

Scottish Natural Heritage
Commissioned Report No. 896

Islay barnacle goose roost survey 2013/2014





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COMMISSIONED REPORT

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Islay barnacle goose roost survey
2013/2014

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COMMISSIONED REPORT

Summary

Islay barnacle goose roost survey 2013/2014

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Keywords

Islay; *Branta leucopsis*; roost; feeding areas; flyways.

Background

RPS Ecology undertook a survey programme of Greenland barnacle geese *Branta leucopsis* on Islay in winter 2013/14 to investigate goose movements to and from roosts sites on the island, three of which are designated as Special Protection Areas (SPAs) for this species.

Main findings

- Data collected in winter 2013/14 suggest that barnacle geese are primarily utilising the three SPA locations as roost sites, but other satellite roost sites have been identified, and confirmed.
- Linkage between the three SPA roosts and feeding areas is discussed and certain clear flyways highlighted.
- Broadly, these linkages were suggested a number of years ago by Percival (1991) and it seems that overall, even with a substantially increased population that barnacle geese are creatures of habit and use similar roosts, feeding areas and flyways from year to year.

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John Armitage assisted with surveys in the first months of the project and answered queries in relation to historical data and logistics. RSPB staff engaged in discussion with us and granted access to sites at Loch Gruinart outwith normal business hours to allow counts to take place.

SNH staff, notably Rae McKenzie provided background data and support throughout and provided feedback and advice to enrich the discussion, while Jessica Shaw provided useful feedback at draft stages.

1. INTRODUCTION

Scottish Natural Heritage (SNH) commissioned research to try and establish a more detailed understanding of use of roost sites by barnacle geese on Islay and the interaction between these roost sites and feeding areas around the island.

The study was prescribed to gather new observational field data to help inform future management decisions affecting barnacle geese. These may include:

- the design of future bespoke goose management schemes on Islay, including the issue of licences to kill geese;
- the introduction of a long term sustainable management plan for barnacle geese on Islay and the rest of Scotland;
- the development of a set of 'SMART' conservation objectives for the three SPAs;
- SNH's Site Condition Monitoring Programme;
- site management casework.

2. BACKGROUND

Islay is one of the main wintering grounds for Greenland barnacle geese *Branta leucopsis*. The species is listed on Annex 1 of the EU Birds Directive (1979), and in recognition of this conservation status, the three main roost areas on Islay were all designated as Special Protection Areas (SPAs) as part of the Natura 2000 process (Figure 1). The site citations are:

- Gruinart Flats SPA designated for up to 20,000 individuals representing 64.5% of the GB population) 64.5% of the wintering population in Great Britain (SPA citation)
- Bridgend Flats SPA designated for 6,700 individuals representing an average of 22% of the wintering population in Great Britain (SPA Citation)
- Laggan SPA designated for 1,800 individuals representing an average of 6.7% of the wintering population in Great Britain (SPA citation)

The main arrival of birds tends to occur in early-mid October, with flocks initially making landfall on the estuarine Loch Gruinart in the north. The majority of birds then disperse more widely across the island, with some moving to other wintering areas in western Scotland and Ireland. Spring departure usually takes place in April, with birds staging in Iceland before returning to breeding areas in Greenland. Over the past 20 years barnacle geese numbers on Islay have more than doubled to 41,250 in 2013. Geese have flourished on Islay due to the availability of high quality feeding, undisturbed roosts and the protection afforded to them under European and Scots law. These geese generally feed on agricultural grassland which is grown to support beef and sheep production. In recent years large numbers of barnacle geese have resulted in a high level of reported damage to the agricultural economy of the island.

SNH have been involved with goose management and payments to farmers for a number of years. A wider project has begun to look at long term sustainable management for barnacle geese which may include habitat manipulation and population control as part of the plan.

As part of this work, this stand-alone project was commissioned to investigate the interaction and linkage between barnacle geese from roost sites and feeding areas. This project, and further research, will provide data which will contribute to the operation of the current Islay Local Goose Management Scheme and inform the development of future management options.

3. AIMS AND APPROACH

3.1 Objectives

As specified by SNH the purpose of the work on Islay was agreed as the following:

- i) Record the number of barnacle geese roosting on the three SPAs and any other located roost sites, both at dawn and dusk;
- ii) Assess the temporal variation in roosting barnacle goose numbers;
- iii) Ascertain, where possible, connectivity between roosts and field use, considering flight direction and numbers of geese recorded in fields during the day.
- iv) Ascertain the number of barnacle geese using individual fields (although more detailed data exists through the SNH count programme)

3.2 Approach

The proposed methodology to address the above aspects was planned and agreed with SNH staff around three core aspects:

- i) Counts of barnacle geese at each roost both at dawn and dusk. These would allow a database to be constructed of roost usage, and directional movements in and out of these sites where it was possible to record such events. Initially, observations took place at dawn only, as RPS considered, based on published work, and prior experience, dusk watches were considered to be of limited effectiveness. This is due to the fact that geese often arrive at roosts shortly before, or after, dark, making plotting of flightlines and accurate counts difficult. Dusk watches were adopted from November at the request of SNH staff, as they had been specified in the original tender document. Dawn and dusk surveys were focussed around known roost locations and expanded to areas that birds were also thought to utilise as roosts, The process of identifying these satellite roost areas was twofold; ongoing consultation with local SNH staff and local ornithologists (e.g. for the Kintour roost), and through direct observation of birds at feeding areas in the late afternoon (e.g. Ardnave/Killinallan).
- ii) Observations of the flight directions of barnacle geese to and from roosts. Direction of flight in combination with numbers would be key factors. Birds would be followed using optics as far as was possible, and this would be noted on field maps. Conventionally bird flights are deemed not visible beyond 2 km, but as barnacles are relatively large, vocal and generally travel in flocks this was extended to a notional 3km. Not every roost or potential roost could be covered each night, so recording was spread over the winter months to give a snapshot from each location.
- iii) Driven transects across the island, focusing on suitable habitat zones, recording the numbers of barnacle geese in each field, were planned. These would be undertaken during daylight hours, between the dawn and dusk periods. Drive over surveys focussed on lowland agricultural sites and were undertaken following completion of dawn surveys and prior to dusk field work. As the main purpose of the driven surveys was to follow up observations of flights away from roosts, routes tended to vary from survey to survey. In March, three surveyors and vehicles were available, so in addition to following up flightlines, a whole island count was undertaken. Due to access issues, not all areas of suitable habitat could be viewed, however, coverage was estimated to be in the region of 90%.

3.3 Outputs

The main outputs were agreed to be:

- i) Written report describing how barnacle geese make use of roost sites across the island throughout the autumn, winter, and spring periods and their interactions with feeding areas;
- ii) A series of GIS maps showing the location of barnacle goose roosts identified during the field work, the feeding areas associated with these roosts, and estimated numbers of geese which use each roost. The purpose of this series of maps is to demonstrate the spatial and temporal changes to roost use and the interactions with feeding areas;
- iii) A dataset of goose roost counts collected as part of the study, presented as a spreadsheet.

4. METHODOLOGY

As prescribed by SNH the work included the following steps:

- i. Visiting known roosts monthly during the winter season to establish numbers of geese using these individual sites.
- ii. Associating roosts to feeding areas where possible through dawn/dusk flight observations and calculating numbers of geese by using daytime field count data
- iii. Identifying new roosts through observing geese at feeding areas not linked to known roosts and following to roost site. Calculating numbers of geese using new roosting and feeding areas as above.
- iv. Searching for distinctive individual geese, whether marked by neck collar, ringing or aberrant plumage, and other species readily identifiable in flocks of barnacles, to allow movements of birds to be logged.

Survey work took place over the winter of 2013/14. Fieldwork commenced in mid-October and was completed in mid-March by a team of ornithologists; all experienced in field survey methods relating to geese, population estimation and general field work protocols.

Field staff visited SNH offices in Islay to pass on updates and discuss methods.

Other inputs into the study were field and/or farm goose count data available from the Islay Goose Scheme Database and a GIS version of the SNH field code maps. Both these sources were made available by SNH and were examined to cross check that known feeding areas across Islay were surveyed.

4.1 Survey area

The survey area covered the whole of Islay in which habitat was deemed suitable for barnacle geese. Broadly this covered all lowland and coastal agricultural areas. It omitted hill ground predominated by heather moorland and forestry where the species was not noted to occur (as instructed by SNH). The survey was also informed through discussion with SNH staff and reviewing the current SNH goose survey database that was supplied. The detailed routes followed are mapped in Figure 2.

The study area comprised the majority of the island, with effort focussed on key areas around roosts, and the fertile pastures favoured by feeding barnacle geese. Areas not covered were primarily those not known to be used by the species, i.e. moorland and forested habitats, although birds crossing these areas in flight would be detected from vantage point observations. Surveying a large population of birds over a large island necessitated prioritisation of data collection; the study aimed to balance consistent coverage of the main roosts, with a flexibility to visit other areas of the island to assess satellite roosts as they formed. Driven surveys targeted observed or speculated destination areas of birds leaving roosts, with the March survey aiming to combine this with two whole island snapshot counts.

4.2 Survey schedule

Field surveys began in mid-October, after the first geese arrived and continued through the winter period to mid-March. Surveys were carried out on a monthly basis, resulting in six full surveys over the period. This programme was deemed to capture data on autumn, winter and spring goose roost activity on Islay, and provide information from stages of varying daylight, weather and agricultural activities while the birds are present on the island.

Sampling ideally took place outwith the full moon period, as geese tend to feed nocturnally over this lunar phase, so roosting behaviour can be atypical. Surveys were planned to avoid one week either side of the full moon, though, due to logistical issues, the October surveys overlapped with this phase.

4.3 Roost observations

The roost sites were observed at both dawn and dusk from selected vantage points (Table 1, Figures 3.1-3.10). Vantage points were chosen in positions which provided an unobstructed view of the flight paths, in a broadly similar manner to that given in guidance for renewables surveys (SNH 2005), but which did not influence the flight paths of the geese. Initially this was done through GIS software checking, but was 'ground truthed' and agreed with the SNH goose manager on Islay. They were located so as to overlook known or presumed roost areas and allow, as best practical, uninterrupted flight lines to be observed. Permission was sought for access to all vantage points in advance of visits.

Table 1. Coordinates for vantage points.

Vantage Point (VP)	OS Grid Reference	VP coverage provided over 'X' designated site
Ardnave Point	NR 29325 74119	Gruinart Flats, Islay SPA
Loch Gruinart	NR 27764 67485	
Killinallan	NR 31373 72159	
Cnoc Don	NR 32394 64646	Bridgend Flats, Islay SPA
Bridgend Flats	NR 33466 61923	
Port Ellen TV Mast	NR 33994 45227	Laggan SPA
Laggan Bay	NR 30000 54700	
Laggan Point	NR 28022 55396	
Kilchoman Chapel	c.NR 21617 63264	n/a
Machir Bay		
Kintour	NR 46103 51856	

Observations started at least one hour before sunrise or sunset, before the time when the birds were expected to start departing or arriving, respectively. Observations continued until at least an hour after sunrise or sunset or until light was so poor no birds could be seen. Weather conditions were noted for each hour of the survey. Visibility is the main constraint with vantage point surveying, so days with forecast low cloud and poor visibility were avoided if possible.

The numbers of barnacle geese flying into or out of the roosts were counted and their flight lines were plotted on large scale maps with emphasis on direction, numbers and timings. The numbers of barnacle geese present on the roost site before or after the observation finished for dusk or dawn observations, respectively, were also counted.

Where possible individually identifiable geese (i.e. colour ringed, tagged, or aberrant birds) were used to monitor movements between flocks, fields and roosts.

4.4 Transects of the feeding areas

Surveyors slowly drove along all of the available roads in the areas (apart from any which duplicated the coverage from other roads), including minor roads and tracks, stopping at intervals to scan the area for flocks of geese. Regular stops were made to scan fields for birds and to minimise disturbance to feeding geese observers remained in vehicles when possible. Any movements of geese between sites were also noted when they occurred.

Following the approach adopted by Patterson et al. (2012) and Keller et al. (1997), the number of barnacle geese within individual fields were counted and plotted on field maps.

Surveys were undertaken in a range of weather conditions, so as to provide a snapshot of the entire range of conditions that occur in winter. However, days with poor visibility (i.e. 1 km or less), were avoided if the forecast suggested this may occur. Effort was based around available daylight hours following dawn surveys and prior to commencement of dusk vantage points. This was obviously compressed, especially in December and January.

The starting point of the route was varied between surveys to prevent any systematic bias in relation to the time of day when each part of the area was visited. Where possible, surveyors were alternated on different routes over consecutive days to minimize observer error and/or bias. Any small flocks seen in flight were closely watched, since they were likely to join larger flocks foraging in fields, some of which may not have been seen from the road transect route. This methodology aimed to give an unbiased description of the birds' foraging distribution at the time of the roost counts, and was augmented by observations of flight lines, which could reveal the use of foraging areas that were not easily seen from the transect.

Some areas were not visible from any roads, but where habitat suggested they were suitable for geese these were checked. Areas not surveyed included the north-east of Islay as this is of generally unsuitable habitat for both foraging and roosting and therefore not considered to bias the results. Further, small pockets of land were not visible from the transect routes selected; however these were considered, as in Patterson et al. (2012) to be evenly distributed and unlikely to also bias the results.

Transects were usually started in the morning, following observations at roosts and continued throughout the day. The survey area was split into three broad areas when three surveyors were present on the island together. This occurred with a split in the island routes, broadly being:

- Rinns – all suitable areas to the west of Blackrock/Gruinart
- Central/Sorn Valley – area to east of Gruinart/Blackrock to Bridgend/Cluanach
- South - Bridgend/Cluanach and the remainder of southern survey route

This allowed for appropriate coverage of the island within one day by three observers whilst minimizing the likelihood of count duplication. If one observer was ahead they would survey a stretch of road of another surveyor's route, but this action would be relayed by telephone to ensure that no data overlaps took place. When two observers were present the route was bisected, and observers maintained phone contact to ensure coverage was constant.

The number of geese and the field they were located in (identified using field boundary maps, supplied by SNH) were recorded on the transect sheets. The data were entered onto bespoke pro-forma recording sheets, including; date, time, field ID, species code, number of birds, and predominant activity (feeding or resting). A separate record was kept of the weather on each survey day, including wind speed and direction, rain, cloud cover and height and visibility. Data were kept secure at all times and were reviewed regularly during

the project, with discussions of interim findings within the project team, and with local ornithologists. This allowed data collection to be responsive to changing patterns of goose behaviour, while remaining tightly focussed around the key aims of the project

The dates, times and weather reported for each transect are reported in Annex 1.

4.5 Data capture and analysis

All data were recorded on bespoke pro-forma recording sheets in the field. Data were then digitised in ArcMap 10.1 and maps produced to supplement written data logs.

The flight line data were collated by observers viewing in the direction of known or suspected roosts and plotting any flight paths. This data was combined to provide maps, showing the flight activity for each roost. Accuracy of data recorded was deemed to be robust by using experienced staff, with good field skills and knowledge of goose movements and patterns generally. As barnacle geese are relatively large, and generally fly in flocks, view sheds were not clipped at 2km, as is often the case with vantage point methodology. Instead birds were followed from the first observation and recorded as far as the observer could accurately plot; often over 3km.

Generally three observers were used on site to record movements. As well as undertaking the roost and driven transect surveys they also liaised while out in the field regarding movements of flocks to try to minimise any potential effects from double counting.

The roost count data was used to provide the number of barnacle geese at each roost for both dawn and dusk surveys.

4.6 Health and Safety

All field work was carried out in accordance with RPS Fieldwork Health and Safety procedures. In particular, care was taken to establish safe access routes to and from vantage points, especially as these were visited in poor light conditions, and sometimes in poor weather. Particular care was also taken when driving on road transects and the surveyors stopped only where it was safe to do so and record geese.

5. RESULTS AND DISCUSSION

5.1 Transects of the feeding areas

The locations where barnacle geese were found during the transect surveys are reported in Figures 6.1 - 7.6. These only relate to geese counted in fields during survey work and do not include birds remaining on roosts. This appeared to be a particular issue during winter 2013/14. The data are split by month and the size of flocks indicated by gradated colour coding. Drive over surveys covered all fields, and fields are shown as 'blank' in the figures where no birds were recorded. This follows the approach utilised by Paterson (2012). The compiled dataset provides a comprehensive feeding distribution survey at the time of dusk and dawn roost counts. If feeding patterns altered in the month this would not be picked up by utilising another dataset, so the timings of flight lines and field counts on the same, or subsequent day, provides the most accurate method of linkage between roosts and feeding areas.

Table 2 shows the total number of barnacle geese recorded on each survey date from driven transects across the island. The peak count of geese was at the end of November with 33,405 birds. The lowest counts were made in January; however, it is the time of shortest daylight hours. Additionally January was one of the wettest periods in the island's recent history (SNH pers comm.) with many fields waterlogged for much of the month following the arrival of a series of Atlantic weather depressions.

Whether this unusual weather took birds into areas within the islands which they do not normally favour, i.e. moorland, or whether the birds departed for other feeding areas is unknown. Both of these eventualities need to be considered, but there is no evidence to suggest that this is the case. One factor noted was that birds largely remained in the roosts during the day due to low cloud and inclement weather; for example, over 6000 remained through daylight on Bridgend Flats on January 25th, and did not follow their typical pattern of moving to fields to feed that day.

Tables 2 and 3 reaffirm autumn population peaks which are well documented for the Islay population (ap Rheinallt, 2007), as are movements of wintering birds within the islands (Percival 1991). Mild weather may have encouraged birds to stay longer in some areas and extend the autumn period, while persistent gales and waterlogged fields, a feature of January 2014, may have encouraged birds to seek alternative feeding grounds. Climatic predictions of milder and wetter winters may ultimately reveal this to be the norm and birds will likely adapt their behaviour to fit into this scenario.

It should be noted that the data is not comprehensive due to incomplete surveys but more reliable count data is available from the SNH goose count database.

Table 2. The total number of barnacle geese counted from drive over transects per survey date.

Date	Total
15/10/2013	1580*
16/10/2013	13652
22/11/2013	500*
23/11/2013	33405
13/12/2013	14389
24/01/2014	582*
25/01/2014	9141*
26/02/2014	16711
25/03/2014	18397

26/03/2014	18446
27/03/2014	18490

*full survey not completed on this date, due to weather.

Table 3. The total number of barnacle geese observed from drive over transects per survey

Monthly composite total	Geese recorded in full monthly survey cycle
October	15,232
November	33,905
December	14,389
January	9,723*
February	16,711
March	18,444**

*only sites west of Bridgend/Gruinart counted; due to inclement weather many birds remained in roosts and did not move into fields. Brief visit to fields north east of Bridgend found no birds emphasising birds had remained in roosts and linkage between the two locations.

**averaged from three full island surveys in consecutive days

5.2 Roosts

5.2.1 Mean number of geese per vantage point

Table 4 shows the mean total number of geese for all roost surveys across the survey period by site at dawn and dusk. It should be noted that birds can move at night, and this was noted from calling birds heard passing in hours of darkness on various dates. As such, a roost count one evening was not necessarily matched by the departing number of birds the following morning.

Table 4. The mean number of geese roosting on each site recorded from each vantage point at dawn and dusk across the season.

Site	Dawn	Dusk	VP coverage provided over 'X' designated site
Ardnave Point*	-	3,452	Gruinart Flats, Islay SPA
Loch Gruinart*	10,955	2,845	
Killinallan*	-	1,650	
Cnoc Don	2,750	2,116	Bridgend Flats, Islay SPA
Bridgend Flats*	4,771	5,929	
Port Ellen TV Mast	0	0	Laggan SPA
Laggan Bay*	1,180	-	
Laggan Point*	2,926	2,605	
Kilchoman Chapel	966	375	n/a
Machir Bay	1,400	-	
Kintour	0	0	

*SPA designated roost

Examination of the table shows that the three SPA roost conglomerations are also the three largest roosts. The wider Loch Gruinart SPA roost is taken to include the (satellite) roosts recorded from Killinallan and Ardnave Point, as well as Loch Gruinart itself.

The counts at Cnoc Don can be added to totals from Bridgend, as its viewshed largely captured this location and no simultaneous VPs between the two locations were undertaken. Likewise counts made from Laggan Bay and Laggan Point largely related to the same SPA area and no overlap in dates occurred. Recording was undertaken at Port Ellen to see if 'leakage' occurred from the Laggan area to the south and east, but this was not recorded.

On the west coast Machir Bay and Kilchoman Chapel can be regarded as covering the same area.

Overall, other satellite roosts, were small and often not located, i.e. Kintour, despite local information suggesting new roosts may be occurring (SNH pers comm.).

The main roost which is not designated as an SPA for barnacle geese is that occurring in the far west around Machir Bay. Though birds seemed to favour this as a relatively secluded spot, it is subject to weather and tidal issues, and may be best regarded as an alternative location. At times of high tide, and in stormy conditions when swells are high, the beach has only limited areas of sand left exposed to allow geese to roost.

5.2.2 Patterns of goose use at each roost site

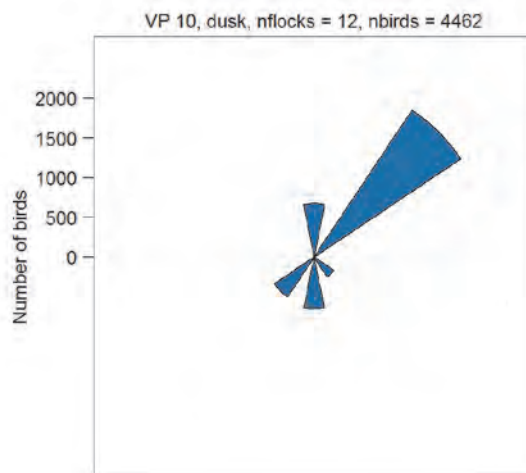
Not all roost sites were visited in every survey month in order to spread effort given logistical constraints. Where a 'zero' is presented in the following tables no birds were recorded, but surveys did take place. A dash denotes no survey conducted.

5.2.3 Ardnave Point (part of Gruinart Flats SPA)

Surveys were not undertaken at this site early in the season, however large numbers were observed roosting in February and March. Ardnave lies at the mouth of Loch Gruinart and is geographically linked to the Gruinart Flats SPA. No dawn surveys were undertaken.

Table 5. The numbers of barnacle geese recorded roosting at Ardnave Point.

Survey	October	November	December	January	February	March
Dawn	-	-	-	-	-	-
Dusk	-	-	-	-	5729	1175



Web 1. The dusk arrival directions of flocks of barnacle geese from Ardnave

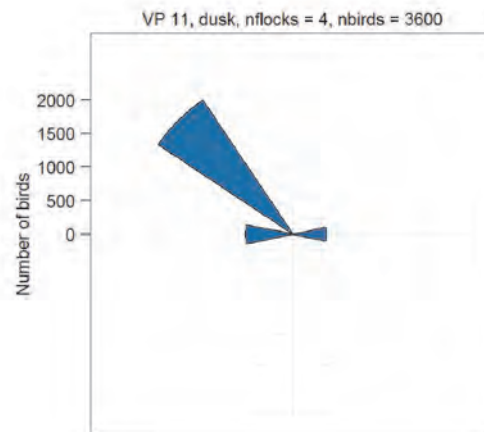
Birds generally approached this site from the north east, having earlier been in fields to the east of Loch Gruinart (Figure 3.9). It is reasonable to assume that birds in this area are linked to the Gruinart Flats SPA and that this site is a satellite roost, away from the main congregations at the head of the loch. It also seems likely that birds may move from here and be absorbed into the main larger Gruinart roost at times. However in terms of the designated SPA boundary, Ardnave roosts are part of the wider the Gruinart Flats SPA populace.

5.2.4 Killinallan (part of Gruinart Flats SPA)

Large numbers of barnacle geese were observed roosting at this site in February and March.

Table 6. The numbers of barnacle geese recorded roosting at Killinallan.

Survey	October	November	December	January	February	March
Dawn	-	-	-	-	-	-
Dusk	-	-	-	-	2600	700



Web 2. The dusk arrival directions of flocks of barnacle geese from Killinallan.

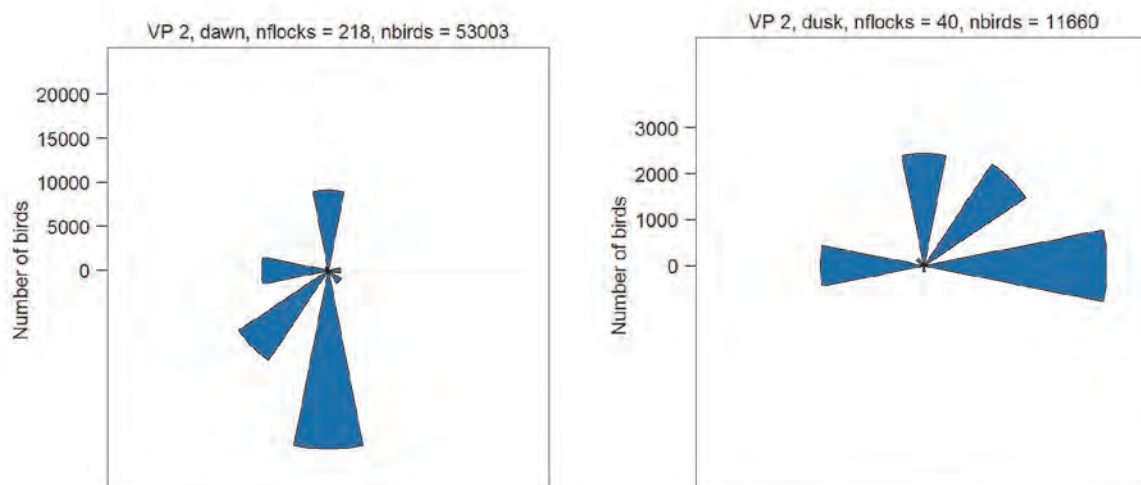
Birds generally approached this site from the north-west (Figure 3.10). This movement is likely to be linked with birds from Ardnave and the wider Gruinart Flats SPA area, with birds often moving seaward at times of disturbance or tide before heading back into the more inland areas and fields of the Gruinart Flats.

5.2.5 Loch Gruinart

Loch Gruinart is part of the SPA network (Gruinart Flats, Islay SPA), and partly managed by RSPB to support geese and other wildfowl. It was used for roosting across the entire survey period and is clearly one of the two main locations utilised on the island. Roosts were largest in the early part of the period (October) when geese first come in from Greenland, with numbers gradually declining, presumably dispersing to other sites as the winter progressed. The roost size again increased in March as is typical of the site (RSPB pers comm.) as birds stage before returning to Greenland to breed. Counts here were noted to be consistently higher at dawn compared to dusk, suggesting that many birds arrive in the hours of darkness.

Table 7. The numbers of barnacle geese recorded roosting at Loch Gruinart.

Survey	October	November	December	January	February	March
Dawn	25000	5000	7100	2374	4380	9396
Dusk	-	-	2000	1442	2494	5445



Web 3. The departure directions of flocks of barnacle geese from Loch Gruinart.

Web 4. The arrival directions of flocks of barnacle geese from Loch Gruinart.

Observations suggest that birds utilising this roost often stayed relatively local around the Loch Gruinart valley. Presumably this was to exploit the sanctuary offered by the RSPB reserve and the habitats managed for them. Disturbance appeared to be a limited issue here, with birds noticeably less wary than at other sites, no doubt linked to the lower levels of disturbances.

In the mornings, birds seem to loiter in the area longer than other roosts, often only heading a short distance into adjacent fields. However, when data from Cnoc Don is analysed and assessed at the same time it can be seen that there is a regular flyway from the south east of Loch Gruinart eastwards towards the Sorn valley area. Late afternoon the return to roost flights were most regularly from fields to the east and north. Again this would suggest that as the day progressed birds utilised different areas, gradually moving further from the ultimate roosting location.

Birds were also followed to the Sunderland Farm area and were observed generally utilising the wider Loch Gorm area. These movements are clearly depicted in Figure 3.2.

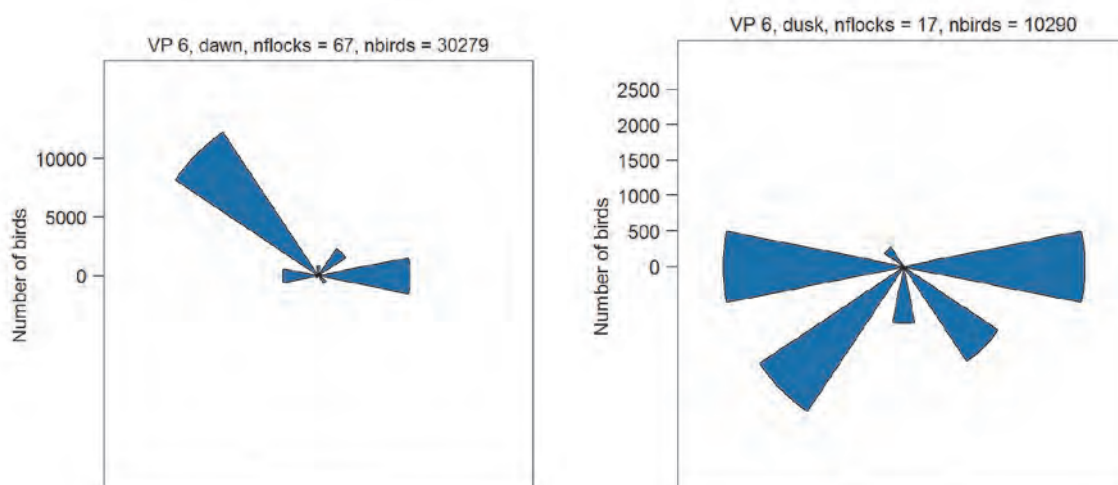
5.2.6 Cnoc Don

This site was chosen as an elevated view point primarily overlooking the Bridgend roost with flightlines around the Gruinart roost, on advice from SNH staff, rather than being positioned at a roost location itself. It also had the advantage of allowing flight routes to be recorded which could show linkage between the SPAs at Bridgend and Loch Gruinart.

The number of birds roosting on Bridgend Flats, observed from Cnoc Don remained around 5000, but birds on the near saltmarsh were not viewable from this location. Numbers decreased in March, at a time when counts increased at Loch Gruinart. No birds were seen roosting on Bridgend Flats from Cnoc Don in November (Table 11) but it is thought that this was an artefact of tidal conditions when birds were pushed onto the saltings out of view of the vantage point.

Table 8. The numbers of barnacle geese recorded roosting at Bridgend Flats, observed from Cnoc Don.

Survey	October	November	December	January	February	March
Dawn	-	0	5000	-	5000	1000
Dusk	-	-	0	-	4500	1850



Web 5. The departure directions of flocks of barnacle geese from Cnoc Don.

Web 6. The arrival directions of flocks of barnacle geese from Cnoc Don.

The dawn directions of flocks of barnacle geese from Cnoc Don were mainly to the north west (Figure 3.5) in terms of overall numbers. However, there is the potential here that data has been artificially skewed by one large flock (always a danger during wildfowl analysis). This pattern suggests movement towards Loch Gruinart from Bridgend, as the VP location lies between these two SPA roosts. Here flight corridors from both Gruinart and Bridgend are obvious, with birds converging in the Sorn valley area at feeding spots such as Eorabus Farm and around Ballygrant.

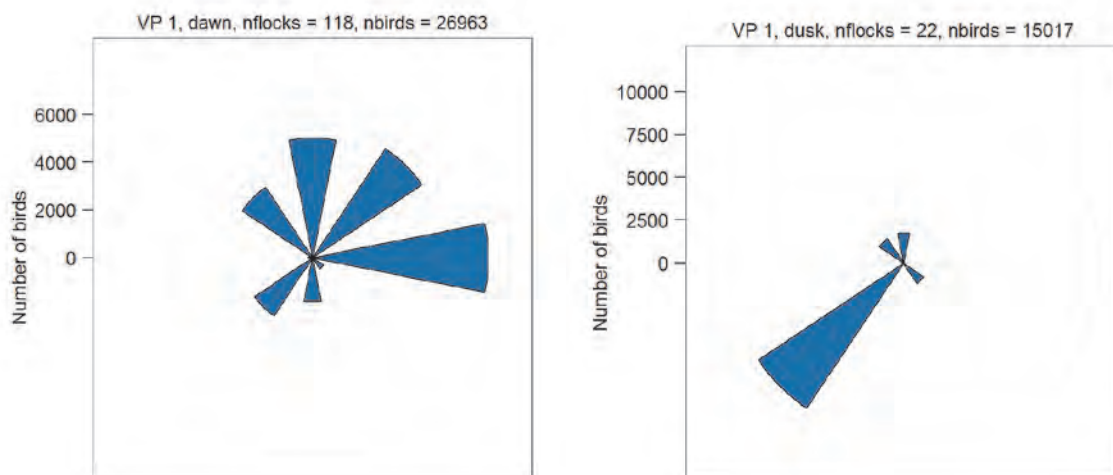
Overall this clearly shows geese from two SPAs feeding in the same area which may have implications for future management. Given that geese are well known to stay in family units through the winter it is likely that birds return to the same roosts on a nightly basis, but this hypothesis requires further investigation, and is out with the scope of this report.

5.2.7 Bridgend Flats

Bridgend Flats, a designated SPA barnacle goose roost, was observed to host thousands of birds. Direct shore side surveys were not undertaken in November or December at this site, instead observers were guided to view from the elevated Cnoc Don location to record movements primarily from the Bridgend roosting location. Dawn counts were normally higher than dusk counts, although c.5000 more geese were observed at dusk in March compared to dawn. This emphasises that nocturnal movements within the barnacle geese population occur.

Table 9. The numbers of barnacle geese recorded roosting at Bridgend Flats.

Survey	October	November	December	January	February	March
Dawn	4800	0	5000	8223	4500	3166
Dusk	-	-	0	5590	3396	8803



Web 7. The departure directions of flocks of barnacle geese from Bridgend Flats.

Web 8. The arrival directions of flocks of barnacle geese from Bridgend Flats.

Bridgend is a major central roost located at the head of Loch Indaal with birds utilising the saltings and mudflats there that are exposed extensively at low tide. It is relatively sheltered from human disturbance by the salt flats that seem to deter dog walkers and other recreational disturbance. As such the birds may see it as a particularly safe haven and often loiter well into daylight hours at this site. In fact it is rare to visit any time through the winter and not see numbers of barnacle geese present on the mud flats at low tide.

The prime disturbance at this site is the tide. In strong south westerly winds and at high tides birds are forced high up onto the vegetated saltings and close to the main A847 road. As such disturbance occurs and birds are noticeably more alert and wary, often taking flight – even just a short distance.

In the early morning birds seem to depart primarily to the east and north, with many birds heading up the Sorn valley towards Ballygrant and Port Askaig to feed (Figure 3.1). These movements from dawn tie in with drive over surveys which showed this fertile valley to be a key feeding area.

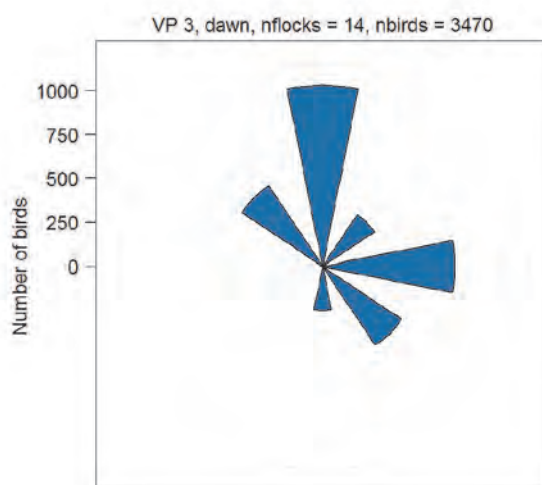
From onsite observations it seems that birds build up in the Bowmore and Gartbreck areas to the south west in the afternoon. Movements thereby suggest that birds utilise a feeding circuit as the day goes on, and return in from the south in the afternoons onto the mudflats to roost, rather than directly from the Sorn valley.

5.2.8 Laggan Bay

The number of geese roosting on the beach at Laggan Bay was highest in the early season (October) and decreased as the season progressed with zero birds found roosting later in the year.

Table 10. The numbers of barnacle geese recorded roosting at Laggan Bay.

Survey	October	November	December	January	February	March
Dawn	2500	140	900	-	-	0
Dusk	-	-	-	-	-	-



Web 9. The departure directions of flocks of barnacle geese from Laggan Bay.

Birds were recorded in mornings dispersing from the beach into nearby fields on the east shore of Laggan Bay (Figure 3.3). Numbers here were relatively small. It is likely that the beach itself is unable to support a large roost as it is tidal and exposed to the west. It seems likely that when prevailing westerly storms hit the area that birds are pushed off the beach and are unable to utilise it as a full night-time roost.

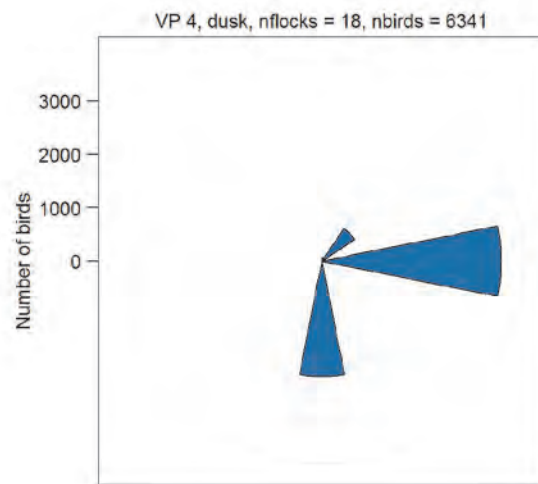
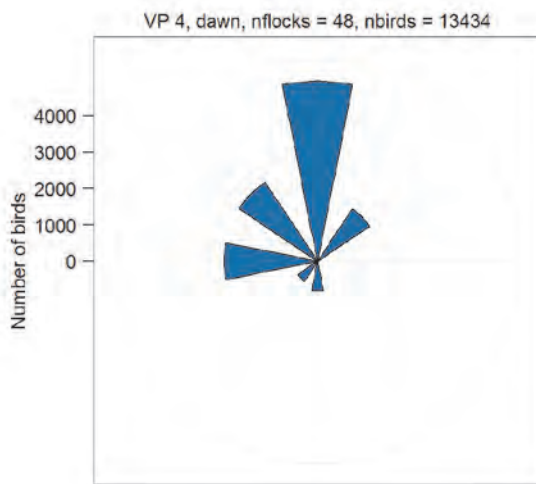
There is a strong argument for Laggan Bay and Laggan Point to be treated as one 'roost' although they occur on separate habitats and are c2 km apart. This is how they are treated in terms of the SPA designation (Figure 1).

5.2.9 Laggan Point

Approximately 4000 geese were found roosting at Laggan Point across the season, although numbers decreased in March. It is felt likely that Laggan Bay and Laggan Point counts should be treated together and that the roost is slightly flexible in its position and occurrence, but remains in the wider Laggan area.

Table 11. The numbers of barnacle geese recorded roosting at Laggan Point.

Survey	October	November	December	January	February	March
Dawn	-	3600	-	-	4500	680
Dusk	-	-	-	-	4100	1111



Web 10. The departure directions of flocks of barnacle geese from Laggan Point.

Web 11. The arrival directions of flocks of barnacle geese from Laggan Bay.

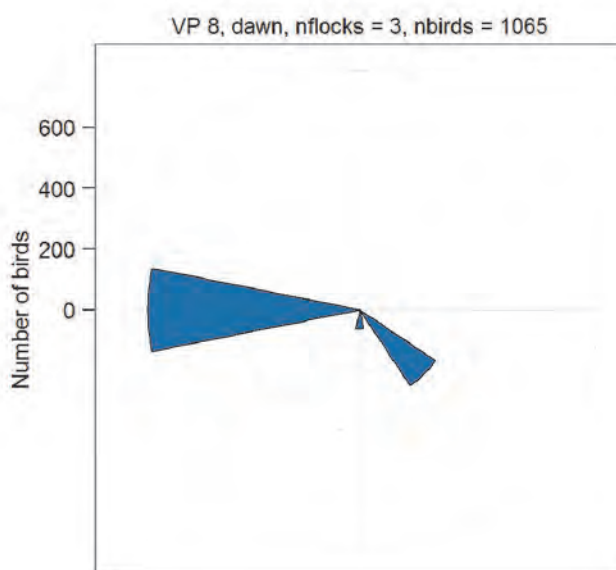
Birds generally departed in a westerly or northerly direction to feed in the dominant agricultural areas in that part of the island. Figures 3.3 and 3.4 show clear linkage between the Rinns peninsula to the west and this roost site. There was no pattern of these birds being recorded returning at dusk, so it seems that these may be the birds that arrive during the hours of darkness.

5.2.10 Port Ellen TV Mast

No birds were observed entering the roost area reported in the area of the Port Ellen TV Mast over five separate surveys. Emphasis was placed on this area to see if movement could be detected relating to birds moving to or from the Laggan area and the Oa Peninsula.

Table 12. The numbers of barnacle geese recorded roosting at Port Ellen.

Survey	October	November	December	January	February	March
Dawn	-	-	0	0	0	-
Dusk	-	-	-	-	0	0



Web 12. The directions of barnacle geese from the Port Ellen TV mast

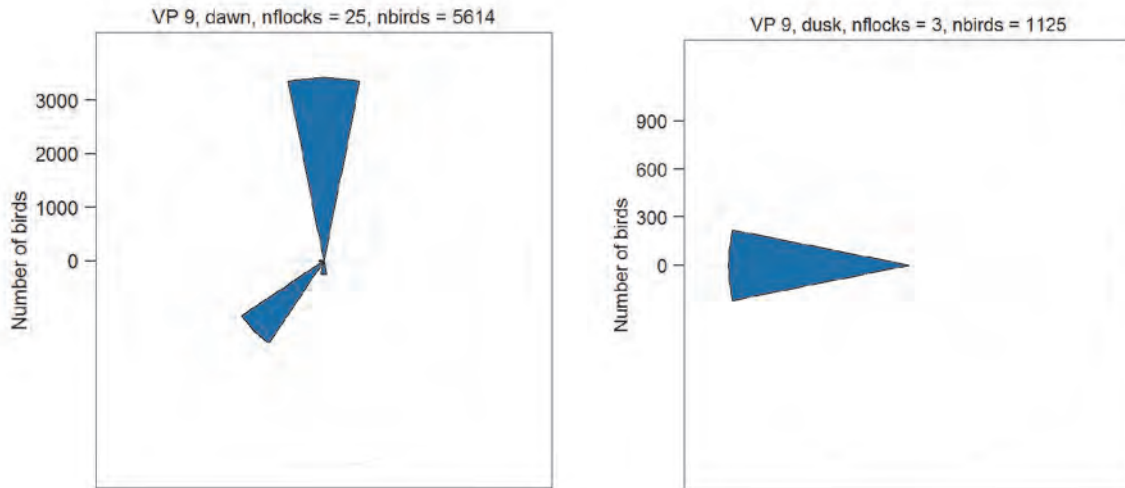
These birds were 'transient', and were not linked to a definite roost location. This pattern suggests movement towards the Oa and Rinns area, if they were assumed to continue across the mouth of Loch Indaal. Part of The Oa is an RSPB managed reserve, with cattle grazing to support red billed chough *Pyrrhocorax pyrrhocorax* but also managing grassland habitat attractive to barnacle geese. At this stage we are not aware of a roost on the Oa Peninsula, and the assumption is that these birds are likely linked to the Laggan Bay SPA.

5.2.11 Kilchoman Chapel/Machir Bay

Details for these locations should be considered together as they encompass the same geographical area. The number of birds varied across the season with the highest roost count in January. Morning movement was to the north, in the direction of Coull Farm, and other areas to the north of Loch Gorm. This pattern may also be linked with Loch Gruinart SPA, as birds from here were also noted as moving in the direction of this feeding area.

Table 13. The numbers of barnacle geese recorded roosting at Kilchoman.

Survey	October	November	December	January	February	March
Dawn	-	400	-	1533	-	-
Dusk	-	-	0	0	-	1125



Web 13. The departure directions of flocks of barnacle geese from Kilchoman

Web 14. The arrival directions of flocks of barnacle geese from Kilchoman

5.2.12 Machir Bay

Only one survey was undertaken at Machir Bay at dawn in December, where 1400 birds were observed roosting, which then moved on to nearby Coull Farm just to the north.

Table 14. The numbers of barnacle geese recorded roosting at Machir Bay.

Survey	October	November	December	January	February	March
Dawn	-	-	1400	-	-	-
Dusk	-	-	0	-	-	-

By contrast there were virtually no geese in the vicinity in late afternoon, nor on Sunderland Farm to the west either, and no roost formed back in the bay that evening. As such the roost was deemed not regular, but rather dependant on circumstances most likely linked to weather and tidal conditions in the bay and the amount of exposed beach available to roost on in the evening. This is a similar scenario to that mentioned for Laggan Bay. Anecdotally when storms came in it has been noted by local ornithologist, John Armitage, that birds did not use these exposed westerly sites, and favoured more sheltered terrestrial haunts.

5.2.13 Kintour

This location was selected as anecdotal information from the general public (per SNH) suggested that a roost may be present in this area. No birds were observed roosting at Kintour during two surveys (Figure 3.6) and as such the site was deemed low priority, and no further effort was expended.

Table 15. The numbers of barnacle geese recorded roosting at Kintour.

Survey	October	November	December	January	February	March
Dawn	-	-	-	0	-	-
Dusk	-	0	-	-	-	-

5.3 Flight direction in relation to feeding locations

Figures 4 and 5 incorporate both flight webs and field usage maps to establish linkage between roosts and feeding areas on an island scale. Percival (1991) suggested that from colour ringing and tracking there was a large degree of 'site faithfulness' with barnacle geese. Our findings show no reason to doubt this and movements are likely to be seasonal rather than due to other influences i.e. peak counts at Gruinart during autumn and spring as birds congregate after/before travelling to Greenland.

Percival's (1991) study of marked individuals showed that during the early 1990s the distribution of barnacles on Islay was non-random. Birds were generally faithful to restricted groups of sites on the island, both within winter and consecutive winters. Fieldwork in 2013/14 complements this conclusion and it seems that, although the population has increased significantly, movements follow a similar pattern.

The use of the south west area of the Rinns by geese is a relatively new phenomena (J. Armitage pers comm). It is an area which is relatively detached from the SPA roosts. However the area is now known to be utilised by barnacles, perhaps in part due to changes in agricultural practice and an increase in reseed areas such as at Ellister. The only clear movements relating to or from this area were birds crossing Loch Indaal from Laggan. However it is likely that creep too occurs from birds moving west and south west from the Bridgend Flats roost.

5.4 Notable individuals and movements

Generally it is very hard to differentiate between individual barnacle geese, and this is also compounded by their flocking behaviour which means that colour rings can be problematic to view. Throughout the survey period 'notable' geese were recorded, which could provide an indication of individual movements.

One partially leucistic barnacle, with an abnormal grey washed out appearance, was noted at Rockside Farm near Kilchoman in October 2013 and again on January 24th 2014. It was recorded there again on January 30th, at Cladville in early February, before being seen back at Lossit on February 8th and then near Port Charlotte on February 11th (Figure 8a These records corroborate birds utilising the Rinns and then roosting at Laggan on the opposite shore of Loch Indaal.

Occasionally vagrant small race Canada geese *Branta canadensis* are recorded on Islay. Figure 8b shows the distribution of records relating to one bird that occurred through the winter period. It was seen to roost at Bridgend Flats and also at Laggan Bay, so utilised two separate SPA locations, but was primarily noted as feeding in the Sorn valley. This supports the suggested movement path of these areas as being the norm for birds using Bridgend at night.

6. CONCLUDING DISCUSSION

Basic linkage between certain roosts and feeding areas is clear from data collated. To what level this linkage can be fully established is uncertain but reasonable assumptions can be made, although more data would be needed to confirm the patterns observed, and to see if this occurred on an annual basis. This may be best gathered by radio tracking of birds or other means that allow clearer distinction between individuals. Overall it appears that birds do utilise feeding areas closest to their roosts sites. As may be expected there is no evidence to suggest that movements are random, but rather birds follow regular routes and corridors which they navigate between roosts and feeding fields.

Birds from the two SPA roosts at Loch Gruinart and Bridgend Flats clearly feed in the Sorn Valley. Whether they stay separate while at this locality or feed sympatrically is currently unknown. It may be that these birds follow differing behavioural patterns though they are influenced by the same receptors on the same site.

Numbers increased at Gruinart in spring when numbers at Bridgend dropped, which suggests roost alternation and the use of Gruinart as a primary staging post before migration back to Greenland. Geese are believed to arrive at Gruinart Flats first in the autumn (RSPB pers comm) and then to begin to gradually utilise other sites around the islands as the winter period moves on. Presumably this applies to roosts as well as feeding locations. As such it may be that at some point most birds on Islay utilise Gruinart Flats at some stage.

All roosts that occur in tidal habitats are undoubtedly affected through displacement at times of higher neap and spring tides, poor weather and disturbance. Whether these factors can be accurately predicted is unclear, but it does seem that as a minima that roosts at Laggan Bay and Machir Bay are underutilised at times of westerly gales.

Birds feeding under the moon was raised as a potential issue that may distort a solid dataset being collated. Based on advice from SNH at the pre field work meeting counts mostly took place at dates away from full moons, but it should be noted that feeding patterns did alter at the time of the equinox. As this is a regular event it seems that geese manage their movements to this, but again accuracy of prediction will be affected by cloud and other weather factors at this time. Future bespoke surveys could be conducted to ascertain the level of night time feeding if this was deemed necessary.

Overall the data collated in winter 2013/14 suggests that birds are still primarily utilising the three SPA roost locations on Islay, but other satellite roost sites such as Machir Bay have been identified. If this is a new phenomenon due to 'overspill' from roosts due to a significant population rise is unclear. In some instances these gatherings seem to relate to 'transient roosts' which are affected by environmental factors such as tide and weather as well as agricultural practices. As such they may not have been recorded, or deemed significant, until more systematic checks took place.

Linkage between SPA roosts and feeding areas is clearly occurring and appears to be along certain clear flyways:

- Laggan Bay to the south west Rinns across Loch Indaal
- Bridgend Flats to the north west into the Sorn valley
- Loch Gruinart to surrounding area (and to a lesser extent northern The Rinns i.e. Loch Gorm farms).
- Loch Gruinart to Sorn valley, from observations recorded at Cnoc Don.

Broadly these sectors were suggested a number of years ago by Percival (1991) and it seems that even with a substantially increased population, barnacles are creatures of habit

and still use similar roosts, feeding areas and flyways. It appears that no significant differences in patterns have occurred in the past 25 years.

7. REFERENCES

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8. ANNEXES

8.1 Field survey dates and weather

The data are: Observer initials, wind force (Beaufort Scale), rain (0-4), cloud cover (in eighths), cloud height (0-2), visibility (0-2) and frost (0-2).

Transect surveys

Survey ID	Date	Observer	Wind		Rain	Cloud		Visibility	Frost
			Force	Direction		Cover	Height		
25	15/10/2013	SJJ	4	NE	0	2-4	2	2	0
26	16/10/2013	SJJ	4	SE	0	2-3	0-1	1-2	0
27	22/11/2013	SJJ	2-3	SE	0-1	4-7	1-2	2	0
28	23/11/2013	SJJ	3-4	S	0	4-5	1-2	2	0
37	13/12/2013	SJJ	2	NE	0	2	2	2	0
44	24/01/2014	ADPC	4	E	0	8	1	2	0
46	25/01/2014	ADPC	1	-	0	1	2	2	2
50	26/02/2014	SJJ	3	W	0-2	4-6	2	2	0
51	26/02/2014	ADPC	4	SE	0-1	4-8	1-2	1-2	0
52	26/02/2014	JSA	5	S	2	8	0-1	1	0
67	25/03/2014	ADPC	4	SW-W	0	4	1	1	0
68	26/03/2014	ADPC	4-5	S	0-2	2-6	2	2	0
70	27/03/2014	ADPC	2-5	S	0-3	0-8	1-2	1-2	0
75	25/03/2014	SJJ	1-5	W	0-1	4-8	2	1-2	0
76	26/03/2014	SJJ	3-4	S	0	2-4	1	2	0
77	27/03/2014	SJJ	1-3	S	0-1	2-8	1	1-2	0
83	25/03/2014	MSc	3	S	0	5-6	1	2	0
84	26/03/2014	MSc	3-4	SW	0	4	2	2	0
85	27/03/2014	MSc	3-4	W	0	3-6	2	2	0

8.2 Roost observations

Roost name	Survey ID	Survey date	Observer	Wind		Rain	Cloud		Visibility	Frost
				Force	Direction		Cover	Height		
Ardnave Point	62	25/02/2014	ADPC	5	S	1-3	5-8	1	1	0
	69	26/03/2014	ADPC	2	W	0	3-4	2	1-2	0
Bridgend Flats	19	15/10/2013	SJJ	1-2	NE	0	1	2	2	0
	47	24/01/2014	MSc	7	S	1-2	8	1-2	1	0
	48	24/01/2014	MSc	5	SW	1	8	1	0-1	0
	55	27/02/2014	ADPC	4-5	SW-W	0-1	5-6	1	1	0
	56	26/02/2014	ADPC	2-3	SW	0	6	1	2	0
	72	25/03/2014	ADPC	4	SW	0	4-8	1	1	0
	73	28/03/2014	ADPC	5	S	0	4	1	0-1	0
	74	26/03/2014	ADPC	4	SW-S	0-1	7-8	0	0-1	0
Cnoc Don	24	23/11/2013	SJJ	3	W	0	4	2	2	0
	30	12/12/2013	SJJ	5	SE	0	7-8	2	2	0
	31	12/12/2013	SJJ	5	SE	0	6	2	2	0
	54	27/02/2014	SJJ	4-5	SW	0-2	4-6	2	2	0
	58	26/02/2014	SJJ	5	S	0	6	2	2	0
	81	26/03/2014	SJJ	5	W	0-1	8	1	1-2	0
	82	25/03/2014	SJJ	4	SW	0	4	2	2	0
Kilchoman Chapel	39	23/11/2013	JSA	3	W	0	4	2	2	0
	40	12/12/2013	JSA	5	SE	0	6	2	2	0
	65	24/01/2014	JSA	5	S	3	8	1	0	0
	66	24/01/2014	JSA	5	S	2-3	8	1-2	0-1	0
	89	26/03/2014	MSc	2	S	0	4	1	2	0
Killinallan	61	25/02/2014	SJJ	5	S	0-3	8	1	2	0
	80	26/03/2014	SJJ	1-3	W	0	1-3	2	2	0
Kintour	22	22/11/2013	SJJ	1	-	0	4-6	2	2	2
	49	25/01/2014	MSc	6	SW-W	2-3	6-8	1-2	0-2	0
Laggan Bay	20	16/10/2013	SJJ	4	E	0	8	1	2	0
	36	13/12/2013	GK	5-6	S	0	8	1	2	0
	38	22/11/2013	JSA	0	-	0	3-5	2	2	1
Laggan Point	23	22/11/2013	SJJ	1	-	0	1	2	2	2
	59	26/02/2014	SJJ	6	S	4	8	1	1	0
	64	24/02/2014	SJJ	5	SE	0	8	1	2	0
	78	28/03/2014	SJJ	3-5	SE	0	4-6	2	2	0
	79	27/03/2014	SJJ	5	E	0-3	4-8	2	2	0
Loch Gruinart	18	15/10/2013	JSA	1-2	NE	0	1	2	2	0
	21	16/10/2013	JSA	4	E	0	8	1	2	0
	29	23/11/2013	FM	1	W-NW	0-1	3-6	1	1-2	0
	34	12/12/2013	GK	4	S	0	8	2	1-2	0
	35	12/12/2013	GK	3	S	0	7-8	1	2	0
	42	24/01/2014	ADPC	5-6	SE-S	2-3	8	0	0	0
	43	24/01/2014	ADPC	5	S	2	8	0	0-1	0
	53	27/02/2014	JSA	4-5	W	0	6	2	2	0
	60	26/02/2014	JSA	3	W	0	5-6	2	2	0
	86	28/03/2014	MSc	5-6	S	1-2	6	1-2	1-2	0
	87	26/03/2014	MSc	3-4	S	1-2	7-8	1	2	0
88	25/03/2014	MSc	4	S	0-1	6-8	1	2	0	
Machir Bay	41	12/12/2013	JSA	5	S	0	8	2	2	0
Port Ellen TV Mast	32	13/12/2013	SJJ	4	SE	0-1	8	1-2	1-2	0
	45	25/01/2014	ADPC	5	SE	2	6	0-1	1	0
	57	26/02/2014	ADPC	5	SW	3	8	1	1	0
	63	24/02/2014	ADPC	4	S	0-1	8	1	1	0
	71	27/03/2014	ADPC	4	SE	0-2	4-8	1	0-2	0

①

Barnacle goose roost data sheet - LOCH GRUMART DAWN

Roost count	Time	Notes
7100	07:45-10:15	LOW TIDE DURING VP.

Flight i.d.	Time	No. of birds	Direction	Notes
①	08:17	150	S	Flew away to S.
②	08:31	34	S	To Flats fields
③	08:33	22	SW	Flew away to SW
④	08:34	16	S	To Flats fields
⑤	08:35	37	SSW	To Flats fields
⑥	08:36	20	SSW	To flooded fields ESE of VP.
⑦	08:38	70	SW	Flew away to SW.
⑧	08:39	30	SW	Flew away to SW
⑨	08:42	200	SE	To Flats fields
⑩	08:43	50	SSW	Flew away to SSW
⑪	08:43	30	SW	Flew away to SW
⑫	08:45	120	SW	Flew away to SW
⑬	08:47	60	SW	Flew away to SW
⑭	08:49	130	SSW	To Flats fields.
⑮	08:50	20	SW	Flew to field to SW of VP.
⑯	08:51	25	WSW	Flew to field to SW of VP.
⑰	08:51	80	SE	To Flats fields.
⑱	08:52	100	SE	To Flats fields.
⑲	08:53	160	SW	To Flats fields.
⑳	08:53	70	WSW	Flew away to WSW
㉑	08:54	80	SE	To Flats fields
㉒	08:55	300	SW	Flew away to SW
㉓	08:56	400	S	To Flats fields.
㉔	08:57	180	SSW	To Flats fields.
㉕	08:57	60	SW	To small field S of VP.
㉖	08:59	100	SE	To Flats fields
㉗	09:00	120	SW	Flew away to SW

Barnacle goose roost data sheet - LOCH GUNVAIRT DAWN

Roost count	Time	Notes
7100	07:45-10:15	LOW TIDE DURING VP.

Flight i.d.	Time	No. of birds	Direction	Notes
28	09:00	30	SSW	Flew away to SSW
29	09:01	80	SW	To field to SW of VP.
30	09:02	200	SE	To Flats fields.
31	09:03	40	ESE	Flew away high to ESE.
32	09:04	50	SW	Flew away to SW
33	09:04	70	SW	To Flats fields
34	09:05	300	SE	To Flats fields
35	09:06	30	SSW	To Flats fields
36	09:08	50	S	To Flats fields
37	09:09	100	SE	To Flats fields
38	09:11	20	SW	Flew away to SW
39	09:13	20	S	Flew to field NE of VP.
40	09:14	70	SE	To Flats fields
41	09:15	20	WSW	Flew from flooded fields, away to WSW.
42	09:16	80	SE	To Flats fields
43	09:16	20	SW	Flew away to SW
44	09:18	10	SW	Flew away to SW.
45	09:19	20	SW	Flew away to SW
46	09:20	90	SE	To Flats fields
47	09:23	40	S	To Flats fields
48	09:25	40	SW	Flew away to SW
49	09:26	60	SE	To Flats fields, from saltmarsh
50	09:29	50	SE	To Flats fields, from saltmarsh
51	09:36	130	WNW	Flew away to WNW
52	09:38	40	SE	Flew away to SE, from saltmarsh.
53	09:41	70	NNW	Flew along sea wall, to NNW
54	09:41	250	NW	Flew from behind sea wall to field NE of VP.

MAP 2 OF 2

RPS

Surveyor: G KEYS

Date: 12/12/13

Start time: 07:45 End time: 16:15

*Please attach weather sheet

Notes:

STEW'S FLIGHTS (24) → (51)

(4) = VP LOCATION

Legend

- Stopping points
- Roads

Islay Goose Survey

Islay Goose Roost Survey
Bay at Bridgend
Map 3 of 3

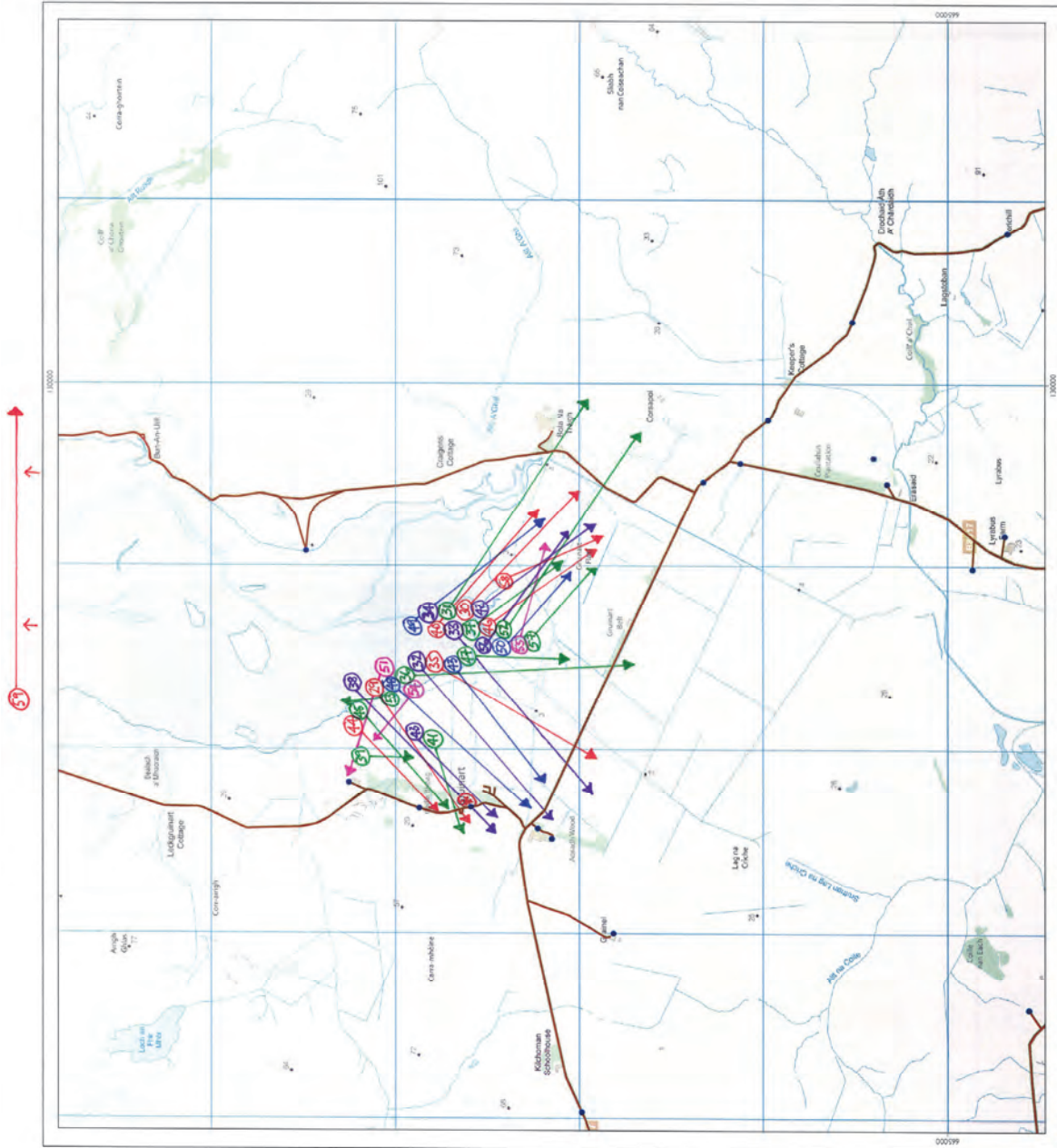
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Scale 1:20,000 @A3

Date: 11/10/2013 Job No: SEC7160 Rev: a

Drawn: MD Checked: DRAFT Approved: DRAFT

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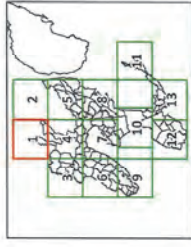
Surveyor: 577

Date: 11/12/13

Start time: 11:15 End time: 16:30

*Please attach weather sheet
Notes:

none



Legend
● Stopping points
— Roads

Islay Goose Survey

Islay Goose Field IDs

Map 1 of 13

0 500 m

Scale: 1:33,000 @A3

Date: 11/10/2013 Job No: SEC7680 Rev. a

Drawn MD Checked DRAFT Approved DRAFT

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Surveyor: *SJS / GK*

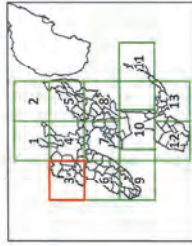
Date: *11/11/13*

Start time: *11.15* End time: *11.34*

*Please attach weather sheet

Notes:

10-K



Legend
 ■ Stopping points
 — Roads

Islay Goose Survey

Islay Goose Field IDs

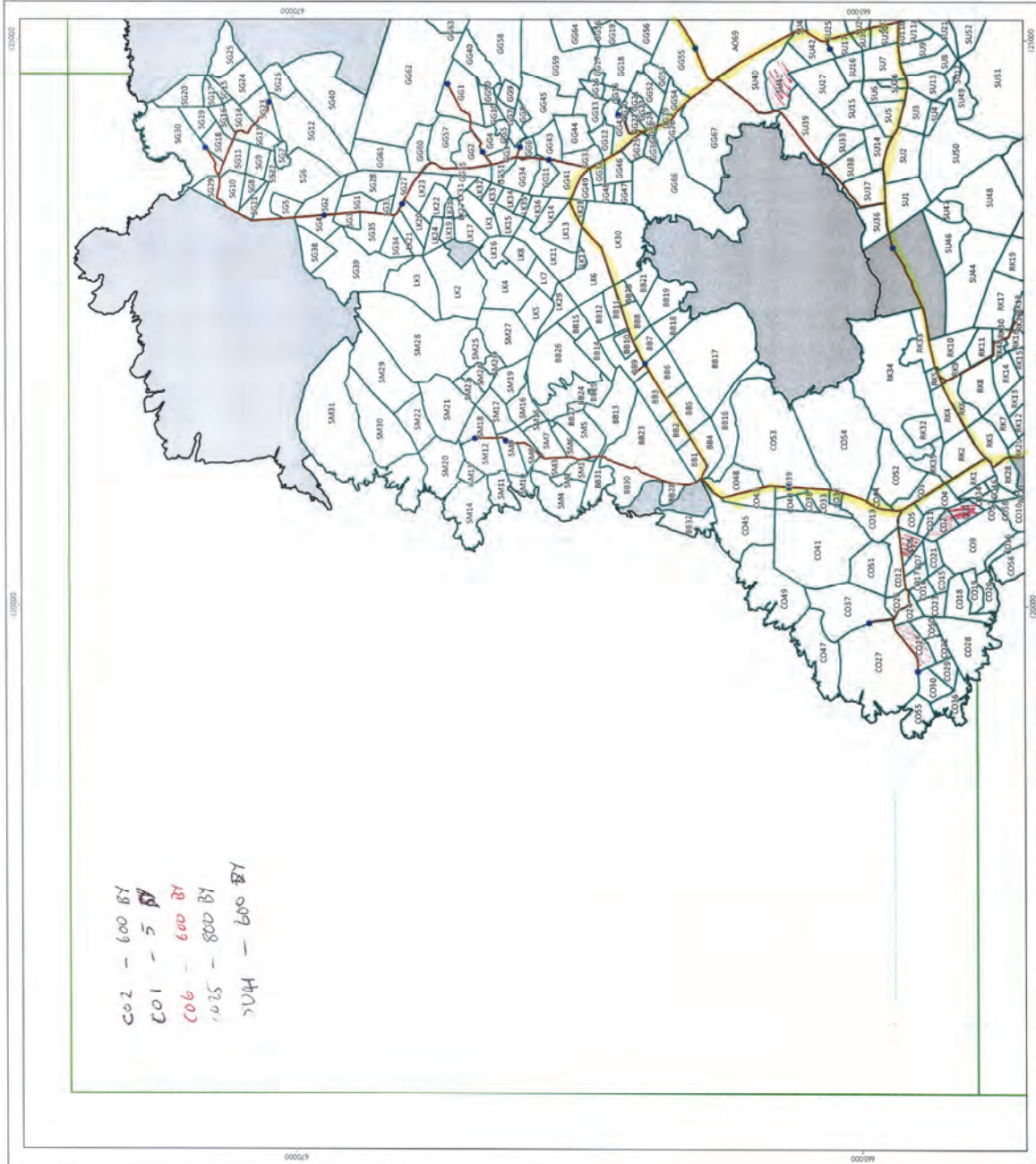
Map 3 of 13

0 500 m
 Scale: 1:33,000 @A3

Date: 11/10/2013 Job No: SEC7480 Rev: a

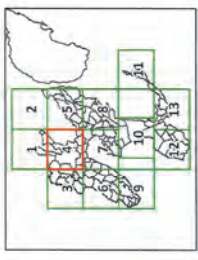
Drawn: MD Checked: DRAFT Approved: DRAFT

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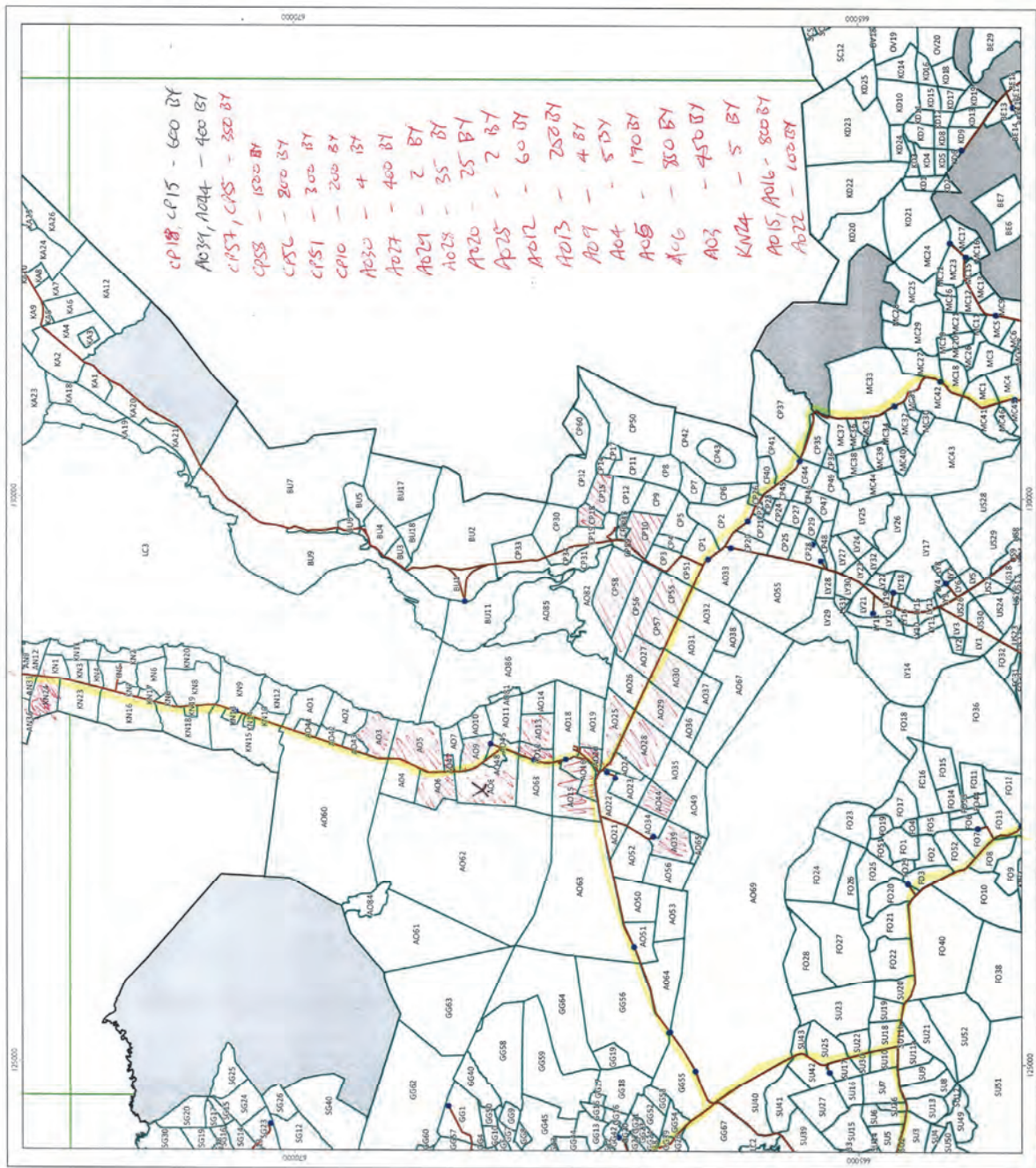
Surveyor: ST/WR
 Date: 11/22/17
 Start time: 11:15 End time: 16:30
 *Please attach weather sheet

Notes:
 : Dark



Legend
 ● Stopping points
 — Roads

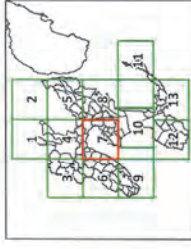
Islay Goose Survey
 Islay Goose Field IDs
 Map 4 of 13
 0 500 m
 Scale: 1:33,000 @A-3
 Date: 26/11/2013 Job No: SEC7180 Rev: a
 Drawn: MID Checked: DRAFT Approved: DRAFT
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RPS

Surveyor: STJ/lck
Date: 12/12/11
Start time: 11:11 End time: 16:30

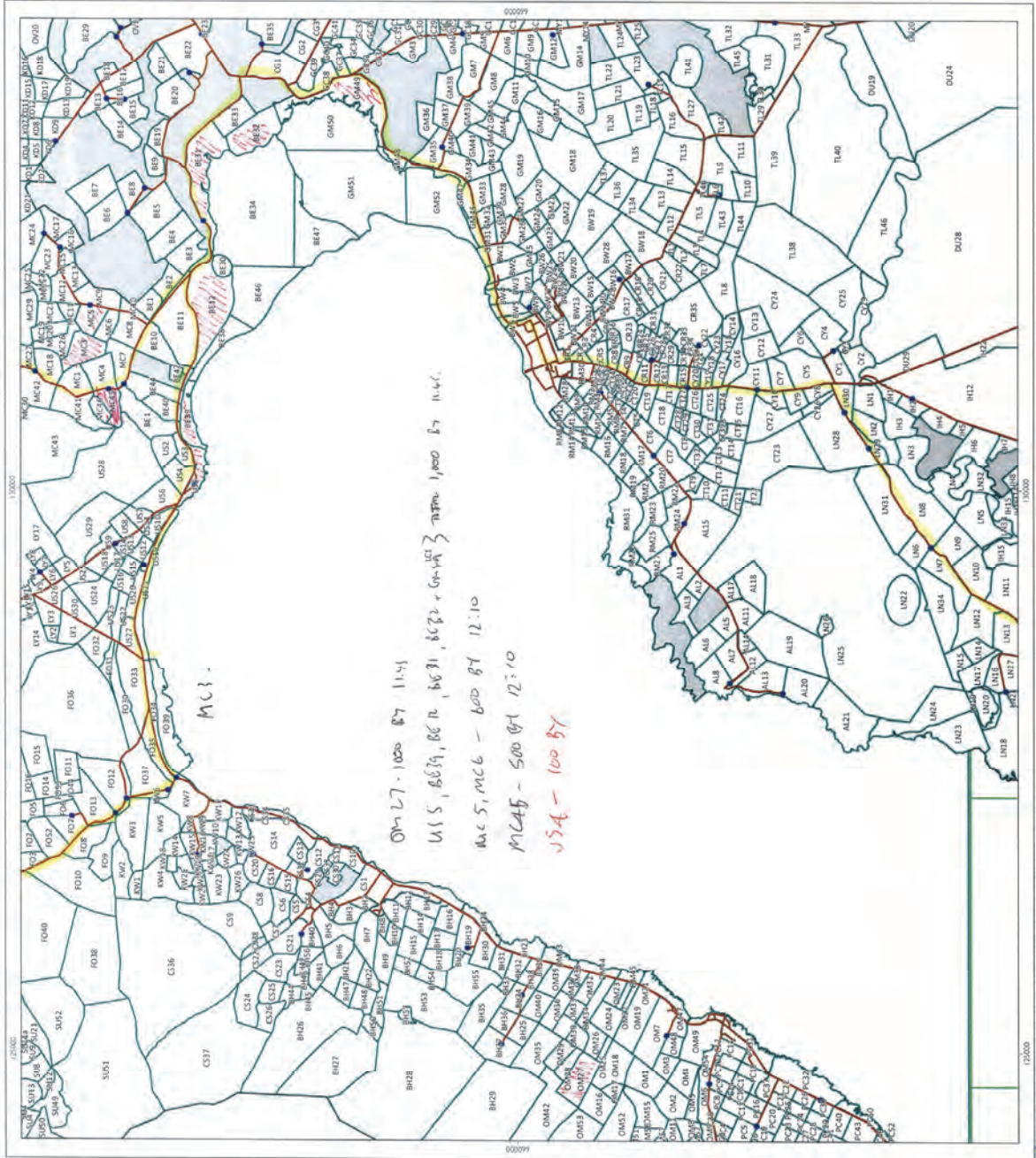
*Please attach weather sheet
Notes:
11:45 - from 106, ~~to~~ no EXposed
road on boundary part.



Legend
● Stopping points
— Roads

Islay Goose Survey
Islay Goose Field IDs
Map 7 of 13

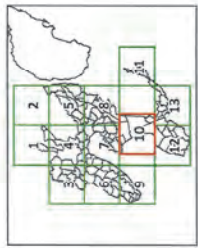
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Scale: 1:33,000 @A3
Date: 26/11/2013 Job No: SEC7680 Rev: a
Drawn: MID Checked: DRAFT Approved: DRAFT
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Surveyor: _____
 Date: _____
 Start time: _____ End time: _____
 *Please attach weather sheet
 Notes: _____

0-10



Legend
 ■ Stopping points
 — Roads

Islay Goose Survey
 Islay Goose Field IDs
 Map 10 of 13

0 500 m
 Scale: 1:33,000 @A-3
 Date: 11/10/2013 Job No: SSC7480 Rev: a

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Barnacle geese coming into roost at Gruinart Flats SPA (Adam Cross/RPS)

8.5 Maps



Legend

- Survey fields
- Special Protection Area (SPA)

0 5,000 m

Scale: 1:145,000 @A3

Date: 09/10/2014	Job No: SEC7680	Rev: -
Drawn: CH	Checked: AC	Approved: MSS

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Relevant SPAs and survey field boundaries

Figure 1
Islay

W:\7680\SEC-SPAs\Islay\Barnacle_Goose\Technical\Graphics\ESM\KDFigures\report\Figures\7680_01_Goose_fields_SPA1.mxd



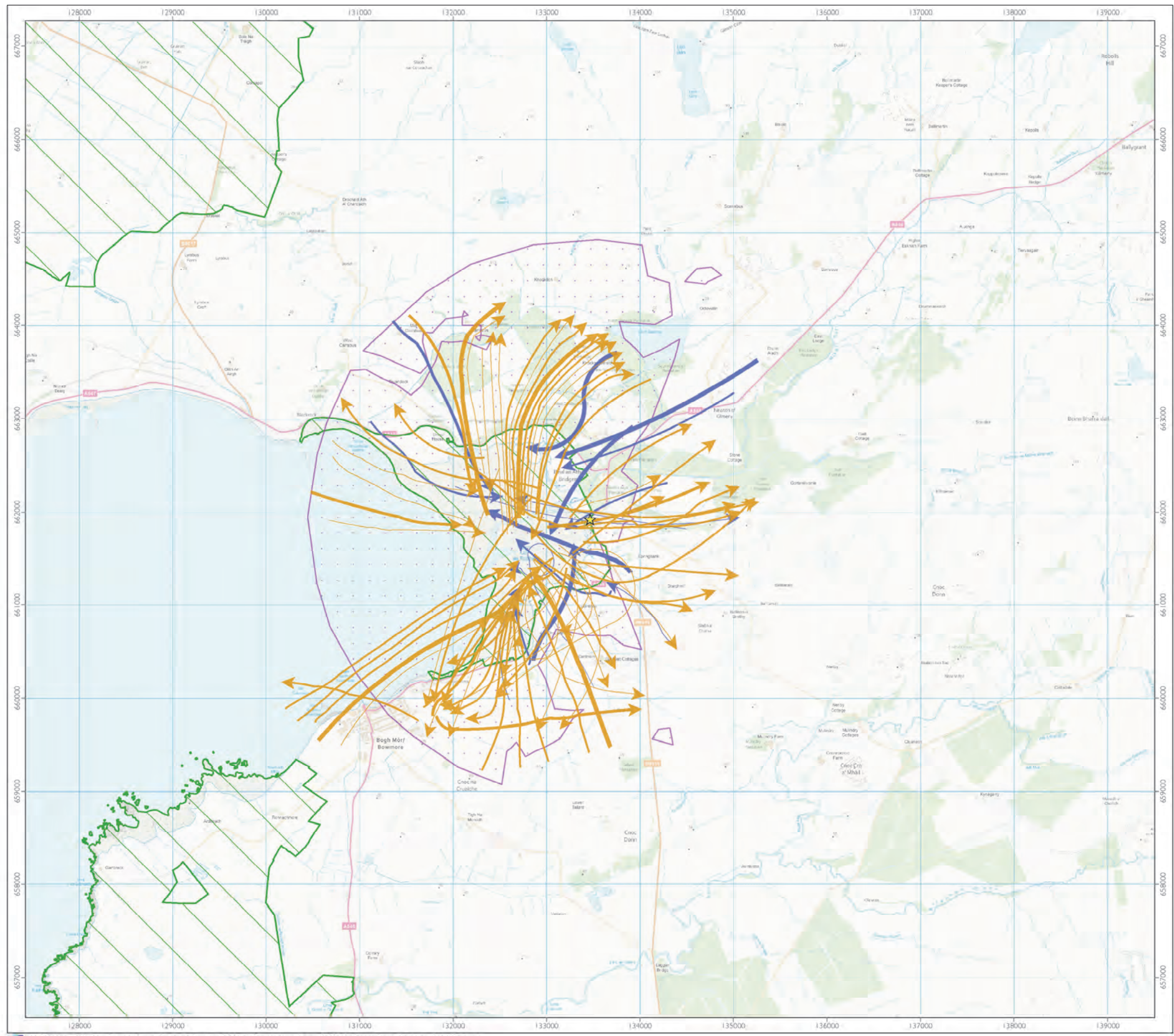
Legend
 Driven survey route
 Survey fields

0 5,000 m
 Scale: 1:145,000 @A3

Date: 09/10/2014 Job No: SEC7680 Rev: -
 Drawn: CH Checked: AC Approved: MSS

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Driven survey route and field boundaries
 Figure 2
 Islay



Legend

- ★ Goose Roost Vantage Point
- Goose roost flights - Number of birds
- Dawn
 - 1 - 100
 - 101 - 500
 - 501 - 1000
 - 1001 - 5000
 - 5001 - 10000
- Dusk
 - 1 - 100
 - 101 - 500
 - 501 - 1000
 - 1001 - 5000
 - 5001 - 10000
- Visible area to 20 m above ground extending to 3 km
- Special Protection Areas (SPA)

0 1 km
 Scale: 1:40,000 @A3

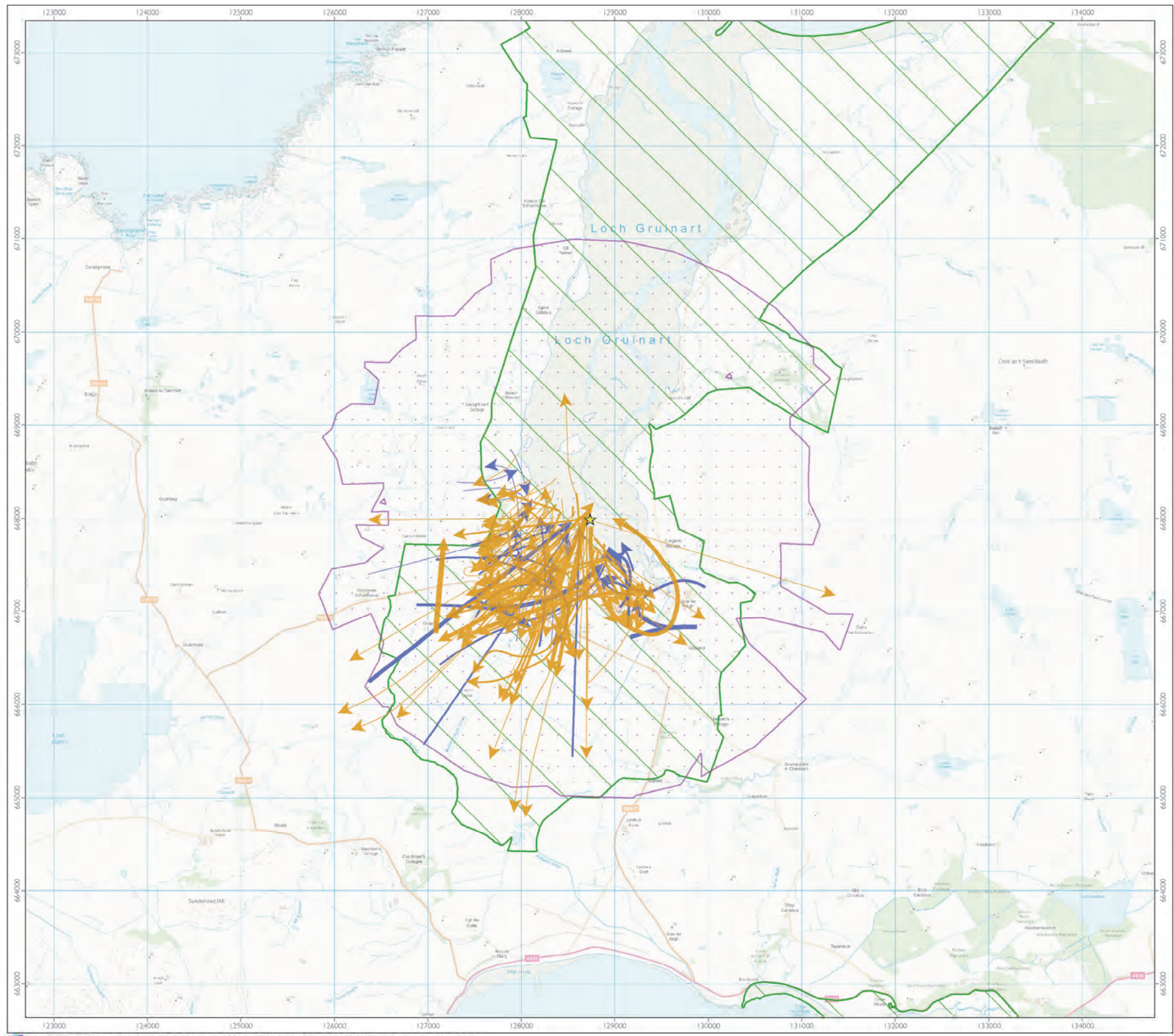
Date: 09/10/2014 Job No: 7680SEC Rev: a
 Drawn: CH Checked: AC Approved: MSS

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Goose roost flights
 Bridgend Flats

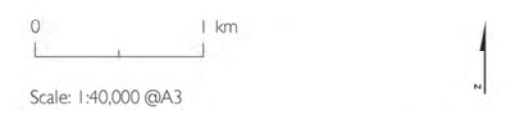
Figure 3.1
 Islay

W:\7680SEC_SNH Islay Barraile Goose\Technical\Graphics\GIS\MXD\Figures\report\Figures\7680_03_Goose_Roost_Flights_2014\714.mxd



Legend

- ★ Goose Roost Vantage Point
- Goose roost flights - Number of birds
- Dawn
 - 1 - 100
 - 101 - 500
 - 501 - 1000
 - 1001 - 5000
 - 5001 - 10000
- Dusk
 - 1 - 100
 - 101 - 500
 - 501 - 1000
 - 1001 - 5000
 - 5001 - 10000
- Visible area to 20 m above ground extending to 3 km
- Special Protection Areas (SPA)

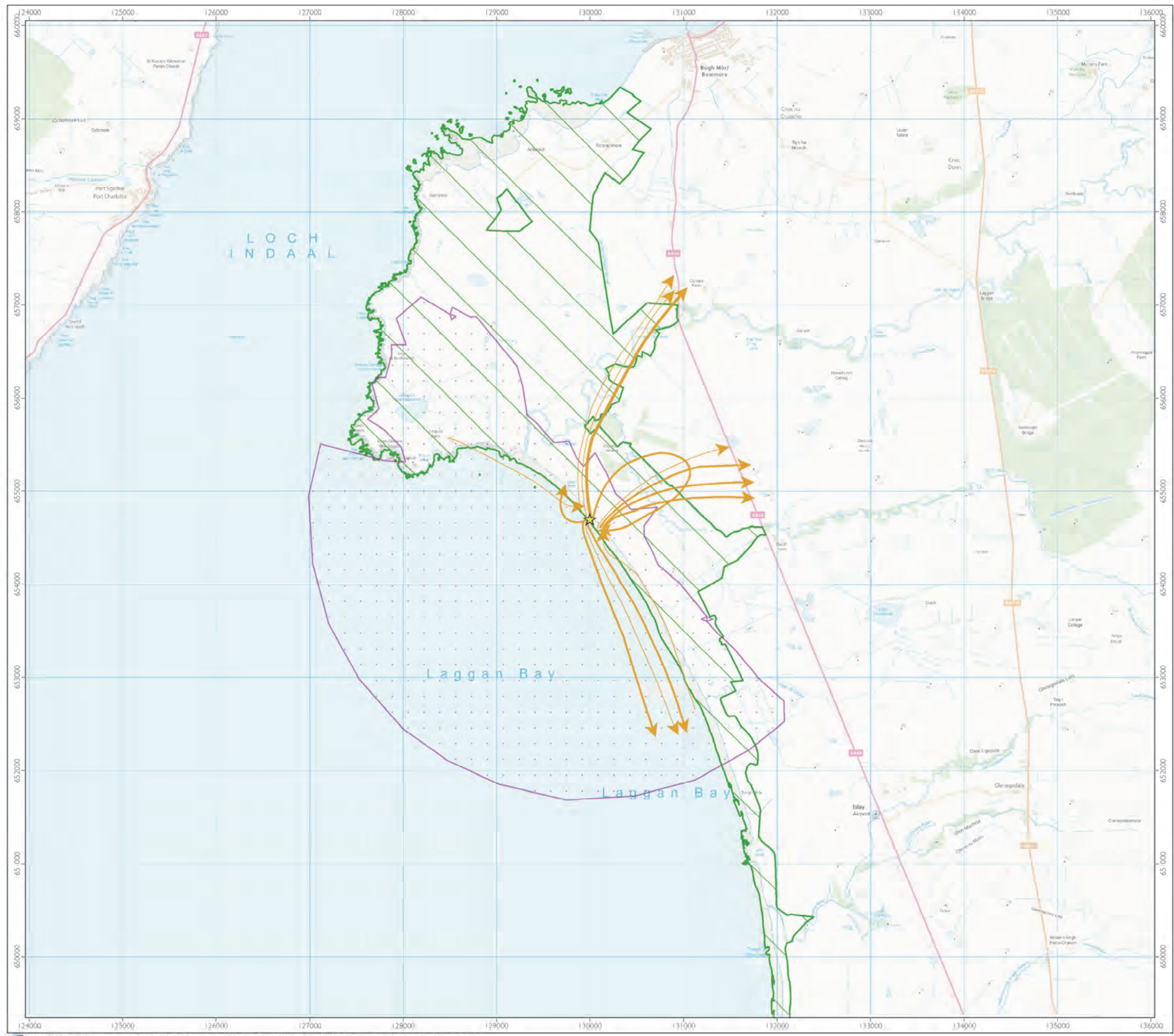


Scale: 1:40,000 @A3
 Date: 09/10/2014 Job No: 7680SEC Rev: a
 Drawn: CH Checked: AC Approved: MSS

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Goose roost flights
 Loch Gruinart

Figure 3.2
 Islay



Legend

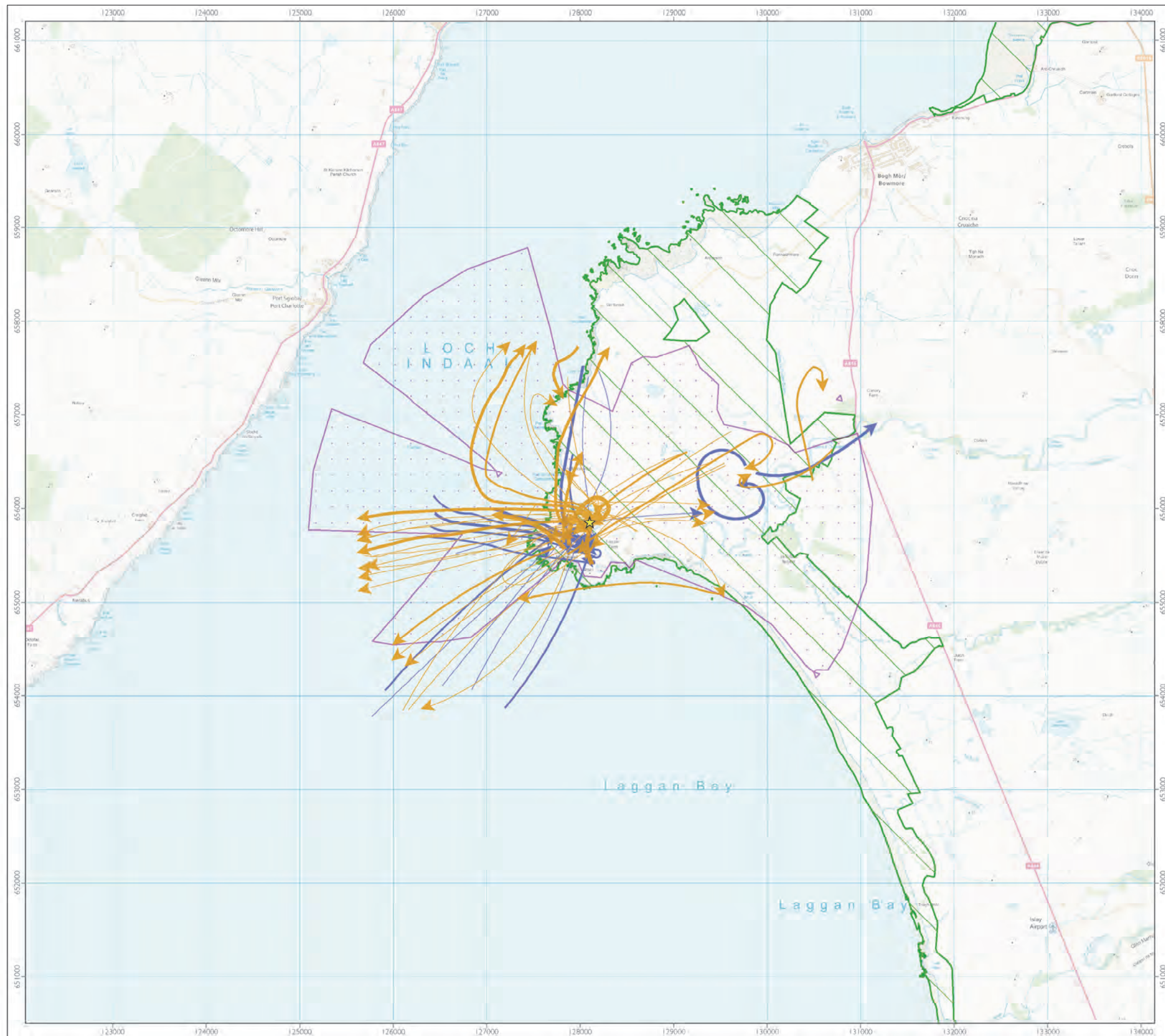
- ★ Goose Roost Vantage Point
- Goose roost flights - Number of birds
- Dawn**
- 1 - 100
- 101 - 500
- 501 - 1000
- 1001 - 5000
- 5001 - 10000
- Dusk**
- 1 - 100
- 101 - 500
- 501 - 1000
- 1001 - 5000
- 5001 - 10000
- Visible area to 20 m above ground extending to 3 km
- Special Protection Areas (SPA)

0 1 km
 Scale: 1:40,000 @A3

Date: 09/10/2014 Job No: 7680SEC Rev: a
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Goose roost flights
 Laggan Bay
 Figure 3.3
 Islay



Legend

- ★ Goose Roost Vantage Point
- Goose roost flights - Number of birds
- Dawn
 - 1 - 100
 - 101 - 500
 - 501 - 1000
 - 1001 - 5000
 - 5001 - 10000
- Dusk
 - 1 - 100
 - 101 - 500
 - 501 - 1000
 - 1001 - 5000
 - 5001 - 10000
- Visible area to 20 m above ground extending to 3 km
- Special Protection Areas (SPA)



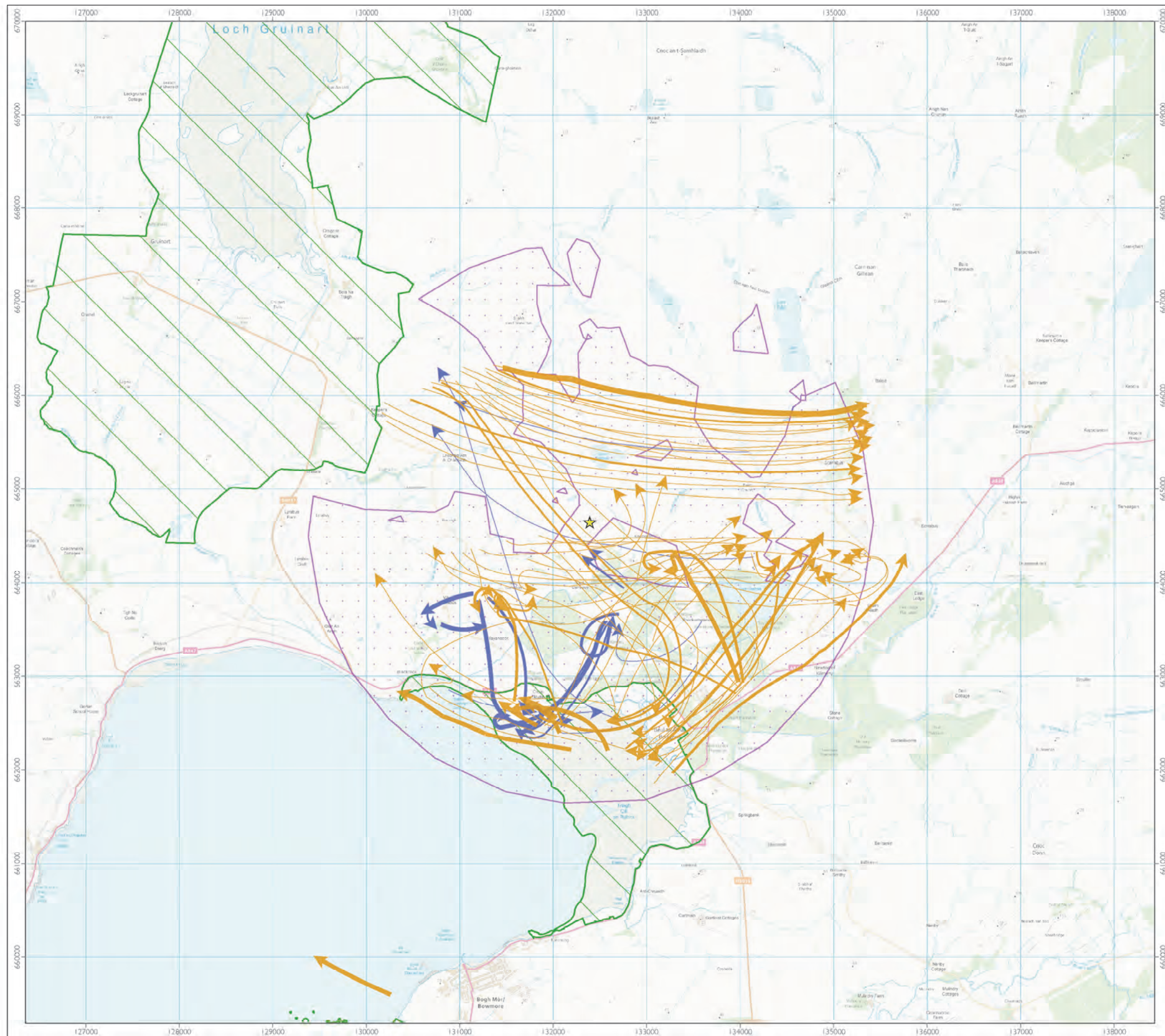
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Date: 09/10/2014 Job No: 7680SEC Rev: a
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Goose roost flights
 Laggan Head

Figure 3.4
 Islay



Legend

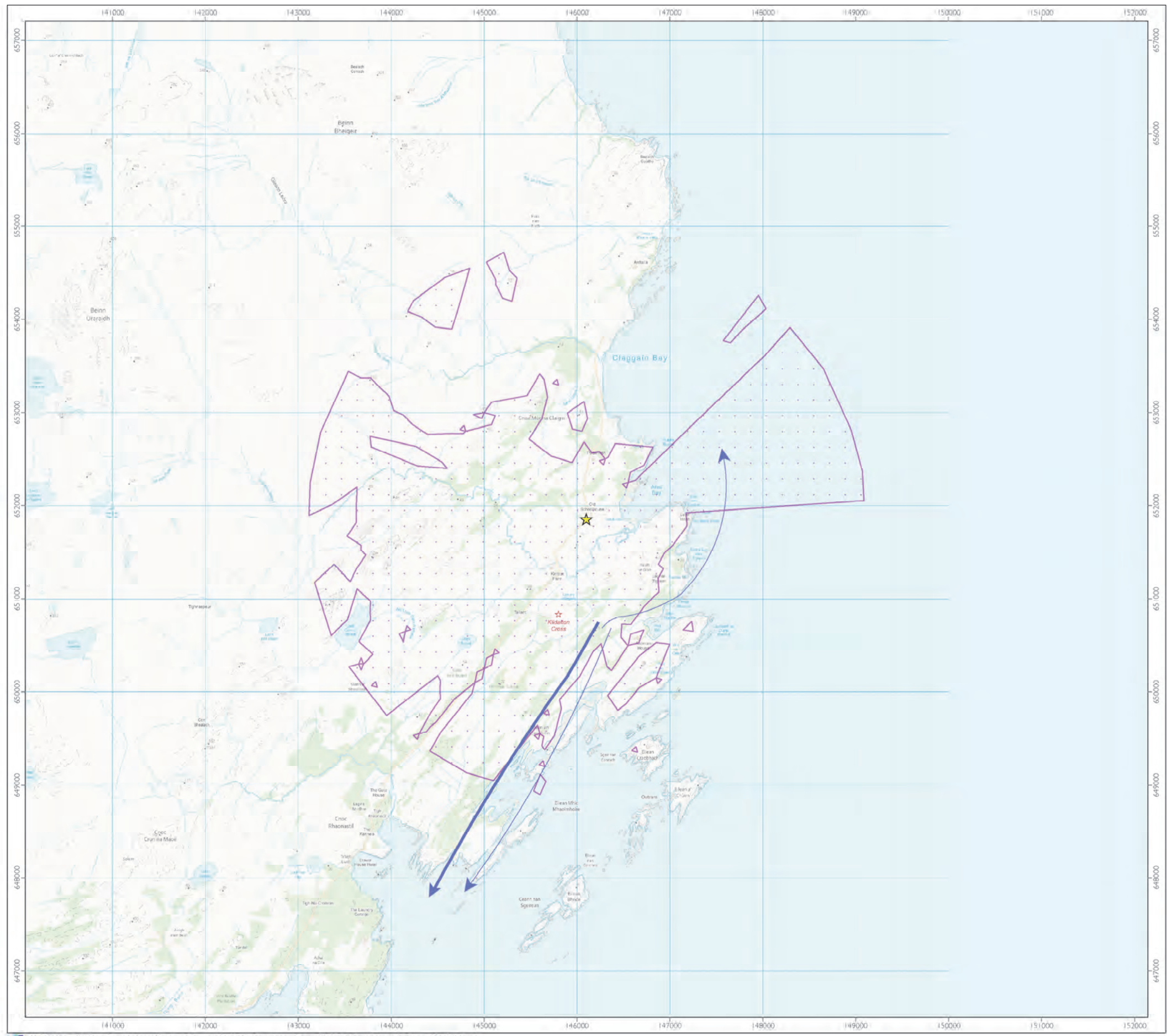
- ★ Goose Roost Vantage Point
- Goose roost flights - Number of birds
- Dawn**
- 1 - 100
- 101 - 500
- 501 - 1000
- 1001 - 5000
- 5001 - 10000
- Dusk**
- 1 - 100
- 101 - 500
- 501 - 1000
- 1001 - 5000
- 5001 - 10000
- Visible area to 20 m above ground extending to 3 km
- Special Protection Areas (SPA)

0 1 km
Scale: 1:40,000 @A3

Date: 09/10/2014 Job No: 7680SEC Rev: a
Drawn: CH Checked: AC Approved: MSS

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Goose roost flights
Cnoc Don
Figure 3.5
Islay



Legend

- ★ Goose Roost Vantage Point
- Goose roost flights - Number of birds
- Dawn**
- 1 - 100
- 101 - 500
- 501 - 1000
- 1001 - 5000
- 5001 - 10000
- Dusk**
- 1 - 100
- 101 - 500
- 501 - 1000
- 1001 - 5000
- 5001 - 10000
- Visible area to 20 m above ground extending to 3 km
- Special Protection Areas (SPA)

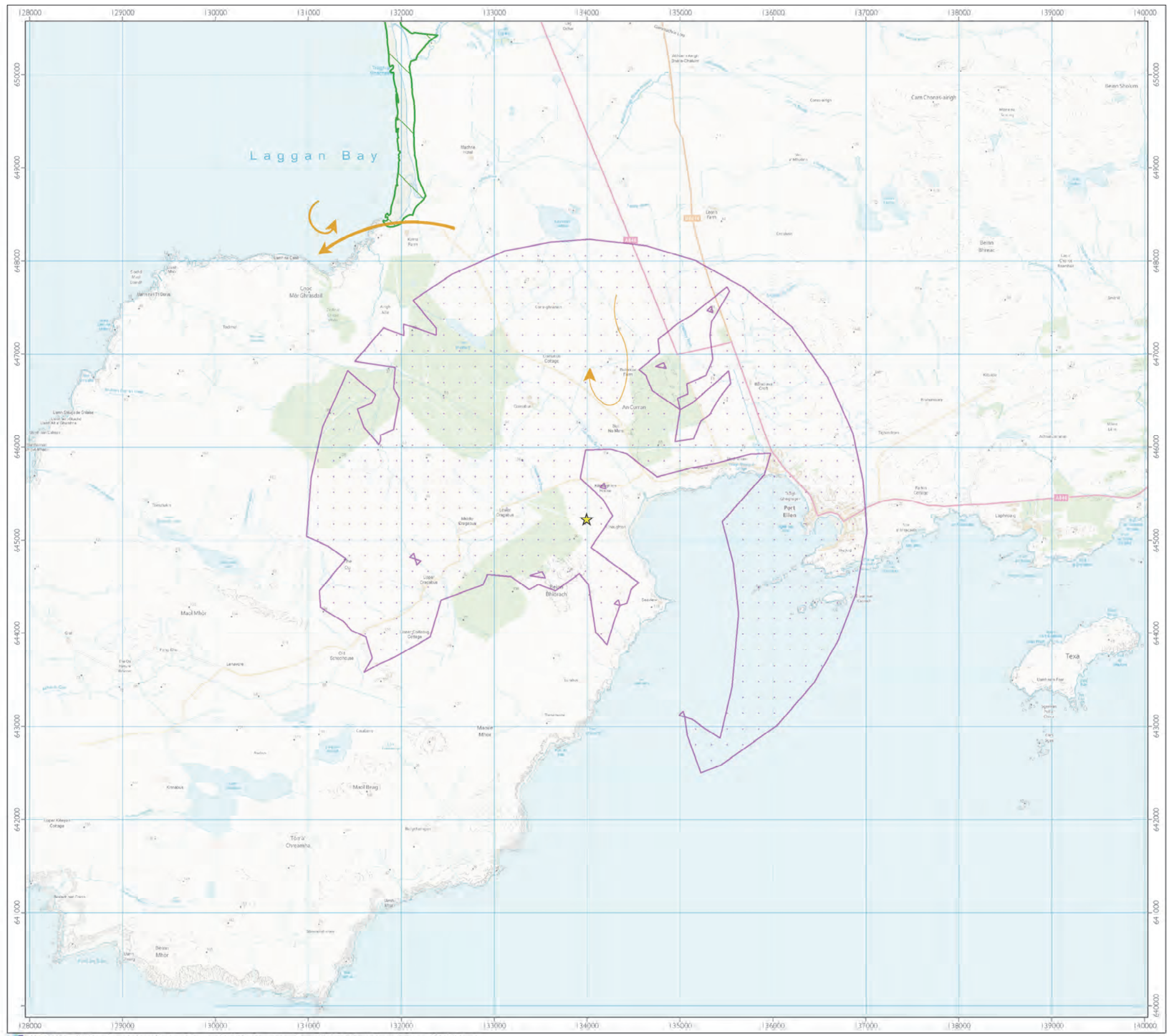
0 1 km

Scale: 1:40,000 @A3

Date: 09/10/2014 Job No: 7680SEC Rev: a
 Drawn: CH Checked: AC Approved: MSS

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Goose roost flights
 Kintour
 Figure 3.6
 Islay



Legend

- ★ Goose Roost Vantage Point
- Goose roost flights - Number of birds
- Dawn**
- 1 - 100
- 101 - 500
- 501 - 1000
- 1001 - 5000
- 5001 - 10000
- Dusk**
- 1 - 100
- 101 - 500
- 501 - 1000
- 1001 - 5000
- 5001 - 10000
- Visible area to 20 m above ground extending to 3 km
- Special Protection Areas (SPA)

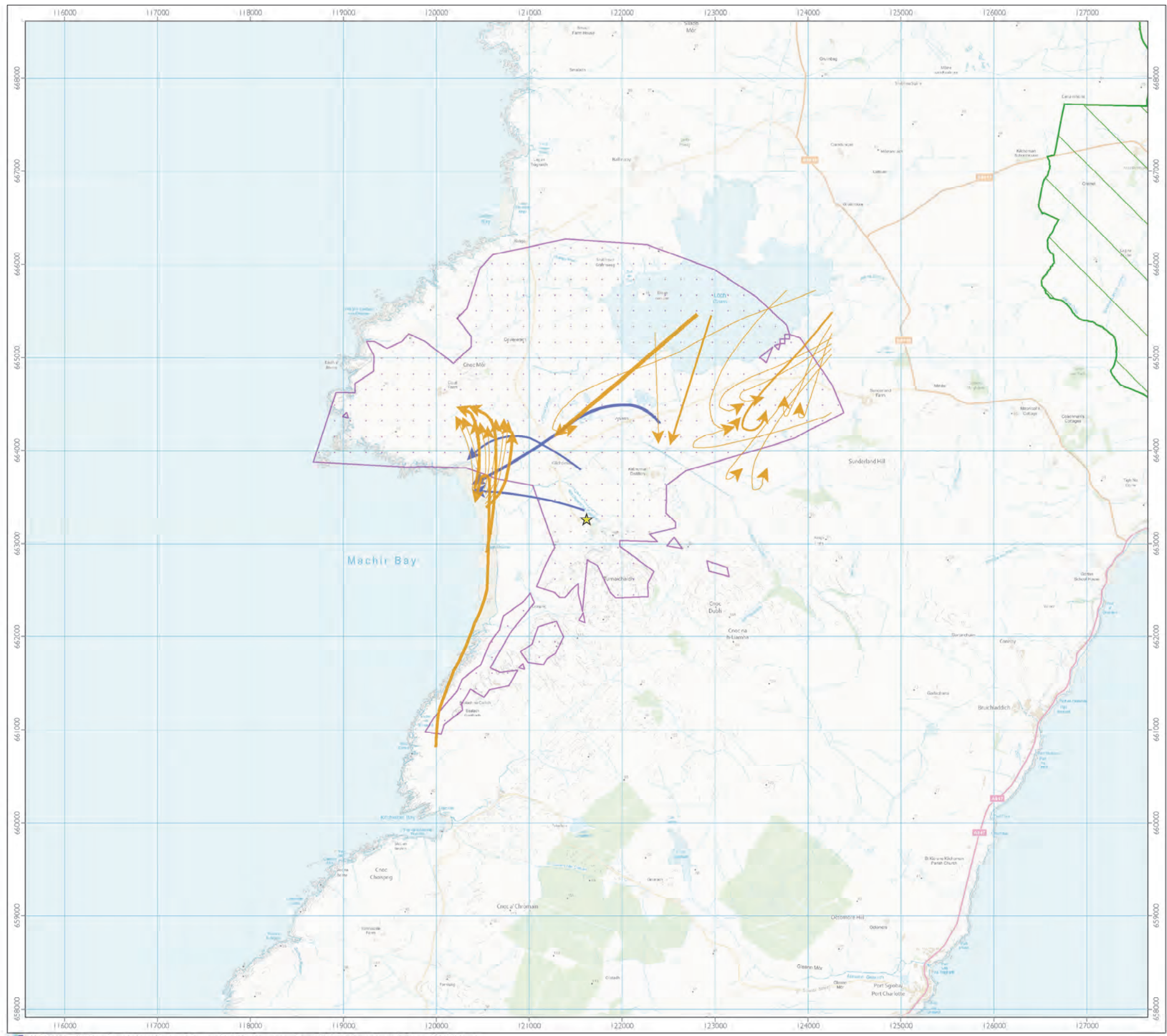


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Date: 09/10/2014 Job No: 7680SEC Rev: a
 Drawn: CH Checked: AC Approved: MSS

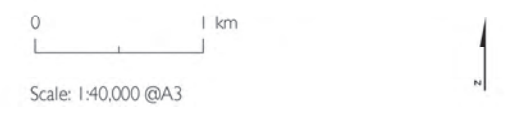
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Goose roost flights
 Port Ellen TV Mast
 Figure 3.7
 Islay



Legend

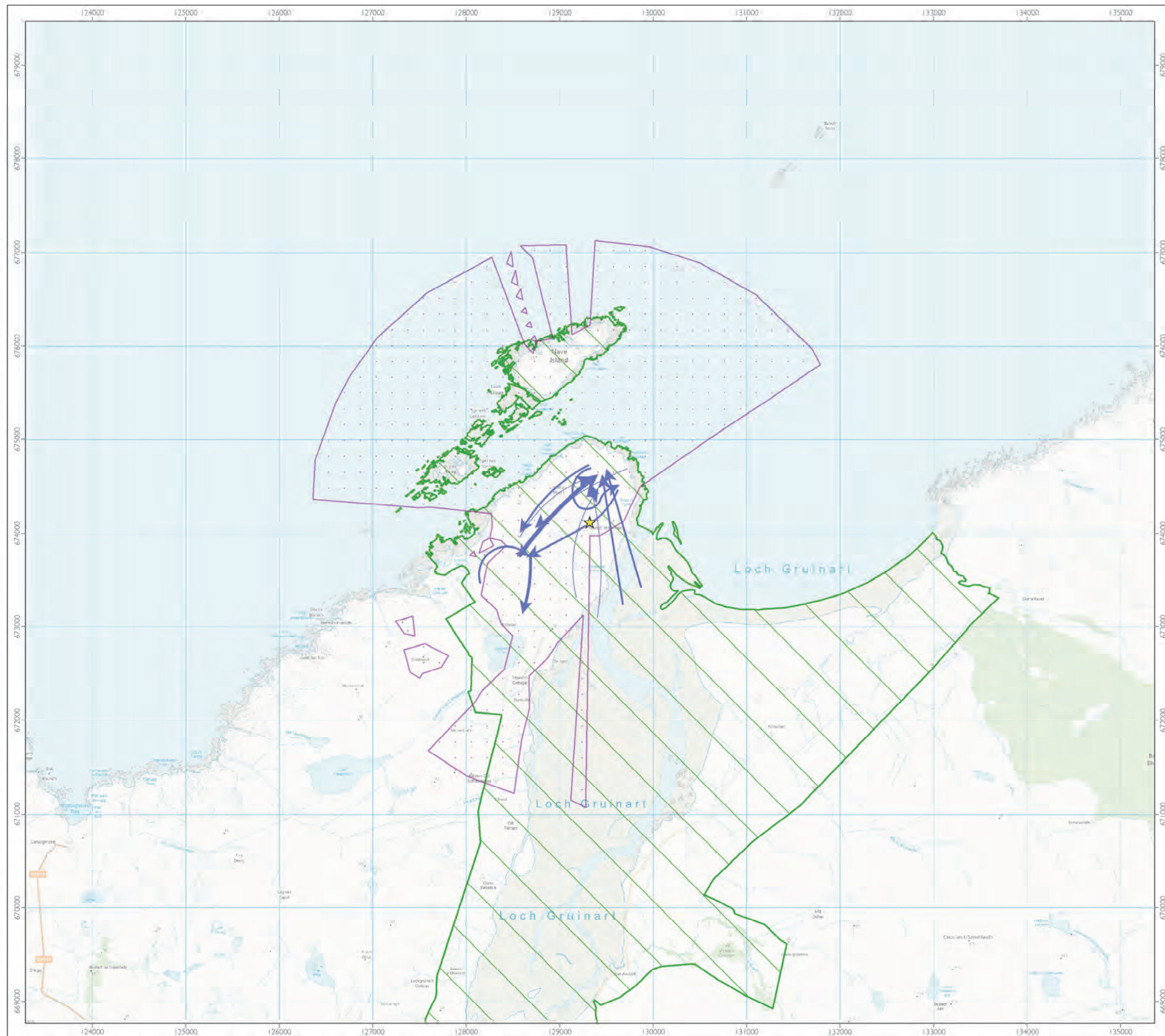
- ★ Goose Roost Vantage Point
- Goose roost flights - Number of birds
- Dawn**
- 1 - 100
- 101 - 500
- 501 - 1000
- 1001 - 5000
- 5001 - 10000
- Dusk**
- 1 - 100
- 101 - 500
- 501 - 1000
- 1001 - 5000
- 5001 - 10000
- Visible area to 20 m above ground extending to 3 km
- Special Protection Areas (SPA)



Scale: 1:40,000 @A3
 Date: 09/10/2014 Job No: 7680SEC Rev: a
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Goose roost flights
 Kilchoman Chapel
 Figure 3.8
 Islay



Legend

- ★ Goose Roost Vantage Point
- Goose roost flights - Number of birds
- Dawn**
 - 1 - 100
 - 101 - 500
 - 501 - 1000
 - 1001 - 5000
 - 5001 - 10000
- Dusk**
 - 1 - 100
 - 101 - 500
 - 501 - 1000
 - 1001 - 5000
 - 5001 - 10000
- Visible area to 20 m above ground extending to 3 km
- Special Protection Areas (SPA)



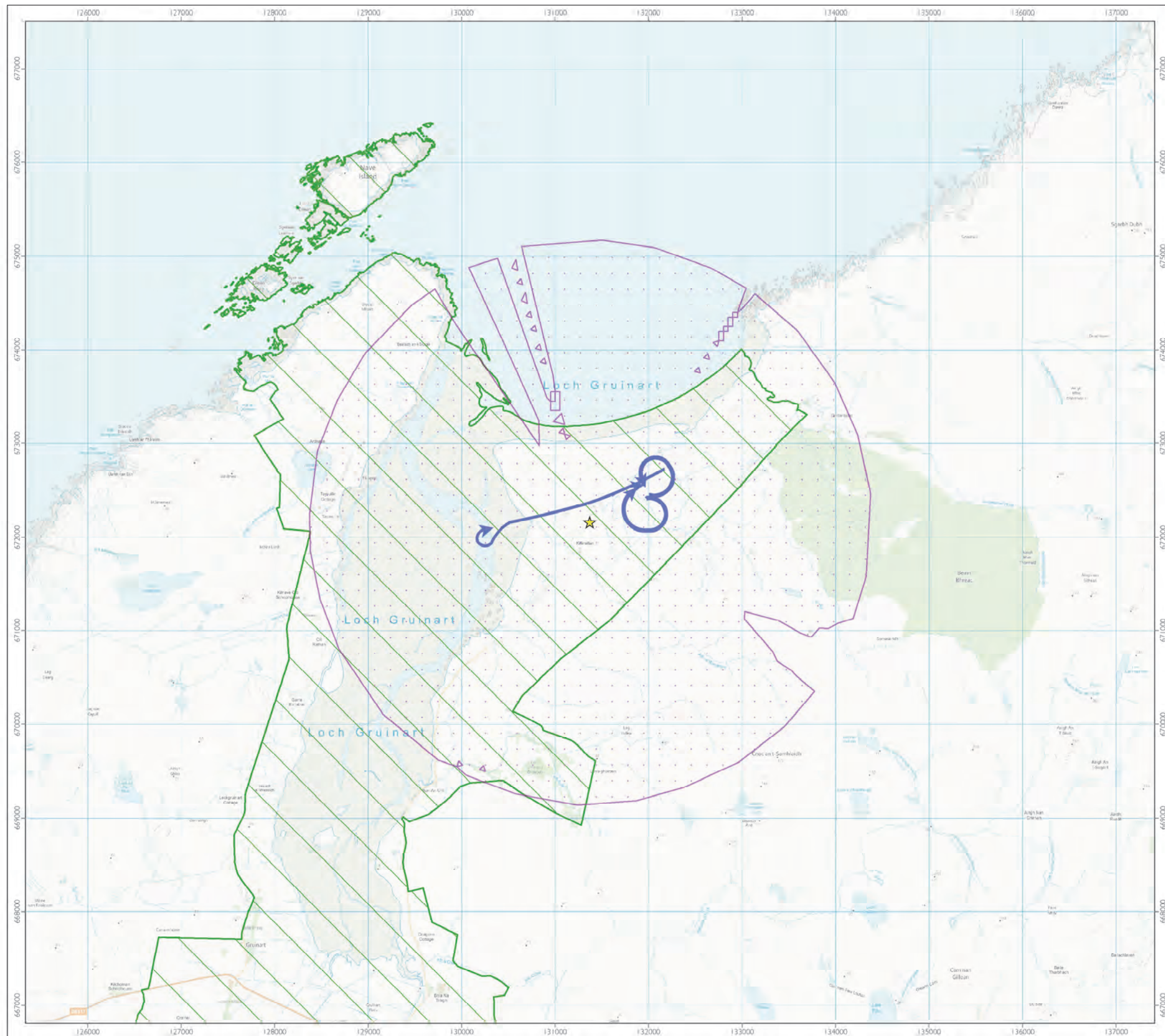
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Date: 09/10/2014 Job No: 7680SEC Rev: a
 Drawn: CH Checked: AC Approved: MSS

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Goose roost flights
 Ardnave Point

Figure 3.9
 Islay



Legend

- ★ Goose Roost Vantage Point
- Goose roost flights - Number of birds
- Dawn
 - 1 - 100
 - 101 - 500
 - 501 - 1000
 - 1001 - 5000
 - 5001 - 10000
- Dusk
 - 1 - 100
 - 101 - 500
 - 501 - 1000
 - 1001 - 5000
 - 5001 - 10000
- Visible area to 20 m above ground extending to 3 km
- Special Protection Areas (SPA)

0 1 km

Scale: 1:40,000 @A3

Date: 09/10/2014 Job No: 7680SEC Rev: a
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Goose roost flights
 Killinallan

Figure 3.10

Islay



Legend

-  Cardinal flight direction sector
-  Goose roost vantage point

Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation between number of birds at each roost therefore histogram scale is not comparable between sites; see the main text for full versions of these plots and sample sizes.

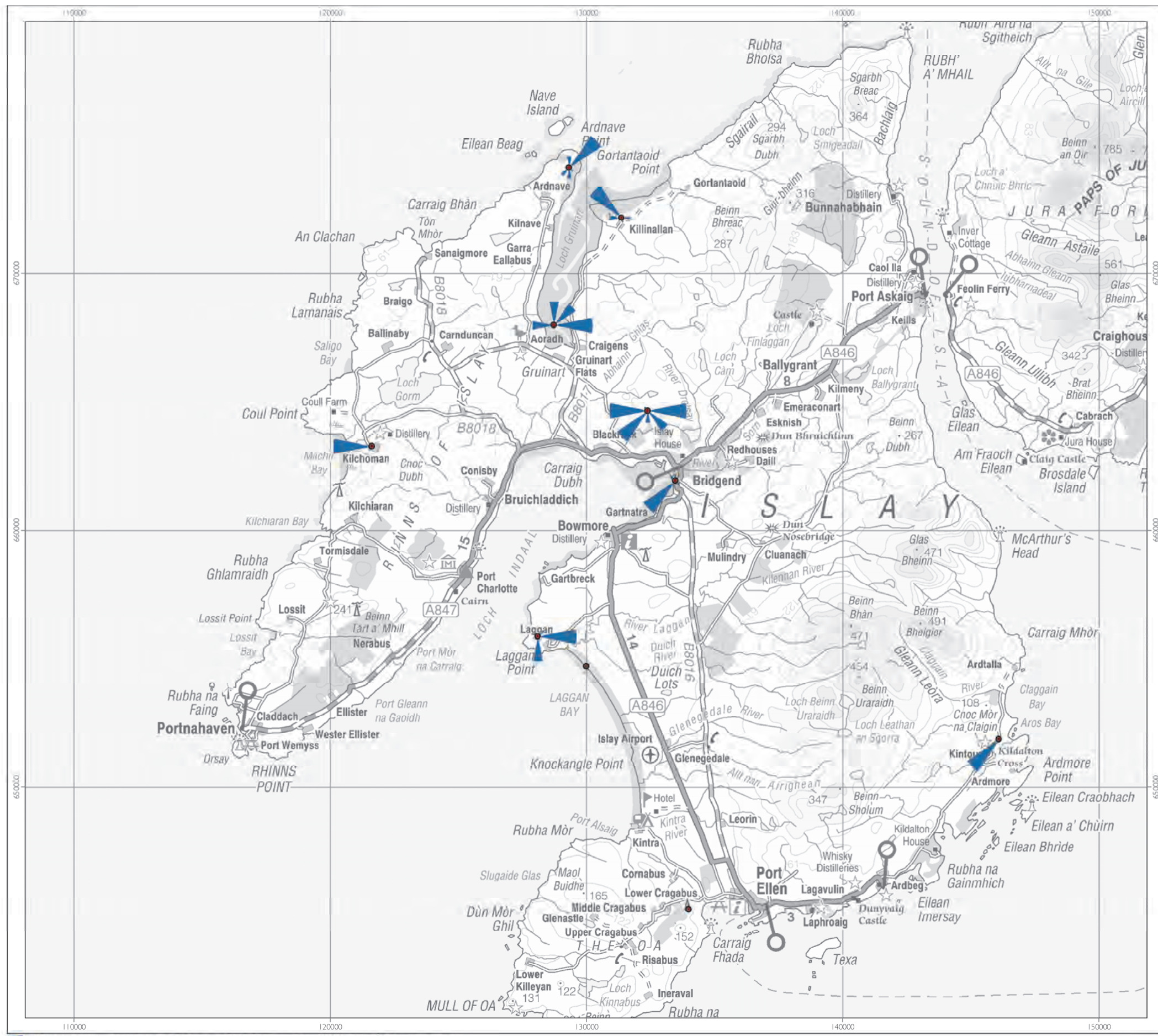
0 5,000 m

Scale: 1:145,000 @A3

Date: 09/10/2014	Job No: SEC7680	Rev: -
Drawn: CH	Checked: AC	Approved: MSS

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Flight direction of barnacle geese leaving roosts at dawn observed from vantage points, October 2013 - March 2014
 Figure 4
 Islay



Legend

- Cardinal flight direction sector
- Goose roost vantage point

Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation between number of birds at each roost therefore histogram scale is not comparable between sites; see the main text for full versions of these plots and sample sizes.

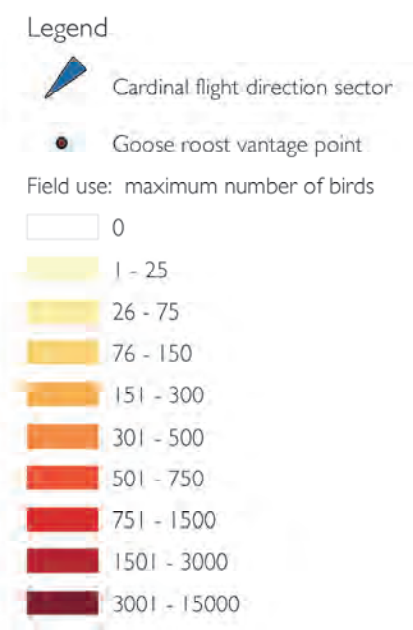
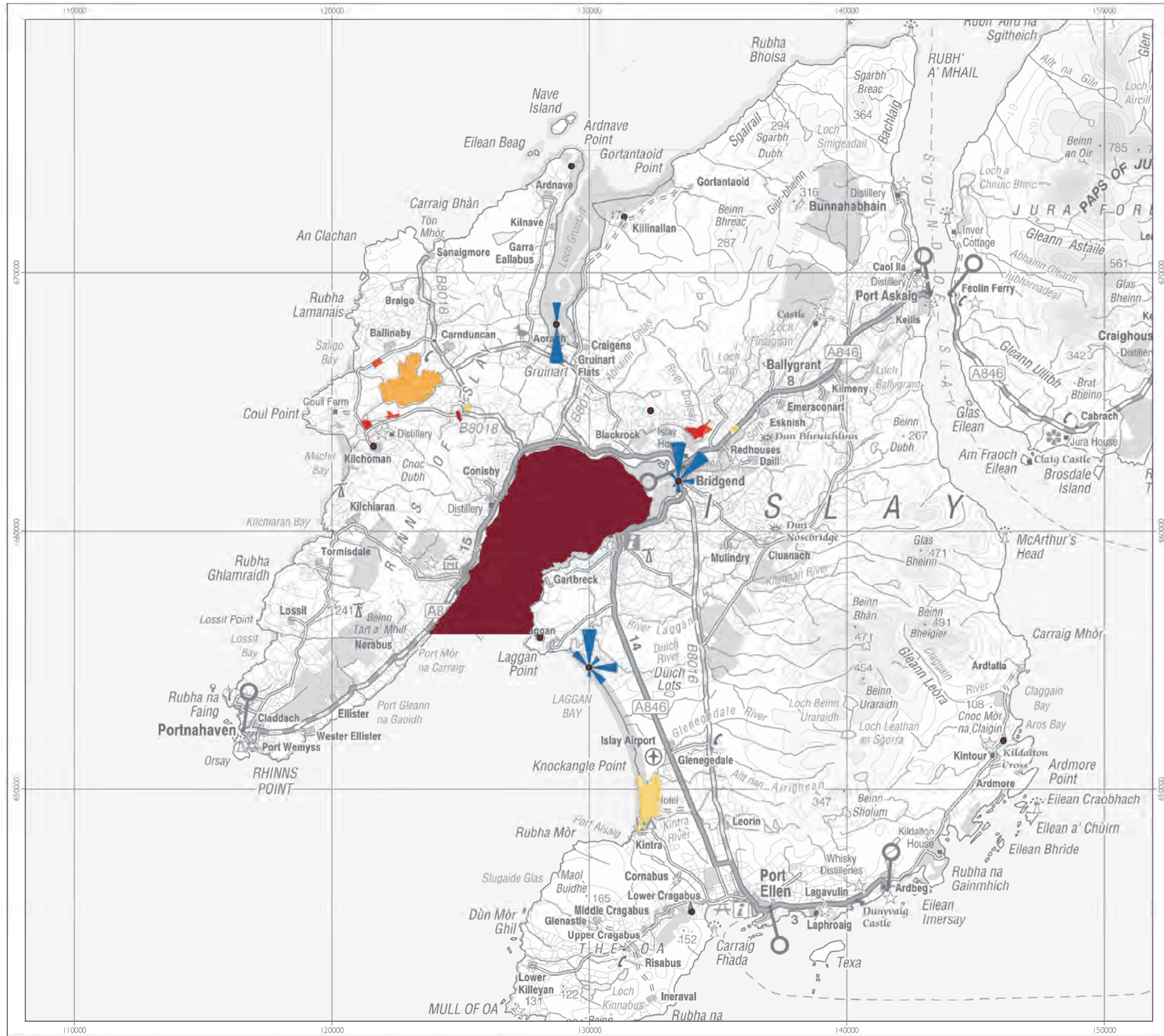
0 5,000 m

Scale: 1:145,000 @A3

Date: 09/10/2014	Job No: SEC7680	Rev: -
Drawn: CH	Checked: AC	Approved: MSS

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Flight direction of barnacle geese arriving at roosts at dusk observed from vantage points, October 2013 - March 2014
 Figure 5
 Islay



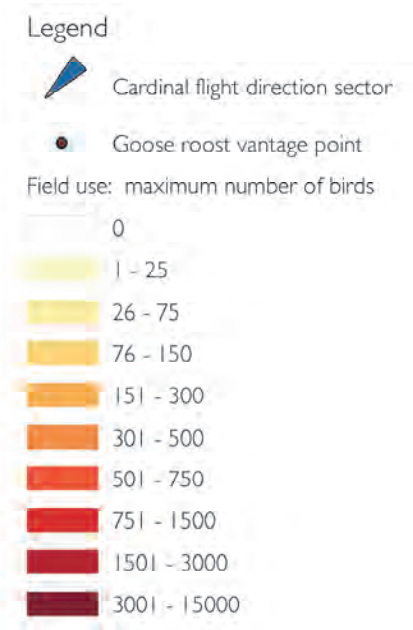
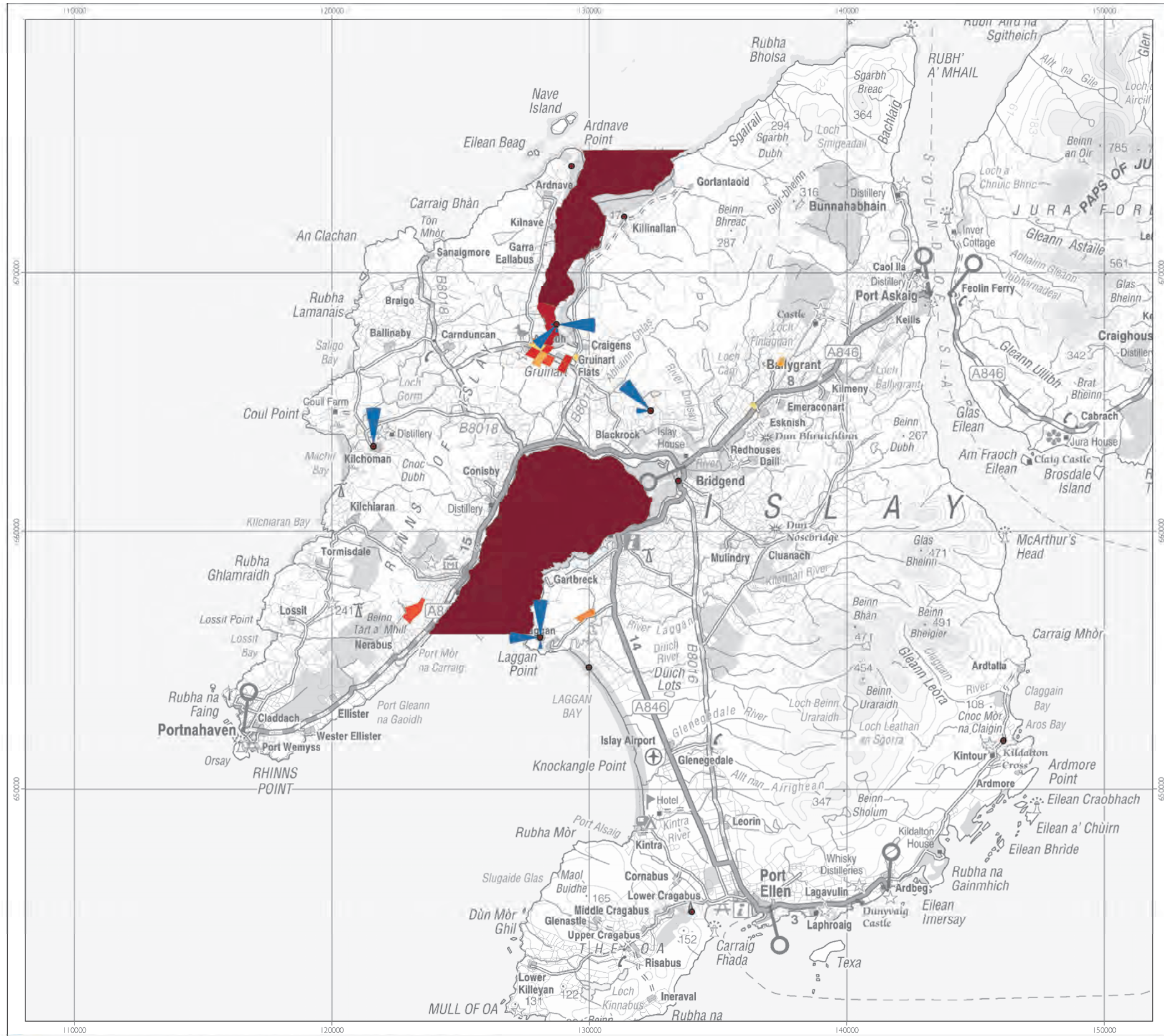
Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation between number of birds at each roost therefore histogram scale is not comparable between sites; see the main text for full versions of these plots and sample sizes.



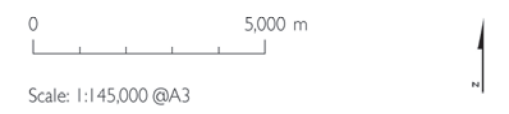
Date: 09/10/2014 Job No: SEC7680 Rev: -
 Drawn: CH Checked: AC Approved: MSS

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Field use and flight direction of barnacle geese leaving roosts at dawn, October 2013
 Figure 6.1
 Islay



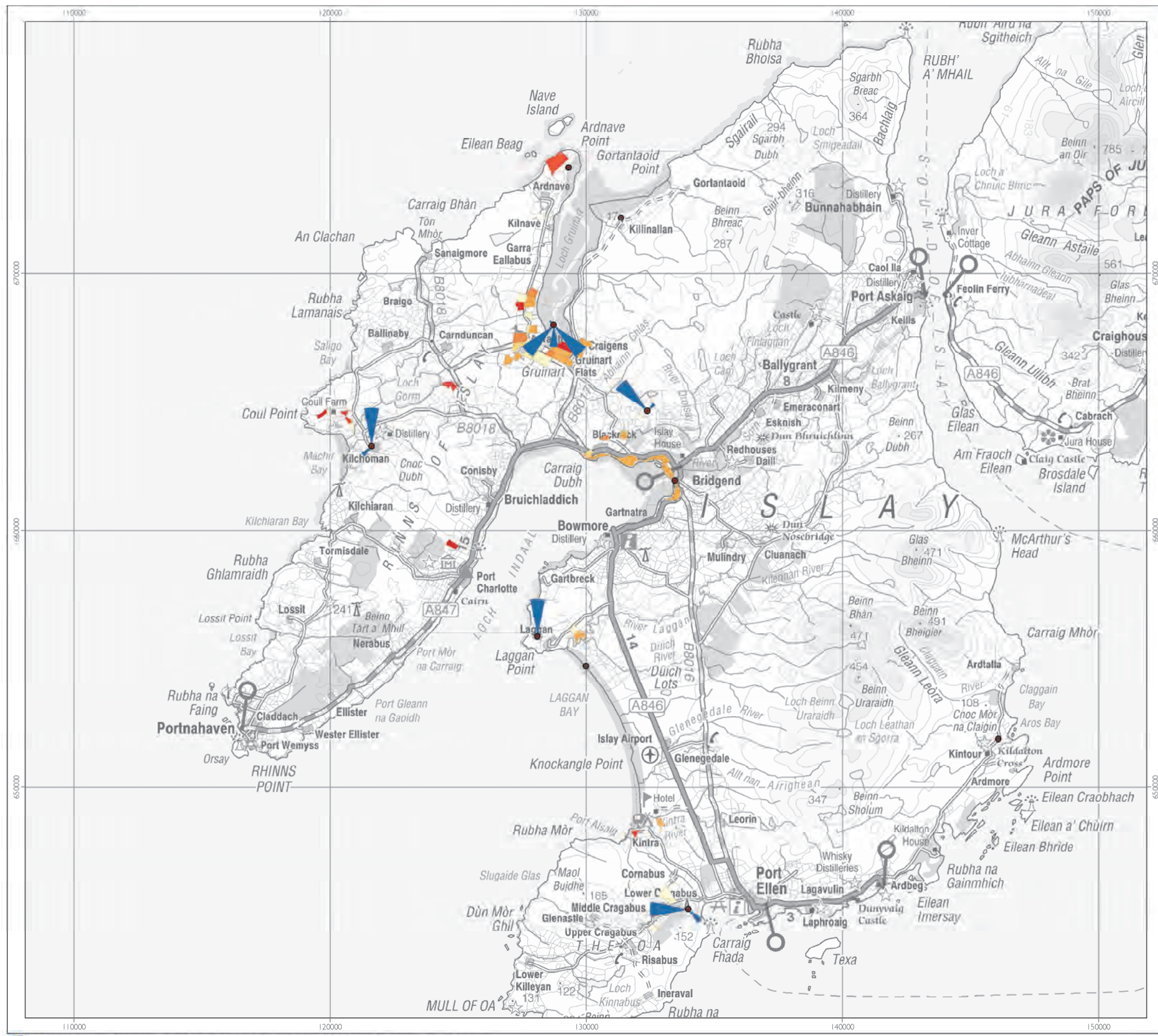
Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation between number of birds at each roost therefore histogram scale is not comparable between sites; see the main text for full versions of these plots and sample sizes.



Date: 09/10/2014 Job No: SEC7680 Rev: -
 Drawn: CH Checked: AC Approved: MSS

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Field use and flight direction of barnacle geese leaving roosts at dawn, November 2013
 Figure 6.2
 Islay



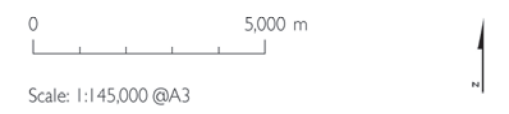
Legend

- Cardinal flight direction sector
- Goose roost vantage point

Field use: maximum number of birds

0
1 - 25
26 - 75
76 - 150
151 - 300
301 - 500
501 - 750
751 - 1500
1501 - 3000
3001 - 15000

Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation between number of birds at each roost therefore histogram scale is not comparable between sites; see the main text for full versions of these plots and sample sizes.



Date: 09/10/2014 Job No: SEC7680 Rev: -
 Drawn: CH Checked: AC Approved: MSS

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Field use and flight direction of barnacle geese leaving roosts at dawn, December 2013
 Figure 6.3
 Islay



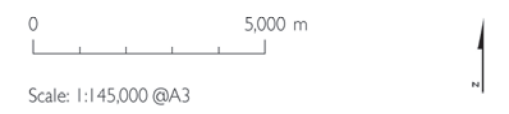
Legend

- Cardinal flight direction sector
- Goose roost vantage point

Field use: maximum number of birds

0
1 - 25
26 - 75
76 - 150
151 - 300
301 - 500
501 - 750
751 - 1500
1501 - 3000
3001 - 15000

Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation in number of birds at each roost therefore histogram scale is not comparable between sites, see the main text for full versions of these plots and sample sizes.



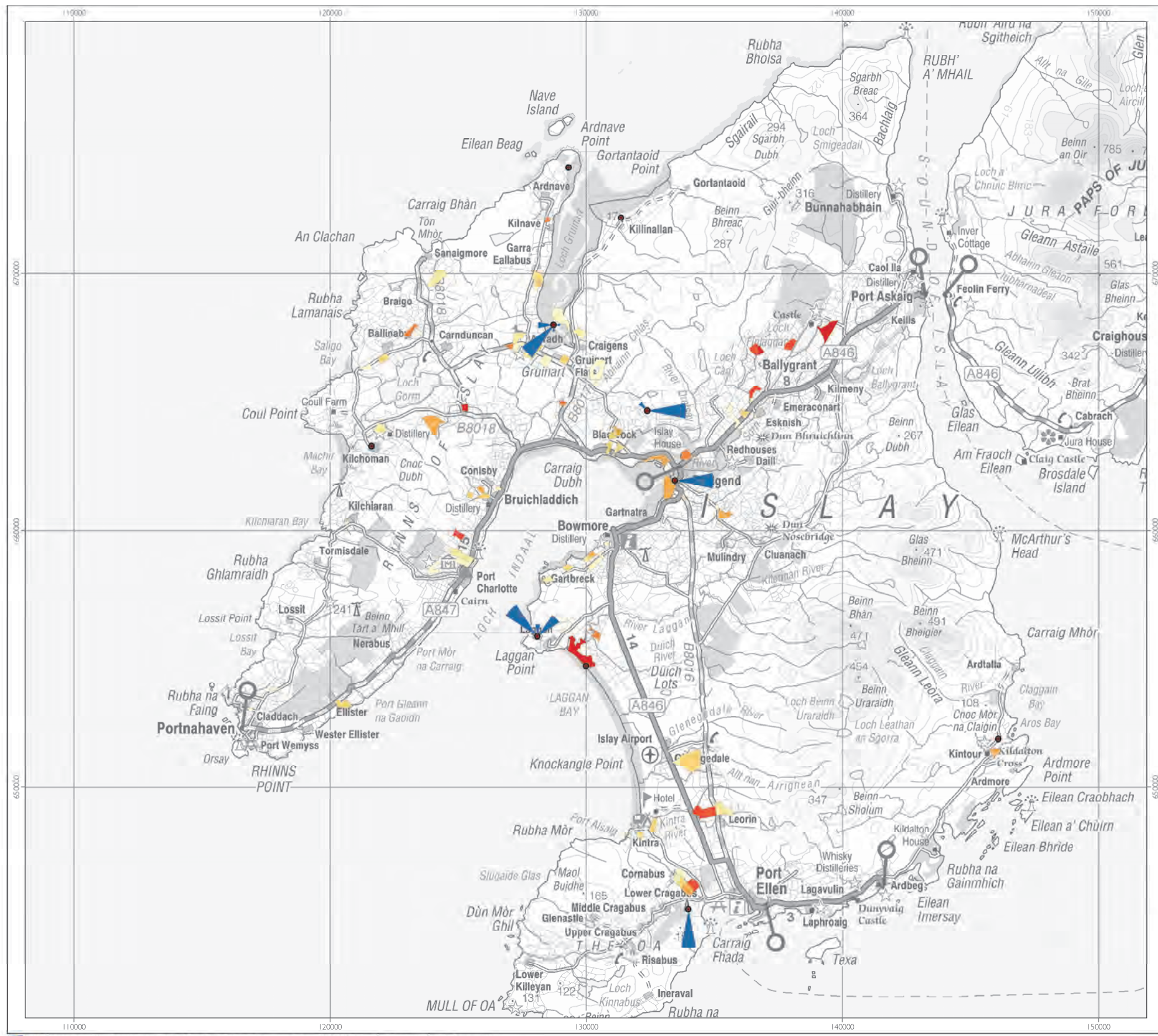
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Date: 09/10/2014 Job No: SEC7680 Rev: -
 Drawn: CH Checked: AC Approved: MSS

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Field use and flight direction of barnacle geese leaving roosts at dawn, January 2014
 Figure 6.4
 Islay

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Legend

- Cardinal flight direction sector
- Goose roost vantage point

Field use: maximum number of birds

0
1 - 25
26 - 75
76 - 150
151 - 300
301 - 500
501 - 750
751 - 1500
1501 - 3000
3001 - 15000

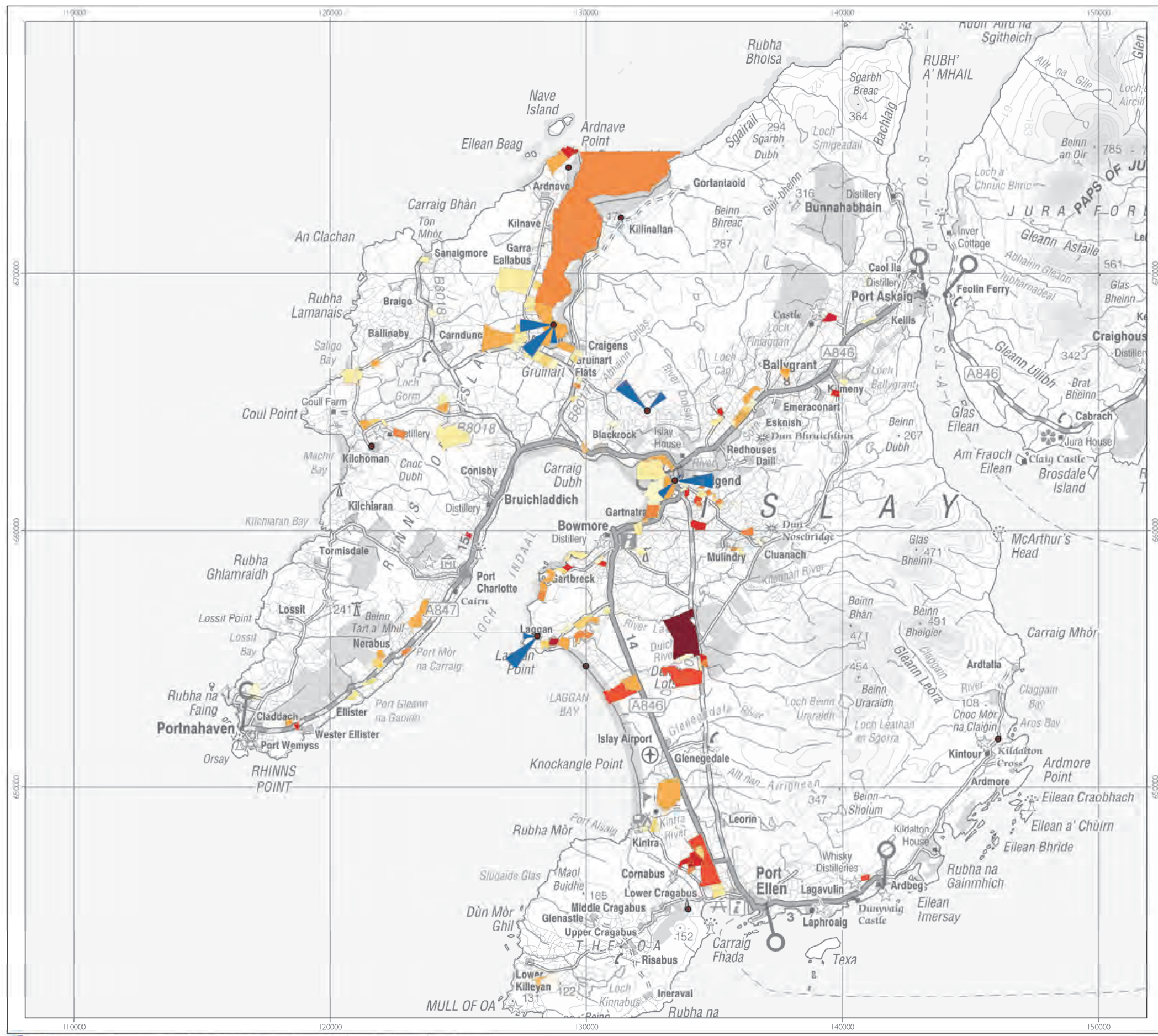
Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation in number of birds at each roost therefore histogram scale is not comparable between sites; see the main text for full versions of these plots and sample sizes.



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Field use and flight direction of barnacle geese leaving roosts at dawn, February 2014
 Figure 6.5
 Islay



Legend

- Cardinal flight direction sector
- Goose roost vantage point

Field use: maximum number of birds

0
1 - 25
26 - 75
76 - 150
151 - 300
301 - 500
501 - 750
751 - 1500
1501 - 3000
3001 - 15000

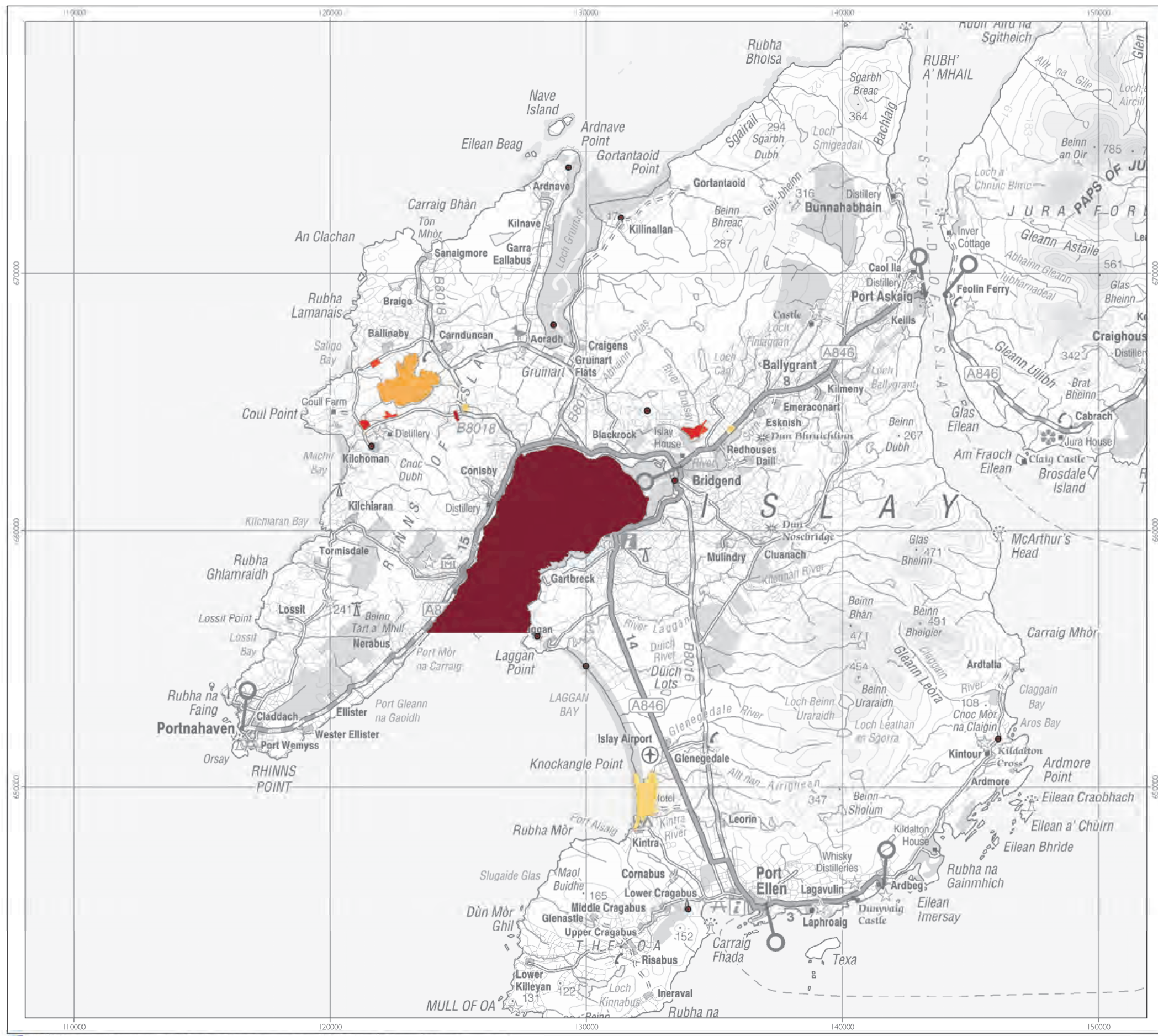
Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation between number of birds at each roost therefore histogram scale is not comparable between sites, see the main text for full versions of these plots and sample sizes.



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Field use and flight direction of barnacle geese leaving roosts at dawn, March 2014
 Figure 6.6
 Islay



Legend

- Cardinal flight direction sector
 - Goose roost vantage point
- Field use: maximum number of birds
- 0
 - 1 - 25
 - 26 - 75
 - 76 - 150
 - 151 - 300
 - 301 - 500
 - 501 - 750
 - 751 - 1500
 - 1501 - 3000
 - 3001 - 15000

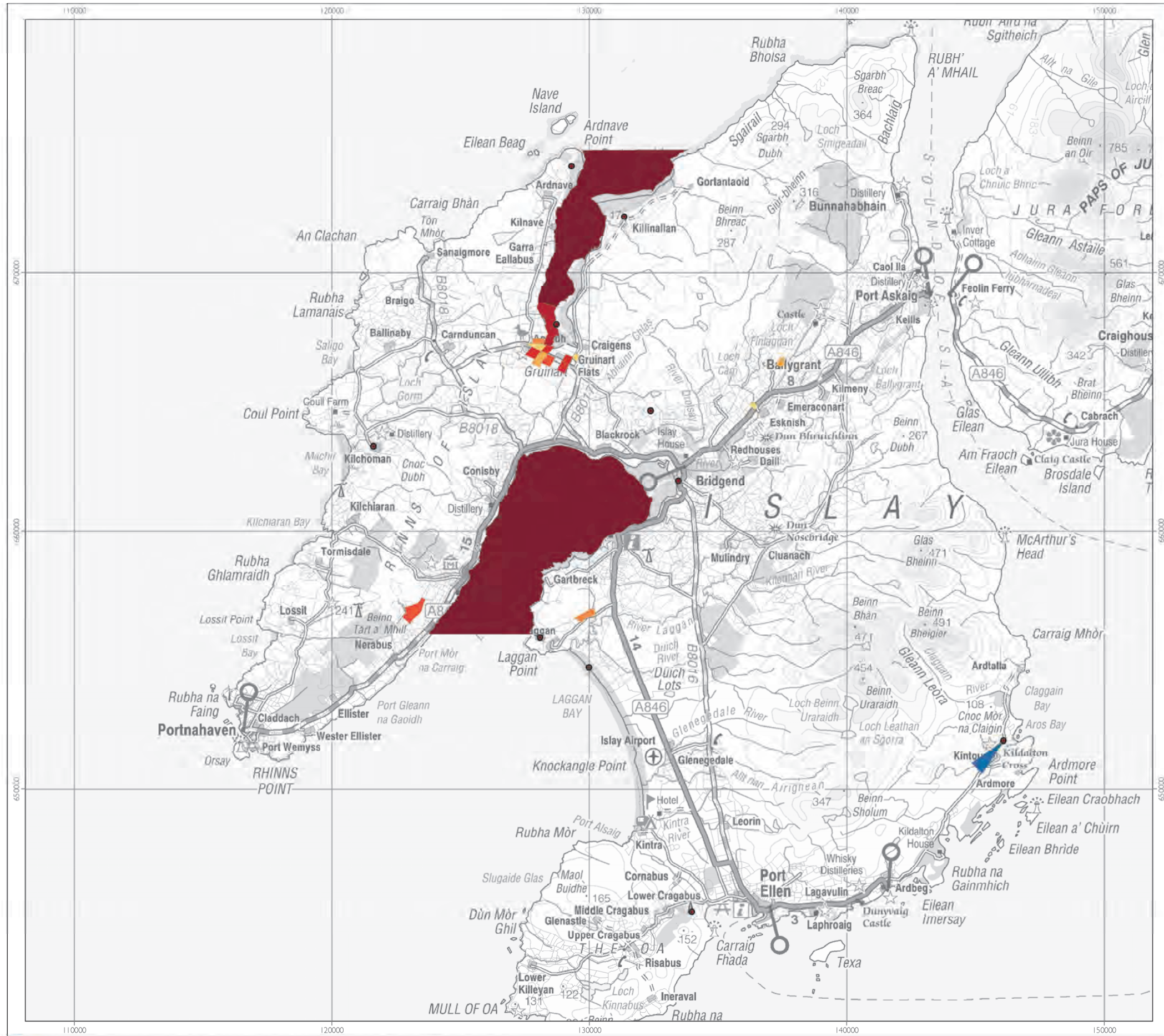
Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation between number of birds at each roost therefore histogram scale is not comparable between sites; see the main text for full versions of these plots and sample sizes.



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Field use and flight direction of barnacle geese arriving at roosts at dusk, October 2013
 Figure 7.1
 Islay



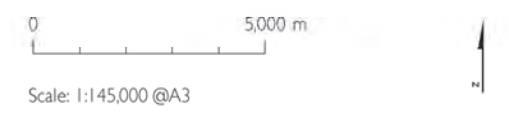
Legend

- Cardinal flight direction sector
- Goose roost vantage point

Field use: maximum number of birds

0
1 - 25
26 - 75
76 - 150
151 - 300
301 - 500
501 - 750
751 - 1500
1501 - 3000
3001 - 15000

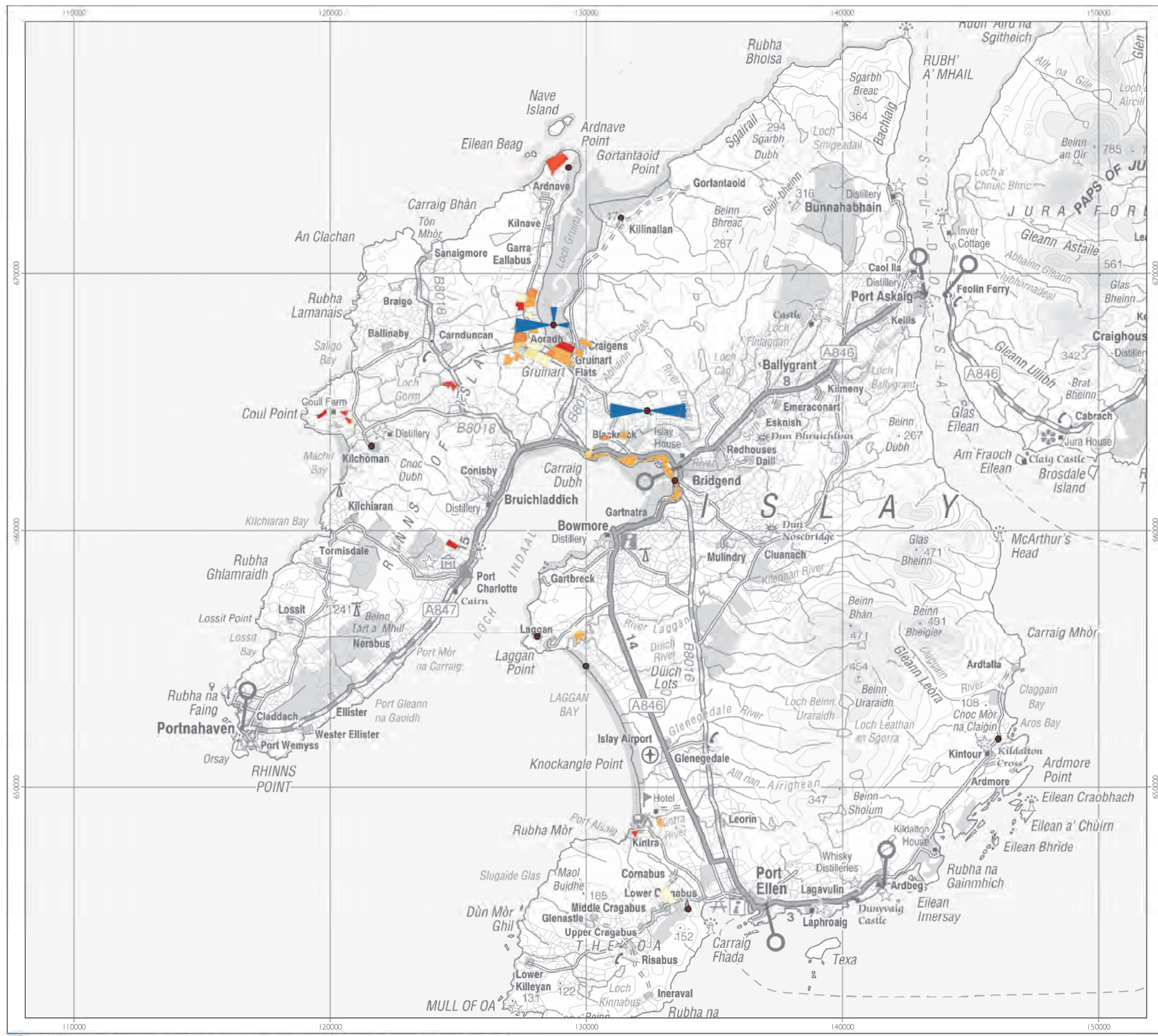
Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation between number of birds at each roost therefore histogram scale is not comparable between sites; see the main text for full versions of these plots and sample sizes.



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Field use and flight direction of barnacle geese arriving at roosts at dusk, November 2013
 Figure 7.2
 Islay



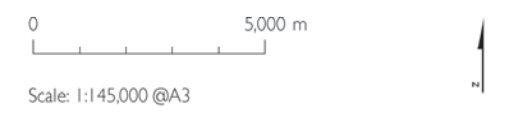
Legend

- Cardinal flight direction sector
- Goose roost vantage point

Field use: maximum number of birds

0
1 - 25
26 - 75
76 - 150
151 - 300
301 - 500
501 - 750
751 - 1500
1501 - 3000
3001 - 15000

Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation between number of birds at each roost therefore histogram scale is not comparable between sites; see the main text for full versions of these plots and sample sizes.



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Field use and flight direction of barnacle geese arriving at roosts at dusk, December 2013
 Figure 7.3
 Islay



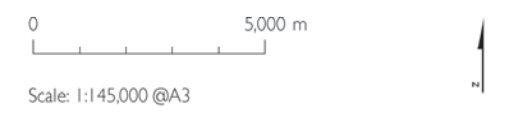
Legend

- Cardinal flight direction sector
- Goose roost vantage point

Field use: maximum number of birds

	0
	1 - 25
	26 - 75
	76 - 150
	151 - 300
	301 - 500
	501 - 750
	751 - 1500
	1501 - 3000
	3001 - 15000

Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation in number of birds at each roost therefore histogram scale is not comparable between sites, see the main text for full versions of these plots and sample sizes.

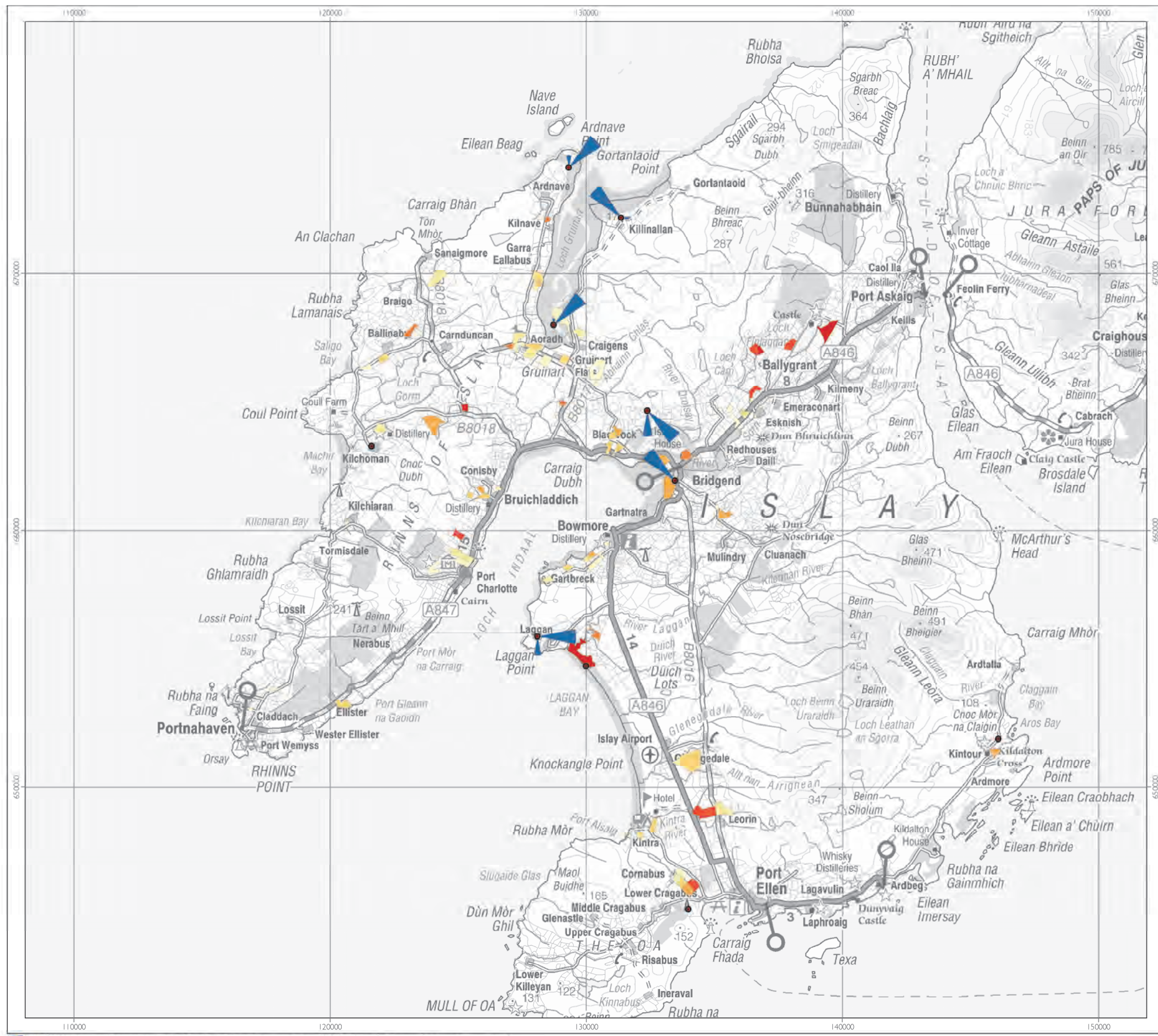


Scale: 1:145,000 @A3

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Field use and flight direction of barnacle geese arriving at roosts at dusk, January 2014
 Figure 7.4
 Islay



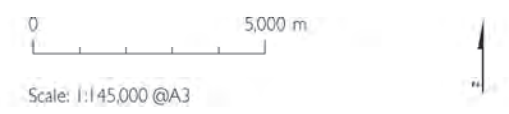
Legend

- Cardinal flight direction sector
- Goose roost vantage point

Field use: maximum number of birds

0
1 - 25
26 - 75
76 - 150
151 - 300
301 - 500
501 - 750
751 - 1500
1501 - 3000
3001 - 15000

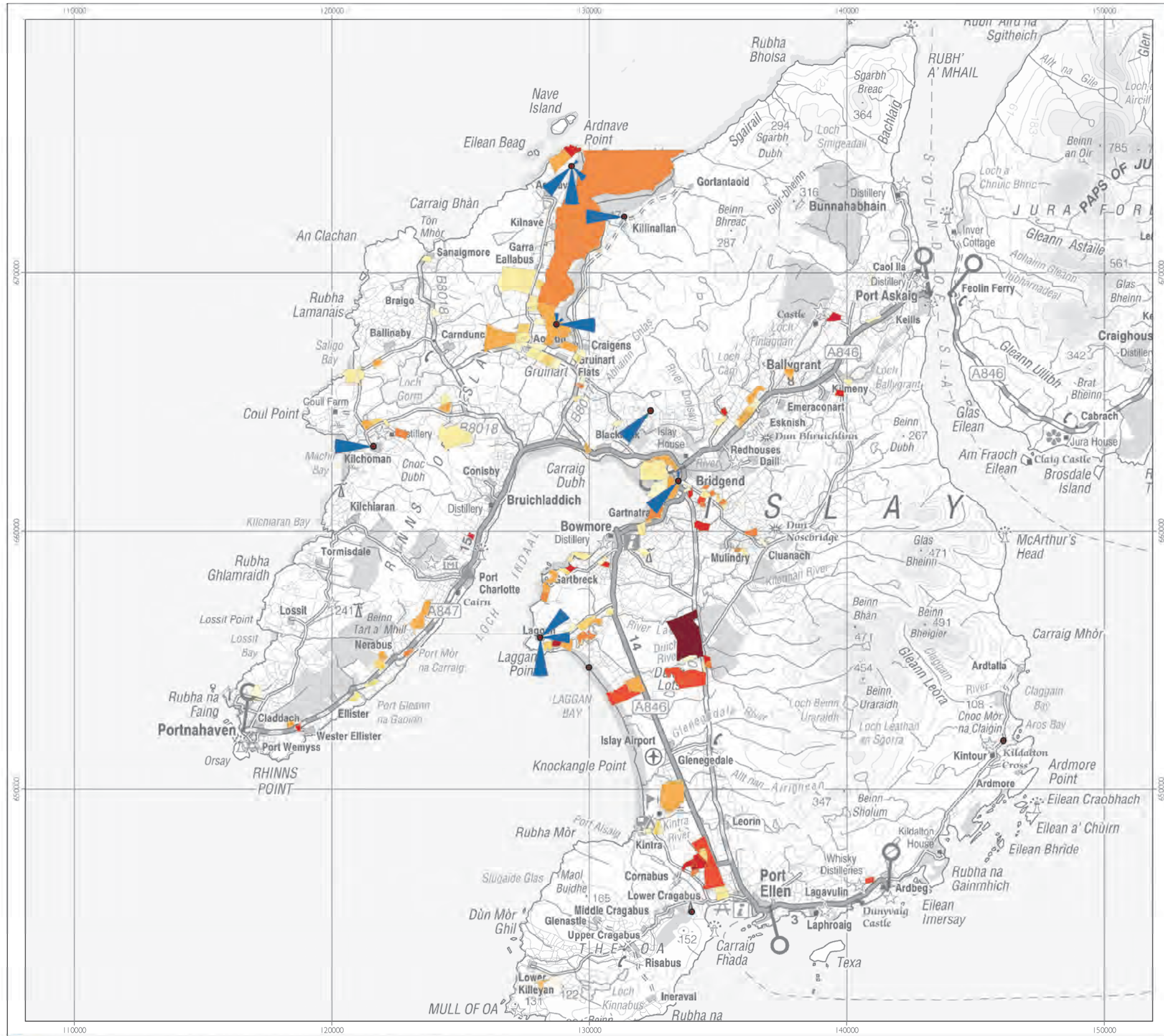
Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation in number of birds at each roost therefore histogram scale is not comparable between sites; see the main text for full versions of these plots and sample sizes.



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Field use and flight direction of barnacle geese arriving at roosts at dusk, February 2014
 Figure 7.5
 Islay



Legend

- Cardinal flight direction sector
- Goose roost vantage point

Field use: maximum number of birds

0
1 - 25
26 - 75
76 - 150
151 - 300
301 - 500
501 - 750
751 - 1500
1501 - 3000
3001 - 15000

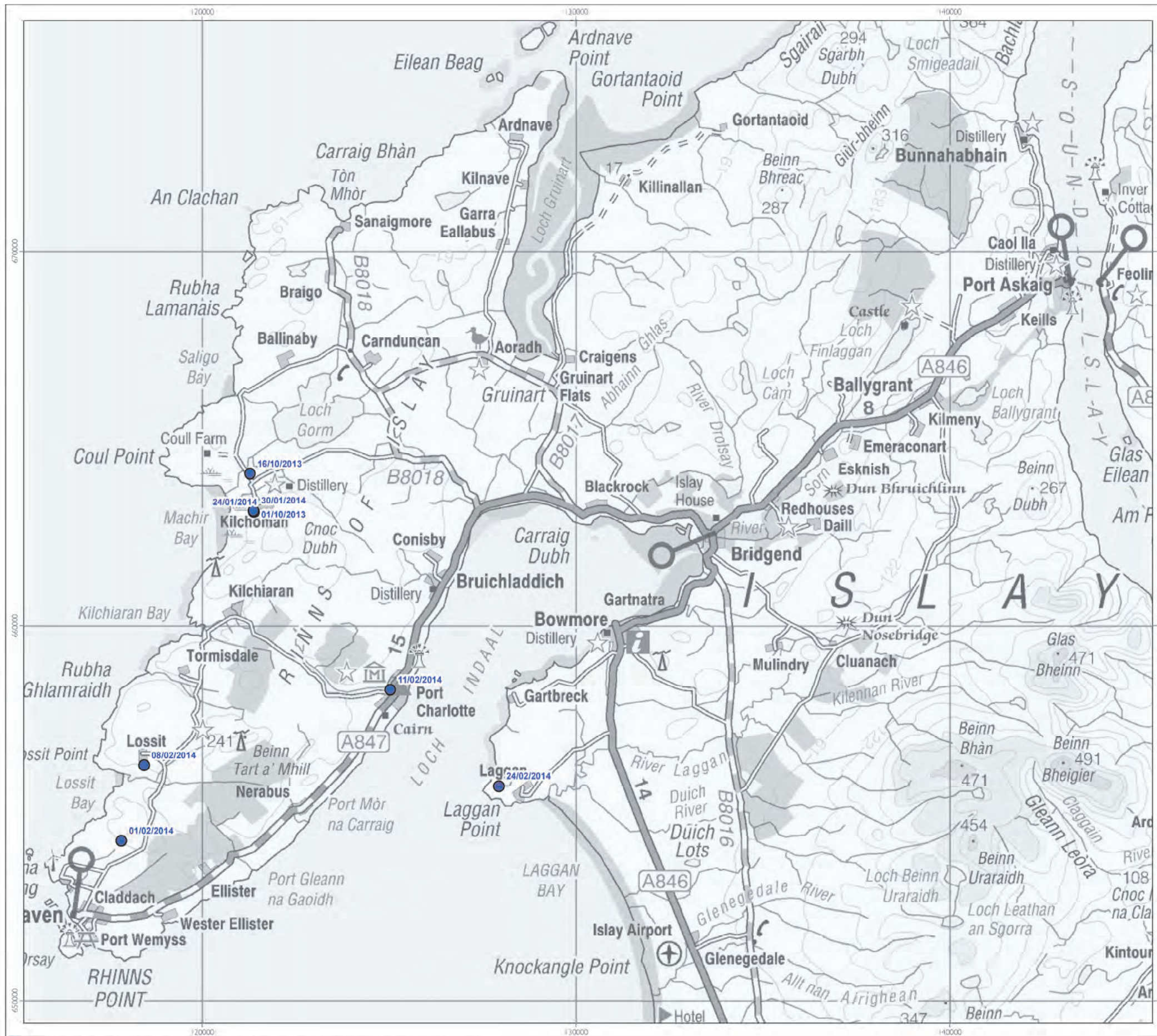
Polar histograms of flight direction of barnacle geese in eight cardinal directions are illustrated geographically. The length of each sector is proportional to the number of birds flying in that cardinal direction. There is a large variation between number of birds at each roost therefore histogram scale is not comparable between sites, see the main text for full versions of these plots and sample sizes.



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Field use and flight direction of barnacle geese arriving at roosts at dusk, March 2014
 Figure 7.6
 Islay



Legend

- Aberrant Barnacle Goose



Scale: 1:100,000 @A3

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Distinctive individual barnacle goose records

Figure 8a

Islay



Legend
 ● Canada Goose

Source RPS, Rare Bird Alert
<http://www.rarebirdalert.co.uk/>



Scale: 1:124,844 @A3

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Distinctive individual canada goose records

Figure 8b

Islay

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