vessel activity, since vessels that do not use AIS are not included in the dataset.

3.5.1.2 The patterns observed in the frequency of Moray West OWF O&M vessel trips indicate that on average, three trips per day is typical for the non-breeding season, with reduced trip numbers likely in the winter months (December, January and February), and a higher proportion of days where no trips occur (Table 3-3 and Table 3-4). This reflects a reduction in suitable weather conditions for O&M works in the winter months. In general, routine O&M activity is scheduled at times of year when weather conditions are expected to be more favourable. This means that it can be expected that O&M vessel activity is typically lower during the "peak" non-breeding season months (i.e., November to February) when compared to other times of year. On days where Moray Firth OWF O&M vessel activity occurred, boats left the O&M base together in the morning on roughly a similar outbound course, and returned separately, generally between 1500 and 1700. This means that the outbound trips would frequently result in a single disturbance event, rather than three separate ones. It should also be noted that O&M vessel activity does not routinely occur at night.

3.5.1.3 Examination of vessel traffic in the lead up to the 2020 DAS indicates that the frequency of vessel traffic across the Moray Firth SPA and area of search was lower than, yet still relatively comparable to that reported in 2023/24. The assessment of potential impacts therefore assumes that since no substantial changes to vessel activity have occurred between the 2020 DAS and the time at which the assessment has been performed, the distribution of birds will have also remained comparable, all other factors being equal.

3.5.1.4 It is concluded that the Moray Firth SPA (and the area of search) is a relatively busy area with respect to vessel traffic, and that modelled distributions of birds used to perform the assessments presented in the assessment of potential impacts are reflective of this vessel activity. The predicted increase in overall vessel traffic within the area of search due to O&M vessel activities as a result of the Proposed Development (Offshore) is relatively modest, with a maximum of several additional daily vessel movements anticipated beyond the minimum of six to eight unique daily movements which already occur in the area of search, and the 120+ unique movements that occur daily across the wider Moray Firth SPA. It is likely that during the middle of the non-breeding season in particular, increases in existing vessel activity will be very small, and will likely be considerably less frequent than indicated by the maximum scenario.

4 Assessment of Potential Impacts

4.1 Common Scoter

4.1.1 Evidence for Sensitivity to Vessel Disturbance

4.1.1.1 Common scoter is known to be sensitive to disturbance and displacement by vessel traffic with high certainty (Wade *et al*., 2016[6]). During the non-breeding season, Schwemmer *et al*. (2011[7]) reported a median flight initiation distance of 804m (sample size of 210 events) for common scoter, whilst flight initiation distances of between 0m to 1,000m were observed by Larsen and Laube (2005[8]). The mean escape distance (and sample size) reported by Fliessbach *et al*. (2019[9]) was considerably higher than the other data sources for both individuals and groups (Table 4-1). In addition, common scoter was assessed to have a high sensitivity to human disturbance by Goodship and Furness (2019[10]) in the context of hand-harvesting of seaweed.

4.1.1.2 For this assessment a displacement buffer of 2,000m was selected. This means that the area of search for this species occupies an area of approximately 153km^2, or 8.7% of the total area of the Moray Firth SPA.

Table 4-1: Mean escape distances, standard deviations, and sample sizes of observations for common scoter (individuals and flocks), reproduced from Fliessbach *et al*. (2019[9]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Common scoter	1,600 (+/- 777) (n=9,417)	1,015 (+/- 727) (n=591)

4.1.2 Moray Firth SPA Population Estimates

4.1.2.1 Key Moray Firth SPA population estimates for this species are summarised in Table 4-2.

Table 4-2: Key population estimates for common scoter within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	5,479 (mean peak)
Lawson *et al*. (2015[4])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	2,544 (mean peak)
Scott *et al*. (2023[2])	19/01/2020	DAS, block bootstrap estimation method	10,336 (95% CIs 200 – 25,284)

4.1.3 Density and Abundance of Birds within Area of Search plus Buffer

4.1.3.1 Key abundance and density metrics of birds within the area of search plus the displacement buffer, and for the whole Moray Firth SPA, are presented in Table 4-3. These were extracted from data produced by Scott *et al*. (2023[2]).

Table 4-3: Density and abundance of common scoter in the area of search and the Moray Firth SPA extracted from 2020 DAS data (Scott *et al*. 2023[2]).

Parameter	Scott *et al*. (2023[2]), 19/01/2020, block bootstrap method	Scott *et al*. (2023[2]), 08/03/2020, block bootstrap method
Abundance: area of search plus 2,000m	0	1.15
Abundance: Moray Firth SPA	10,336	2,607
% of population within area of search	0	0.04
Mean density (with 95% CIs): area of search plus 2,000m (n/km^2)	0	0.01 (0.00 – 0.05)
Max density: area of search plus 2,000m (n/km^2)	0	0.08
Mean density (with 95% CIs): Moray Firth SPA (n/km^2)	5.69 (0.00 – 60.28)	1.30 (0.00 – 12.81)
Max density: Moray Firth SPA (n/km^2)	581.30	25.07

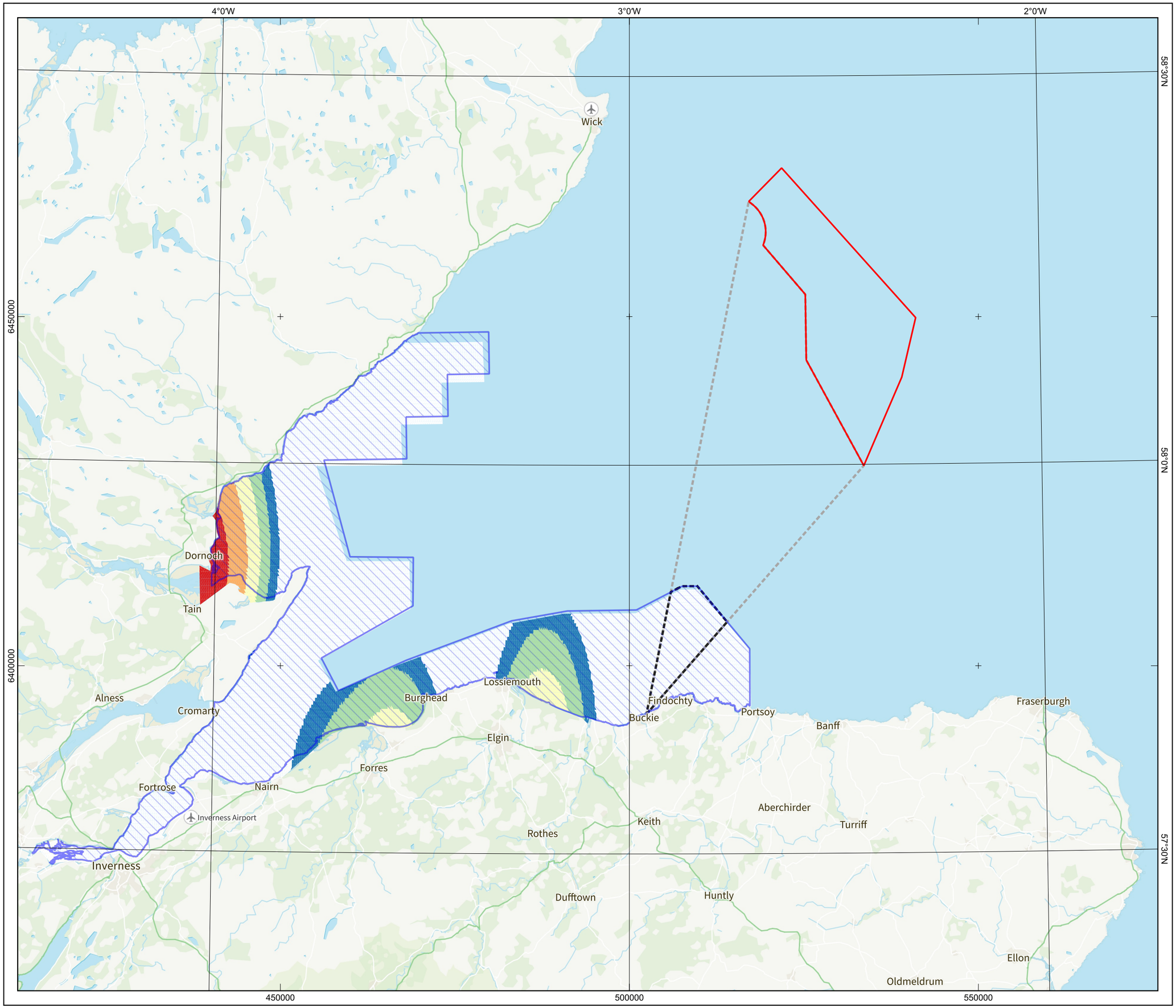
4.1.4 Moray Firth SPA Population Distribution

4.1.4.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[3]) states that within the SPA, common scoters have been recorded most frequently close inshore between Burghead and Nairn, around the mouth of the inner Dornoch Firth, at Spey Bay and on the Riff Bank. Observations in 2019 and 2020 indicate that the inshore shallow sandy coast of Golspie to Embo also has importance as a foraging zone. The key supporting processes for common scoter in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow (NatureScot, 2022[3]). In general, birds tend to be found in shallow (<20m depth) waters at distances of around 500m to 2km of coastlines.

4.1.4.2 Based on the 2020 DAS data, common scoter are not especially widely distributed within the Moray Firth SPA, tending instead to occur in particular areas in large aggregations. This is reflected in the large confidence intervals around the mean abundance and density estimates for the Moray Firth SPA presented in Table 4-2 and Table 4-3 respectively.

4.1.4.3 Aggregations of birds were recorded in the 2020 DAS around the mouth of the inner Dornoch Firth between Burghead and Nairn (located approximately 50km from the area of search), Culbin Bar (located approximately 40km from the area of search), and in Spey Bay (located approximately 8km from the area of search) (Figure 4–1 and Figure 4–2). The highest modelled densities of birds were predicted to occur in nearshore locations. Scott *et al*. (2023[2]) noted that similar patterns of distribution were evident from previous surveys, which was confirmed by figures presented in MacArthur Green (2024[5]). Together, this suggests a longstanding preference for coastal, inshore areas by this species.

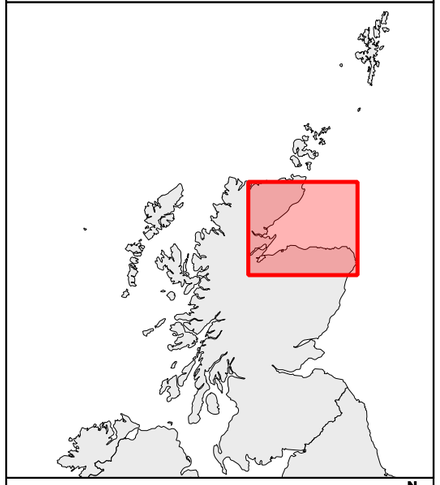
4.1.4.4 The locations of the recorded aggregations and modelled densities from the 2020 DAS do not overlap with the area of search, which is reflected in the low density and abundance estimates for this area presented in Table 4-3. It is noted that this species may have a different distribution across the Moray Firth SPA at night, due to its known tendency to move into offshore roosting areas during this time.



Caledonia Array Area
Area of Search
Buckie Transit Area
Moray Firth Special Protection Area (SPA)

Modelled density of Common Scoter (birds/km2)

- 0 - 1
- 1 - 2
- 2 - 4
- 4 - 8
- 8 - 16
- 16 - 25



0 5 10 15 20 25 km

N

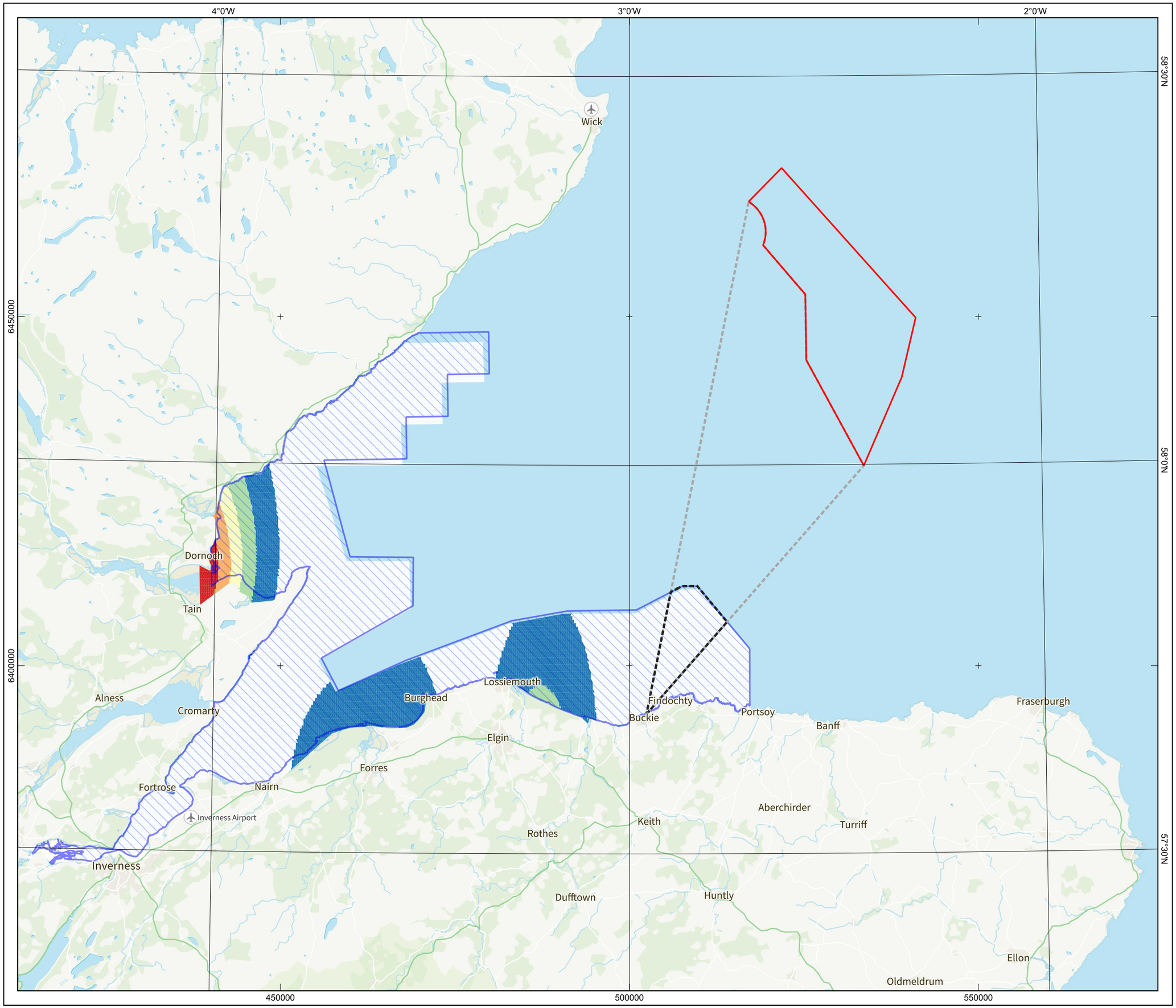
01	02/10/2025	Information	TG	RI	AS
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 4-1: Modelled distribution of common scoter based on digital aerial survey data collected on 19th January 2020

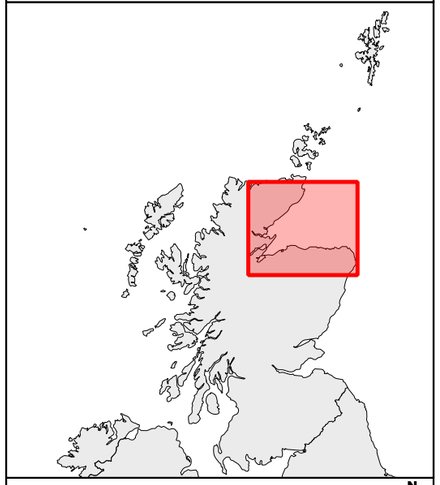
STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00020	01 of 01	01



Caledonia Array Area
Area of Search
Buckie Transit Area
Moray Firth Special Protection Area (SPA)

Modelled density of Common Scoter (birds/km2)

- 0 - 1
- 1 - 5
- 5 - 10
- 10 -15
- 15 - 20
- 20 - 25



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE

Figure 4-2: Modelled distribution of common scoter based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00021	01 of 01	01

4.1.5 Assessment of Potential Impacts

4.1.5.1 Modelled abundances from the January 2020 and March 2020 DAS data indicated that a peak of 1.15 birds (0.04% of the Moray Firth SPA population for that survey) were predicted to be present in the area of search (Table 4-3). The literature and data sources examined indicate that within the Moray Firth SPA, the area of search (which occupies 8.7% of the total area of the Moray Firth SPA when the relevant displacement buffer is included) is of low importance to common scoter. The areas where higher numbers of birds were predicted by modelled density surfaces based on the 2020 DAS (Figure 4–1 and Figure 4–2), and on other sources of information, are not located sufficiently close to the area of search for direct impacts due to O&M vessels associated with the Proposed Development (Offshore) to occur on the habitats within these areas, or the birds using them.

4.1.5.2 Of the very small number of birds predicted to be present in the area of search by the 2020 DAS (peak of 1.15; Table 4-3), a proportion would be subject to disturbance and displacement impacts at a given time due to their proximity to O&M vessel transits associated with the Proposed Development (Offshore). Of those, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.1.5.3 The high levels of existing vessel activity within both the area of search (Figure 3–2) and much of the wider Moray Firth SPA (Figure 3–1) suggest that disturbance and displacement of birds is part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.1.5.4 The numbers of birds involved is very small relative to the wider Moray Firth SPA population (0.04% of the total; Table 4-3), and therefore it is not considered that effects of any type at the population level are likely.

4.1.5.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by O&M vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.1.5.6 Common scoter distributions are heavily associated with coastal, shallow waters, meaning that the area of search is in the main unlikely to represent key habitat for this species. Whilst distributions of this species may differ at night, no impacts are considered to be possible as no O&M vessel activity will routinely occur at this time.

4.1.5.7 In summary, it is not considered that the addition of three return vessel trips per day across the area of search would materially impact the abundance or distribution of common scoter in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts (Table 4-4). It is therefore concluded that the O&M vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the common scoter qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-4: Assessment of predicted impacts on common scoter qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA common scoter population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of common scoter within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the area of search and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, common scoter will continue to have access to and utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for common scoter in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow. Small increases in the number of vessel movements confined to the area of search, with adherence to best practice procedures detailed by the Vessel Management Plan (VMP) to minimise disturbance, mean that no impacts on Moray Firth SPA common scoter are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.2 Eider

4.2.1 Evidence for Sensitivity to Vessel Disturbance

4.2.1.1 Furness (2013[11]) indicated that this species was moderately sensitive to disturbance by vessel traffic relative to others, being allocated a score of three (out of five, where five was the most sensitive). More recently, the certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as moderate (Wade *et al*., 2016[6]).

4.2.1.2 Eider was assessed to have a medium/high sensitivity to human disturbance by Goodship and Furness (2019[10]) in the context of hand-harvesting of seaweed, with vessel-mediated disturbance cited by the authors as being understood to be relatively strong for this species.

4.2.1.3 During the non-breeding season, identified literature indicated a median flight initiation distance of 208m (sample size of 154 events) (Schwemmer *et al*., 2011[7]), between 0m to 1,000m in the case of Larsen and Laube (2005), and 30m to 400m, with a mean of 177m in a Norwegian study based on a sample size of 48 flocks (Dehnhard *et al*., 2020[12]). The mean escape distance reported by Fliessbach *et al*. (2019[9]) was similar for both individuals and groups, with this study reporting a large sample size (Table 4-5).

4.2.1.4 For this assessment, a displacement buffer of 1,000m was selected for this species. This means that the area of search for this species occupies an area of approximately 123km^2, or 7.0% of the total area of the Moray Firth SPA.

Table 4-5: Mean escape distances, standard deviations, and sample sizes of observations for eider (individuals and flocks), reproduced from Fliessbach *et al*. (2019[9]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Eider	277 (+/- 218) (n=1496)	255 (+/- 195) (n=290)

4.2.2 Moray Firth SPA Population Estimates

4.2.2.1 Key Moray Firth SPA population estimates for this species are summarised in Table 4-6.

Table 4-6: Key population estimates for eider within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation, Lawson *et al*. (2015[4])	2001/02 to 2005/06	Visual aerial surveys, distance analysis	1,733 (mean peak)
Scott *et al*. (2023[2])	19/01/2020	DAS, block bootstrap estimation method	4,091 (95% CIs 612 – 12,182)
	08/03/2020	DAS, block bootstrap estimation method	3,316 (95% CIs 1,105 – 6,148)

4.2.3 Density and Abundance of Birds within Area of Search plus Buffer

4.2.3.1 Key abundance and density metrics of birds within the area of search plus the displacement buffer, and for the whole Moray Firth SPA, are presented in Table 4-7. These were extracted from data produced by Scott *et al*. (2023[2]).

Table 4-7: Density and abundance of eider in the area of search and the Moray Firth SPA extracted from 2020 DAS data (Scott *et al*. 2023[2]).

Parameter	Scott *et al*. (2023[2]), 19/01/2020, block bootstrap method	Scott *et al*. (2023[2]), 08/03/2020, block bootstrap method
Abundance: area of search plus 1,000m	No data (model did not produce density surface)	21.49
Abundance: Moray Firth SPA	4,091	3,316
% of population within area of search	No data (model did not produce density surface)	0.65
Mean density (with 95% CIs): area of search plus 1,000m (n/km^2)	No data (model did not produce density surface)	0.18 (0.02 – 0.55)
Max density: area of search plus 1,000m (n/km^2)	No data (model did not produce density surface)	0.66
Mean density (with 95% CIs): Moray Firth SPA (n/km^2)	No data (model did not produce density surface)	1.65 (0.00 – 14.03)
Max density: Moray Firth SPA (n/km^2)	No data (model did not produce density surface)	24.44

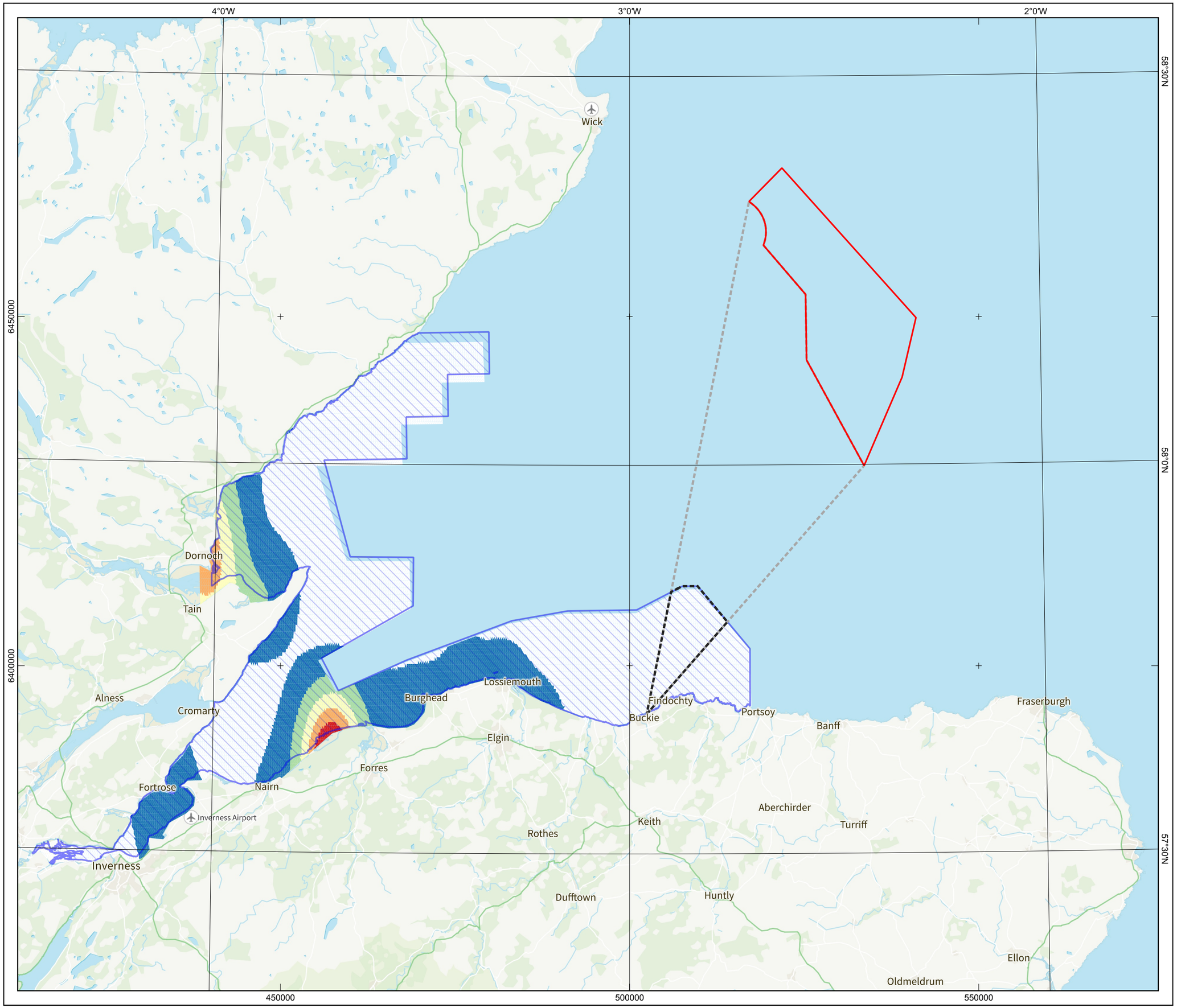
4.2.4 Moray Firth SPA Population Distribution

4.2.4.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[3]) does not provide specific information with regard to eider distribution. However, in Scotland, the advice notes that they can be found in sheltered bays with rocky, stony or hard substrates associated with their main prey items. Foraging in these habitats occurs on the seabed. Open waters are also used for loafing, moulting and roosting. The key supporting processes for eiders in the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[3]).

4.2.4.2 Eider were recorded in the 2020 DAS in the Nairn and Culbin Bar areas in the January 2020 survey (located approximately 40km from the area of search), with the model failing to produce a density surface. In the March survey, modelled distributions indicated higher numbers of birds distributed around the outer Dornoch Firth and Loch Fleet and the Nairn coast (Figure 4–3), which are located approximately 50km and 40km respectively from the area of search. The highest modelled densities of birds were predicted to occur in nearshore locations. Modelled distributions based on data from 2001 to 2007 indicated a preference for coastal waters between Burghead and Lossiemouth, with waters off the Nairn coast also predicted to support higher numbers of birds (MacArthur Green, 2024[5]). The distribution of birds

in both the most recent data, and also older sources, reflects the species strong preference for nearshore waters, and suggests relatively consistent habitat selection over an extended period of time.

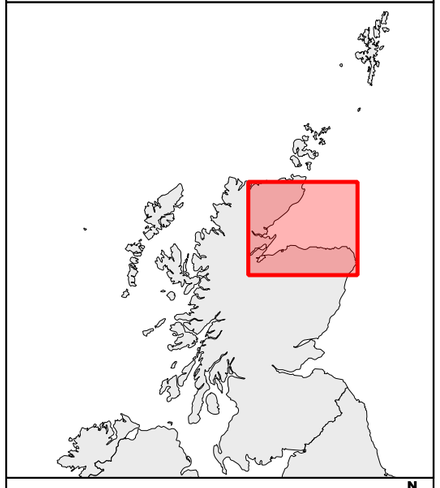
4.2.4.3 The lack of overlap between areas supporting higher numbers of birds and the area of search is reflected in the low density and abundance estimates for the area of search relative to the wider Moray Firth SPA, as presented in Table 4-7. It is noted that this species may have a different distribution across the Moray Firth SPA at night, due to its known tendency to move into offshore roosting areas during this time.



Caledonia Array Area
Area of Search
Buckie Transit Area
Moray Firth Special Protection Area (SPA)

Modelled density of Eider (birds/km2)

- 0 - 1
- 1 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE

Figure 4-3: Modelled distribution of eider based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00022	01 of 01	01

4.2.5 Assessment of Potential Impacts

4.2.5.1 Modelled abundances from the 2020 DAS indicate that a peak of 21.49 birds were predicted to be present within the area of search (Table 4-7), representing a peak of 0.65% of the Moray Firth SPA population despite the area of search occupying 7.0% of the SPAs total area. The literature and data sources examined indicate that within the Moray Firth SPA, the area of search (including the relevant buffer) is of relatively low importance to Moray Firth SPA eider. The areas where higher numbers of birds were predicted by modelled density surfaces based on the 2020 DAS (Figure 4–3), and on other sources of information, are not located sufficiently close to the area of search for direct impacts due to O&M vessels associated with the Proposed Development (Offshore) to occur on the habitats within these areas, or the birds using them.

4.2.5.2 Of the small number of birds predicted to be present in the area of search (peak of 21.49; Table 4-7), a proportion would be subject to disturbance and displacement impacts at a given time due to their proximity to O&M vessel transits associated with the Proposed Development (Offshore). Of those, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.2.5.3 The high levels of existing vessel activity within both the area of search (Figure 3–2) and much of the wider Moray Firth SPA (Figure 3–1) suggest that disturbance and displacement of birds is part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.2.5.4 The numbers of birds involved is small relative to the wider Moray Firth SPA population (0.65% of the total; Table 4-7), and therefore it is not considered that effects of any type at the population level are likely.

4.2.5.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by O&M vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.2.5.6 Eider distributions in the Moray Firth SPA are heavily associated with coastal waters, meaning that the area of search is in the main unlikely to represent key habitat for this species. Whilst distributions of this species

may differ at night, no impacts are considered to be possible as no O&M vessel activity will routinely occur at this time.

4.2.5.7 In summary, it is not considered that the addition of three return vessel trips per day across the area of search would materially impact the abundance or distribution of eider in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts (Table 4-8). It is therefore concluded that the O&M vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the eider qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-8: Assessment of predicted impacts on eider qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will therefore not prevent the Moray Firth SPA eider population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of eider within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the area of search and so no impacts on these habitats or the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, eider will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for eiders at the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow. Small increases in the number of vessel movements confined to the area of search, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA eider are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.3 Goldeneye

4.3.1 Evidence for Sensitivity to Vessel Disturbance

4.3.1.1 Goldeneye was assessed to have a high sensitivity to human disturbance by Goodship and Furness (2019[10]) in the context of hand-harvesting of seaweed, with a suggested buffer zone during the non-breeding season of 150m to 800m. A variety of data sources were included by this study as evidence for non-breeding season disturbance; motorized watercraft disturbance was identified as causing mean flight initiation distances of 640m and 765m in a Danish study, whilst a UK source recorded flight initiation distances of between 550m to 700m due to disturbance by a motorboat. This species was not included in Fliessbach *et al*. (2019[9]). The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[6]).

4.3.1.2 For this assessment, a displacement buffer of 1,000m was selected based on the information outlined above. This means that the area of search for this species occupies an area of approximately 123km^2, or 7.0% of the total area of the Moray Firth SPA.

4.3.2 Moray Firth SPA Population Estimates

4.3.2.1 Key Moray Firth SPA population estimates for this species are summarised in Table 4-9.

Table 4-9: Key population estimates for goldeneye within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	907 (mean peak)
Lawson *et al*. (2015[4])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	74 (mean peak)
Scott *et al*. (2023[2])	19/01/2020	DAS, block bootstrap estimation method	55 (95% CIs 12 – 107)
		DAS, block bootstrap estimation method	109 (95% CIs 6 – 285)

4.3.3 Density and Abundance of Birds within Area of Search plus Buffer

4.3.3.1 Key abundance and density metrics of birds within the area of search plus the displacement buffer, and for the whole Moray Firth SPA, are presented in Table 4-10. These were extracted from data produced by Scott *et al*. (2023).

Table 4-10: Density and abundance of goldeneye in the area of search and the Moray Firth SPA extracted from 2020 DAS data (Scott *et al*. 2023[2]).

Parameter	Scott *et al*. (2023[2]), 19/01/2020, block bootstrap method	Scott *et al*. (2023[2]), 08/03/2020, block bootstrap method
Abundance: area of search plus 1,000m	No data (model did not produce a meaningful density surface)	0.85
Abundance: Moray Firth SPA	55	109
% of population within area of search	No data (model did not produce a meaningful density surface)	0.78
Mean density (with 95% CIs): area of search plus 1,000m (n/km^2)	No data (model did not produce a meaningful density surface)	0.01 (0.00 – 0.01)
Max density: area of search plus 1,000m (n/km^2)	No data (model did not produce a meaningful density surface)	0.01
Mean density (with 95% CIs): Moray Firth SPA (n/km^2)	No data (model did not produce a meaningful density surface)	0.05 (0.00 – 0.64)
Max density: Moray Firth SPA (n/km^2)	No data (model did not produce a meaningful density surface)	0.97

4.3.4 Moray Firth SPA Population Distribution

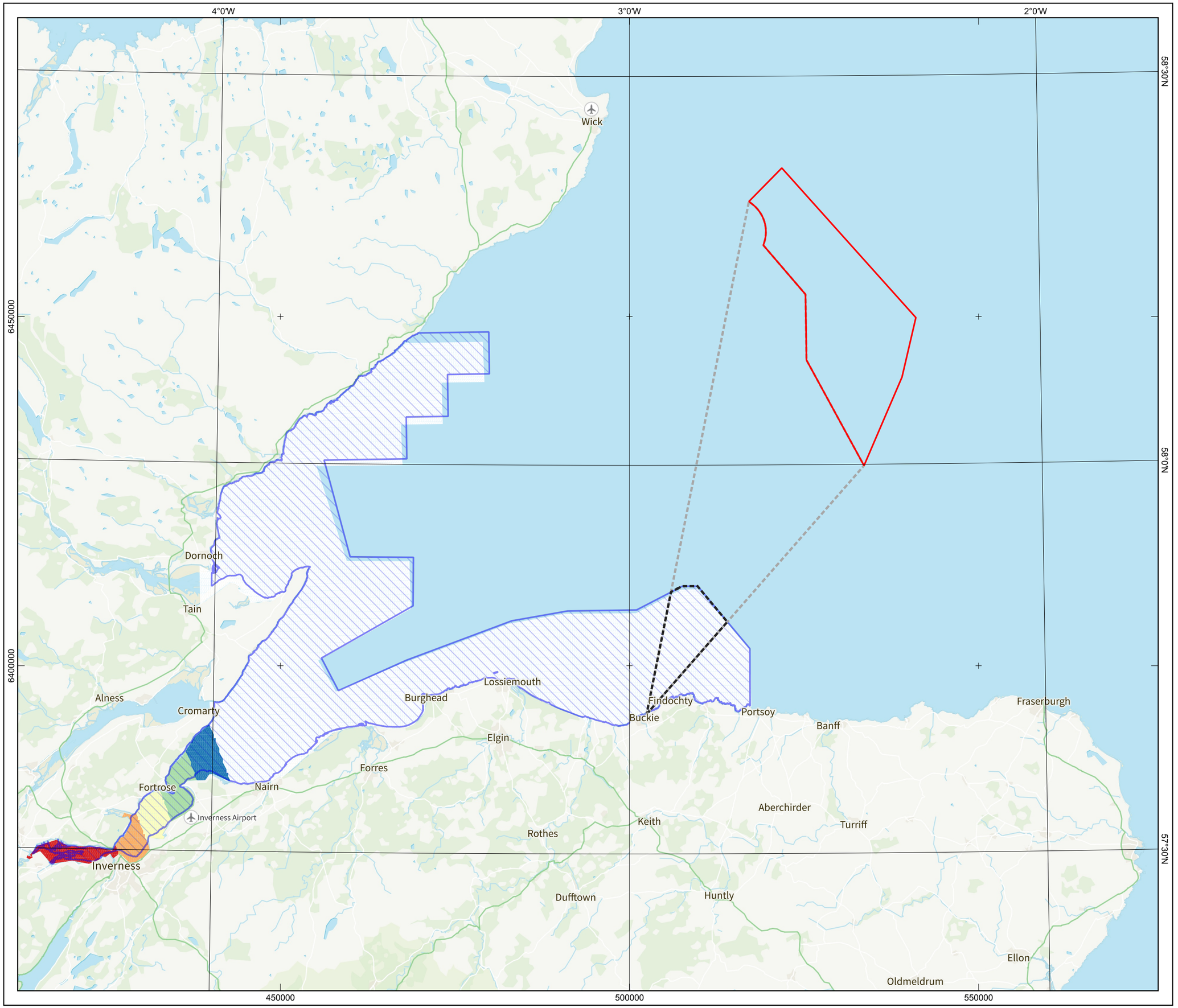
4.3.4.1 Goldeneye use a range of freshwater, brackish and marine waters in the non-breeding season and are commonly associated with estuaries (NatureScot, 2022[3]). The key supporting processes for goldeneye in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow (NatureScot, 2022[3]).

4.3.4.2 Goldeneye were recorded in coastal locations during the 2020 DAS, with the model failing to produce a density surface for the January 2020 survey. In the March 2020 survey, modelled distributions indicated higher numbers of birds distributed around the inner Moray Firth (located approximately 70km from the area of search) compared with the rest of the Moray Firth SPA (Figure 4–4). The highest modelled density of birds was predicted to

occur to the west of Inverness. Distributions of birds recorded in both DAS is reflective of the known preference that this species has for inshore waters during the non-breeding season.

4.3.4.3 The distribution of observations from 2001 to 2006 indicated a preference for coastal locations, with the inner Moray Firth being the locations where the highest numbers of birds were recorded. Birds were restricted to inshore areas, reflecting their preference for shallow waters (MacArthur Green, 2024[5]).

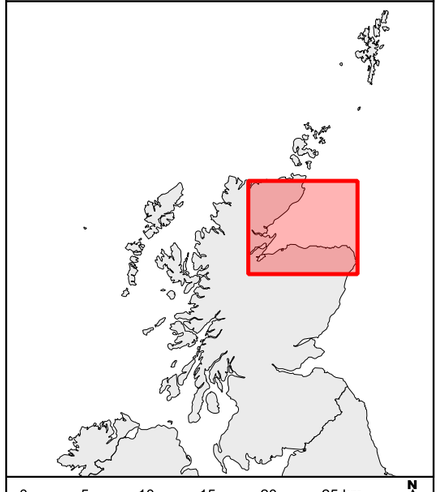
4.3.4.4 The locations of higher numbers of birds do not overlap with the area of search, which is reflected in the low density and abundance estimates for this area relative to the wider Moray Firth SPA, as presented in Table 4-10.



Caledonia Array Area
Area of Search
Buckie Transit Area
Moray Firth Special Protection Area (SPA)

Modelled density of Goldeneye (birds/km2)

- 0 - 0.1
- 0.1 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE

Figure 4-4: Modelled distribution of goldeneye based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00023	01 of 01	01

4.3.5 Assessment of Potential Impacts

4.3.5.1 In the 2020 DAS, a peak of 0.85 birds were predicted to be present within the area of search, representing 0.78% of the population of the Moray Firth SPA (Table 4-10), despite the area of search occupying 7.0% of the SPAs total area. The literature and data sources examined indicate that within the Moray Firth SPA, the area of search (including the relevant buffer) is of relatively low importance to Moray Firth SPA goldeneye. The areas where higher numbers of birds were predicted by modelled density surfaces based on the 2020 DAS (Figure 4–4), and on other sources of information, are not located sufficiently close to the area of search for direct impacts due to O&M vessels associated with the Proposed Development (Offshore) to occur on the habitats within these areas, or the birds using them.

4.3.5.2 Of the small number of birds present in the area of search (peak of 0.85; Table 4-10), a proportion would be subject to disturbance and displacement impacts at a given time due to their proximity to O&M vessel transits associated with the Proposed Development (Offshore). Of those, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.3.5.3 The high levels of existing vessel activity within both the area of search (Figure 3–2) and much of the wider Moray Firth SPA (Figure 3–1) suggest that disturbance and displacement of birds is part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.3.5.4 The numbers of birds involved is small relative to the wider Moray Firth SPA population (0.78% of the total; Table 4-10), and therefore it is not considered that effects of any type at the population level are likely. Goldeneye distributions in the Moray Firth SPA are heavily associated with coastal waters and estuaries, meaning that the area of search is in the main unlikely to represent key habitat for this species.

4.3.5.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by O&M vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.3.5.6 In summary, it is not considered that the addition of three return vessel trips per day across the area of search would materially impact the abundance or distribution of goldeneye in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts (Table 4-11). It is therefore concluded that the O&M vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the goldeneye qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-11: Assessment of predicted impacts on goldeneye qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	No detectable mortality of this qualifying feature is predicted due to the impacts considered by this assessment. The predicted impacts will therefore not prevent the Moray Firth SPA goldeneye population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of goldeneye within the Moray Firth SPA is anticipated as a result of the predicted impacts. The predicted impacts will therefore not contribute to this objective not being met.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the area of search and so no direct impacts on the birds within them are predicted. It is therefore anticipated that despite the predicted impacts, goldeneye will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for goldeneye in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow (NatureScot, 2022). Small increases in the number of vessel movements confined to the area of search, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA goldeneye are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.4 Great Northern Diver

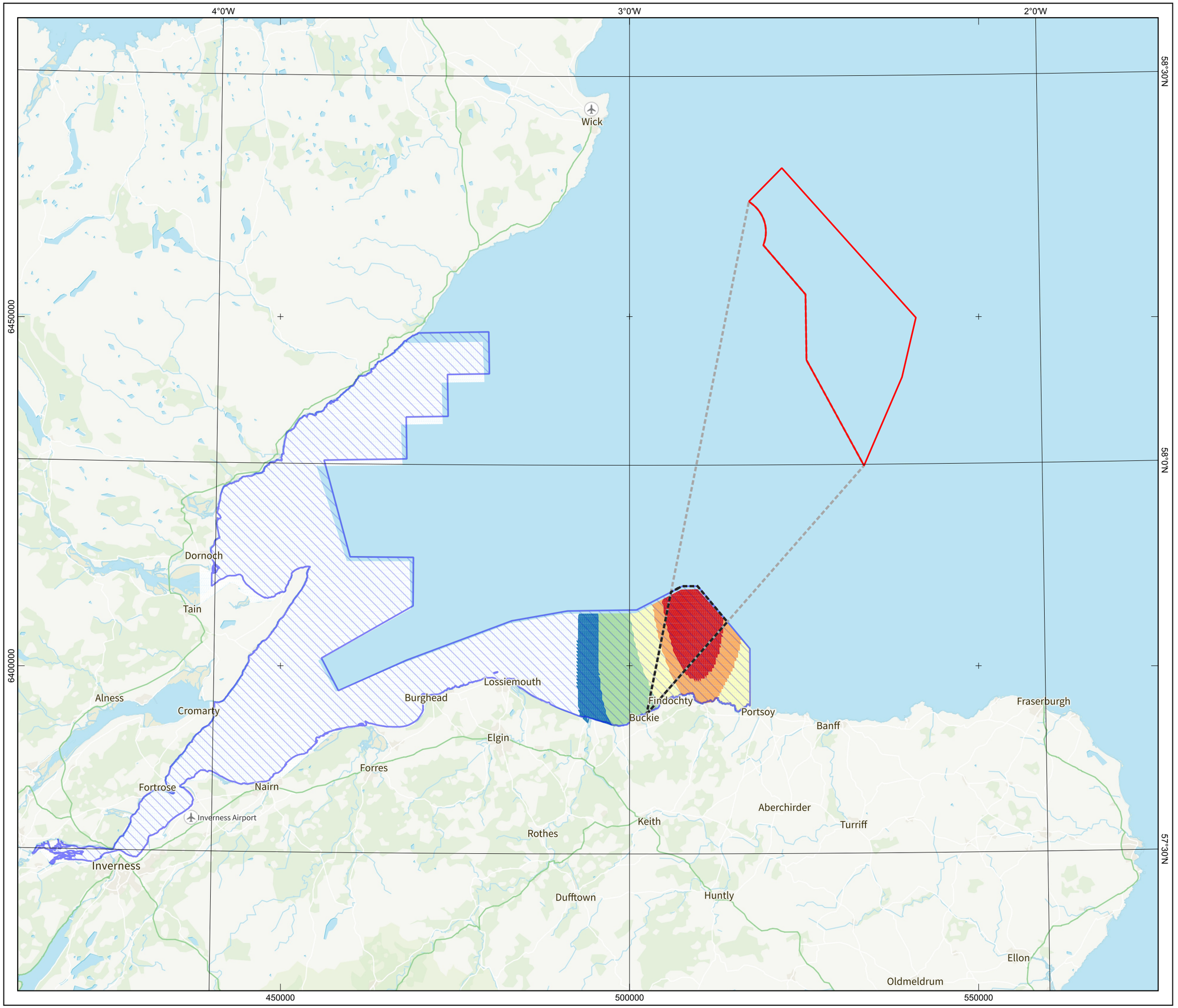
4.4.1 Evidence for Sensitivity to Vessel Disturbance

4.4.1.1 Compared to other diver species, less published information on disturbance and displacement distances is available; this species was not included in Fliessbach *et al*. (2019[9]), and the certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as very high by Wade *et al*. (2016[6]).

4.4.1.2 Jarrett *et al*. (2018[13]) noted diving in response to the presence of a passing ferry at 200m to 300m, and swimming responses at several kilometres, but categorised the sensitivity of this species to disturbance as high (rather than very high for red-throated diver). During their experimental work, it was noted that great northern divers were not observed flying in response to nearby marine activity, instead swimming or diving in its presence. Gittings *et al*. (2015[14]) suggested that in Galway Harbour, great northern diver responses to vessel activity occurred at lower distances than for red-throated diver.

4.4.1.3 Great northern diver was assessed to have a high sensitivity to human disturbance by Goodship and Furness (2019[10]) in the context of hand-harvesting of seaweed, with similar conclusions reached by Furness *et al*. (2013[11]).

4.4.1.4 For this assessment, a displacement buffer of 2,000m was selected, to ensure that this species was treated in the same way as other species which are regarded as being highly sensitive to human disturbance by some of the information sources cited above. This is considered particularly precautionary given that great northern divers do appear to frequently continue to use habitats in the presence of marine activities. This means that the area of search for this species occupies an area of approximately 153km^2, or 8.7% of the total area of the Moray Firth SPA.



Caledonia Array Area

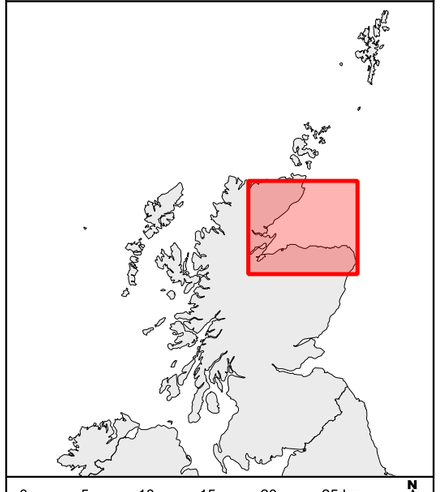
Area of Search

Buckie Transit Area

Moray Firth Special Protection Area (SPA)

Modelled density of Great Northern Diver (birds/km2)

- 0 - 0.1
- 0.1 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.7
- 0.7 - 0.9



0 5 10 15 20 25 km

N

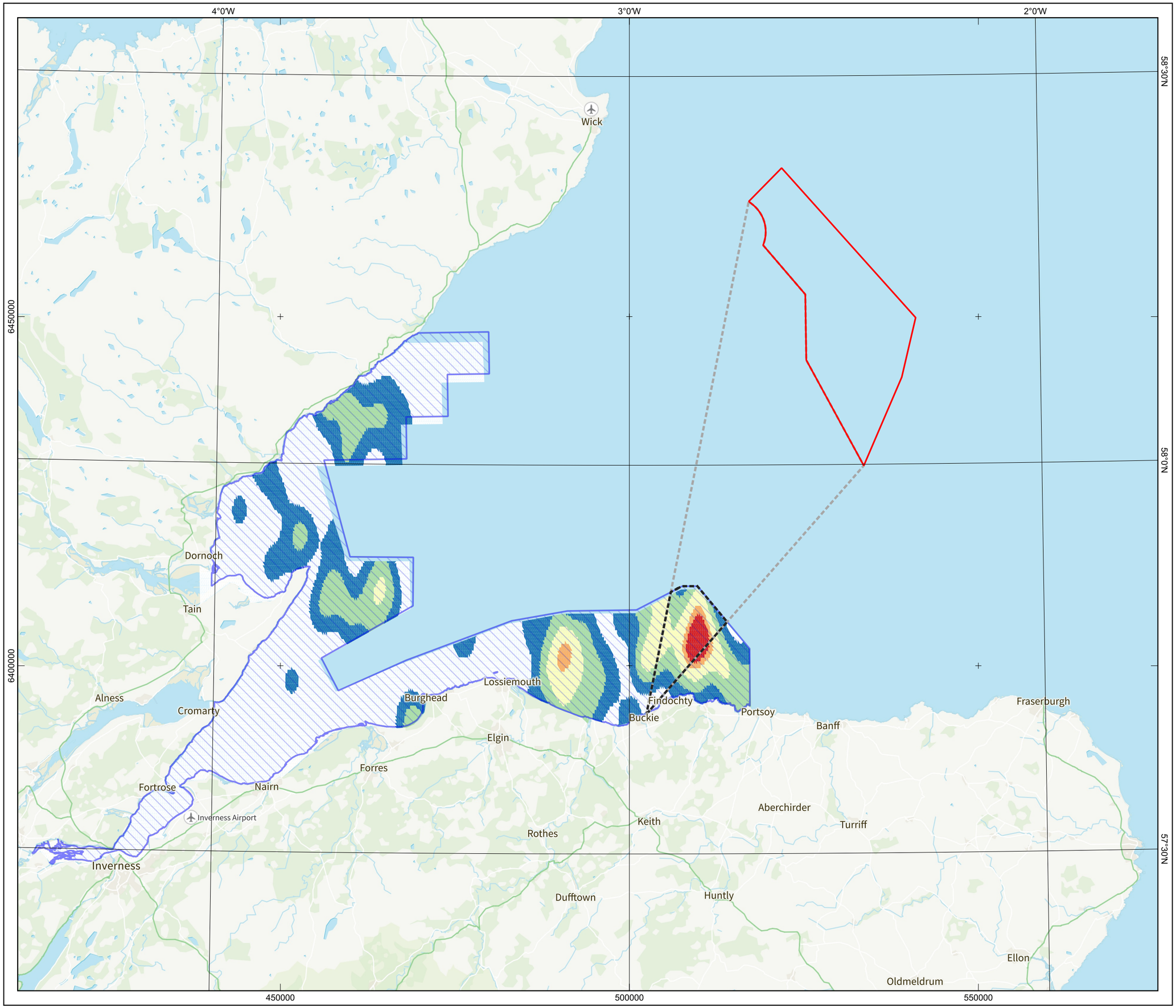
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 4-5: Modelled distribution of great northern diver based on digital aerial survey data collected on 19th January 2020

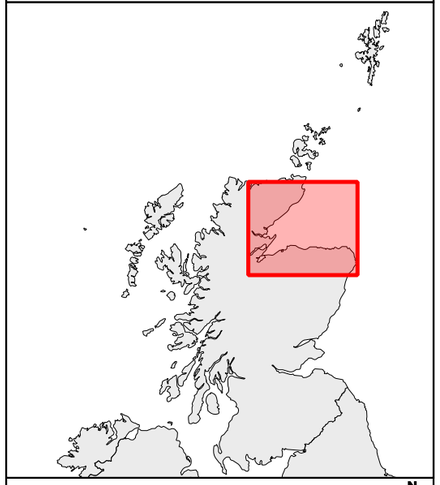
STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00024	01 of 01	01



Caledonia Array Area
Area of Search
Buckie Transit Area
Moray Firth Special Protection Area (SPA)

Modelled density of Great Northern Diver (birds/km2)

- 0 - 0.25
- 0.25 - 0.75
- 0.75 - 1.5
- 1.5 - 2.5
- 2.5 - 3
- 3 - 4



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 4-6: Modelled distribution of great northern diver based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00025	01 of 01	01

4.4.2 Moray Firth SPA Population Estimates

4.4.2.1 Key Moray Firth SPA population estimates for this species are summarised in Table 4-12.

Table 4-12: Key population estimates for great northern diver within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation, Lawson *et al*. (2015[4])	2001/02 to 2006/07	Shore-based count	144 (mean peak)
Scott *et al*. (2023[2])	19/01/2020	DAS, block bootstrap estimation method	187 (95% CIs 59 – 360)
	08/03/2020	DAS, block bootstrap estimation method	747 (95% CIs 440 – 1,090)

4.4.3 Density and Abundance of Birds within Area of Search plus Buffer

4.4.3.1 Key abundance and density metrics of birds within the area of search plus the displacement buffer, and for the whole Moray Firth SPA, are presented in Table 4-13. These were extracted from data produced by Scott *et al*. (2023[2]).

Table 4-13: Density and abundance of great northern diver in the area of search and the Moray Firth SPA extracted from 2020 DAS data (Scott *et al*. 2023[2]).

Parameter	Scott *et al*. (2023[2]), 19/01/2020, block bootstrap method	Scott *et al*. (2023[2]), 08/03/2020, block bootstrap method
Abundance: area of search plus 2,000m	99.47	242.82
Abundance: Moray Firth SPA	187	747
% of population within area of search	53.19	32.51
Mean density (with 95% CIs): area of search plus 2,000m (n/km^2)	0.66 (0.31 – 0.87)	1.58 (0.12 – 3.60)
Max density: area of search plus 2,000m (n/km^2)	0.88	3.79
Mean density (with 95% CIs): Moray Firth SPA (n/km^2)	0.10 (0.00 – 0.78)	0.42 (0.00 – 2.25)
Max density: Moray Firth SPA (n/km^2)	0.88	3.79

4.4.4 Moray Firth SPA Population Distribution

4.4.4.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[3]) states that great northern diver are widely distributed throughout the Moray Firth SPA, with open coastal waters and more sheltered marine waters used for foraging, roosting, and maintenance activities. The key supporting processes for great northern divers at the Moray Firth SPA are not well known but may include water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[3]).

4.4.4.2 The highest densities of great northern diver were recorded in the 2020 DAS to the east of Spey Bay (Figure 4–5 and Figure 4–6), which is within the area of search. Scott *et al*. (2023[2]) noted quite large differences in modelled distribution in the wider Moray Firth SPA between the two surveys. In the January 2020 DAS, the areas to the east of Spey Bay were predicted to hold over half of the total SPA population (Figure 4–5). In the March 2020 DAS, the same area was predicted to hold a high proportion of the population, though the modelled distribution of great northern diver within the Moray Firth SPA was considerably more widespread (Figure 4–6). Modelled distributions of birds from the 2020 DAS indicated a preference for habitats several kilometres from the coast. Other areas also supporting high numbers of birds included Spey Bay itself (located approximately 8km from the area of search), areas off Tarbert Ness (located approximately 40km from the area of search), the mouth of the

Dornoch Firth and coastal waters to the north (located approximately 50km from the area of search).

4.4.4.3 The distributions of birds reported by Scott *et al*. (2023[2]) were noted by the author of that study to be relatively similar to those previously reported by Lawson *et al*. (2015[4]). Modelled distributions based on data collected between 2001 and 2007 indicate that in addition to the area in Spey Bay and the coastal waters around the Dornoch Firth, other areas of high predicted great northern/red-throated density were located at the mouth of the Cromarty Firth and the inner Moray Firth (MacArthur Green, 2024[5]).

4.4.5 Assessment of Potential Impacts

4.4.5.1 Modelled abundance data derived the from the January 2020 DAS indicated that 99.47 birds (53.19% of the Moray Firth SPA population for that survey) were predicted to be present in the area of search, whilst in the March 2020 DAS, 242.82 birds (32.51% of the Moray Firth SPA population for that survey) were predicted to be present in the area of search (Table 4-13).

4.4.5.2 It is noted both from the modelled distribution data and other information sources that great northern divers use habitats throughout the Moray Firth SPA. Taking into account all available information on great northern diver distribution across the Moray Firth, the area of search (which occupies 8.7% of the total area of the Moray Firth SPA when the relevant displacement buffer is included) is of relatively high importance to great northern diver. This means that direct impacts on areas with some of the highest modelled densities in the Moray Firth SPA for this species (based on the 2020 DAS data) are anticipated as a result of O&M vessel traffic associated with the Proposed Development (Offshore).

4.4.5.3 Of the birds present in the area of search, a proportion would be subject to disturbance and displacement impacts at a given time due to their proximity to O&M vessel transits associated with the Proposed Development (Offshore). The peak mean density of great northern diver within the area of search during the 2020 DAS was 1.58 birds/km^2. Assuming a highly precautionary 2km disturbance and displacement distance around a vessel, a 100% displacement rate, and an 18km transit between the port of Buckie and the boundary of the Moray Firth SPA, up to 113.76 birds could be disturbed and/or displaced by a single O&M vessel transit (i.e., 1.58 x ((2 x 2) x 18).

4.4.5.4 This is an overly simplistic approach to calculating the potential disturbance and displacement impact and will substantially overestimate the true impacts for several reasons, most notably that displacement rates due to vessel passage are highly unlikely to be 100% within 2km of every vessel crossing.

4.4.5.5 The high levels of existing vessel activity within both the area of search (Figure 3–2) and much of the wider Moray Firth SPA (Figure 3–1) suggest that disturbance of habitats used by Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement SPA qualifying features, is likely to be part of the existing nature of the SPA. Birds are present in the area of search (and indeed the wider Moray Firth SPA) despite existing levels of vessel traffic, which within the area of search consists of a minimum of approximately six to eight unique crossings per day during the non-breeding season (Table 3-2). It is presumed that vessels crossing the area of search at the present rate does not materially impact the ability of birds present to either use the area to carry out their normal activities, or to relocate to other areas of the Moray Firth SPA, which are for the most part subject to similar levels of vessel disturbance as the area of search (Figure 3–1 and Table 3-1). It is therefore anticipated that the true displacement rate is highly likely to be substantially less than 100% of birds within a 2km radius of a vessel, particularly since great northern diver appear not to respond to disturbance by flying.

4.4.5.6 An additional maximum of three return vessel trips through the area of search each day would increase the exposure risk of the birds present to vessels. Whether this would proportionally increase the risk of disturbance and displacement depends on the level of sensitivity/habituation within the population to the presence of vessels. More frequent displacement of birds could potentially have energetic consequences at the individual level, which could result in population-level effects. On the basis that great northern diver does not commonly exhibit flight-based responses to vessel disturbance, the risk of this occurring is judged to be low.

4.4.5.7 The baseline level of disturbance present within the Moray Firth SPA indicates that existing disturbance or displacement has a limited spatiotemporal effect on many of the birds present, or that the proportion of birds affected is actually relatively low, possibly as the population is somewhat habituated to the presence of vessels in their non-breeding season habitats.

4.4.5.8 It is anticipated that the birds that could be disturbed or displaced would, if needed, be able to relocate to appropriate habitats within the Moray Firth SPA (within or beyond the area of search). Birds will return to the area from which they were displaced due to the transient nature of vessel disturbance.

4.4.5.9 It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.4.5.10 In summary, it is not considered that the addition of three return vessel trips per day across the area of search would materially impact the abundance or distribution of great northern diver in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts (Table 4-14). It is therefore concluded that the O&M vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the great northern diver qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-14: Assessment of predicted impacts on great northern diver qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA great northern diver population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of great northern diver within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	The wider literature indicates that great northern divers are distributed throughout the Moray Firth SPA. Key areas within the Moray Firth SPA for this species overlap with the area of search. Whilst direct impacts on the birds within them are likely to occur, the area of search is already subject to disturbance by vessel traffic. The extra vessel traffic would not result in significant disturbance of great northern diver within the Moray Firth SPA beyond the level that already exists. It is therefore anticipated that despite the predicted impacts, great northern diver will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for great northern divers at the Moray Firth SPA are not well known but may include water quality (nutrients and turbidity), tidal cycles, and water flow. Small increases in the number of vessel movements confined to the area of search, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA great northern diver are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.5 Long-tailed Duck

4.5.1 Evidence for Sensitivity to Vessel Disturbance

4.5.1.1 Long-tailed duck was assessed to have a low sensitivity to human disturbance by Goodship and Furness (2019[10]) in the context of hand-harvesting of seaweed. However, Jarrett *et al*. (2018[13]) reported a high sensitivity of this species to boat disturbance, with a particularly high likelihood of flight responses to disturbance noted. The mean escape distance (and sample size) reported by Fliessbach *et al*. (2019[9]) was relatively low when compared with other species thought to be sensitive to disturbance by vessels and was similar for both individuals and groups (Table 4-15). The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[6]).

4.5.1.2 For this assessment a displacement buffer of 1,000m was selected. This was based largely on the outputs of Fliessbach *et al*. (2019[9]). This means that the area of search for this species occupies an area of approximately 123km^2, or 7.0% of the total area of the Moray Firth SPA.

Table 4-15: Mean escape distances, standard deviations, and sample sizes of observations for long-tailed duck (individuals and flocks), reproduced from Fliessbach *et al*. (2019[9]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Long-tailed duck	389 (+/- 227) (n=8,274)	325 (+/- 235) (n=604)

4.5.2 Moray Firth SPA Population Estimates

4.5.2.1 Key Moray Firth SPA population estimates for this species are summarised in Table 4-16.

Table 4-16: Key population estimates for long-tailed duck within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	5,001 (mean peak)
Lawson *et al*. (2015[4])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	3,167 (mean peak)
Scott *et al*. (2023[2])	19/01/2020	DAS, block bootstrap estimation method	1,671 (95% CIs 876 – 2,658)
	08/03/2020	DAS, block bootstrap estimation method	4,328 (95% CIs 1,985 – 7,412)

4.5.3 Density and Abundance of Birds within Area of Search plus Buffer

4.5.3.1 Key abundance and density metrics of birds within the area of search plus the displacement buffer, and for the whole Moray Firth SPA, are presented in Table 4-17. These were extracted from data produced by Scott *et al*. (2023[2]).

Table 4-17: Density and abundance of long-tailed duck in the area of search and the Moray Firth SPA extracted from 2020 DAS data (Scott *et al*. 2023[2]).

Parameter	Scott *et al*. (2023[2]), 19/01/2020, block bootstrap method	Scott *et al*. (2023[2]), 08/03/2020, block bootstrap method
Abundance: area of search plus 1,000m	7.72	229.19
Abundance: Moray Firth SPA	1,671	4,328
% of population within area of search	0.46	5.30
Mean density (with 95% CIs): area of search plus 1,000m (n/km^2)	0.07 (0.00 – 0.34)	1.80 (0.00 – 8.47)
Max density: area of search plus 1,000m (n/km^2)	0.47	9.92
Mean density (with 95% CIs): Moray Firth SPA (n/km^2)	0.79 (0.00 – 5.21)	2.35 (0.00 – 19.26)
Max density: Moray Firth SPA (n/km^2)	14.32	124.01

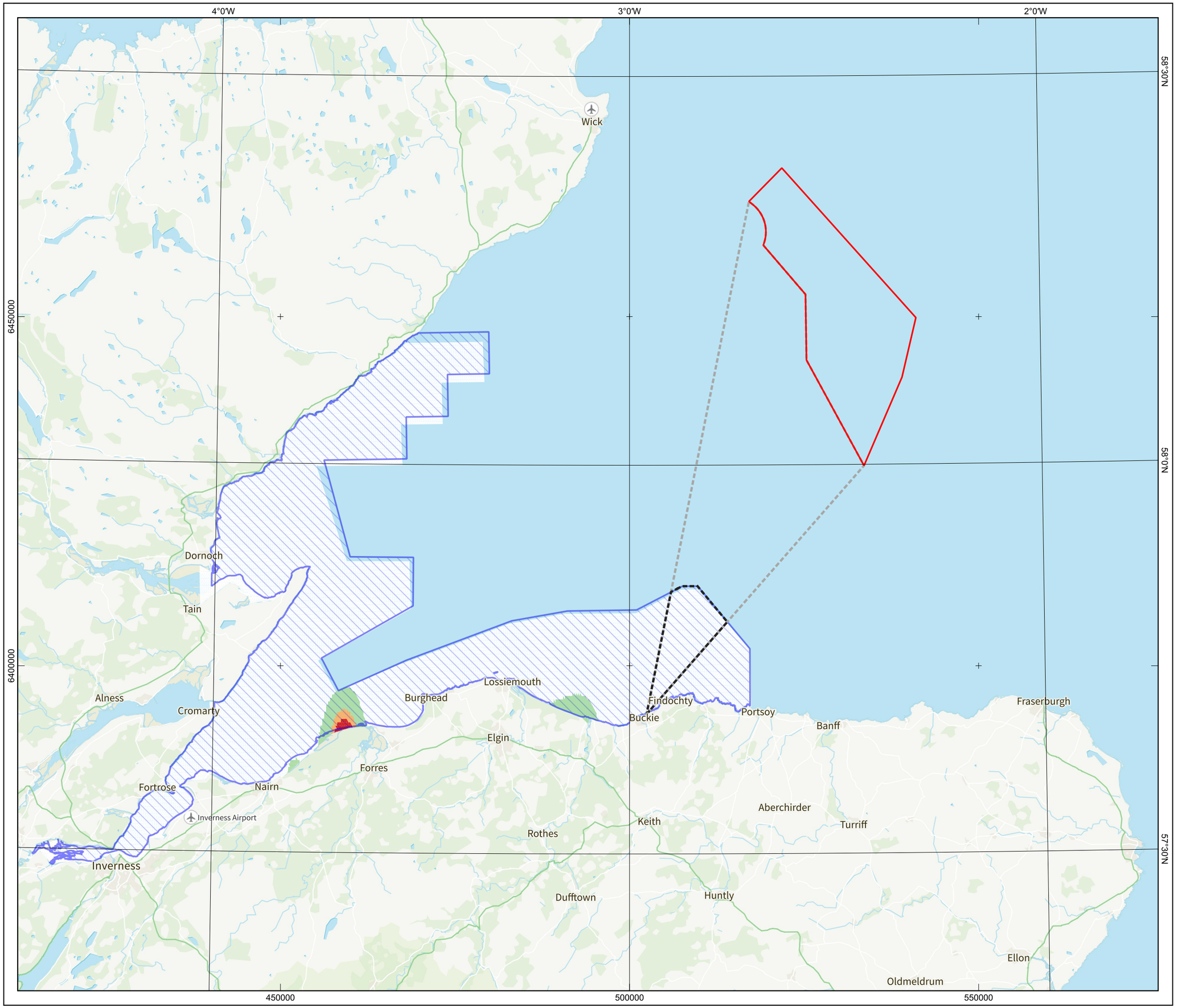
4.5.4 Moray Firth SPA Population Distribution

4.5.4.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[3]) states that long-tailed duck are widely distributed throughout the Moray Firth SPA, with high concentrations often being recorded off Golspie, Embo, Dornoch, Portmahomack, Spey Bay and along the south coast of the Moray Firth. Inshore waters are normally used for foraging, socialising, roosting and maintenance activities. The key supporting processes for long-tailed duck at the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[3]).

4.5.4.2 Long-tailed duck occurred in the 2020 DAS throughout much of the Moray Firth SPA, in line with information presented by NatureScot (2022[3]). Higher densities of birds were predicted to occur in the Nairn and Culbin Bar areas (located approximately 40km from the area of search), Spey Bay (located approximately 8km from the area of search), the inner Moray Firth (located approximately 70km from the area of search), and the Dornoch Firth (located approximately 60km from the area of search) (Figure 4–7 and Figure 4–8). In all cases, the highest modelled densities of birds were strongly associated with coastal locations. It is noted that this species may have a different distribution across the Moray Firth SPA at night, due to its known tendency to move into offshore roosting areas during this time.

4.5.4.3 Some areas of predicted low to moderate usage by this species were identified which overlapped with the area of search during the March 2020 DAS, which tallies with the higher modelled abundances for the area of search in this month (Table 4-17).

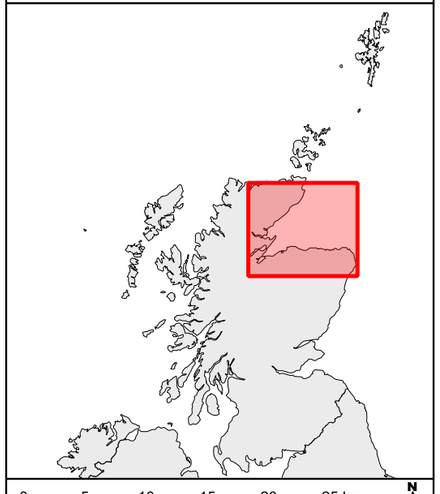
4.5.4.4 Modelled distributions based on data from 2001 to 2007 indicated that birds are predicted to occur throughout the Moray Firth SPA, with particularly high densities predicted to occur off Burghead (MacArthur Green, 2024[5]).



Caledonia Array Area
Area of Search
Buckie Transit Area
Moray Firth Special Protection Area (SPA)

Modelled density of Long-Tailed Duck (birds/km2)

0 - 5
5 - 10
10 - 12
12 - 15



0 5 10 15 20 25 km

N

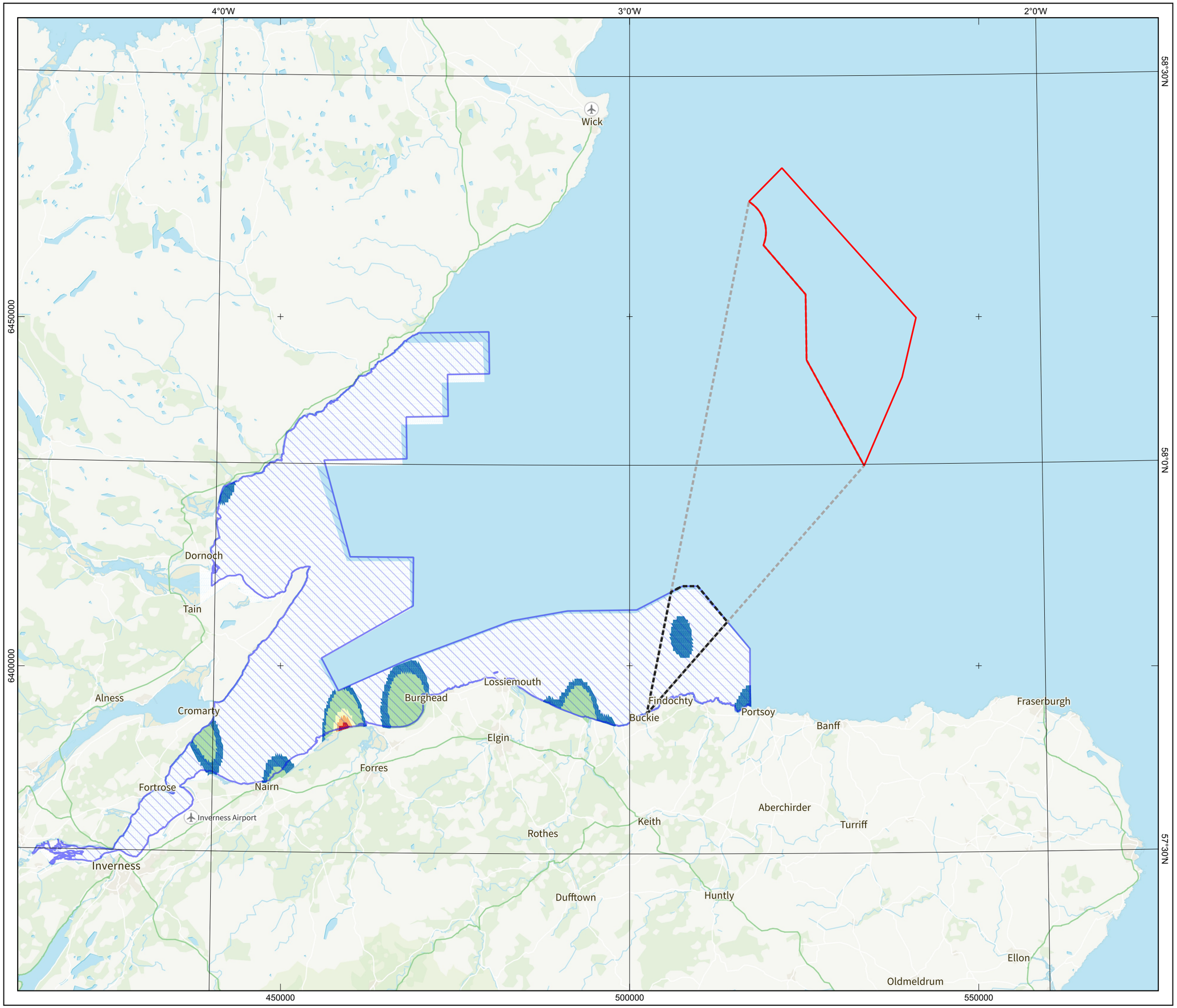
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 4-7: Modelled distribution of long-tailed duck based on digital aerial survey data collected on 19th January 2020

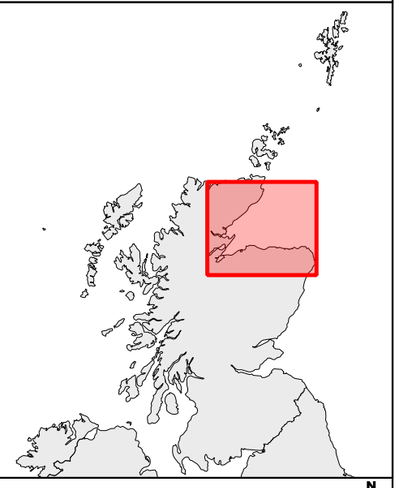
STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00026	01 of 01	01



Caledonia Array Area
Area of Search
Buckie Transit Area
Moray Firth Special Protection Area (SPA)

Modelled density of Long-Tailed Duck (birds/km2)

- 0 - 5
- 5 - 10
- 10 - 50
- 50 - 75
- 75 - 100
- 100 - 125



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE

Figure 4-8: Modelled distribution of long-tailed duck based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00027	01 of 01	01

4.5.5 Assessment of Potential Impacts

4.5.5.1 Modelled abundance data based on the 2020 DAS indicated that a peak of 229.19 birds were predicted to be present within the area of search (Table 4-17), representing up to 5.3% of the population of the Moray Firth SPA.

4.5.5.2 It is noted both from the modelled distribution data and other information sources that long-tailed ducks use habitats throughout the Moray Firth SPA. Taking into account all available information on great northern diver distribution across the Moray Firth, the area of search (which occupies 7.0% of the SPAs total area) is at times of moderate importance to long-tailed duck. This means that direct impacts on areas with moderately high modelled densities in the Moray Firth SPA for this species (based on the 2020 DAS data) are anticipated as a result of O&M vessel traffic associated with the Proposed Development (Offshore).

4.5.5.3 Of the birds present in the area of search (peak of 229.19; Table 4-17), a proportion would be subject to disturbance and displacement impacts at a given time due to their proximity to O&M vessel transits associated with the Proposed Development (Offshore). Of those, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population. The areas where the highest numbers of birds were predicted by modelled density surfaces based on the 2020 DAS Figure 4–8 and Figure 4–8, and on other sources of information, are not located sufficiently close to the area of search for direct impacts due to O&M vessels associated with the Proposed Development (Offshore) to occur on the habitats within these areas, or the birds using them. Whilst distributions of this species may differ at night, no impacts are considered to be possible as no O&M vessel activity will routinely occur at this time.

4.5.5.4 The high levels of existing vessel activity within both the area of search (Figure 4) and much of the wider Moray Firth SPA (Figure 3–1) suggest that disturbance and displacement of birds is part of the existing nature of the SPA. Birds are present in the area of search (and indeed the wider Moray Firth SPA) despite existing levels of vessel traffic, which within the area of search consists of a minimum of approximately six to eight unique crossings per day during the non-breeding season (Table 3-2). It is presumed that vessels crossing the area of search at the present rate does not materially impact the ability of birds present to either use the area to carry out their normal activities, or to relocate to other areas of the Moray Firth SPA, which are for the most part subject to similar levels of vessel disturbance as the area of search (Figure 3–1 and Table 3-1).

4.5.5.5 An additional maximum of three return vessel trips through the area of search each day would increase the exposure risk of the birds present to vessels. Whether this would proportionally increase the risk of disturbance and displacement depends on the level of sensitivity/habituation within the

population to the presence of vessels. More frequent displacement of birds could potentially have energetic consequences at the individual level, which could result in population-level effects. On the basis that great northern diver does not commonly exhibit flight-based responses to vessel disturbance, the risk of this occurring is judged to be low.

4.5.5.6 The baseline level of disturbance present within the Moray Firth SPA indicates that existing disturbance or displacement has a limited spatiotemporal effect on many of the birds present, or that the proportion of birds affected is actually relatively low, possibly as the population is somewhat habituated to the presence of vessels in their non-breeding season habitats.

4.5.5.7 It is anticipated that the birds that could be disturbed or displaced would, if needed, be able to relocate to appropriate habitats within the Moray Firth SPA (within or beyond the area of search). Birds will return to the area from which they were displaced due to the transient nature of vessel disturbance.

4.5.5.8 It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources is not anticipated to be impacted for the same reason.

4.5.5.9 In summary, it is not considered that the addition of three return vessel trips per day across the area of search would materially impact the abundance or distribution of long-tailed duck in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts (Table 4-18). It is therefore concluded that the O&M vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the long-tailed duck qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-18: Assessment of predicted impacts on long-tailed duck qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA great northern diver population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of great northern diver within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	The wider literature indicates that great northern divers are distributed throughout the Moray Firth SPA. Key areas within the Moray Firth SPA for this species overlap with the area of search. Whilst direct impacts on the birds within them are likely to occur, the area of search is already subject to disturbance by vessel traffic. The extra vessel traffic would not result in significant disturbance of great northern diver within the Moray Firth SPA beyond the level that already exists. It is therefore anticipated that despite the predicted impacts, great northern diver will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for great northern divers at the Moray Firth SPA are not well known but may include water quality (nutrients and turbidity), tidal cycles, and water flow. Small increases in the number of vessel movements confined to the area of search, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA great northern diver are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.6 Red-breasted Merganser

4.6.1 Evidence for Sensitivity to Vessel Disturbance

4.6.1.1 Jarrett *et al*. (2018[13]) reported a very high sensitivity of red-breasted merganser to vessel disturbance at sea. The mean escape distance (and sample size) reported by Fliessbach *et al*. (2019[9]) was relatively high when compared with other species thought to be sensitive to disturbance by vessels and was considerably larger for individuals than groups of birds (Table 4-19). Red-breasted merganser was assessed to have a medium sensitivity to human disturbance by Goodship and Furness (2019[10]) in the context of hand-harvesting of seaweed.

4.6.1.2 For this assessment a displacement buffer of 2,000m was selected. This was based largely on the outputs of Fliessbach *et al*. (2019[9]). This means that the area of search for this species occupies an area of approximately 153km^2, or 8.7% of the total area of the Moray Firth SPA.

Table 4-19: Mean escape distances, standard deviations, and sample sizes of observations for red-breasted merganser (individuals and flocks), reproduced from Fliessbach *et al*. (2019[9]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Red-breasted merganser	1,178 (+/- 617) (n=193)	681 (+/- 485) (n=41)

4.6.2 Moray Firth SPA Population Estimates

4.6.2.1 Key Moray Firth SPA population estimates for this species are summarised in Table 4-20.

Table 4-20: Key population estimates for red-breasted merganser within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	151 (mean peak)
Lawson *et al*. (2015[4])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	80 (mean peak)
Scott *et al*. (2023[2])	19/01/2020	DAS, block bootstrap estimation method	49 (95% CIs 6 – 108)
	08/03/2020	DAS, block bootstrap estimation method	362 (95% CIs 134 – 655)

4.6.3 Density and Abundance of Birds within Area of Search plus Buffer

4.6.3.1 Key abundance and density metrics of birds within the area of search plus the displacement buffer, and for the whole Moray Firth SPA, are presented in Table 4-21. These were extracted from data produced by Scott *et al*. (2023[2]).

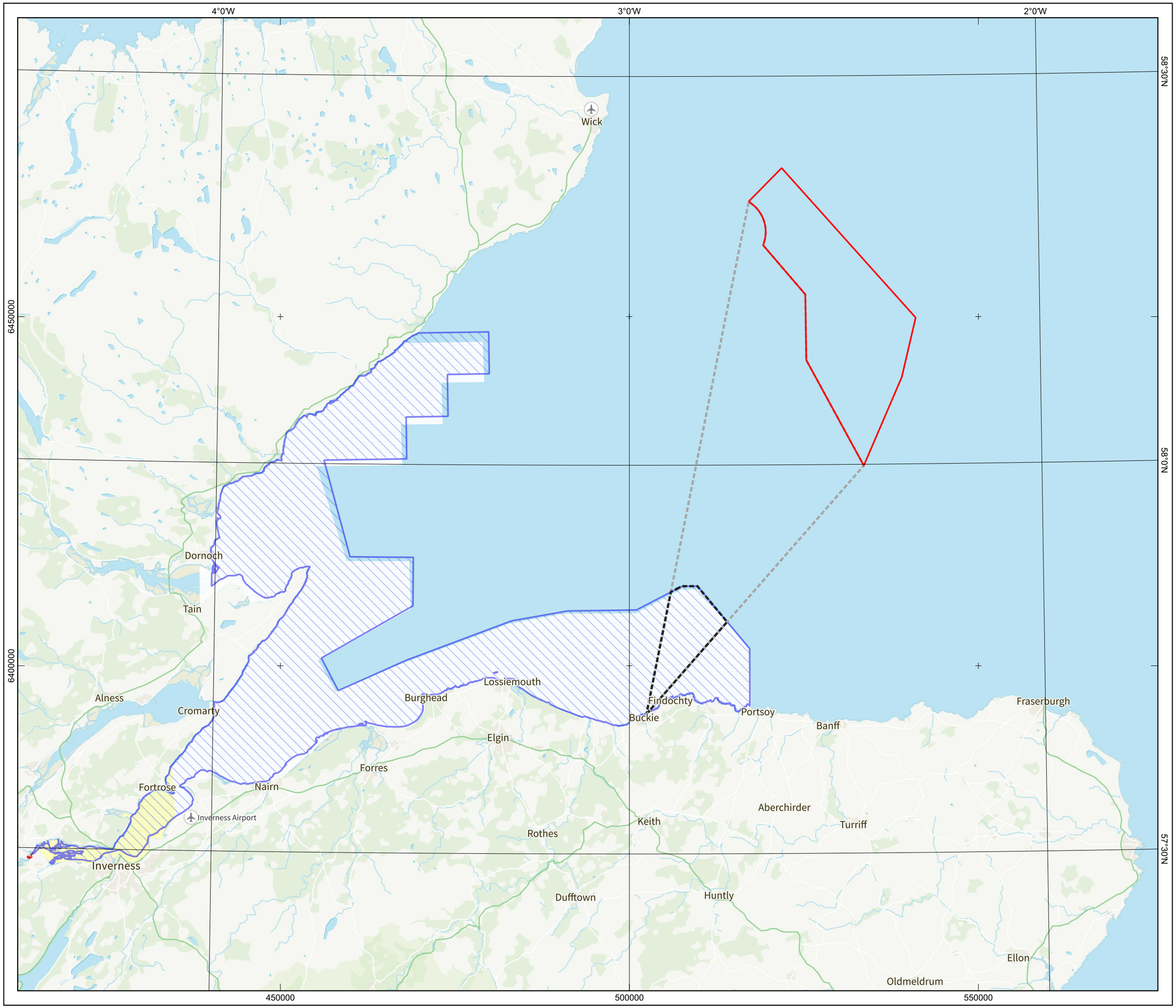
Table 4-21: Density and abundance of red-breasted merganser in the area of search and the Moray Firth SPA extracted from 2020 DAS data (Scott *et al*. 2023[2]).

Parameter	Scott *et al*. (2023[2]), 19/01/2020, block bootstrap method	Scott *et al*. (2023[2]), 08/03/2020, block bootstrap method
Abundance: area of search plus 2,000m	0.07	0.01
Abundance: Moray Firth SPA	49	362
% of population within area of search	0.15	0.00
Mean density (with 95% CIs): area of search plus 2,000m (n/km^2)	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.00)
Max density: area of search plus 2,000m (n/km^2)	0.00	0.00
Mean density (with 95% CIs): Moray Firth SPA (n/km^2)	0.02 (0.00 – 0.06)	0.17 (0.00 – 1.75)
Max density: Moray Firth SPA (n/km^2)	0.10	4.44

4.6.4 Moray Firth SPA Population Distribution

4.6.4.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[3]) does not contain site-specific information regarding the distribution of red-breasted merganser. The advice does note that in Scotland, red-breasted mergansers occur in open coastal habitats with clear, shallow waters and have been associated with both rocky and sandy substrates. Open, deeper waters are also used potentially for loafing, moulting and roosting. The key supporting processes for red-breasted merganser at the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[3]).

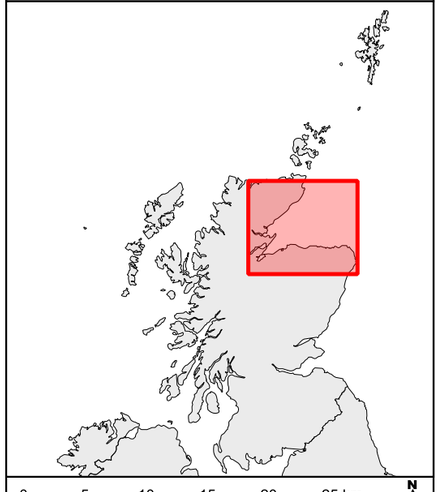
4.6.4.2 The modelled density surfaces produced from the 2020 DAS data (Figure 4–9 and Figure 4–10) indicate that red-breasted merganser were strongly associated coastal waters at the western extent of the Moray Firth SPA, with all areas of predicted higher modelled density strongly associated with coastal locations. Key areas for this species were the Dornoch Firth and Loch Fleet to the north (located approximately 60km from the area of search), the inner Moray Firth (located approximately 70km from the area of search), and the Nairn coast (located approximately 50km from the area of search). Whilst the March 2020 DAS revealed a small modelled hotspot of birds in Spey Bay (located approximately 8km from the area of search), the area of search itself was predicted to support only very low numbers of birds, reflected in the very low numbers of birds to be predicted to be present there in Table 4-21. These observations were similar to the distribution of records of this species made between 2001 and 2006; all records were made in coastal areas, with a higher proportion located towards the western extent of the Moray Firth SPA (MacArthur Green, 2024[5]).



Caledonia Array Area
Area of Search
Buckie Transit Area
Moray Firth Special Protection Area (SPA)

Modelled density of Red-Breasted Merganser (birds/km2)

0 - 0.05
0.05 - 0.1
0.1 - 0.12



0 5 10 15 20 25 km

N

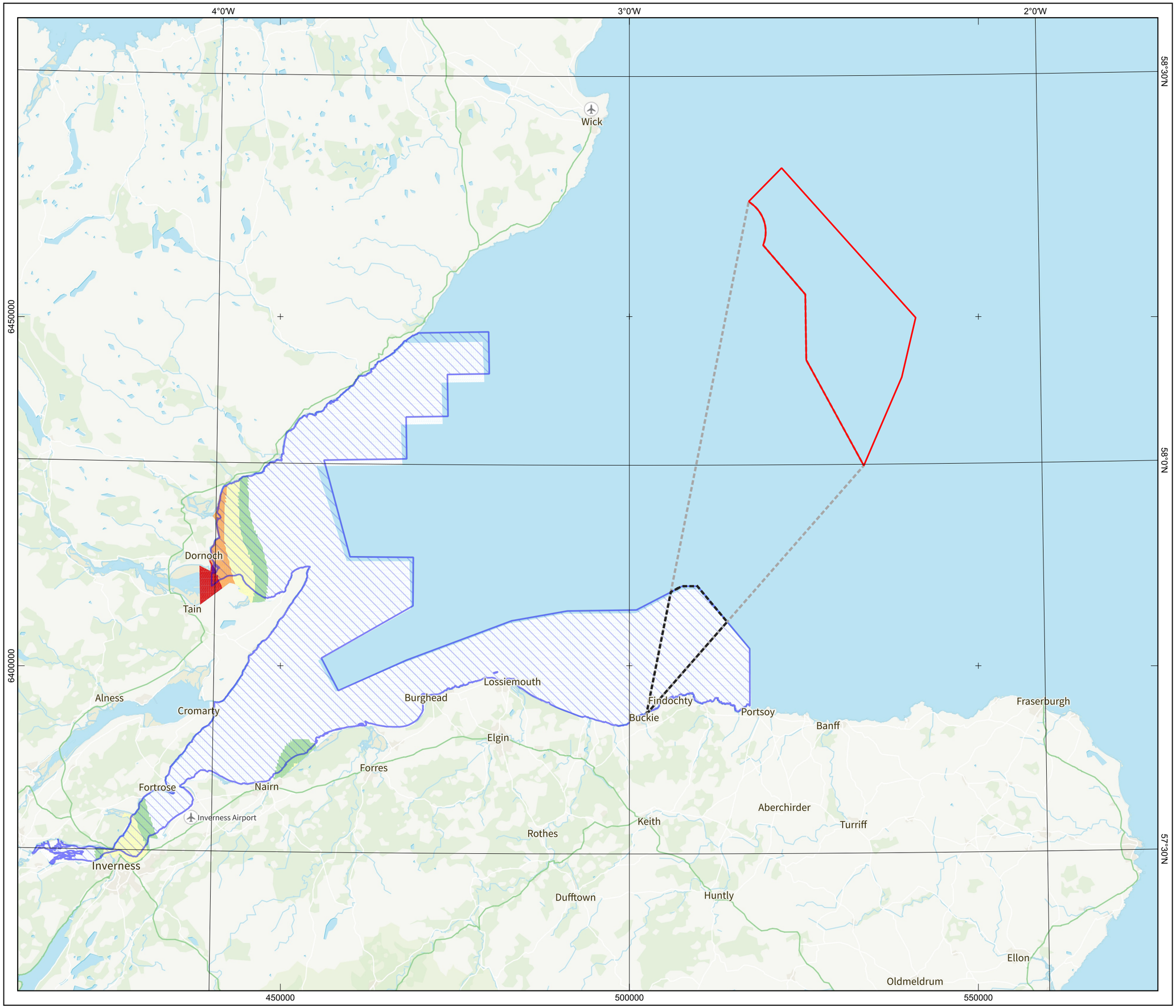
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 4-9: Modelled distribution of red-breasted merganser based on digital aerial survey data collected on 19th January 2020

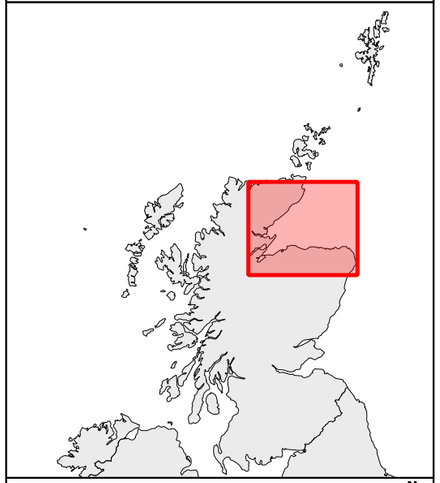
STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00028	01 of 01	01



Caledonia Array Area
Area of Search
Buckie Transit Area
Moray Firth Special Protection Area (SPA)

Modelled density of Red-Breasted Merganser (birds/km2)

- 0 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 4.5



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 4-10: Modelled distribution of red-breasted merganser based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00029	01 of 01	01

4.6.5 Assessment of Potential Impacts

4.6.5.1 Modelled abundances from the January and March 2020 DAS data indicated that 0.01 and 0.07 birds respectively were predicted to be present in the area of search, (a maximum of 0.15% of the Moray Firth SPA population; Table 4-21). The literature and data sources examined indicate that within the Moray Firth SPA, the area of search (which occupies 8.7% of the total area of the Moray Firth SPA when the relevant displacement buffer is included) is of low importance to red-breasted merganser. The areas where higher numbers of birds were predicted by modelled density surfaces based on the 2020 DAS (Figure 4–9 and Figure 4–10), and on other sources of information, are not located sufficiently close to the area of search for direct impacts due to O&M vessels associated with the Proposed Development (Offshore) to occur on the habitats within these areas, or the birds using them.

4.6.5.2 Of the very small number of birds present in the area of search (peak of 0.07; Table 4-21), a proportion would be subject to disturbance and displacement impacts at a given time due to their proximity to O&M vessel transits associated with the Proposed Development (Offshore). Of those, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.6.5.3 The high levels of existing vessel activity within both the area of search (Figure 3–2) and much of the wider Moray Firth SPA (Figure 3–1) suggest that disturbance and displacement of birds is part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.6.5.4 The numbers of birds involved is very small relative to the wider Moray Firth SPA population (0.15% of the total; Table 4-21), and therefore it is not considered that effects of any type at the population level are likely.

4.6.5.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by O&M vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.6.5.6 Red-breasted merganser distributions in the Moray Firth SPA are heavily associated with coastal waters, particularly at the western extent of the

Moray Firth SPA according to the modelled DAS data. This means that the area of search is in the main unlikely to represent key habitat for this species.

4.6.5.7 In summary, it is not considered that the addition of three return vessel trips per day across the area of search would materially impact the abundance or distribution of red-breasted merganser in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts (Table 4-22). It is therefore concluded that the O&M vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the red-breasted merganser qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-22: Assessment of predicted impacts on red-breasted merganser qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will therefore not prevent the Moray Firth SPA red-breasted merganser population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of great northern diver within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the area of search and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, red-breasted merganser will continue to have access to and utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for red-breasted merganser at the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow. Small increases in the number of vessel movements confined to the area of search, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA red-breasted merganser are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.7 Red-throated Diver

4.7.1 Evidence for Sensitivity to Vessel Disturbance

4.7.1.1 Red-throated diver is widely regarded as being of very high sensitivity to vessel disturbance (Furness *et al*., 2013[11]; Jarrett *et al*., 2018[13]; Schwemmer *et al*., 2011[7]). However, the certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[6]).

4.7.1.2 The mean escape distance reported by Fliessbach *et al*. (2019[9]) was similar for both individuals and groups of birds. The sample size of the study was relatively small, and observations of escape distances for unidentified divers, which were probably in the main red-throated divers that could not be identified due to the distance between the observer and the bird, were considerably greater (Table 4-23).

4.7.1.3 For this assessment a displacement buffer of 2,000m was selected. This was based on the outputs of Fliessbach *et al*. (2019[9]), as well as a similar assessment carried out for a project in English waters (Royal HaskoningDHV, 2022[15]). This means that the area of search for this species occupies an area of approximately 153km^2, or 8.7% of the total area of the Moray Firth SPA.

Table 4-23: Mean escape distances, standard deviations, and sample sizes of observations for unidentified diver and red-throated diver (individuals and flocks), reproduced from Fliessbach *et al*. (2019[9]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Unidentified diver	1,374 (+/- 416) (n=64)	1,281 (+/-424) (n=40)
Red-throated diver	750 (+/- 437) (n=31)	702 (+/- 348) (n=21)

4.7.2 Moray Firth SPA Population Estimates

4.7.2.1 Key Moray Firth SPA population estimates for this species are summarised in Table 4-24.

Table 4-24: Key population estimates for red-throated diver within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation and Lawson *et al*. (2015[4])	2001/02 to 2005/07	Visual aerial surveys, distance analysis	324 (mean peak)
Scott *et al*. (2023[2])	19/01/2020	DAS, block bootstrap estimation method	259 (95% CIs 139 – 386)
	08/03/2020	DAS, block bootstrap estimation method	880 (95% CIs 552 – 1,315)

4.7.3 Density and Abundance of Birds within Area of Search plus Buffer

4.7.3.1 Key abundance and density metrics of birds within the area of search plus the displacement buffer, and for the whole Moray Firth SPA, are presented in Table 4-25. These were extracted from data produced by Scott *et al*. (2023[2]).

Table 4-25: Density and abundance of red-throated diver in the area of search and the Moray Firth SPA extracted from 2020 DAS data (Scott *et al*. 2023[2]).

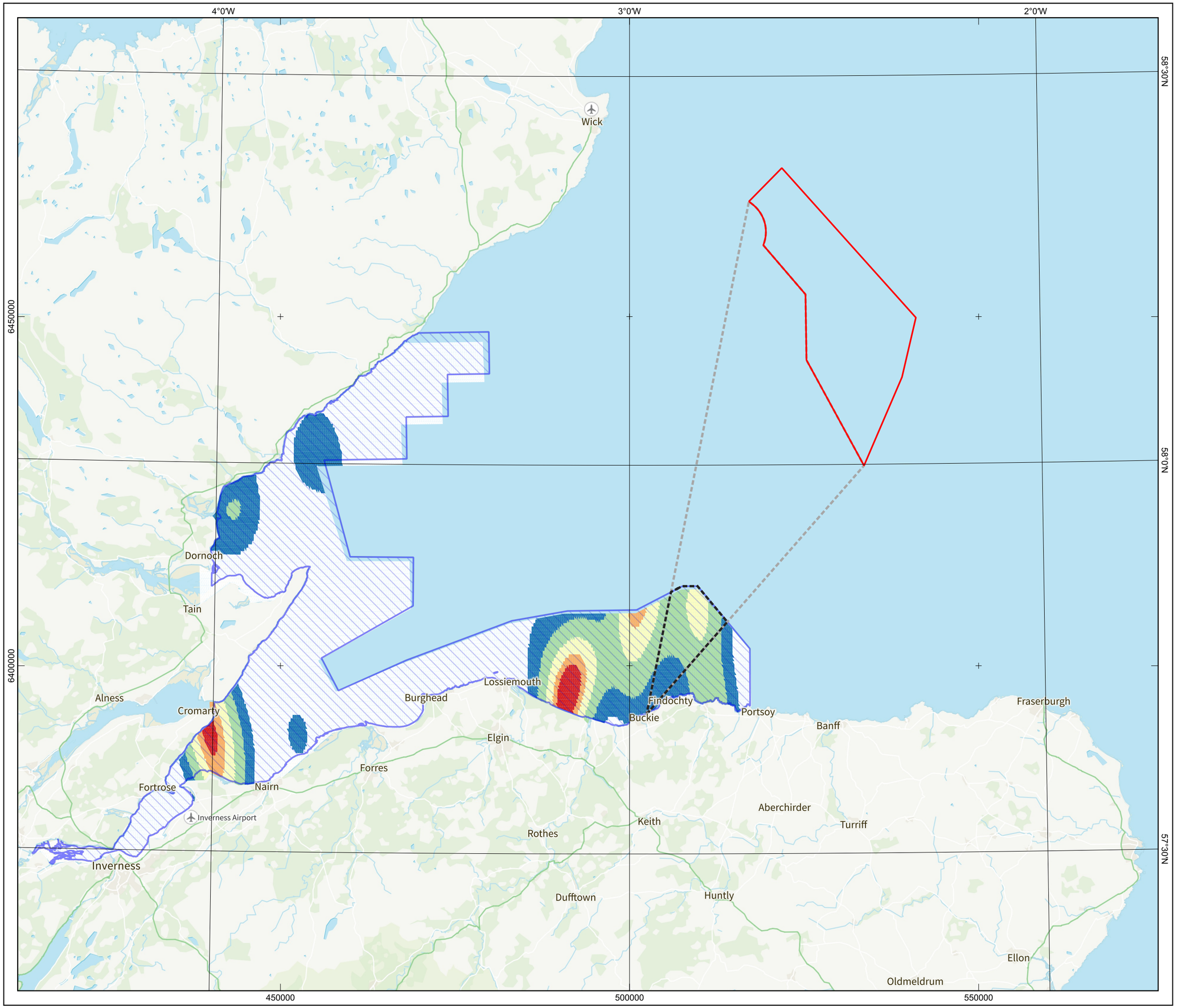
Parameter	Scott *et al*. (2023[2]), 19/01/2020, block bootstrap method	Scott *et al*. (2023[2]), 08/03/2020, block bootstrap method
Abundance: area of search plus 2,000m	51.78	41.04
Abundance: Moray Firth SPA	259	880
% of population within area of search	19.99	4.66
Mean density (with 95% CIs): area of search plus 2,000m (n/km^2)	0.35 (0.11 – 0.57)	0.27 (0.01 – 0.63)
Max density: area of search plus 2,000m (n/km^2)	0.62	0.73
Mean density (with 95% CIs): Moray Firth SPA (n/km^2)	0.14 (0.00 – 0.80)	0.50 (0.00 – 2.62)
Max density: Moray Firth SPA (n/km^2)	1.09	7.81

4.7.4 Moray Firth SPA Population Distribution

4.7.4.1 Red-throated diver use habitats within the Moray Firth SPA for foraging, resting, and other maintenance activities. The key supporting processes for red-throated divers in the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[3]). Conservation Advice for the Moray Firth SPA (NatureScot, 2022[3]) states that red-throated divers are widely distributed throughout the Moray Firth SPA. Birds have been recorded in higher densities in the Outer Dornoch Firth, the Inverness Firth, around Spey Bay and between Cromarty Firth and Tarbet Ness along the coast of Easter Ross. Modelled distributions based on data collected between 2001 and 2007 indicate that in addition to the area in Spey Bay and the coastal waters around the Dornoch Firth, other areas of high predicted great northern/red-throated density were located at the mouth of the Cromarty Firth and the inner Moray Firth (MacArthur Green, 2024[5]).

4.7.4.2 In the January 2020 DAS (Figure 4–11), the highest modelled densities of red-throated divers were located in Spey Bay (approximately 8km from the area of search), as well as overlapping the area of search itself at the eastern edge of the Moray Firth SPA. Another area of high modelled density was the habitat area to the northwest of Nairn, stretching north to the mouth of the Cromarty Firth (located approximately 60km from the area of search). Other hotspots in modelled density occurred at Culbin Bar (located approximately 40km from the area of search), the mouth of Loch Fleet, and off the coast of Brora (both located approximately 60km from the area of search).

4.7.4.3 Modelled distribution and density data from the March 2020 DAS indicates a more westerly predicted distribution of the population compared with the January 2020 DAS (Figure 4–12). Numbers of birds predicted to occur in the area of search were comparable to the January survey (Table 4-25). The highest densities of birds were predicted off Inver and at the mouth of the Dornoch Firth (located approximately 60km from the area of search). Culbin Bar and Nairn (located approximately 40km from the area of search), the Spey Bay area (including the area of search) and the East Caithness coast (located approximately 50km from the area of search) were also predicted to support higher densities of birds relative to the surrounding habitats.



Caledonia Array Area

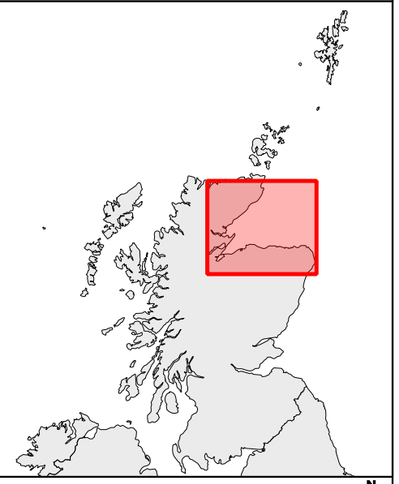
Area of Search

Buckie Transit Area

Moray Firth Special Protection Area (SPA)

Modelled density of Red-Throated Diver (birds/km2)

- 0 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 0.9
- 0.9 - 1.1



0 5 10 15 20 25 km

N

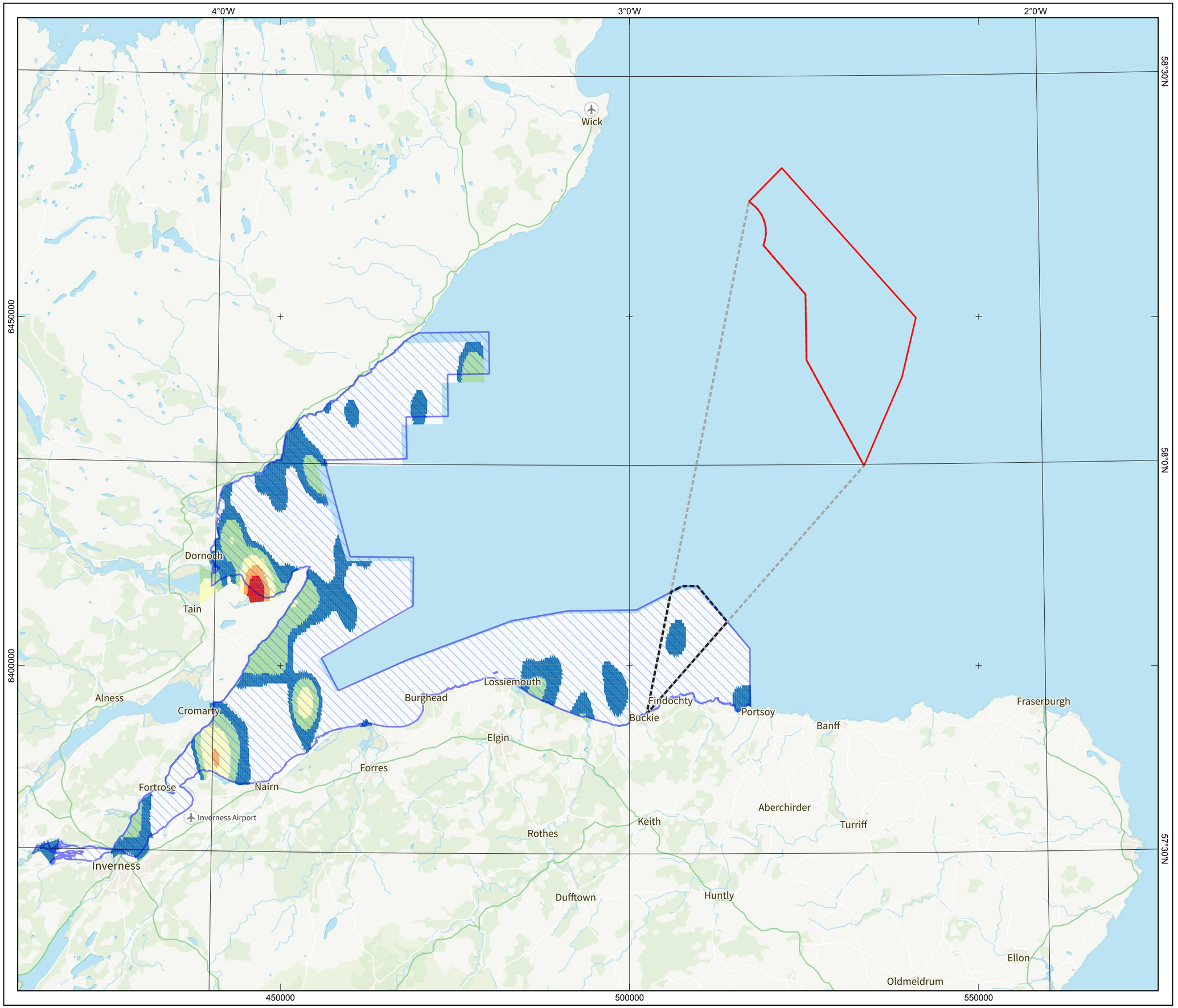
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 4-11: Modelled distribution of red-throated diver based on digital aerial survey data collected on 19th January 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00030	01 of 01	01



Caledonia Array Area

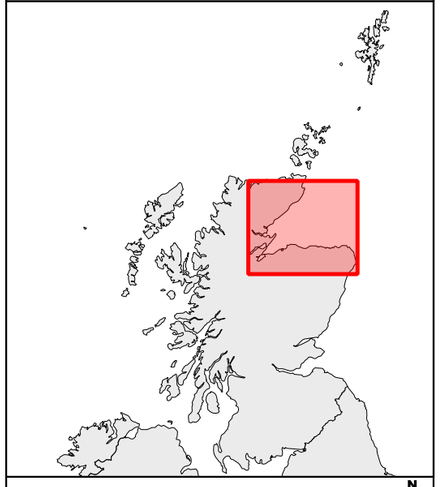
Area of Search

Buckie Transit Area

Moray Firth Special Protection Area (SPA)

Modelled density of Red-Throated Diver (birds/km2)

- 0 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 4
- 4 - 6
- 6 - 8



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE

Figure 4-12: Modelled distribution of red-throated diver based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00031	01 of 01	01

4.7.5 Assessment of Potential Impacts

4.7.5.1 Modelled abundance data presented in Table 4-25 show that from the January 2020 DAS data 51.78 birds (19.99% of the Moray Firth SPA population for that survey) were predicted to be present in the area of search. In the March 2020 DAS, 41.04 birds (4.66% of the Moray Firth SPA population for that survey) were predicted to be present in the area of search.

4.7.5.2 It is noted both from the modelled distribution data and other information sources that red-throated divers use habitats throughout the Moray Firth SPA. Taking into account all available information on red-throated diver distribution across the Moray Firth, the area of search (which occupies 8.7% of the total area of the Moray Firth SPA when the relevant displacement buffer is included) is of relatively high importance to red-throated diver. This means that direct impacts on areas with relatively high modelled abundance of birds within the Moray Firth SPA are anticipated as a result of O&M vessel traffic associated with the Proposed Development (Offshore).

4.7.5.3 Of the birds present in the area of search, a proportion would be subject to disturbance and displacement impacts at a given time due to their proximity to O&M vessel transits associated with the Proposed Development (Offshore). The peak mean density of red-throated diver within the area of search during the 2020 DAS was 0.35 birds/km^2. Assuming a 2km disturbance distance around a vessel, and an 18km transit between the port of Buckie and the boundary of the Moray Firth SPA, 25.2 birds could be disturbed and/or displaced by a single O&M vessel transit (i.e., 0.35 x ((2 x 2) x 18).

4.7.5.4 This is an overly simplistic approach to calculating the potential disturbance and displacement impact and will substantially overestimate the true impacts for several reasons, most notably that displacement rates due to vessel passage are highly unlikely to be 100% within 2km of every vessel crossing.

4.7.5.5 The high levels of existing vessel activity within both the area of search (Figure 3–2) and much of the wider Moray Firth SPA (Figure 3–1) suggest that disturbance and displacement of birds is part of the existing nature of the SPA. Birds are present in the area of search (and indeed the wider Moray Firth SPA) despite existing levels of vessel traffic, which within the area of search consists of a minimum of approximately six to eight unique crossings per day during the non-breeding season (Table 3-2). It is presumed that vessels crossing the area of search at the present rate does not materially impact the ability of birds present to either use the area to carry out their normal activities, or to relocate to other areas of the Moray Firth SPA, which are for the most part subject to similar levels of vessel disturbance as the area of search (Figure 3–1 and Table 3-1). It is

therefore anticipated that the true displacement rate is highly likely to be substantially less than 100% of birds within a 2km radius of a vessel.

4.7.5.6 An additional maximum of three return vessel trips through the area of search each day would increase the exposure risk of the birds present to vessels. Whether this would proportionally increase the risk of disturbance and displacement depends on the level of sensitivity/habituation within the population to the presence of vessels. More frequent displacement of birds could potentially have energetic consequences at the individual level, which could result in population-level effects. However, Thompson *et al*. (2023[16]) indicated that red-throated divers may be able to accommodate the energetic costs associated with displacement.

4.7.5.7 The baseline level of disturbance present within the Moray Firth SPA indicates that existing disturbance or displacement has a limited spatiotemporal effect on many of the birds present, or that the proportion of birds affected is actually relatively low, possibly as the population is somewhat habituated to the presence of vessels in their non-breeding season habitats.

4.7.5.8 It is anticipated that the birds that could be disturbed or displaced would, if needed, be able to relocate to appropriate habitats within the Moray Firth SPA (within or beyond the area of search). Birds will return to the area from which they were displaced due to the transient nature of vessel disturbance. Burger *et al*. (2019[17]) suggested that red-throated diver populations may partially return into areas a vessel has passed through after around seven hours, noting that the displacement effect may be greater where faster vessels are concerned.

4.7.5.9 In summary, it is not considered that the addition of three return vessel trips per day across the area of search would materially impact the abundance or distribution of red-throated diver in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts (Table 4-26). It is therefore concluded that the O&M vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the red-throated diver qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-26: Assessment of predicted impacts on red-throated diver qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA red-throated diver population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of red-throated diver within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	The wider literature indicates that red-throated divers are distributed throughout the Moray Firth SPA. A relatively important area within the Moray Firth SPA for this species overlaps with the area of search. Whilst direct impacts on the birds within them are likely to occur, the area of search is already subject to disturbance by vessel traffic. This extra vessel traffic would not result in significant disturbance of red-throated diver within the Moray Firth SPA beyond the level that already exists. It is therefore anticipated that despite the predicted impacts, red-throated diver will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for red-throated divers at the Moray Firth SPA are not well known but may include water quality (nutrients and turbidity), tidal cycles, and water flow. Small increases in the number of vessel movements confined to the area of search, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA red-throated diver are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.8 Scaup

4.8.1 Evidence for Sensitivity to Vessel Disturbance

4.8.1.1 No published information on vessel disturbance for scaup was identified, though Furness (2013[11]) identified scaup as having a high vulnerability to disturbance by boats. The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[6]). Scaup was assessed to have a high sensitivity to human disturbance by Goodship and Furness (2019[10]) in the context of hand-harvesting of seaweed.

4.8.1.2 For this assessment a displacement buffer of 1,000m was selected. This is in line with many of the other duck species considered by this assessment and is considered to be appropriately precautionary. This means that the area of search for this species occupies an area of approximately 123km^2, or 7.0% of the total area of the Moray Firth SPA.

4.8.2 Moray Firth SPA Population Estimates

4.8.2.1 Key Moray Firth SPA population estimates for this species are summarised in Table 4-27.

Table 4-27: Key population estimates for scaup within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	930 (mean peak)
Lawson *et al*. (2015[4])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	0
Scott *et al*. (2023[2])	19/01/2020	DAS, block bootstrap estimation method	6 (95% CIs 0 – 18)
	08/03/2020	DAS, block bootstrap estimation method	0

4.8.3 Density and Abundance of Birds within Area of Search plus Buffer

4.8.3.1 Key abundance and density metrics of birds within the area of search plus the displacement buffer, and for the whole Moray Firth SPA, are presented in Table 4-28. These were extracted from data produced by Scott *et al*. (2023[2]).

Table 4-28: Density and abundance of scaup in the area of search and the Moray Firth SPA extracted from 2020 DAS data (Scott *et al*. 2023[2]).

Parameter	Scott *et al*. (2023[2]), 19/01/2020, block bootstrap method	Scott *et al*. (2023[2]), 08/03/2020, block bootstrap method
Abundance: area of search plus 1,000m	0.02	0
Abundance: Moray Firth SPA	6	0
% of population within area of search	0.26	0
Mean density (with 95% CIs): area of search plus 1,000m (n/km^2)	0.00 (0.00 – 0.00)	0
Max density: area of search plus 1,000m (n/km^2)	0.00	0
Mean density (with 95% CIs): Moray Firth SPA (n/km^2)	0.00 (0.00 – 0.01)	0
Max density: Moray Firth SPA (n/km^2)	0.01	0

4.8.4 Moray Firth SPA Population Distribution

4.8.4.1 Scaup require suitable habitat within the SPA for foraging, loafing and roosting, and have a preference for shallow waters. They have been previously recorded as being associated with sandy substrates and over the Zostera zone or over blue mussel beds, although it is not known if they have the same preferences within the Moray Firth SPA (NatureScot, 2022[3]). The key supporting processes for scaup in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow (NatureScot, 2022[3]).

4.8.4.2 Scaup were recorded in very low numbers during the 2020 DAS, with no birds at all recorded during the March 2020 survey (Table 4-28). The only location in which birds were recorded in the January 2020 survey was the inner Moray Firth (located approximately 70km from the area of search). The low number of observations meant that a modelled distribution surface could not be produced. However, the location of the observation made during the 2020 DAS does tally with observations made between 2001 and 2006, which indicate a westerly distribution of birds strongly associated with coastal waters (MacArthur Green, 2024[5]).

4.8.5 Assessment of Potential Impacts

4.8.5.1 Modelled abundances from the 2020 DAS indicate that a peak of 0.02 birds were predicted to be present within the area of search, representing 0.26% of the population of the Moray Firth SPA (Table 4-28), despite the area of search occupying 7.0% of the SPAs total area. The literature and data sources examined indicate that within the Moray Firth SPA, the area of search (including the relevant buffer) is of low importance to Moray Firth SPA scaup. The areas where higher numbers of birds were recorded, and on other sources of information, are not located sufficiently close to the area of search for direct impacts due to O&M vessels associated with the Proposed Development (Offshore) to occur on the habitats within these areas, or the birds using them.

4.8.5.2 Of the very small number of birds predicted to be present in the area of search (peak of 0.02; Table 4-28), a proportion would be subject to disturbance and displacement impacts at a given time due to their proximity to O&M vessel transits associated with the Proposed Development (Offshore). Of those, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.8.5.3 The high levels of existing vessel activity within both the area of search (Figure 3–2) and much of the wider Moray Firth SPA (Figure 3–1) suggest that disturbance and displacement of birds is part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.8.5.4 The numbers of birds involved is small relative to the wider Moray Firth SPA population (0.26% of the total; Table 4-28), and therefore it is not considered that effects of any type at the population level are likely.

4.8.5.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by O&M vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.8.5.6 Scaup distributions in the Moray Firth SPA are heavily associated with coastal waters, with birds typically being recorded in the western areas of the SPA. This means that the area of search is in the main unlikely to represent key habitat for this species.

4.8.5.7 In summary, it is not considered that the addition of three return vessel trips per day across the area of search would materially impact the abundance or distribution of scaup in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts (Table 4-29). It is therefore concluded that the O&M vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the scaup qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-29: Assessment of predicted impacts on scaup qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will therefore not prevent the Moray Firth SPA scaup population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of scaup within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the area of search and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, scaup will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for scaup in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow (NatureScot, 2022[3]). Small increases in the number of vessel movements confined to the area of search, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA scaup are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.9 Slavonian Grebe

4.9.1 Evidence for Sensitivity to Vessel Disturbance

4.9.1.1 Jarrett *et al*. (2018[13]) reported a very high sensitivity of Slavonian grebe to vessel disturbance at sea, noting that evasive flights for this species can be longer than for other species. This can result in the species appearing to be absent from areas where marine activity occurs. Furness (2013[11]) indicated that this species was moderately sensitive to disturbance by vessel traffic relative to others, being allocated a score of three (out of five, where five was the most sensitive). Slavonian grebe was assessed to have a low/medium sensitivity to human disturbance by Goodship and Furness (2019[10]) in the context of hand-harvesting of seaweed. The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[6]).

4.9.1.2 The mean escape distance (and sample size) reported by Fliessbach *et al*. (2019[9]) was relatively low when compared with other species thought to be sensitive to disturbance by vessels and was similar for individuals and groups of birds (Table 4-30).

4.9.1.3 For this assessment a displacement buffer of 2,000m was selected. Whilst the outputs of Fliessbach *et al*. (2019[9]) were considerably less than even 1,000m, the observations of Jarrett *et al*. (2018[13]) mean that a precautionary buffer distance is considered to be appropriate. This means that the area of search for this species occupies an area of approximately 153km^2, or 8.7% of the total area of the Moray Firth SPA.

Table 4-30: Mean escape distances, standard deviations, and sample sizes of observations for Slavonian grebe (individuals and flocks), reproduced from Fliessbach *et al*. (2019[9]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Slavonian grebe	343 (+/- 255) (n=33)	325 (+/- 268) (n=24)

4.9.2 Moray Firth SPA Population Estimates

4.9.2.1 Key Moray Firth SPA population estimates for this species are summarised in Table 4-31.

Table 4-31: Key population estimates for Slavonian grebe within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	151 (mean peak)
Lawson *et al*. (2015)	2001/02 to 2006/07	Visual aerial surveys, distance analysis	80 (mean peak)
Scott *et al*. (2023)	19/01/2020	DAS, block bootstrap estimation method	49 (95% CIs 6 – 108)
	08/03/2020	DAS, block bootstrap estimation method	362 (95% CIs 134 – 655)

4.9.3 Density and Abundance of Birds within Area of Search plus Buffer

4.9.3.1 Key abundance and density metrics of birds within the area of search plus the displacement buffer, and for the whole Moray Firth SPA, are presented in Table 4-32. These were extracted from data produced by Scott *et al*. (2023[2]).

Table 4-32: Density and abundance of Slavonian grebe in the area of search and the Moray Firth SPA extracted from 2020 DAS data (Scott *et al*. 2023[2]).

Parameter	Scott *et al*. (2023[2]), 19/01/2020, block bootstrap method	Scott *et al*. (2023[2]), 08/03/2020, block bootstrap method
Abundance: area of search plus 2,000m	No data (model did not produce density surface)	No data (model did not produce density surface)
Abundance: Moray Firth SPA	49	362
% of population within area of search	No data (model did not produce density surface)	No data (model did not produce density surface)
Mean density (with 95% CIs): area of search plus 2,000m (n/km^2)	No data (model did not produce density surface)	No data (model did not produce density surface)
Max density: area of search plus 2,000m (n/km^2)	No data (model did not produce density surface)	No data (model did not produce density surface)
Mean density (with 95% CIs): Moray Firth SPA (n/km^2)	No data (model did not produce density surface)	No data (model did not produce density surface)
Max density: Moray Firth SPA (n/km^2)	No data (model did not produce density surface)	No data (model did not produce density surface)

4.9.4 Moray Firth SPA Population Distribution

4.9.4.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[3]) states that within the SPA, Slavonian grebe require suitable habitat within the SPA for foraging, loafing, and roosting, with birds widely distributed along the coast of the Moray Firth SPA. Slavonian grebes occur in sheltered inshore marine areas with sandy substrates associated with their main prey items. The key supporting processes for Slavonian grebe in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow (NatureScot, 2022[3]).

4.9.4.2 During the January 2020 DAS, low numbers of birds were recorded around Brora/Golspie (located approximately 60km from the area of search), and in Spey Bay (located approximately 8km from the area of search), with an observation of this species made within the area of search. A similar distribution was recorded during the March 2020 DAS, with the addition of a record from the inner Moray Firth (located approximately 70km from the area of search).

4.9.4.3 Based on the 2020 DAS data, Slavonian grebe generally display a preference for coastal waters within the Moray Firth SPA. A very similar distributional pattern (along with birds more commonly being recorded towards to the western boundary of the Moray Firth SPA) was observed from data collected between 2006 and 2011 (MacArthur Green, 2024[5]).

4.9.5 Assessment of Potential Impacts

4.9.5.1 The 2020 DAS detected too few observations of Slavonian grebe to generate meaningful density surface maps, so quantitative comparisons between abundance and density within the area of search and the wider Moray Firth SPA are not possible. Based on the literature and data sources examined (Lawson *et al*., 2015[4]; MacArthur Green, 2024[5]; NatureScot, 2022[3]; Scott *et al*., 2023[2]), it is considered that within the Moray Firth SPA, the area of search is likely to be of relatively low importance to Slavonian grebe due to the species preference for nearshore, shallow waters. This means that the area of search is in the main unlikely to represent key habitat for this species.

4.9.5.2 The areas where birds were mainly recorded during the 2020 DAS, and have previously been recorded based on other sources of information, are generally not located sufficiently close to the area of search for direct impacts due to O&M vessels associated with the Proposed Development (Offshore) to occur on the habitats within these areas, or the birds using them.

4.9.5.3 The available data and other information indicates that displacement of Slavonian grebe by O&M vessel traffic, if it occurs, would involve low numbers of birds relative to the wider population of the Moray Firth SPA.

4.9.5.4 The high levels of existing vessel activity within both the area of search (Figure 3–2) and much of the wider Moray Firth SPA (Figure 3–1) suggest that disturbance and displacement of birds is part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.9.5.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by O&M vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.9.5.6 In summary, it is not considered that the addition of three return vessel trips per day across the area of search would materially impact the abundance or distribution of Slavonian grebe in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts (Table 4-33). It is therefore concluded that the O&M vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the Slavonian grebe qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-33: Assessment of predicted impacts on Slavonian grebe qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will therefore not prevent the Moray Firth SPA Slavonian grebe population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of Slavonian grebe within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the area of search and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, Slavonian grebe will continue to have access to and utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for Slavonian grebe in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow. Small increases in the number of vessel movements confined to the area of search, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA Slavonian grebe are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.10 Velvet Scoter

4.10.1 Evidence for Sensitivity to Vessel Disturbance

4.10.1.1 Jarrett *et al*. (2018[13]) reported a high flight response of velvet scoter to vessel disturbance at sea, though given few records were made, sensitivity could not be fully assessed. Schwemmer *et al*. (2011[7]) reported a median flight initiation distance of 404m (sample size of 59 events). Furness (2013[11]) indicated that this species was highly sensitive to disturbance by vessel traffic relative to others. The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as moderate by Wade *et al*. (2016[6]).

4.10.1.2 The mean escape distance (and sample size) reported by Fliessbach *et al*. (2019[9]) was relatively low when compared with other species thought to be sensitive to disturbance by vessels and was similar for individuals and groups of birds (Table 4-34).

4.10.1.3 Velvet scoter was assessed to have a high sensitivity to human disturbance by Goodship and Furness (2019[10]) in the context of hand-harvesting of seaweed.

Table 4-34: Mean escape distances, standard deviations, and sample sizes of observations for velvet scoter (individuals and flocks), reproduced from Fliessbach *et al*. (2019[9]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Velvet scoter	474 (+/- 304) (n=1,062)	444 (+/- 307) (n=241)

4.10.1.4 For this assessment a displacement buffer of 1,000m was selected. This was based on the outputs of Fliessbach *et al*. (2019[9]) and Schwemmer *et al*. (2011[7]). This means that the area of search for this species occupies an area of approximately 123km^2, or 7.0% of the total area of the Moray Firth SPA.

4.10.2 Moray Firth SPA Population Estimates

4.10.2.1 Key Moray Firth SPA population estimates for this species are summarised in Table 4-35.

Table 4-35: Key population estimates for velvet scoter within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	1,488 (mean peak)
Lawson *et al*. (2015[4])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	249 (mean peak)
Scott *et al*. (2023[2])	19/01/2020	DAS, block bootstrap estimation method	79 (95% CIs 0 – 234)
	08/03/2020	DAS, block bootstrap estimation method	12 (95% CIs 0 – 36)

4.10.3 Density and Abundance of Birds within Area of Search plus Buffer

4.10.3.1 Key abundance and density metrics of birds within the area of search plus the displacement buffer, and for the whole Moray Firth SPA, are presented in Table 4-36. These were extracted from data produced by Scott *et al*. (2023[2]).

Table 4-36: Density and abundance of velvet scoter in the area of search and the Moray Firth SPA extracted from 2020 DAS data (Scott *et al*. 2023[2]).

Parameter	Scott *et al*. (2023[2]), 19/01/2020, block bootstrap method	Scott *et al*. (2023[2]), 08/03/2020, block bootstrap method
Abundance: area of search plus 1,000m	No data (model did not produce density surface)	No data (model did not produce density surface)
Abundance: Moray Firth SPA	79	12
% of population within area of search	No data (model did not produce density surface)	No data (model did not produce density surface)
Mean density (with 95% CIs): area of search plus 1,000m (n/km^2)	No data (model did not produce density surface)	No data (model did not produce density surface)
Max density: area of search plus 1,000m (n/km^2)	No data (model did not produce density surface)	No data (model did not produce density surface)
Mean density (with 95% CIs): Moray Firth SPA (n/km^2)	No data (model did not produce density surface)	No data (model did not produce density surface)
Max density: Moray Firth SPA (n/km^2)	No data (model did not produce density surface)	No data (model did not produce density surface)

4.10.4 Moray Firth SPA Population Distribution

4.10.4.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[3]) states that the distribution of velvet scoter overlaps considerably to that of common scoter. Velvet scoters were recorded most frequently close inshore between Burghead and Nairn, at Spey Bay and on the Riff Bank. Smaller numbers also occur around the mouth of the Inner Dornoch Firth, normally in association with common scoter. The species displays a preference for open coast habitats in shallow waters, which are used for foraging, loafing, and roosting., with birds widely distributed along the coast of the Moray Firth SPA. Slavonian grebes occur in sheltered inshore marine areas with sandy substrates associated with their main prey items. The key supporting processes for velvet scoter at the Moray Firth SPA are poorly understand but may be linked to water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[3]).

4.10.4.2 During the January 2020 and March 2020 DAS, low numbers of birds were recorded, with the highest abundances reported off the coast of Loch Fleet and Nairn, which are located approximately 50km and 40km respectively from the area of search. The latter area has historically been associated with observations of this species (MacArthur Green, 2024[5]).

4.10.4.3 It is noted that this species may have a different distribution across the Moray Firth SPA at night, due to its known tendency to move into offshore roosting areas during this time.

4.10.5 Assessment of Potential Impacts

4.10.5.1 The 2020 DAS detected too few observations of velvet scoter to generate meaningful density surface maps, so quantitative comparisons between abundance and density within the area of search and the wider Moray Firth SPA are not possible. However, based on the literature and data sources examined (Lawson *et al*., 2015[4]; MacArthur Green, 2024[5]; NatureScot, 2022[3]; Scott *et al*., 2023[2]), it is considered that within the Moray Firth SPA, the area of search is likely to be of relatively low importance to velvet scoter due to the species preference for nearshore, relatively shallow waters. This means that the area of search is in the main unlikely to represent key habitat for this species. Whilst distributions of this species may differ at night, no impacts are considered to be possible as no O&M vessel activity will routinely occur at this time.

4.10.5.2 The areas where birds were mainly recorded during the 2020 DAS, and have previously been recorded based on other sources of information, are generally not located sufficiently close to the area of search for direct impacts due to O&M vessels associated with the Proposed Development (Offshore) to occur on the habitats within these areas, or the birds using them.

4.10.5.3 The available data and other information indicates that displacement of velvet scoter by O&M vessel traffic, if it occurs, would involve low numbers of birds relative to the wider population of the Moray Firth SPA.

4.10.5.4 The high levels of existing vessel activity within both the area of search (Figure 3–2) and much of the wider Moray Firth SPA (Figure 3–1) suggest that disturbance and displacement of birds is part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.10.5.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by O&M vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.10.5.6 In summary, it is not considered that the addition of three return vessel trips per day across the area of search would materially impact the abundance or distribution of velvet scoter in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts (Table 4-37). It is therefore concluded that the O&M vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the velvet scoter qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-37: Assessment of predicted impacts on velvet scoter qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will therefore not prevent the Moray Firth SPA velvet scoter population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of velvet scoter within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	not overlap with the area of search and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, velvet scoter will continue to have access to and utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for velvet scoter in the Moray Firth SPA are not well known but may include water quality (nutrients and turbidity), tidal cycles and water flow. Small increases in the number of vessel movements confined to the area of search, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA velvet scoter are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.11 Shag

4.11.1 Evidence for Sensitivity to Vessel Disturbance

4.11.1.1 Jarrett *et al*. (2018[13]) categorised the sensitivity of shag to vessel disturbance as medium. Furness (2013[11]) indicated that this species was moderately sensitive to disturbance by vessel traffic relative to others, being allocated a score of three (out of five, where five was the most sensitive). The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[6]). This species was not included in Fliessbach *et al*. (2019[9]). Shag was assessed to have a medium sensitivity to human disturbance by Goodship and Furness (2019[10]) in the context of hand-harvesting of seaweed.

4.11.1.2 For this assessment a displacement buffer of 1,000m was selected. This means that the area of search for this species occupies an area of approximately 123km^2, or 7.0% of the total area of the Moray Firth SPA.

4.11.2 Moray Firth SPA Population Estimates

4.11.2.1 Key Moray Firth SPA population estimates for this species are summarised in Table 4-38.

Table 4-38: Key population estimates for shag within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	1980 to 2006	Visual boat surveys, analysis method unknown	6,462 (mean peak)
Scott *et al*. (2023[2])	19/01/2020	DAS, block bootstrap estimation method	0
	08/03/2020	DAS, block bootstrap estimation method	1,762 (95% CIs 76 – 4,607)

4.11.3 Density and Abundance of Birds within Area of Search plus Buffer

4.11.3.1 Key abundance and density metrics of birds within the area of search plus the displacement buffer, and for the whole Moray Firth SPA, are presented in Table 4-39. These were extracted from data produced by Scott *et al*. (2023[2]).

Table 4-39: Density and abundance of shag in the area of search and the Moray Firth SPA extracted from 2020 DAS data (Scott *et al*. 2023[2]).

Parameter	Scott *et al*. (2023[2]), 19/01/2020, block bootstrap method	Scott *et al*. (2023[2]), 08/03/2020, block bootstrap method
Abundance: area of search plus 1,000m	0	No data (model did not produce density surface)
Abundance: Moray Firth SPA	0	1,762
% of population within area of search	0	No data (model did not produce density surface)
Mean density (with 95% CIs): area of search plus 1,000m (n/km^2)	0	No data (model did not produce density surface)
Max density: area of search plus 1,000m (n/km^2)	0	No data (model did not produce density surface)
Mean density (with 95% CIs): Moray Firth SPA (n/km^2)	0	No data (model did not produce density surface)
Max density: Moray Firth SPA (n/km^2)	0	No data (model did not produce density surface)

4.11.4 Moray Firth SPA Population Distribution

4.11.4.1 Shags require suitable habitat for foraging, loafing, bathing, and other maintenance activities within the Moray Firth SPA. Conservation Advice for the Moray Firth SPA (NatureScot, 2022[3]) states that shags are benthic feeding piscivores with a preference for rocky coasts with deep, clear water. Their foraging areas tend to coincide with areas of sandy benthic sediment in depths up to 80m, but they also forage over rocky seabeds. Shags forage in sheltered bays and channels, but will generally avoid estuaries, shallow or muddy inlets and fresh or brackish waters. During the non-breeding season, shags are widely distributed throughout the Moray Firth SPA, with higher concentrations of birds being previously recorded around Portsoy and between Brora and Berriedale.

4.11.4.2 The key supporting processes for shags in the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow.(NatureScot, 2022[3]).

4.11.4.3 During the January 2020 DAS shag was not recorded. In the March 2020 DAS, low numbers of birds were recorded across mainly coastal areas, with the highest abundances reported off the coast of Helmsdale (located approximately 50km from the area of search), and a scattering of records in coastal areas to the north and south of the Cromarty Firth.

4.11.5 Assessment of Potential Impacts

4.11.5.1 The 2020 DAS detected too few observations of shag to generate meaningful density surface maps, so quantitative comparisons between abundance and density within the area of search and the wider Moray Firth SPA are not possible. Based on the literature and data sources examined (Lawson *et al*., 2015[4]; MacArthur Green, 2024[5]; NatureScot, 2022[3]; Scott *et al*., 2023[2]), it is considered that within the Moray Firth SPA, the area of search is likely to be of relatively low importance to shag due to the species preference for nearshore waters. This means that the area of search is in the main unlikely to represent key habitat for this species.

4.11.5.2 The areas where birds were mainly recorded during the 2020 DAS, and have previously been recorded based on other sources of information, are generally not located sufficiently close to the area of search for direct impacts due to O&M vessels associated with the Proposed Development (Offshore) to occur on the habitats within these areas, or the birds using them.

4.11.5.3 The available data and other information indicates that displacement of shag by O&M vessel traffic, if it occurs, would involve low numbers of birds relative to the wider population of the Moray Firth SPA.

4.11.5.4 The high levels of existing vessel activity within both the area of search (Figure 3–2) and much of the wider Moray Firth SPA (Figure 3–1) suggest that disturbance and displacement of birds is part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.11.5.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by O&M vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.11.5.6 In summary, it is not considered that the addition of three return vessel trips per day across the area of search would materially impact the abundance or distribution of shag in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts (Table 4-40). It is therefore concluded that the O&M vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the shag qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-40: Assessment of predicted impacts on shag qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will therefore not prevent the Moray Firth SPA shag population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of shag within the Moray Firth SPA is anticipated as a result of the predicted impacts. The predicted impacts will therefore not contribute to this objective not being met.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the area of search and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, shag will continue to have access to and utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for shags at the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow. Small increases in the number of vessel movements confined to the area of search, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA shag are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.12 Summary of Conclusions

4.12.1.1 For all qualifying features of the Moray Firth SPA, assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential predicted impacts of O&M vessel activity associated with the Proposed Development (Offshore).

4.12.1.2 Therefore, it is concluded that no AEoSI will result due to disturbance and displacement as a result of O&M vessel activity associated with the Proposed Development (Offshore), either alone, or in-combination with other existing activities.

4.13 Embedded Mitigation

4.13.1.1 A range of best practice procedures will be adhered to by O&M vessel traffic associated with the Proposed Development (Offshore), which will be detailed in the VMP. The VMP will be produced post-consent, once the O&M base location has been confirmed.

4.13.1.2 The VMP will include information such as:

- Preferred transit routes between the O&M base and the Proposed Development (Offshore) to, where possible, avoid areas of the Moray Firth SPA anticipated to support higher abundances of birds;
- Details of vessel transit speed limits within the Moray Firth SPA, to minimise disturbance and displacement of birds within its boundaries;
- Procedures for avoiding unnecessary disturbance to aggregations of birds identified in the path of an O&M vessel; and
- Clear instructions for O&M vessels not to loiter within the Moray Firth SPA.

4.13.1.3 Implementation of and adherence to the VMP will minimise disturbance to birds, their habitats, and the prey species and other processes supported by them.

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