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Environmental Imaging Solutions

Year 2 Digital Aerial Wildlife Survey of BOEM Lease Area OCS-A 0512

Combined Monthly Survey Report (Year 2): February 2019-December 2019

Equinor Wind US

APEM Ref: P00004039

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1. Executive Summary

- A program of 12 monthly digital aerial wildlife surveys of the Bureau of Ocean Energy Management (BOEM) Lease Area Outer Continental Shelf – Atlantic (OCS-A) 0512 in the New York Bight, were conducted between February 2019 and December 2019, using APEM Inc.'s high-resolution camera system to capture digital still imagery. The program is the second year of surveys, using the same methodology and study area as APEM's "Ornithological and Marine Fauna Aerial Survey Results of Lease Area OCS-A 0512" on behalf of Equinor Wind US.

- Images collected have been analyzed by APEM Inc. (hereafter referred to as APEM) and quality assured by Normandeau Associates (hereafter referred to as Normandeau). Raw counts of all species and incidental observations recorded during the 12 surveys are presented here.

- Survey 13 – February 2019

    - The most abundant group recorded in Survey 13 was gannets (n=65), followed by loons (n=46), gulls (n=27), auks (n=15), and waterfowl (n=9) and marine mammals (n=9).

- Survey 14 – February 2019

    - The most abundant group recorded in Survey 14 was auks (n=140), followed by loons (n=57), marine mammals (n=28), gulls (n=27), gannets (n=9), waterfowl (n=4), and shearwaters (n=1).

- Survey 15 – March 2019

    - The most abundant group recorded in Survey 15 was auks (n=112), followed by gulls (n=27) and loons (n=27), waterfowl (n=21), gannets (n=3), and shorebirds (n=1) and large bony fish (n=1).

- Survey 16 – April 2019

    - The most abundant group recorded in Survey 16 was gulls (n=39), followed by gannets (n=36), loons (n=26), marine mammals (n=16), terns (n=4), and auks (n=1).

- Survey 17 – May 2019

    - The most abundant group recorded in Survey 17 was loons (n=50), followed by large bony fish (n=22), terns (n=15), gannets (n=13), marine mammals (n=5), and gulls (n=3).

- Survey 18 – June 2019

    - The most abundant group recorded in Survey 18 was terns (n=59), followed by storm petrels (n=48), marine mammals (n=25), large bony fish (n=16), turtles (n=10), sharks (n=4), loons (n=2), and gulls (n=1) and gannets (n=1).

- Survey 19 – August 2019

    - The most abundant group recorded in Survey 19 was shorebirds (n=184), followed by marine mammals (n=44), turtles (n=22), sharks (n=16), large bony fish (n=11), storm petrels (n=9), terns (n=7), gulls (n=3) and passerines (n=3), and rays (n=2).

- Survey 20 – August 2019

    - The most abundant group recorded in Survey 20 was storm petrels (n=333), followed by shearwaters (n=13), turtles (n=12), large bony fish (n=3), terns (n=2), gulls (n=2) and sharks (n=2), and loons (n=1) and marine mammals (n=1).

- Survey 21 – September 2019

    - The most abundant group recorded in Survey 21 was rays (n=812), followed by marine mammals (n=38), gulls (n=33), turtles (n=17), sharks (n=7), large bony fish (n=4), and terns (n=1).

- Survey 22 – October 2019

    - The most abundant group recorded in Survey 22 was gulls (n=38), followed by large bony fish (n=9), turtles (n=3), gannets (n=2) and sharks (n=2), and loons (n=1).

- Survey 23 – December 2019

    - The most abundant group recorded in Survey 23 was gulls (n=189), followed by waterfowl (n=152), auks (n=55), gannets (n=34), loons (n=27), shorebirds (n=12), shearwaters (n=5), marine mammals (n=2), and turtles (n=1).

- Survey 24 – December 2019

    - The most abundant group recorded in Survey 24 was auks (n=507), followed by gannets (n=78) and gulls (n=78), loons (n=34), marine mammals (n=28), waterfowl (n=6), shorebirds (n=4), and turtles (n=1).

- A summary of the raw counts for all species recorded in each season are presented in Table 1, with an indication of their protected status as being Listed (Federally or New York State Listed as Threatened or Endangered), where applicable.

- Overall, Survey 21 (September 2019) recorded the highest number of targets (n=912), predominantly rays, whilst the succeeding Survey 22 (October 2019) featured the lowest overall number of targets (n=55). Auks were both the most numerous avian species and overall species group recorded throughout the survey period (n=830), with rays being the second most numerous species group (n=814). Owing to the high count of rays in Survey 21, the fall season recorded the highest number of targets (n=1444), whilst the lowest overall seasonal total was recorded for spring (n=422).

Table 1 **Number of individuals recorded within the Survey Area in each survey season and their Listed status**

Avian	Number of individuals per season				Federally Listed	State Listed
Species	Winter	Spring	Summer	Fall		
Waterfowl						
Surf Scoter	2	-	-	-	No	No
White-winged Scoter	15	17	-	-	No	No
Black Scoter	-	-	-	152	No	No
Scoter sp. – unidentified	1	-	-	-	No	No
Duck sp. – unidentified	1	4	-	-	No	No
Shorebirds						
Black-bellied Plover	-	-	2	-	No	No
Red / Red-necked Phalarope	-	1	-	-	No	No
Red Phalarope	4	-	-	12	No	No
Shorebird sp. – unidentified	-	-	182	-	No	No
Auks						
Dovekie	-	2	-	-	No	No
Common / Thick-billed Murre	23	1	-	-	No	No
Razorbill	7	-	-	2	No	No
Murre[1] / Razorbill	617	106	-	50	No	No
Atlantic Puffin	6	2	-	3	No	No
Auk sp. – unidentified	9	2	-	-	No	No
Gulls						
Black-legged Kittiwake	-	-	-	17	No	No
Bonaparte's Gull	56	23	-	124	No	No
Laughing Gull	-	3	2	34	No	No
Small Gull sp. – unidentified	14	7	2	7	No	No
Ring-billed Gull	1	-	-	2	No	No
Herring Gull	14	16	1	40	No	No
Lesser Black-backed Gull	-	-	-	1	No	No
Great Black-backed Gull	45	18	1	27	No	No
Large Gull sp. – unidentified	2	2	-	6	No	No
Gull sp. – unidentified	-	-	-	2	No	No
Terns						
Least Tern	-	2	9	-	E[2]	T
Common Tern	-	4	20	-	No	T
Arctic Tern	-	1	-	-	No	No
'Commic'[3] Tern	-	2	-	-	No	P*
Forster's Tern	-	-	3	-	No	No
'Commic'[3] / Forster's Tern	-	8	35	-	No	P*
Sterna Tern sp. – unidentified	-	2	1	-	P*	P*
Tern sp. – unidentified	-	-	-	1	No	No
Loons						
Red-throated Loon	28	9	-	8	No	No
Common Loon	106	93	3	20	No	SC
Loon sp. – unidentified	3	1	-	-	No	No
Storm Petrels						

Storm Petrel sp. – unidentified	-	-	390	-	No	No
Shearwaters						
Great Shearwater	-	-	13	-	No	No
Manx Shearwater	1	-	-	5	No	No
Gannets						
Northern Gannet	152	52	1	36	No	No
Other Avian						
Passerine sp. – unidentified	-	-	3	-	No	No
Marine Mammals	**Number of individuals per season**				**Federally Listed**	**State Listed**
Species	**Winter**	**Spring**	**Summer**	**Fall**		
Common Minke Whale	-	1	1	-	No	No
Whale sp. – unidentified	-	-	1	-	P*	No
Common Dolphin	22	6	60	40	No	No
Common / Atlantic White-sided Dolphin	-	8	-	-	No	No
Common Bottlenose Dolphin	-	-	3	-	No	No
Dolphin sp. – unidentified	5	-	4	-	No	No
Harbor Porpoise	7	6	-	-	No	SC
Seal sp. – unidentified	3	-	-	-	No	No
Marine Mammal sp. – unidentified	28	-	1	-	No	No
Turtles	**Number of individuals per season**				**Federally Listed**	**State Listed**
Species	**Winter**	**Spring**	**Summer**	**Fall**		
Loggerhead Turtle	-	-	19	6	T	T
Kemp's Ridley Turtle	1	-	7	10	E	E
Loggerhead / Kemp's Ridley Turtle	-	-	12	4	T / E	T / E
Turtle sp. – unidentified	-	-	6	1	P*	P*
Large Bony Fish	**Numbers of individuals per season**				**Federally Listed**	**State Listed**
Species	**Winter**	**Spring**	**Summer**	**Fall**		
Mahi-mahi	-	-	2	1	No	No
Ocean Sunfish	-	1	11	12	No	No
Sunfish sp. – unidentified	-	-	5	-	No	No
Atlantic Bluefin Tuna	-	15	-	-	No	No
Tuna sp. – unidentified	-	1	7	-	No	No
Billfish sp. – unidentified	-	-	1	-	No	No
Fish sp. – unidentified	-	6	4	-	No	No
Sharks and Rays	**Numbers of individuals per season**				**Federally Listed**	**State Listed**
Species	**Winter**	**Spring**	**Summer**	**Fall**		
Blacktip Shark	-	-	1	-	No	No
Blue Shark	-	-	1	-	No	No
Carcharhinidae Shark sp. – unidentified	-	-	4	1	No	No
Basking Shark	-	-	1	2	No	No
White Shark	-	-	-	1	No	No
Shortfin Mako	-	-	1	-	No	No
Scalloped Hammerhead	-	-	-	2	E	No
Hammerhead sp. – unidentified	-	-	3	2	P*	No
Shark sp. – unidentified	-	-	11	1	No	No
Chilean Devil Ray	-	-	1	-	No	No
Cownose Ray	-	-	-	812	No	No

Ray sp. – unidentified	-	-	1	-	No	No

[1]*Murre refers to either common murre or thick-billed murre.*

[2] *Federally Endangered inland US only.*

[3]*'Commic' refers to either common or Arctic tern.*

**P = Possible. Where species has not been determined, but the genus or grouping encompasses one or more Listed species for which range overlaps the survey area.*

2. Introduction

APEM and Normandeau were contracted by Equinor Wind US to provide a second full year of digital aerial wildlife surveys of the 'Empire Wind' BOEM Lease Area OCS-A 0512 (**Figure 1**). Surveys were carried out on a monthly basis from February 2019 through December 2019.

The aims and objectives of the work are to assess the abundance and distribution of birds, marine mammals, sharks, rays, and turtles present in the Lease Area OCS-A 0512 over the course of a full year.

The Survey Area referred to herein is comprised of the Lease Area OCS-A 0512, plus a 4 km (*c*. 2 NM) buffer surrounding it. The data in this report represent the total number of birds, other marine megafauna, and incidental occurrences recorded across all collected images.

Images were captured using a grid-based survey design with a 1.5 cm ground sampling distance (GSD). Images were analyzed by APEM and quality assurance was undertaken by Normandeau. This annual report summarizes the information collected following the completion of 12 monthly aerial digital surveys of Lease Area OCS-A 0512 between January 2019 and December 2019.

The following information is provided in Section 3:

- The number of surveys conducted;
- The dates, start and end times, and weather conditions;
- Survey and analysis methodology; and
- Health and safety notes.

The following information is provided in Section 4:

- The number of each species or designated species group recorded;
- Recorded behaviors of fauna;
- Maps showing locations of fauna.

The following is provided in Section 5:

- Abiotic observations made from the aircraft and within the imagery.

The following is provided in Section 6:

- Species group discussion of findings with reference to the year one surveys.

The following is provided in Section 7:

- General conclusions.

3. Survey and Analysis Methodologies

3.1 Summary of Aerial Digital Surveys

A program of twelve digital aerial wildlife surveys have been undertaken to cover the span of a year, survey conditions and scheduling permitting. The survey follows one year of surveys completed on the same study area using the same methodology.

APEM has a bespoke camera system, termed “Shearwater III,” customized by in-house specialists for surveying the offshore environment. The camera system is integrated with custom flight planning software that allowed each survey transect to be accurately mapped out before the aircraft leaves the ground. Each image capture node is precisely defined, allowing the system to fire the camera exposures at exactly the right location. This ensures that each survey is flown with the same transect orientation and the camera is triggered at the same position along each transect within set tolerances. APEM’s planning systems enable tolerances on flight path along survey lines to be set, automatically aborting survey lines that drift away from the aircraft’s planned flight line. APEM’s on-board camera technician continually monitored the imagery as it was collected to ensure the data collected were fit for purpose. The camera technician would make the decision to cease data collection should the conditions become unsuitable for surveying and / or data collection. Subsequently, the survey would then be resumed at the next earliest opportunity.

The aerial digital surveys captured images along 28 lines spaced approximately 0.8 km across-track and 0.6 km along-track between image nodes within the Lease Area OCS-A 0512 plus 4 km buffer (**Figure 2**). Data collected were 1.5 cm GSD digital still images using a GPS-linked bespoke flight management system to ensure the tracks were flown with a high degree of accuracy. The aircraft’s internal GPS and IMU systems record to an accuracy of +/- 3 to 5 m as standard.

Imagery is captured in raw format and post-processed to ensure optimal quality for the subsequent stage of image analysis, to extract information on marine fauna or other notable occurrences. When a survey is completed, the data are checked to ensure the number of lines and the number of images collected is correct, and that the quality of the imagery is acceptable. Once the image analysis is completed, further Quality Control (QC) processes take place (see Summary of Quality Control).

No health or safety issues were reported during the surveys.

The date(s), start, and end times are provided for each aerial digital survey in **Table 2** with the corresponding weather conditions provided in **Table 3**. Weather conditions during all surveys were conducive to collecting and analyzing imagery for the purpose of providing data on the identification, distribution and abundance of bird species and marine fauna within the Lease Area OCS-A 0512 plus 4 km buffer. Favorable conditions for surveying are defined as there being no precipitation, a sea state of <4, wind speeds of <30 knots, visibility of >5 km, and sun angle of >5 degrees (depending on cloud cover and other environmental conditions). For safety reasons, no surveying takes place in icing conditions. The weather criteria follow the BOEM guidelines for aerial digital surveys of birds for projects requiring a Construction and Operation Plan (COP) (BOEM, 2017). Measures were also taken to minimize glint and glare, when conditions may be subject to this, such as avoiding surveying around midday when the sun angle has the greatest potential to impact image quality. Furthermore, in the unlikely event imagery were affected by glint or glare, additional imagery is collected through our survey method provides an alternative data set could be selected for analysis to ensure that sufficient coverage is achieved. The various weather conditions that these data were captured in would not affect the ability to detect marine fauna in the imagery.

The number of images and coverage collected per survey is presented in **Table 4**.

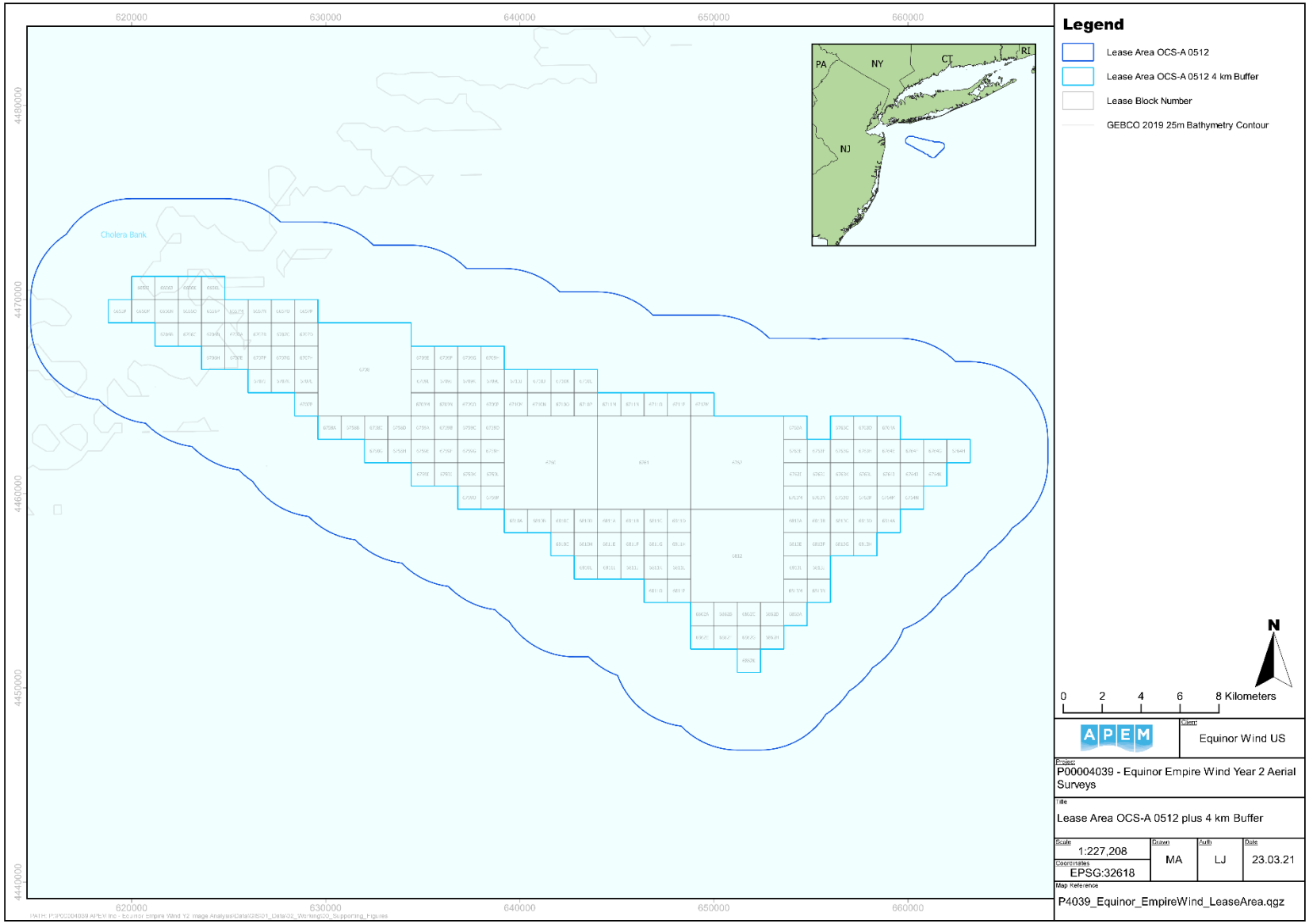

Figure 1 Lease Area OCS-A 0512 plus 4 km buffer with lease block numbers

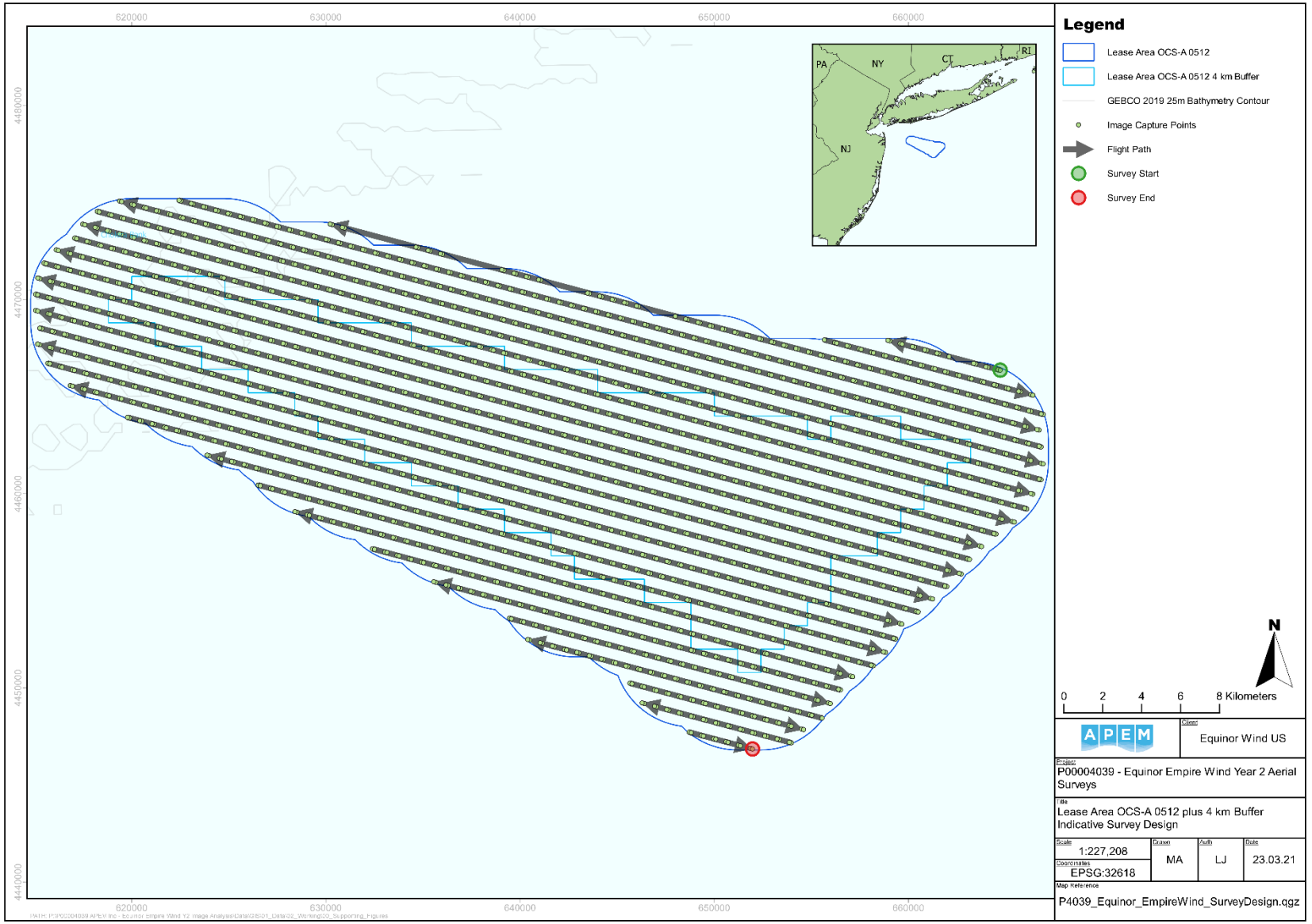

Figure 2 Lease Area OCS-A 0512 plus 4 km buffer indicative survey design

Table 2 Dates and times of surveys undertaken from February 2019 to December 2019

Survey No.	Survey Date	Flight 01		Flight 02	
		UTC Start Time (HH:MM)	UTC End Time (HH:SS)	UTC Start Time (HH:MM)	UTC End Time (HH:SS)
Survey 13	02/02/2019	13:28	16:56	19:33	21:12
Survey 14	02/19/2019	13:29	16:42	19:18	21:18
Survey 15	03/08/2019	12:54	16:32	18:38	20:11
Survey 16	04/25/2019	11:10	15:03	18:44	20:09
Survey 17	05/11/2019	15:00	19:25	21:10	22:05
Survey 18	06/08/2019	13:56	16:21	18:39	21:31
Survey 19	08/10/2019	18:32	22:44	-	-
	08/11/2019	11:32	12:53	-	-
Survey 20	08/27/2019	12:20	17:04	19:08	20:11
Survey 21	09/05/2019	11:37	16:28	19:17	20:02
Survey 22	10/04/2019	12:50	16:05	18:40	20:59
Survey 23	12/05/2019	13:14	14:18	-	-
	12/06/2019	14:55	19:23	20:48	21:17
Survey 24	12/20/2019	14:32	18:50	20:17	21:12

Table 3 Weather conditions recorded for completed surveys to date: February 2019 to December 2019

Survey No.	Survey Date	Douglas Sea State[1]	Turbidity[2]	Wind Speed (knots) / Direction	Cloud Cover (%)[3]	Visibility (km)	Air Temp (°F)
Survey 13	02/02/2019	1-3	1-2	20 / NW-SW	10-60	> 10	19-28
Survey 14	02/19/2019	2-3	1	20-25 N-NW	0-10	> 10	22-25
Survey 15	03/08/2019	0-1	0	0-10 E-W	0-100	> 10	26-31
Survey 16	04/25/2019	1-2	1	5-12 NE-S	30-80	> 10	49-54
Survey 17	05/11/2019	1-2	1	5-15 W-S	0-95	> 10	52-63
Survey 18	06/08/2019	1-2	1	28-32 E	60-90	> 10	69-72
Survey 19	08/10/2019	1-2	0	15-20 NW	0-75	> 10	73-76
	08/11/2019	1-2	0	0-10 N	0	> 10	67-69
Survey 20	08/27/2019	1-2	1	5-12 E	75-100	> 10	62-64
Survey 21	09/05/2019	1-3	1	5-12 NW / E / SE	80-100	> 10	62-67
Survey 22	10/04/2019	4	1	20-30 N-NW	0-100	> 10	55-61
Survey 23	12/05/2019	3	2	35 W-NW	50-80	> 10	37-39
	12/06/2019	2-4	2-3	8-17 W	80-100	> 10	38-48
Survey 24	12/20/2019	3-4	1	14-18 N	0	> 10	22-29

[1]0 = Calm (Glassy); 1 = Calm (Rippled); 2 = Smooth; 3 = Slightly Moderate; 4 = Moderate
[2]0= Clear; 1 = Slightly Turbid; 2 = Moderately Turbid; 3 = Highly Turbid
[3]0 = Clear; 1-10 = Few; 11-50 = Scattered; 51-95 = Broken; 96-100 = Overcast

Table 4 **Number of images and survey coverage for each survey**

Survey No.	Number of Images	Coverage (%)
Survey 13	12,176	13.57
Survey 14	12,176	13.57
Survey 15	12,176	13.57
Survey 16	12,175	13.56
Survey 17	12,176	13.57
Survey 18	12,175	13.56
Survey 19	12,179	13.57
Survey 20	12,176	13.57
Survey 21	12,192	13.58
Survey 22	12,176	13.57
Survey 23	12,176	13.57
Survey 24	12,192	13.58

3.2 Summary of Quality Control

Images were analyzed to enumerate birds to species level and to enumerate any other non-avian marine fauna. Survey data were uploaded to APEM's partner Normandeau's ReMOTe website in 'real time' as soon as image analysis was completed. These data are publicly accessible[1]. Normandeau provided QC of the data to check for missed animals in 10% of images recorded as empty and also quality controlled 20% of the bird species identification undertaken by APEM (and 100% of Listed species). Normandeau identified 100% of the species of non-avian marine fauna including marine mammals, turtles, sharks, and rays. Birds and marine fauna identified from the images were 'snagged' (i.e. located within the images) and categorized usually to species, but sometimes to the species grouping. The results of the QC are provided in **Table 5** and **Table 6**, demonstrating agreement exceeding 98% for all surveys.

Table 5 **The number of blank images, blank images to QC, and results of the QC**

Survey No.	Blank Images	Blank Images QC'd	Image Number QC'd Not Blank	Agreement (%)
Survey 13	12,101	1,210	0	100
Survey 14	12,076	1,208	1	99.92
Survey 15	12,049	1,205	0	100
Survey 16	12,120	1,212	3	99.75
Survey 17	12,099	1,210	1	99.92
Survey 18	12,066	1,207	4	99.67
Survey 19	12,122	1,212	3	99.75
Survey 20	11,950	1,195	15	98.74
Survey 21	11,722	1,172	2	99.83

[1] https://remote.normandeau.com/ewind_overview.php

Survey No.	Blank Images	Blank Images QC'd	Image Number QC'd Not Blank	Agreement (%)
Survey 22	12,019	1,202	4	99.67
Survey 23	11,964	1,196	2	99.83
Survey 24	12,060	1,202	5	99.58

Table 6 The number of individuals that were found during blank image QC

Survey No.	Identification Group Found by QC	Number of Individual Targets
Survey 13	-	-
Survey 14	Avian	1
Survey 15	-	-
Survey 16	Avian	2
	Tanker	1
Survey 17	Avian	1
Survey 18	Avian	3
	Ray	1
Survey 19	Large Bony Fish	4
	Shark	1
	Ray	1
Survey 20	Avian	26
Survey 21	Avian	2
Survey 22	Large Bony Fish	2
	Shark	1
	Ray	1
Survey 23	Avian	2
Survey 24	Avian	5

3.3 Species Distribution Maps

Each individual located by the surveys is geo-referenced and this allows those locations to be related to the boundary of Empire and any buffer placed around it out to 4 km. Per survey target distribution maps were produced for each species or species group using QGIS (version 3.16.5) by separating targets into their respective species or species group designation from each survey. These were then represented as a designated icon on a map with an arrow indicating direction of travel. For the purposes of this report, the survey with the highest number of individuals is shown below their respective species or species group designation in Section 4. For those with equal highest occurrences, the earliest occurring survey has been used. A collection of all the maps for each species or species group from the surveys is presented in Appendix II.

4. Species Accounts

The following species accounts present the raw counts, behavioral, and distribution data from the 12-survey program of aerial digital surveys of Lease Area OCS-A 0512 and a 4 km buffer (the Lease Area OCS-A 0512 plus 4 km buffer). Additionally, age and sex of targets is provided for species where appropriate (age for gulls and gannets, and sex for waterfowl). For purpose of this report, data are only presented for surveys where a species of bird or marine megafauna were recorded. Species groups are presented in taxonomic order.

4.1 Waterfowl

4.1.1 Surf Scoter *Melanitta perspicillata*

Surf scoters were recorded in Survey 24 only, with a grand total of two. Overall, 50% of surf scoters were recorded as male, and 50% were recorded as female (**Table 7**).

Both surf scoters were located in the northwest of the Survey Area (**Figure 3**).

Table 7 **Total counts and behaviors of surf scoters in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Sex		Survey Total
	Flying	Sitting	Male	Female	
Survey 24	2	0	1	1	**2**

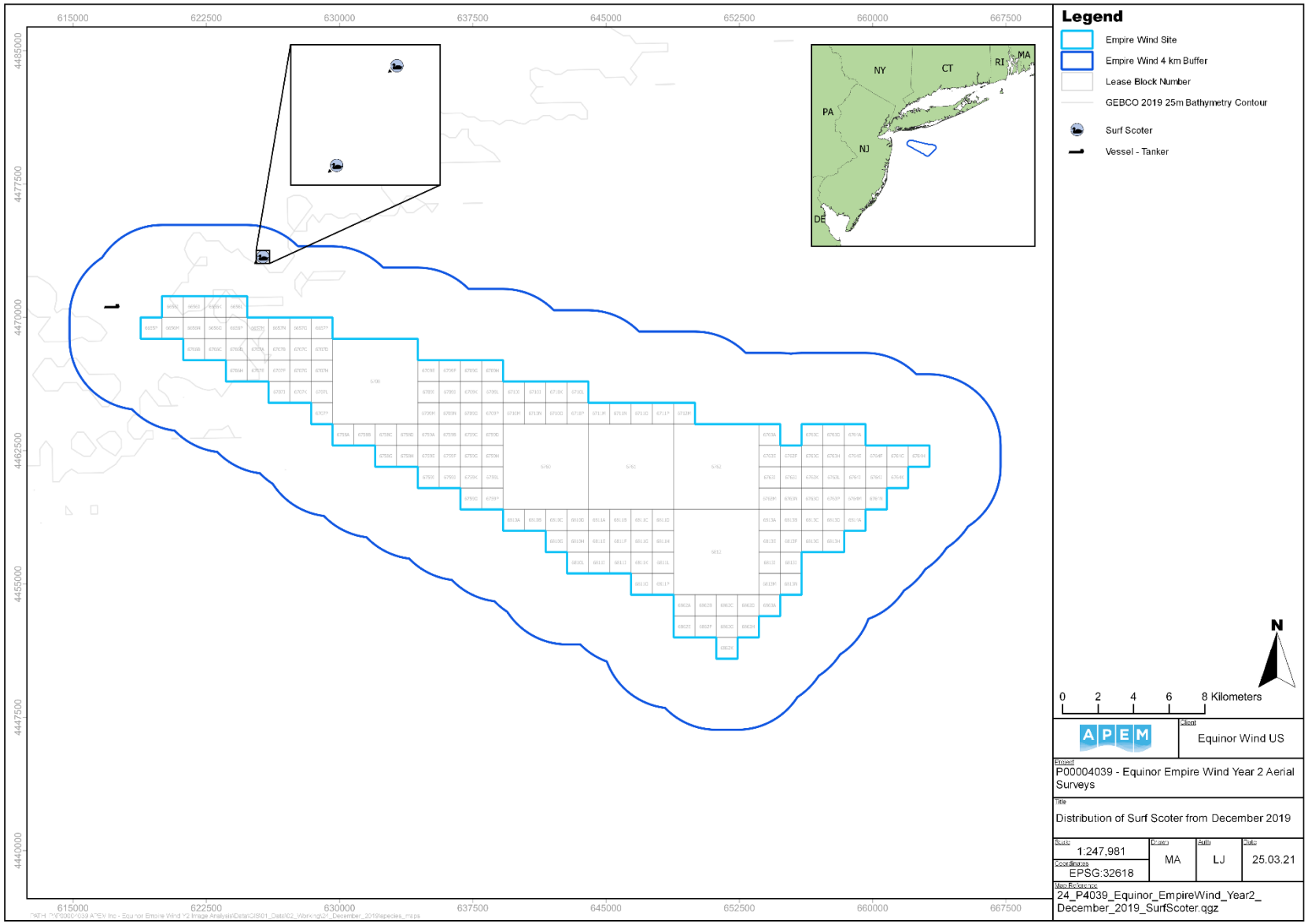

Figure 3 Distribution of surf scoter recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 24

4.1.2 White-winged Scoter *Melanitta perspicillata*

White-winged scoters were recorded in Surveys 13 to 15 inclusive, and Survey 24, with a grand total of 32. Highest numbers on a per-survey basis were recorded in Survey 15, totaling 17. Overall, 53% of white-winged scoters were recorded as male, 34% were recorded as female, and the remainder 13% did not have their sex identified (**Table 8**).

White-winged scoters were distributed towards the north of the Survey Area, with Survey 15 exhibiting two groups; one in the north and one in the northwest (**Figure 4**).

Table 8 **Total counts, behaviors, and sex of white-winged scoters in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Sex			Survey Total
	Flying	Sitting	Male	Female	Unknown	
Survey 13	3	6	5	3	1	**9**
Survey 14	0	2	0	0	2	**2**
Survey 15	2	15	11	5	1	**17**
Survey 24	0	4	1	3	0	**4**

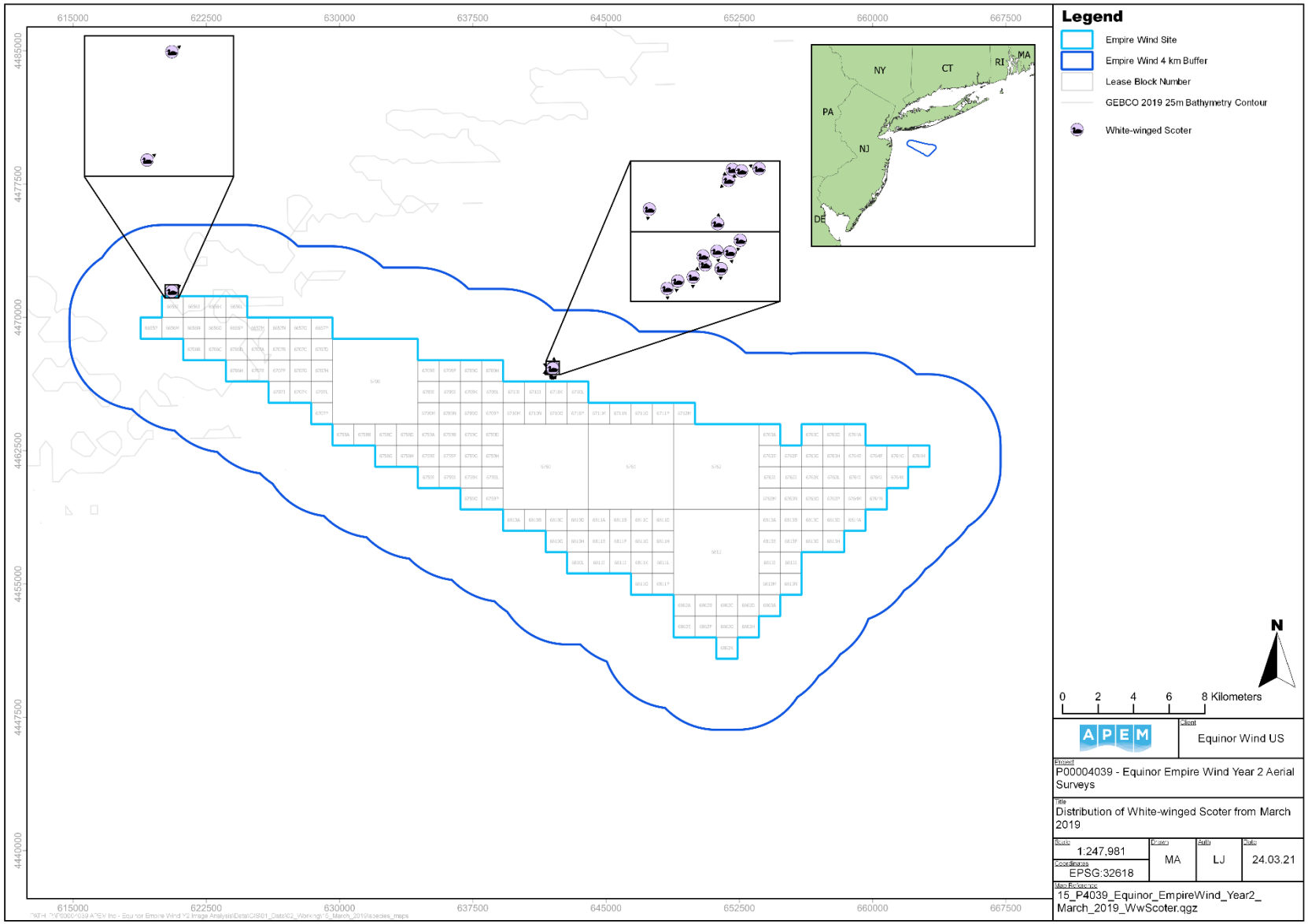

Figure 4 Distribution of white-winged scoter recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 15

4.1.3 Black Scoter *Melanitta americana*

Black scoters were recorded in Survey 23 only, with a grand total of 152. Overall, 66% of black scoters were recorded as female, with the remainder 34% being males (**Table 9**).

Black scoters were distributed in three distinct groups; one in the northwest, one in the center of the Survey Area, and one in the east (**Figure 5**).

Table 9 **Total counts, behaviors, and sex of black scoters in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Sex		Survey Total
	Flying	Sitting	Male	Female	
Survey 23	149	3	51	101	**152**

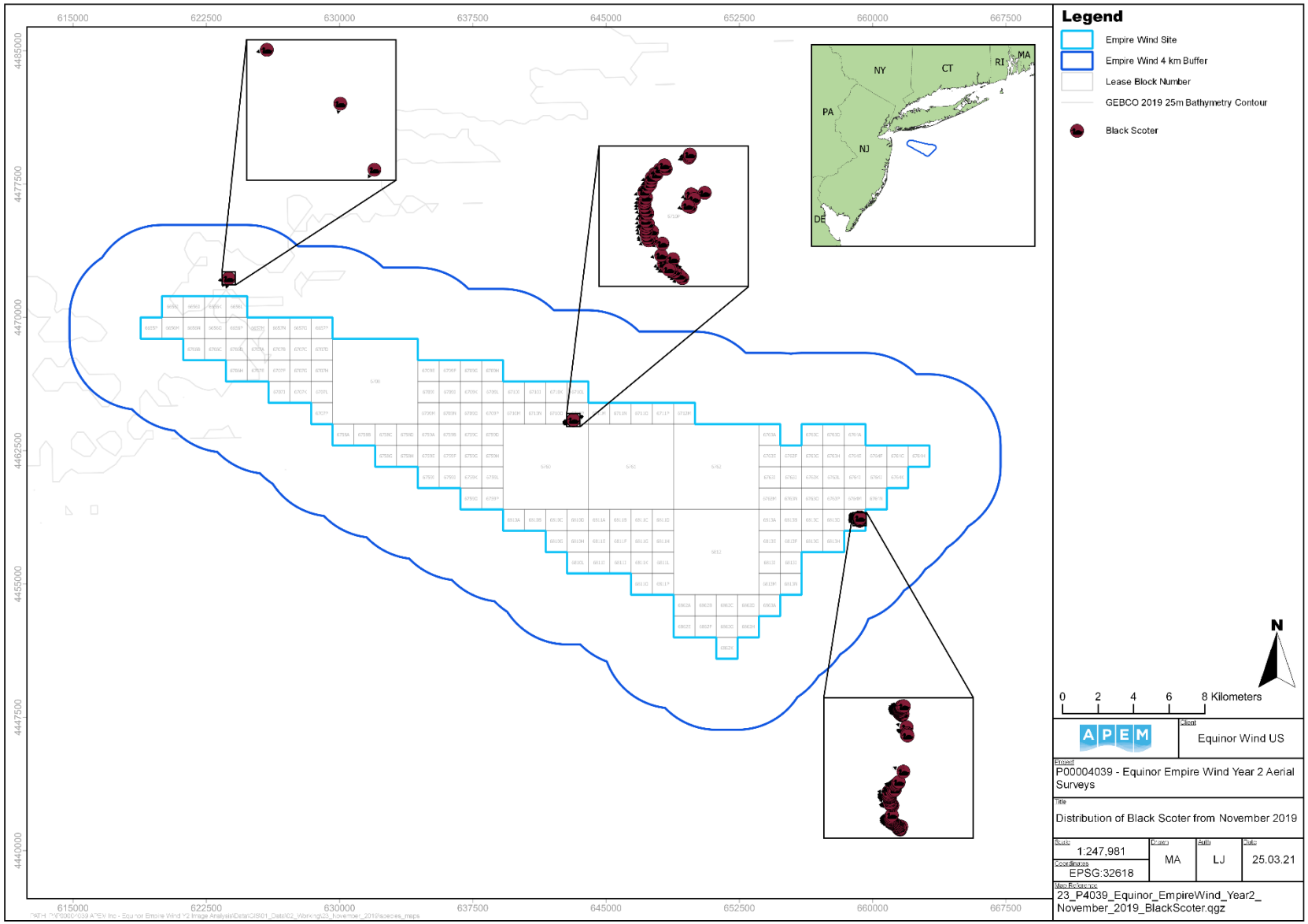

Figure 5 Distribution of black scoter recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 23

4.1.4 Scoter species – Unidentified *Melanitta* spp.

An unidentified scoter was recorded in Survey 14 only, with a grand total of one (**Table 10**). The single unidentified scoter was located in the northwest of the Survey Area (**Figure 6**).

Table 10 **Total counts and behaviors of unidentified scoters in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 14	0	1	**1**

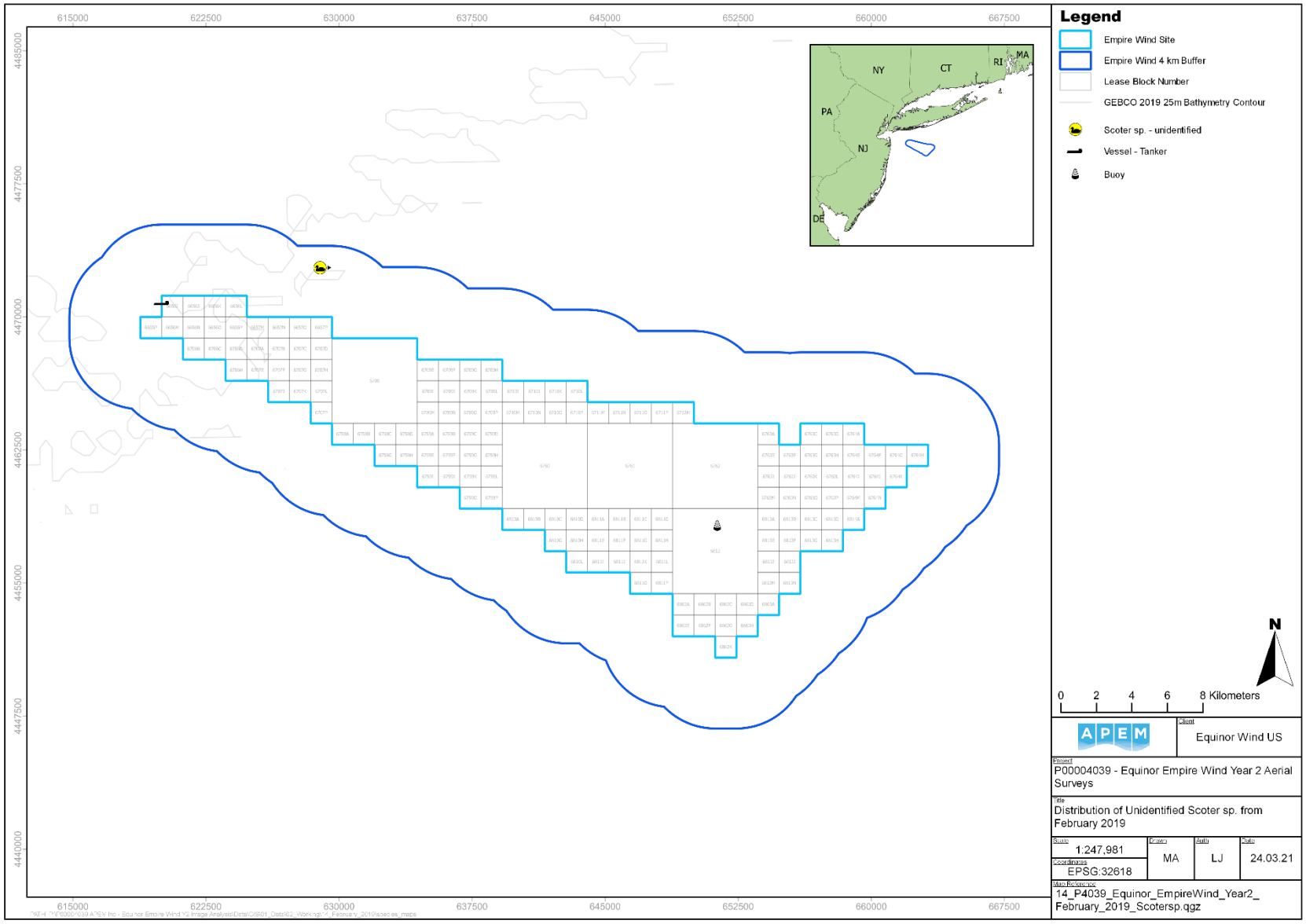

Figure 6 **Distribution of unidentified scoter species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 14**

4.1.5 Duck species – Unidentified Anatidae

Unidentified ducks were recorded in Survey 14 and 15 only, with a grand total of five. Highest numbers on a per-survey basis were recorded in Survey 15 (**Table 11**).

Unidentified ducks were located in the eastern half of the Survey Area, specifically in the east and northeast for Survey 15 (**Figure 7**).

Table 11 **Total counts and behaviors of unidentified ducks in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 14	0	1	**1**
Survey 15	0	4	**4**

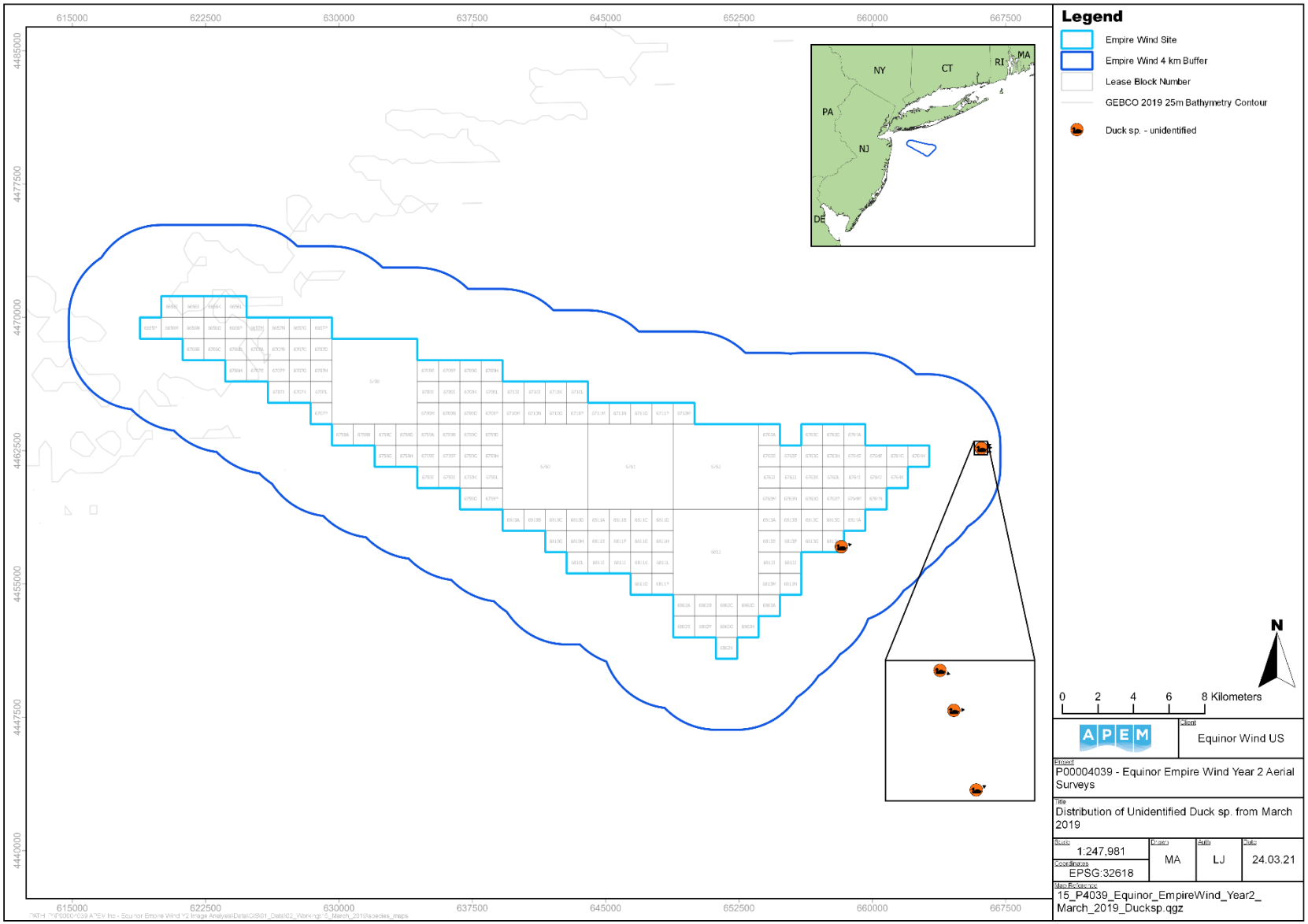

Figure 7 **Distribution of unidentified duck species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 15**

4.2 Loons

4.2.1 Red-throated Loon *Gavia stellata*

Red-throated loons were recorded in Surveys 13 to 16 inclusive, as well as Surveys 23 and 24, with a grand total of 45. The highest number on a per-survey basis was recorded in Survey 13, totaling 13 (**Table 12**).

Red-throated loons were loosely distributed across the Survey Area (**Figure 8**).

Table 12 **Total counts and behaviors of red-throated loons in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 13	2	11	**13**
Survey 14	0	5	**5**
Survey 15	2	4	**6**
Survey 16	0	3	**3**
Survey 23	0	8	**8**
Survey 24	4	6	**10**

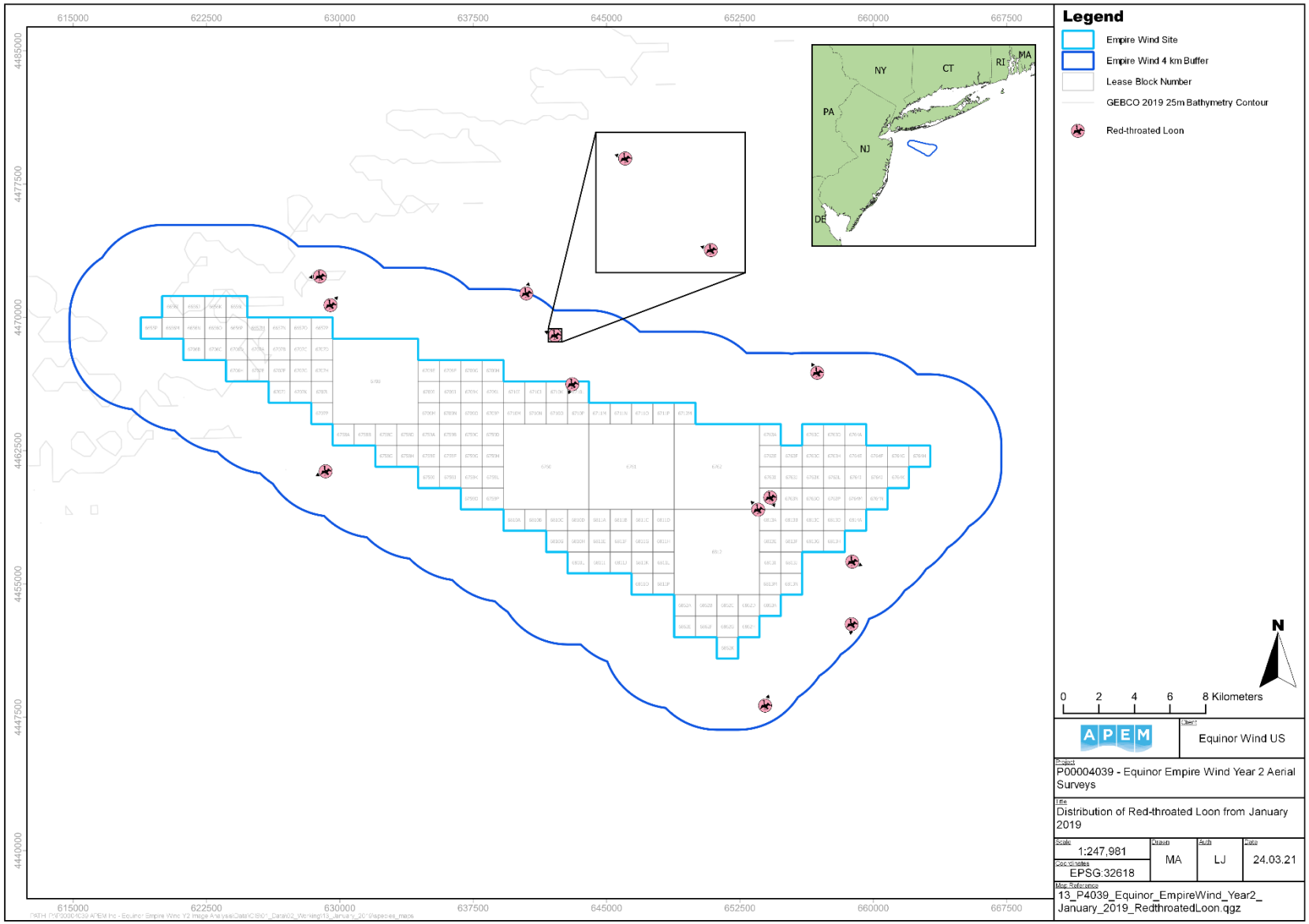

Figure 8 Distribution of red-throated loon recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 13

4.2.2 Common Loon *Gavia immer*

Common loons were recorded in the majority of surveys, only being absent from Survey 19 and 21, with a grand total of 222. Highest numbers on a per-survey basis were recorded in Survey 14, totaling 51 (**Table 13**).

Common loons were loosely distributed across the Survey Area for all surveys, including Survey 14 (**Figure 9**).

Table 13 **Total counts and behaviors of common loons in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Sitting	Flying	
Survey 13	33	0	**33**
Survey 14	51	0	**51**
Survey 15	21	0	**21**
Survey 16	16	6	**16**
Survey 17	50	0	**50**
Survey 18	2	0	**2**
Survey 20	1	0	**1**
Survey 22	0	1	**1**
Survey 23	18	1	**19**
Survey 24	22	0	**22**

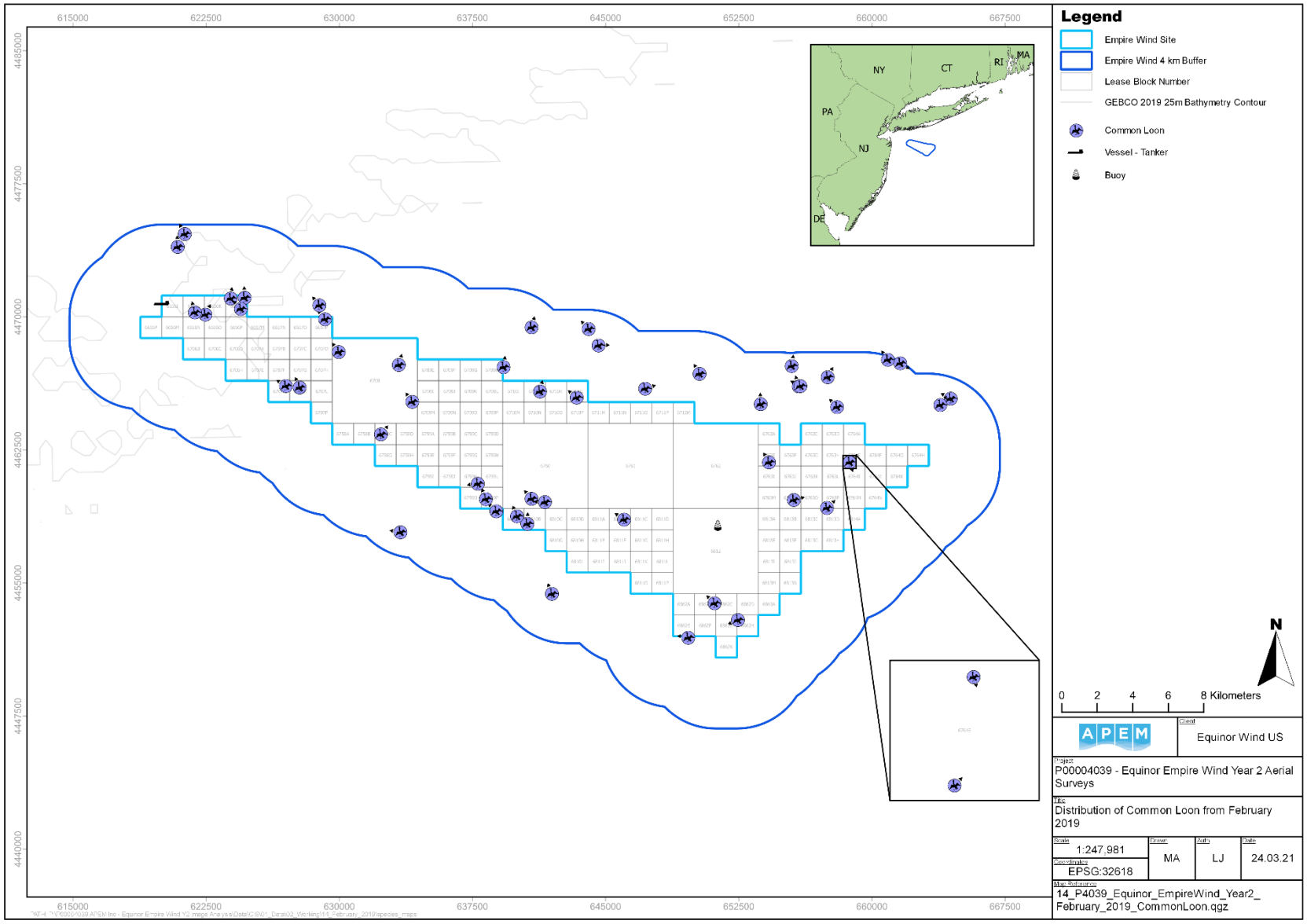

Figure 9 Distribution of common loon recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 14

4.2.3 Loon species – Unidentified *Gavia* spp.

Unidentified loons were recorded in Surveys 14, 16, and 24, with a grand total of four. The highest number on a per-survey basis was recorded in Survey 24, totaling 2 (**Table 14**).

Unidentified loons were predominantly distributed towards the northwest of the Survey Area (**Figure 10**).

Table 14 **Total counts and behaviors of unidentified loons in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 14	0	1	**1**
Survey 16	0	1	**1**
Survey 24	0	2	**2**

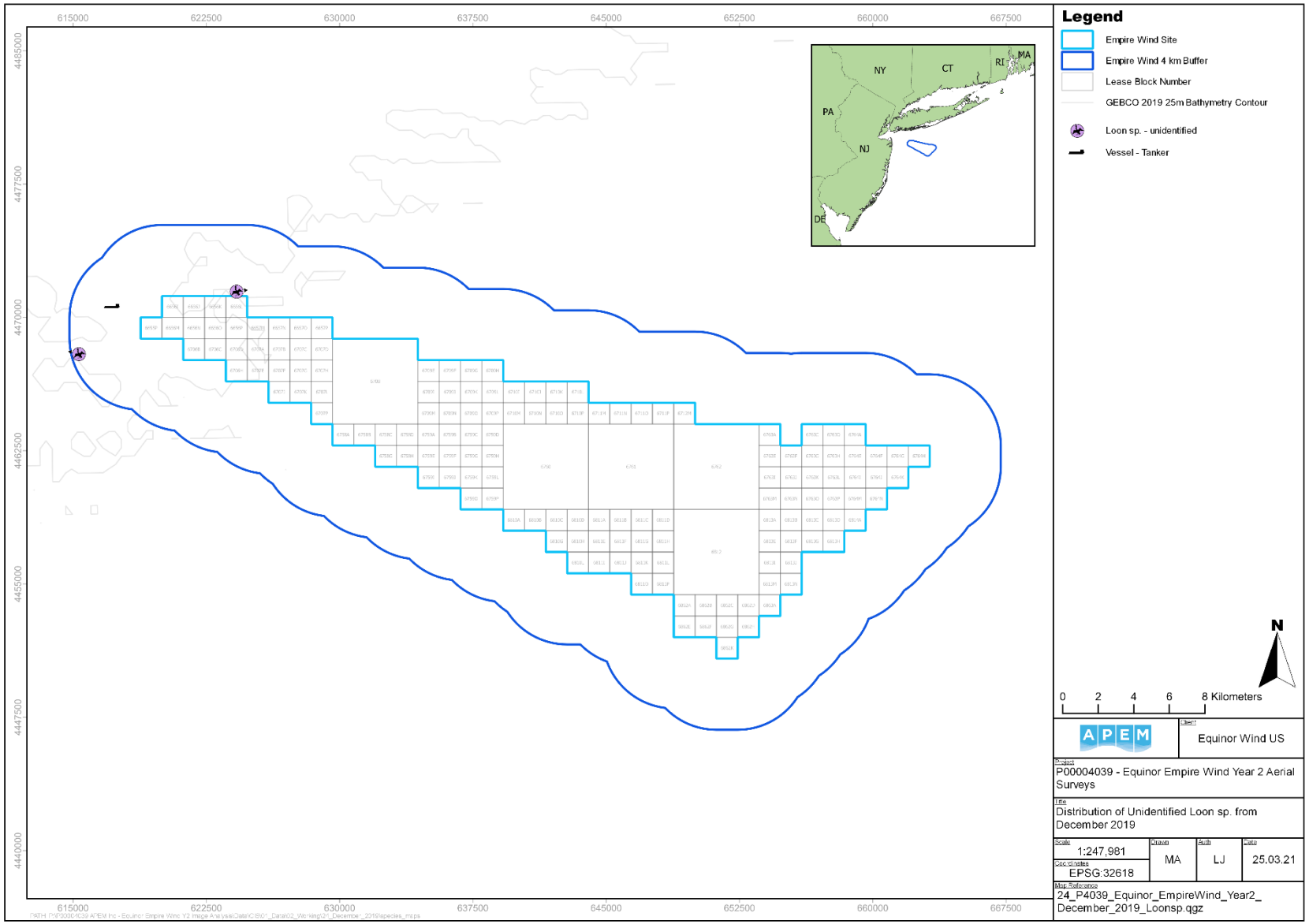

Figure 10 Distribution of unidentified loon species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 24

4.3 Shearwaters

4.3.1 Great Shearwater *Ardenna gravis*

Great shearwaters were recorded in Survey 20 only, with a grand total of 13 (**Table 15**).

Great shearwaters were loosely distributed, predominantly towards the northwest of the Survey Area (**Figure 11**).

Table 15 **Total counts and behaviors of great shearwaters in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 20	12	1	**13**

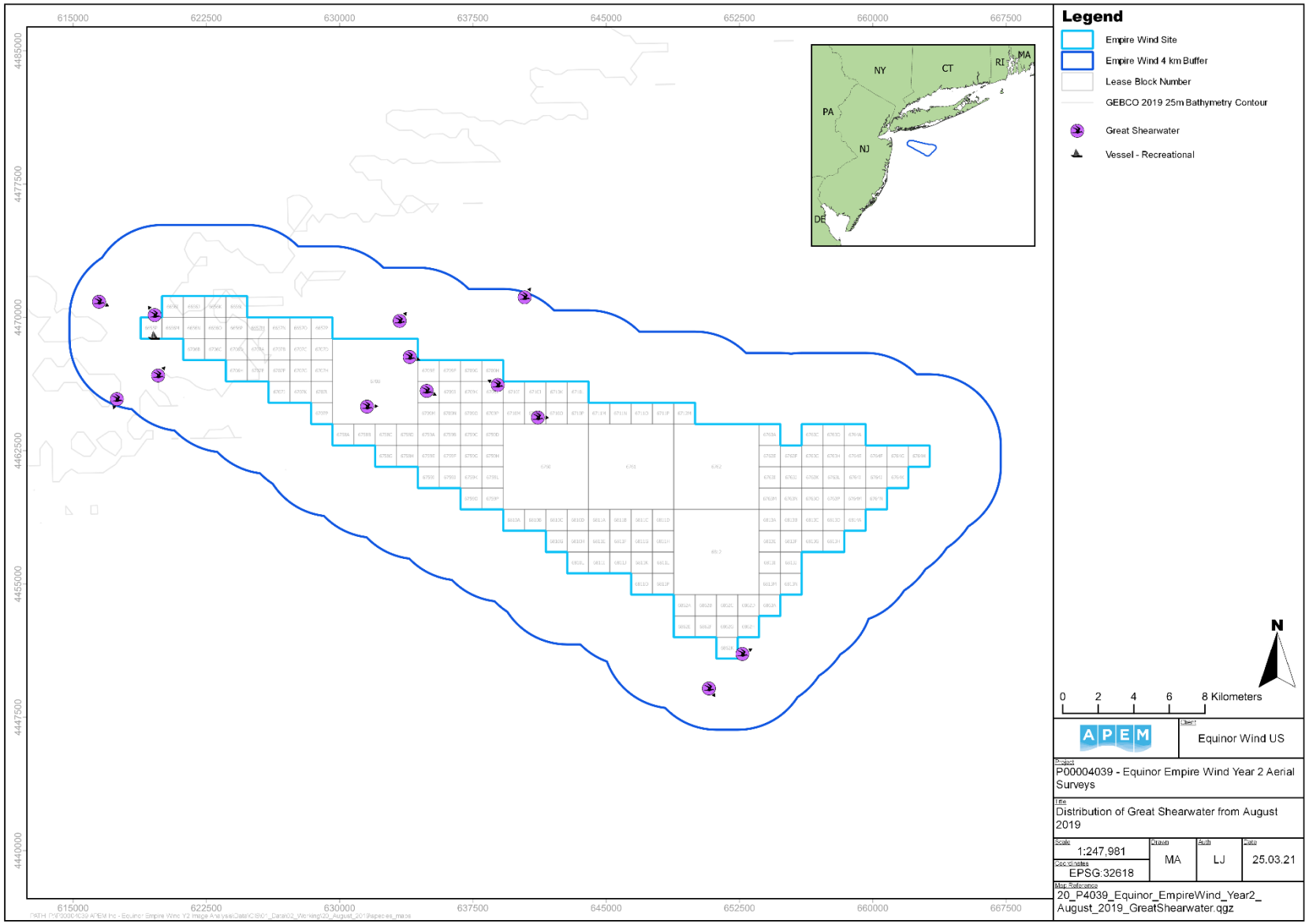

Figure 11 Distribution of great shearwater recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 20

4.3.2 Manx Shearwater *Puffinus puffinus*

Manx shearwaters were recorded in Survey 14 and 23 only, with a grand total of six. The highest numbers on a per-survey basis were recorded in Survey 23, totaling five (**Table 16**).

Manx shearwaters were loosely distributed across the Survey Area, with a slight concentration in the south (**Figure 12**).

Table 16 **Total counts and behaviors of Manx shearwaters in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 14	1	0	**1**
Survey 23	1	4	**5**

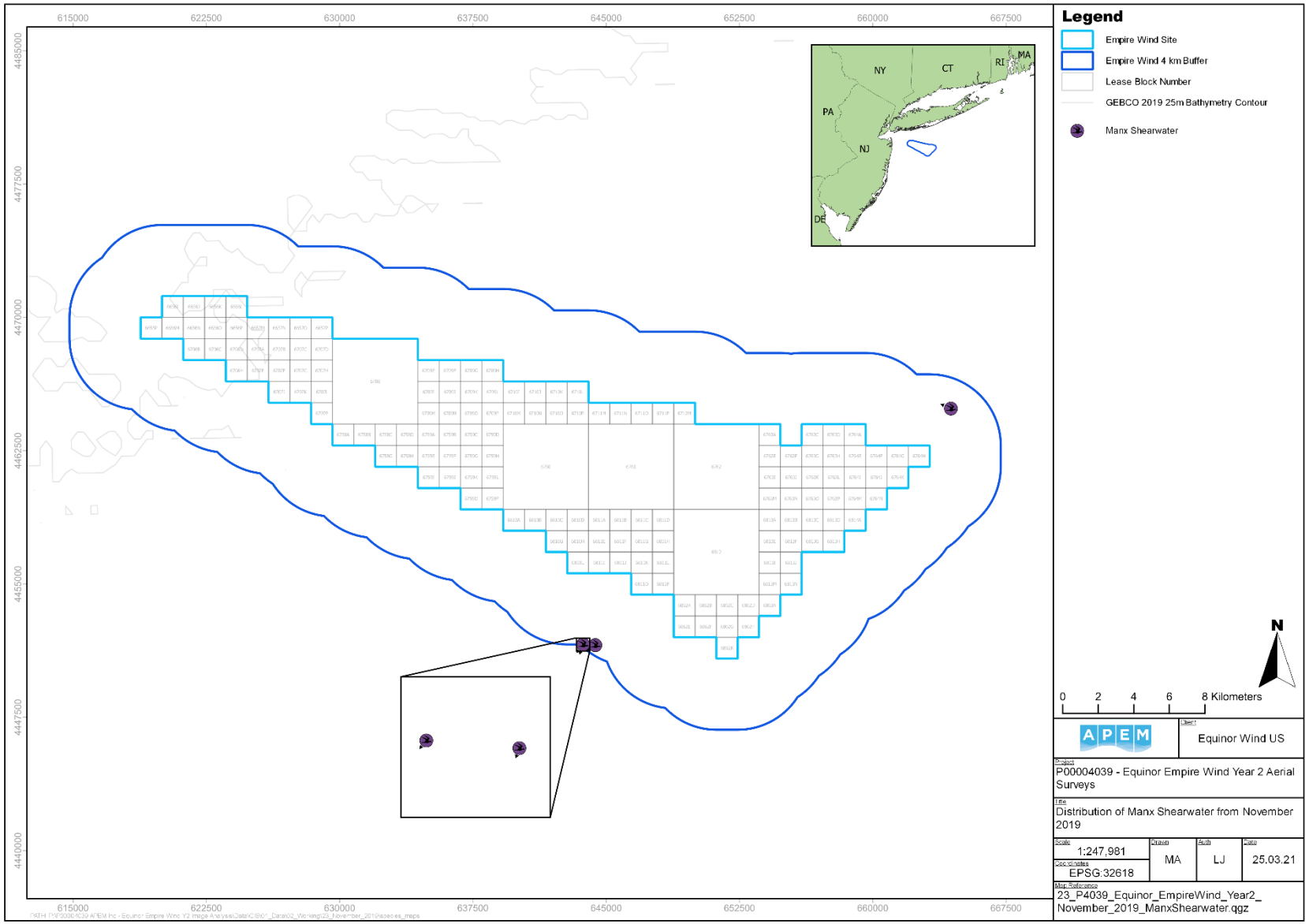

Figure 12 Distribution of Manx shearwater recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 23

4.4 Storm Petrels

4.4.1 Storm Petrel species – Unidentified Hydrobatidae / Oceanitidae

Unidentified storm petrels were recorded in Surveys 18 to 20 inclusive, with a grand total of 390. The highest number on a per-survey basis was recorded in Survey 20, totaling 333 (**Table 17**).

Unidentified storm petrels were distributed across the majority of the Survey Area, either unassociated with other storm petrels or in varying small to large group sizes (**Figure 13**).

Table 17 **Total counts and behaviors of unidentified storm petrels in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 18	48	0	**48**
Survey 19	9	0	**9**
Survey 20	333	0	**333**

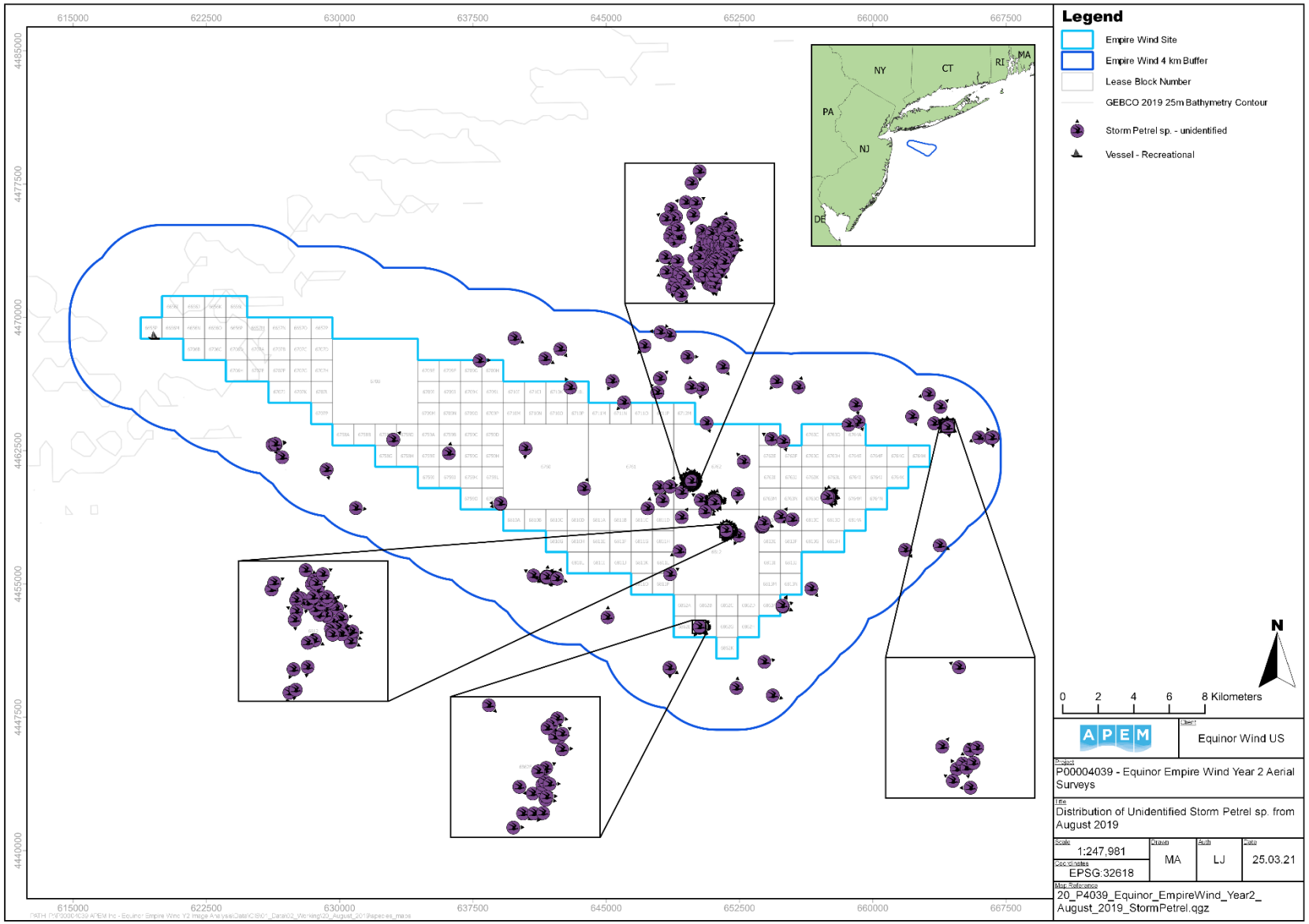

Figure 13 **Distribution of unidentified storm petrel species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 20**

4.5 Gannets

4.5.1 Northern Gannet *Morus bassanus*

Northern gannets were recorded in Surveys 13 to 18, and 22 to 24 inclusive, with a grand total of 241. The highest numbers on a per-survey basis were recorded in Survey 24, totaling 78. Overall, 80% of northern gannets were recorded as adults, 19% were recorded as juveniles, and the remaining 1% were not aged (**Table 18**).

Northern gannets were loosely distributed across the Survey Area for all surveys (**Figure 14**).

Table 18 **Total counts and behaviors of northern gannets in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Age			Survey Total
	Flying	Sitting	Adult	Juvenile	Unknown	
Survey 13	23	42	63	2	0	**65**
Survey 14	5	4	8	1	0	**9**
Survey 15	0	3	3	0	0	**3**
Survey 16	17	19	9	24	3	**36**
Survey 17	13	0	1	12	0	**13**
Survey 18	0	1	0	1	0	**1**
Survey 22	2	0	2	0	0	**2**
Survey 23	7	27	33	1	0	**34**
Survey 24	20	58	73	4	1	**78**

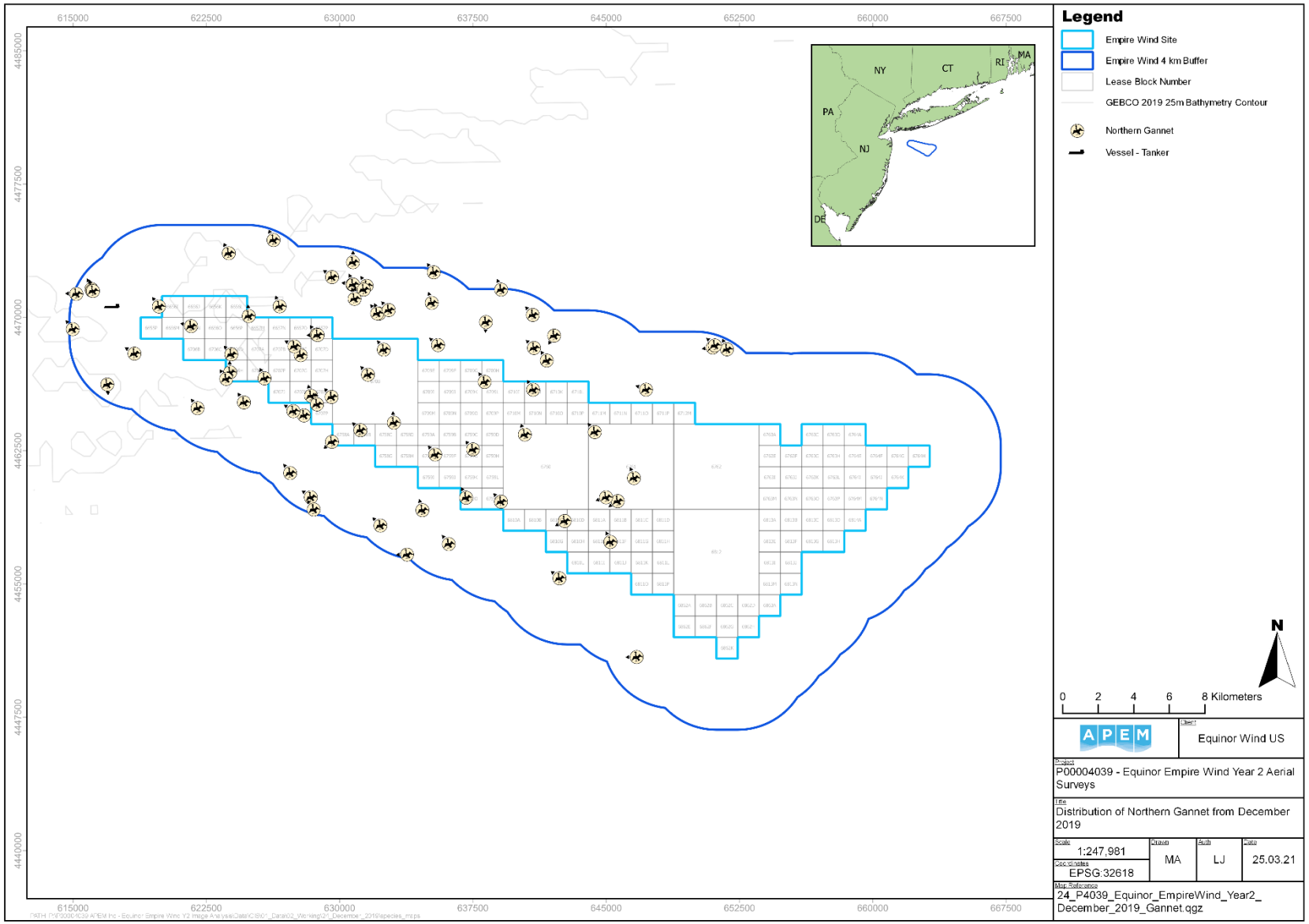

Figure 14 Distribution of northern gannet recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 24

4.6 Shorebirds

4.6.1 Black-bellied Plover *Pluvialis squatarola*

Black-bellied plovers were recorded in Survey 19 only, with a grand total of two (**Table 19**).

Both black-bellied plovers were located in the northeast of the Survey Area (**Figure 15**).

Table 19 **Total counts and behaviors of black-bellied plovers in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 19	2	0	**2**

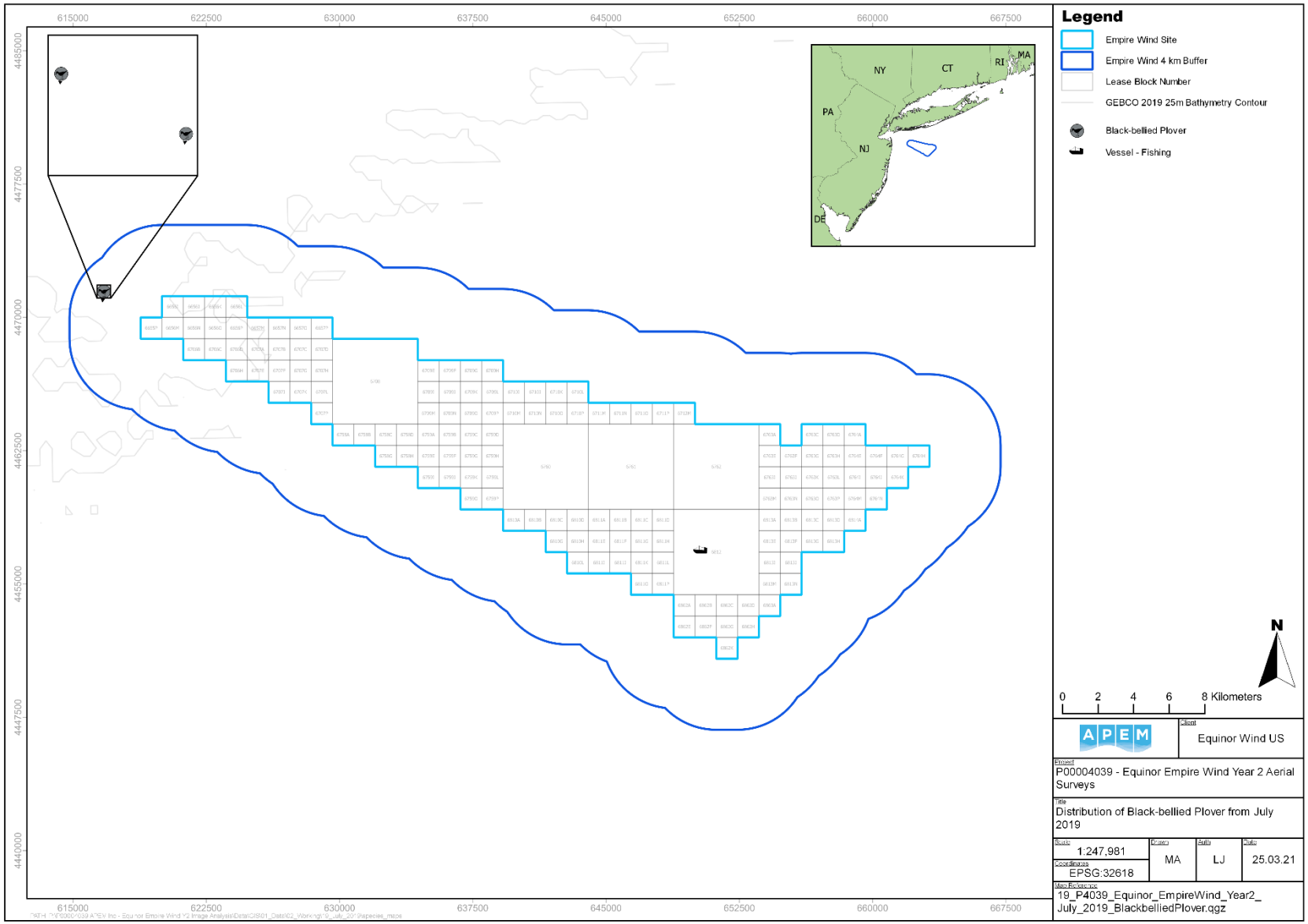

Figure 15 **Distribution of black-bellied plover recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19**

4.6.2 Shorebird species – Unidentified Scolopaci / Charadrii

Unidentified shorebirds were recorded in Survey 19 only, with a grand total of 182 (**Table 20**).

Unidentified shorebirds were almost entirely located in one group west of the center of the Survey Area, with the remaining two individuals located in the south (**Figure 16**).

Table 20 **Total counts and behaviors of unidentified shorebirds in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 19	182	0	**182**

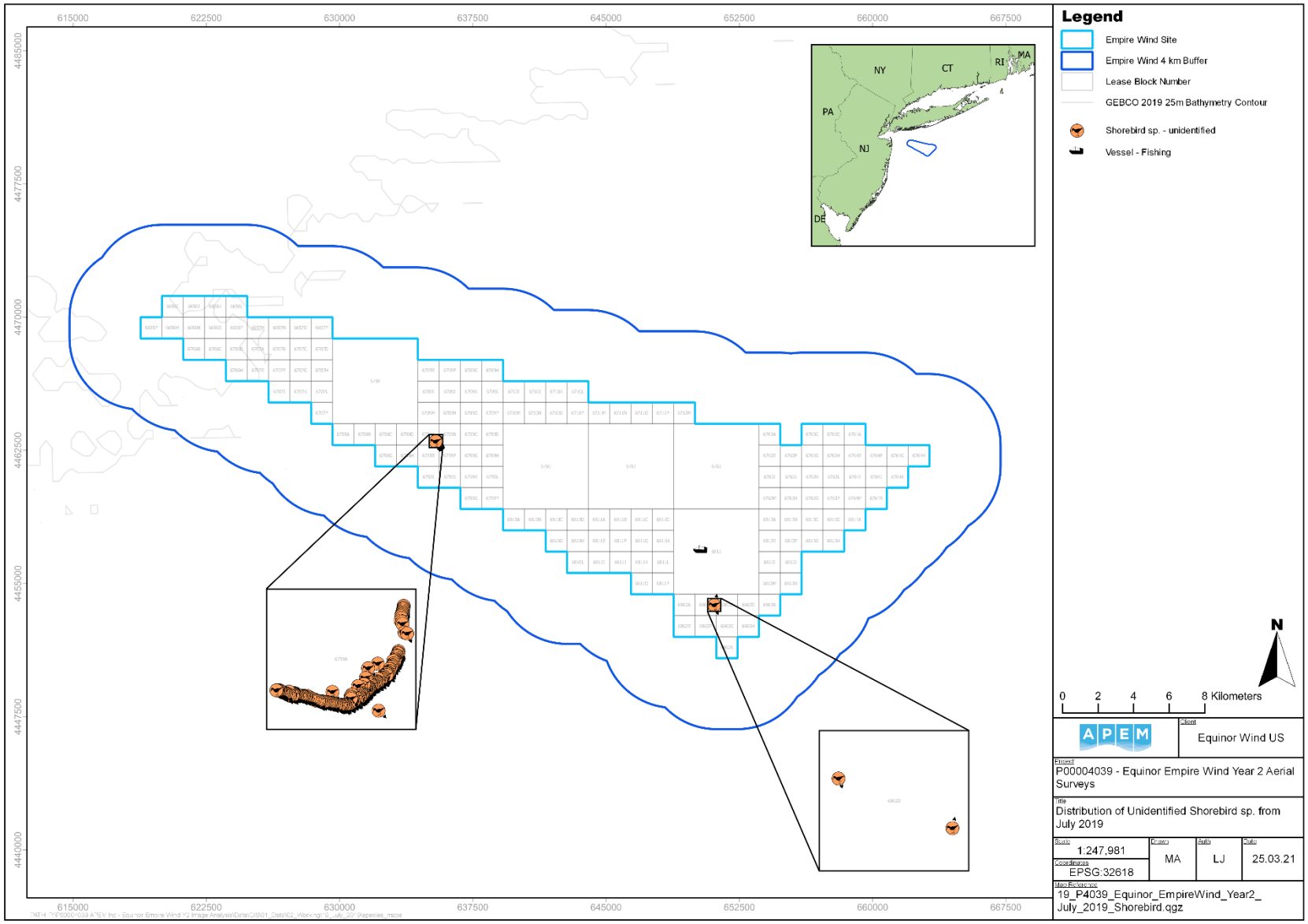

Figure 16 **Distribution of unidentified shorebird species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19**

4.6.3 Red Phalarope *Phalaropus fulicarius*

Red phalaropes were recorded in Surveys 23 and 24 only, with a grand total of 16. Highest numbers on a per-survey basis were recorded in Survey 23, totaling 12 (**Table 21**).

Red phalaropes were distributed in the south of the Survey Area, specifically in the south and southeast for Survey 23 (**Figure 17**).

Table 21 **Total counts and behaviors of red phalaropes in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 23	12	0	**12**
Survey 24	4	0	**4**

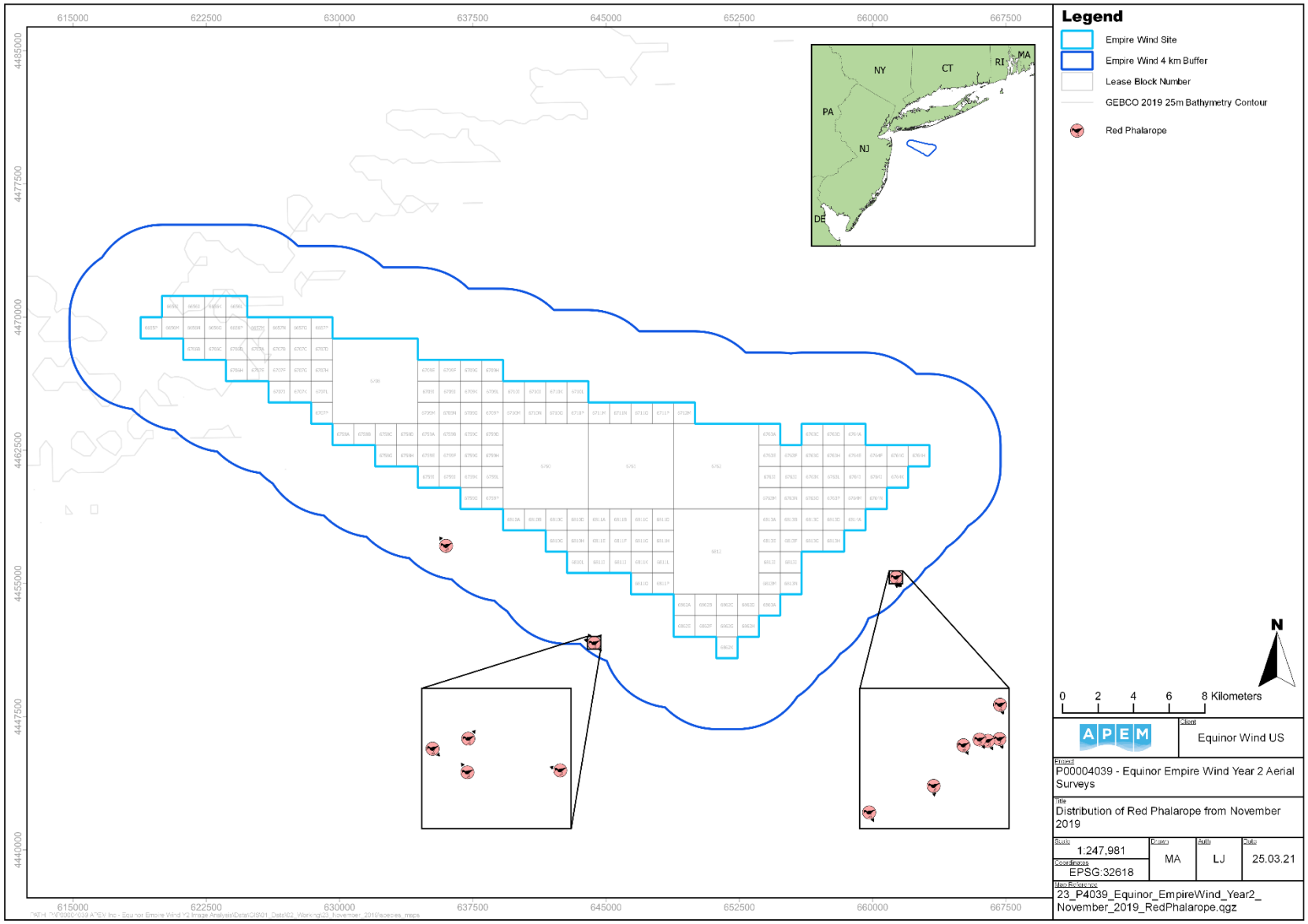

Figure 17 Distribution of red phalarope recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 23

4.6.4 Red / Red-necked Phalarope *Phalaropus fulicarius / lobatus*

A single red / red-necked phalarope was recorded in Survey 15 only, with a grand total of one (**Table 22**).

The single red / red-necked phalarope was located in the north-northeast of the Survey Area (**Figure 18**).

Table 22 **Total counts and behaviors of red / red-necked phalaropes in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 15	1	0	**1**

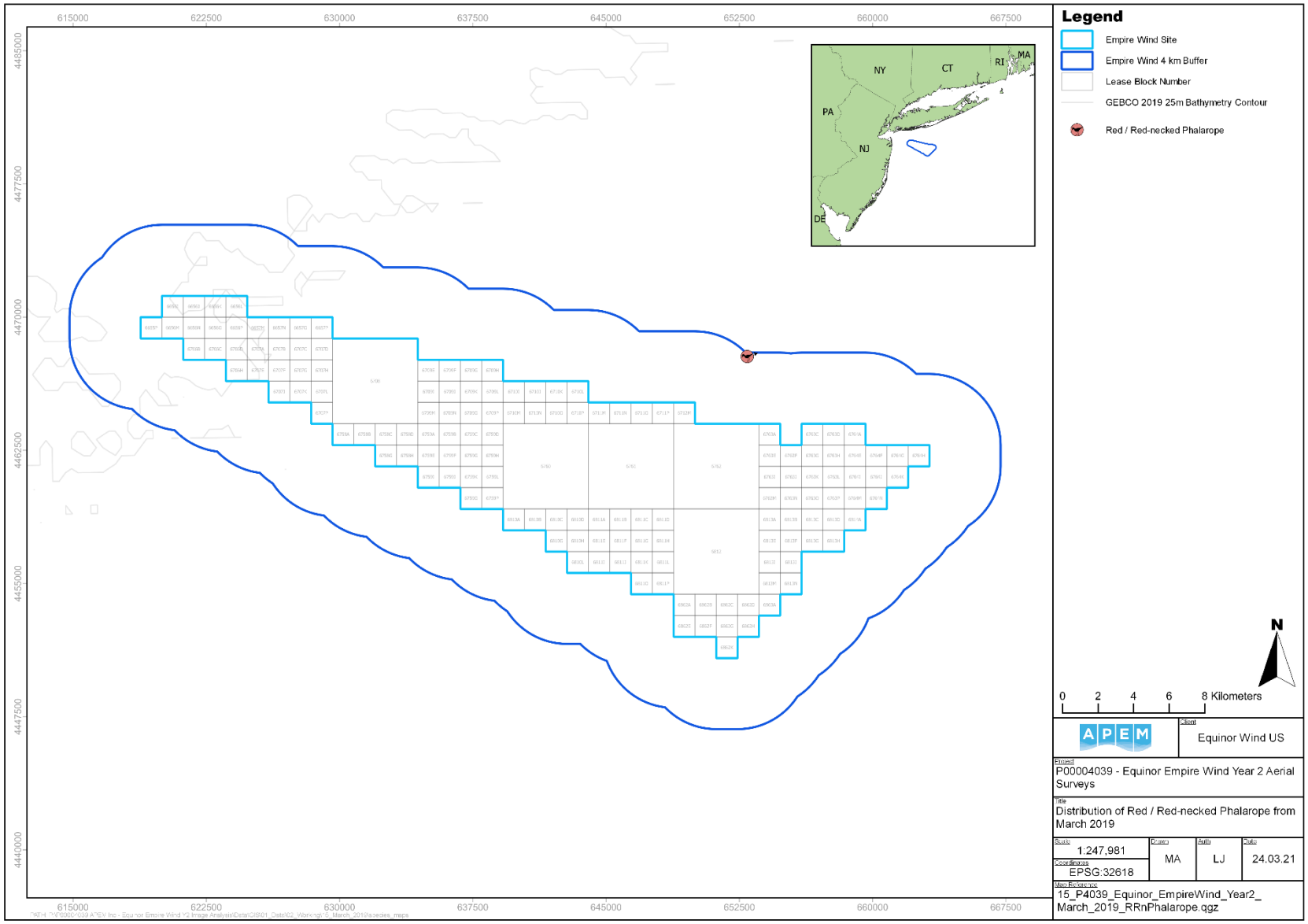

Figure 18 Distribution of red / red-necked phalarope recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 15

4.7 Auks

4.7.1 Dovekie *Alle alle*

Dovekies were recorded in Survey 15 only, with a grand total of two (**Table 23**).

Both dovekies were located in the far northwest of the Survey Area (**Figure 19**).

Table 23 **Total counts and behaviors of dovekies in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 15	0	2	**2**

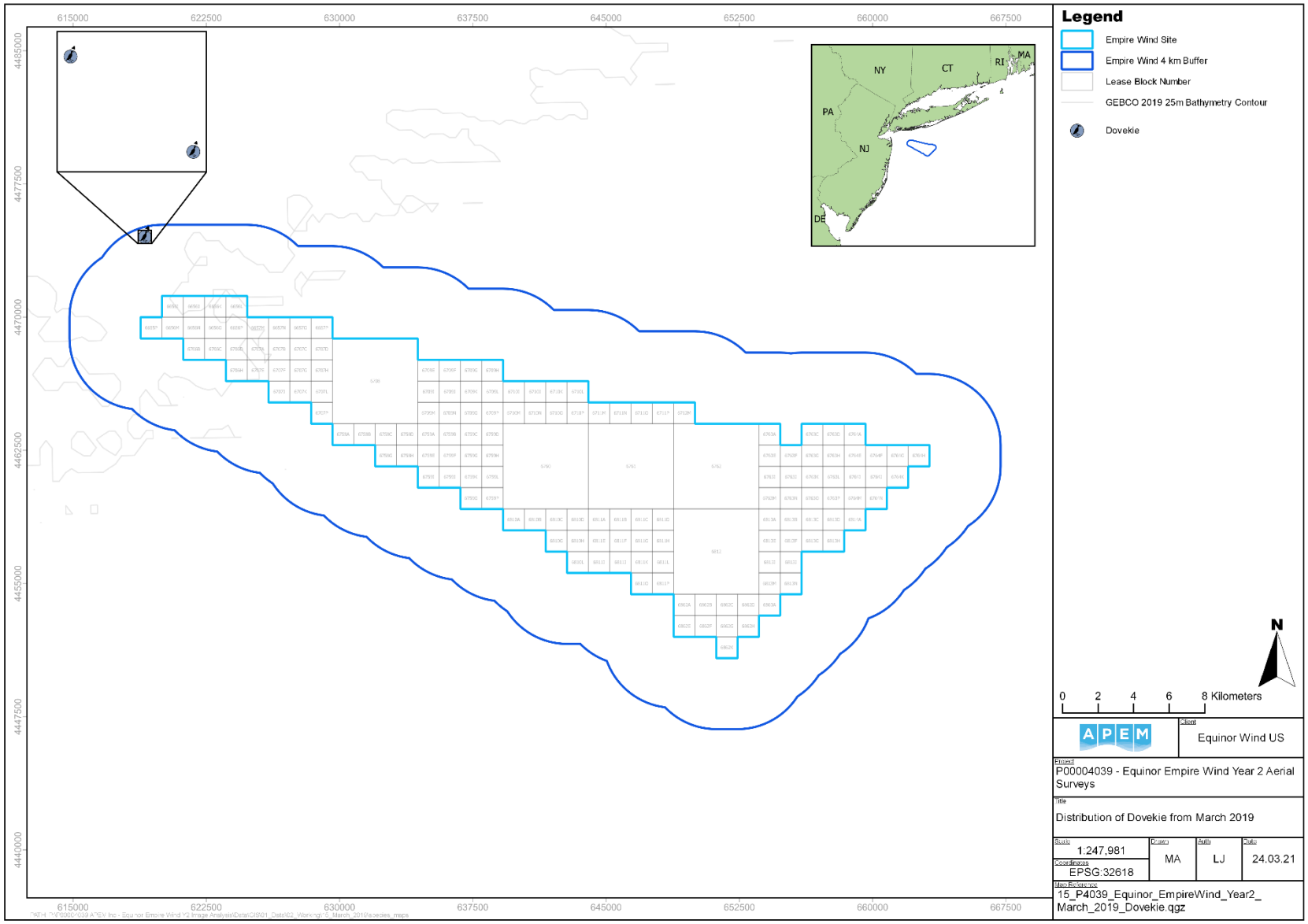

Figure 19 Distribution of dovekie recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 15

4.7.2 Common / Thick-billed Murre *Uria aalge / lomvia*

Common / thick-billed murres were recorded in Surveys 14 and 15 only, with a grand total of 24. Highest numbers on a per-survey basis were recorded in Survey 14, totaling 23 (**Table 24**).

Overall, common / thick-billed murres were loosely distributed across the Survey Area (**Figure 20**).

Table 24 **Total counts and behaviors of common / thick-billed murres in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 14	4	19	**23**
Survey 15	0	1	**1**

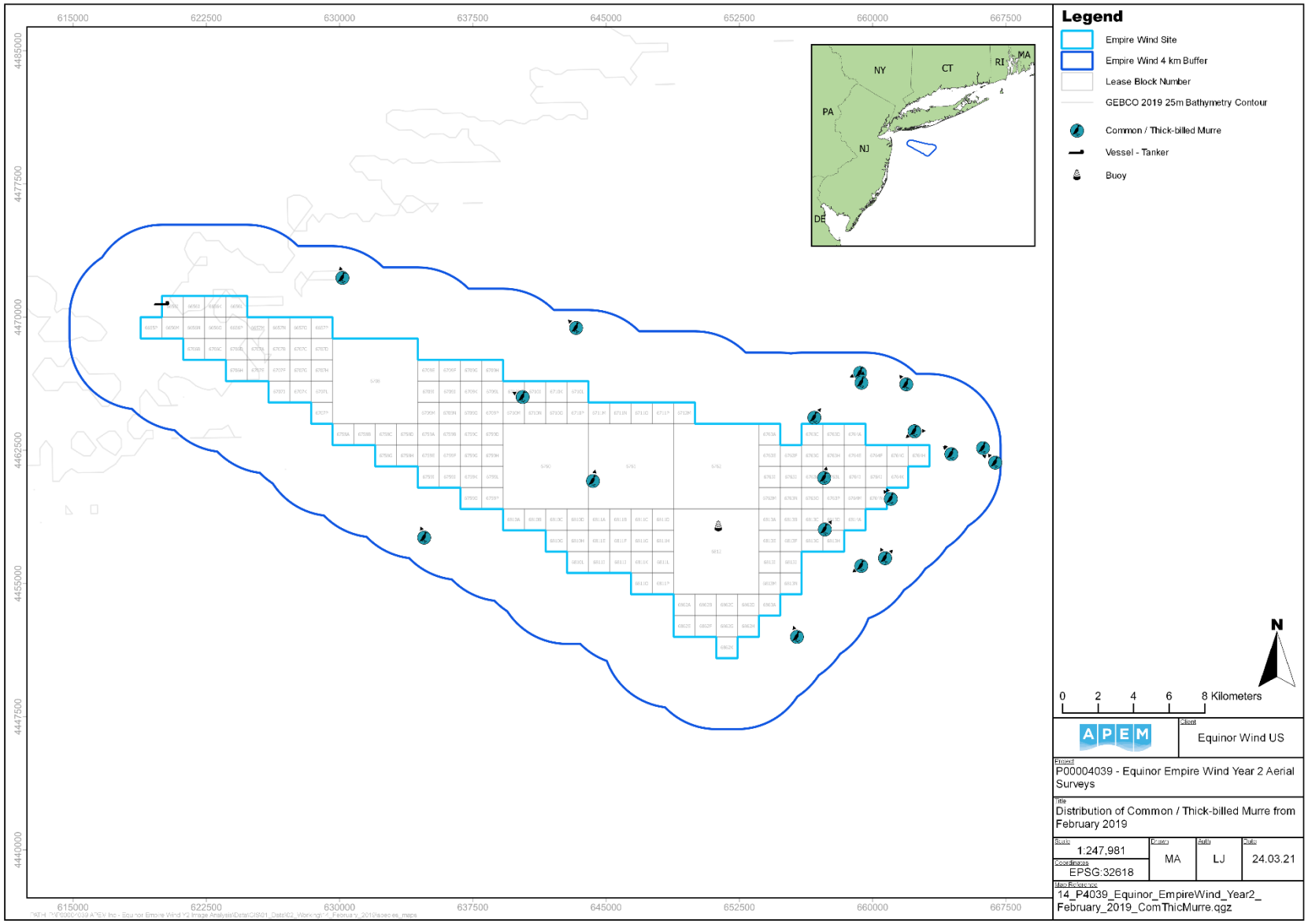

Figure 20 Distribution of common / thick-billed murre recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 14

4.7.3 Razorbill *Alca torda*

Razorbills were recorded in Surveys 23 and 24 only, with a grand total of nine. Highest numbers on a per-survey basis were recorded in Survey 24, totaling seven (**Table 25**).

Overall, razorbills were distributed in small groups towards the northwest of the Survey Area (**Figure 21**).

Table 25 **Total counts and behaviors of razorbills in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 23	2	0	**2**
Survey 24	7	0	**7**

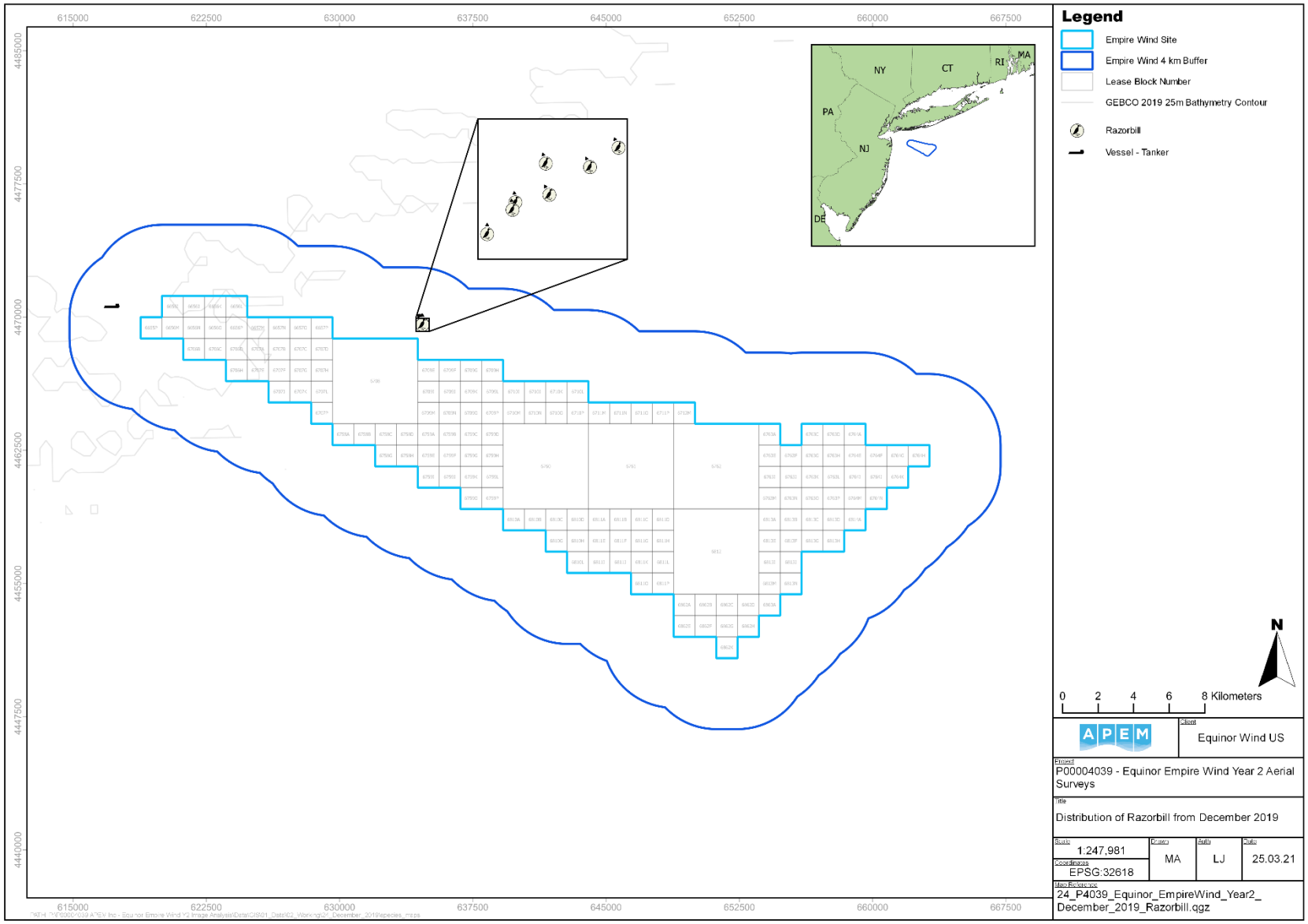

Figure 21 Distribution of razorbills recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 24

4.7.4 Murre / Razorbill *Uria aalge / Alca torda*

Murre / razorbills were recorded in Surveys 13 to 16 inclusive, as well as Surveys 23 and 24, with a grand total of 773. Highest numbers on a per-survey basis were recorded in Survey 24, totaling 493 (**Table 26**).

Overall, murre / razorbills were loosely distributed across the Survey Area (**Figure 22**).

Table 26 **Total counts and behaviors of murre / razorbills in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 13	0	15	**15**
Survey 14	0	109	**109**
Survey 15	21	84	**105**
Survey 16	0	1	**1**
Survey 23	1	49	**50**
Survey 24	40	453	**493**

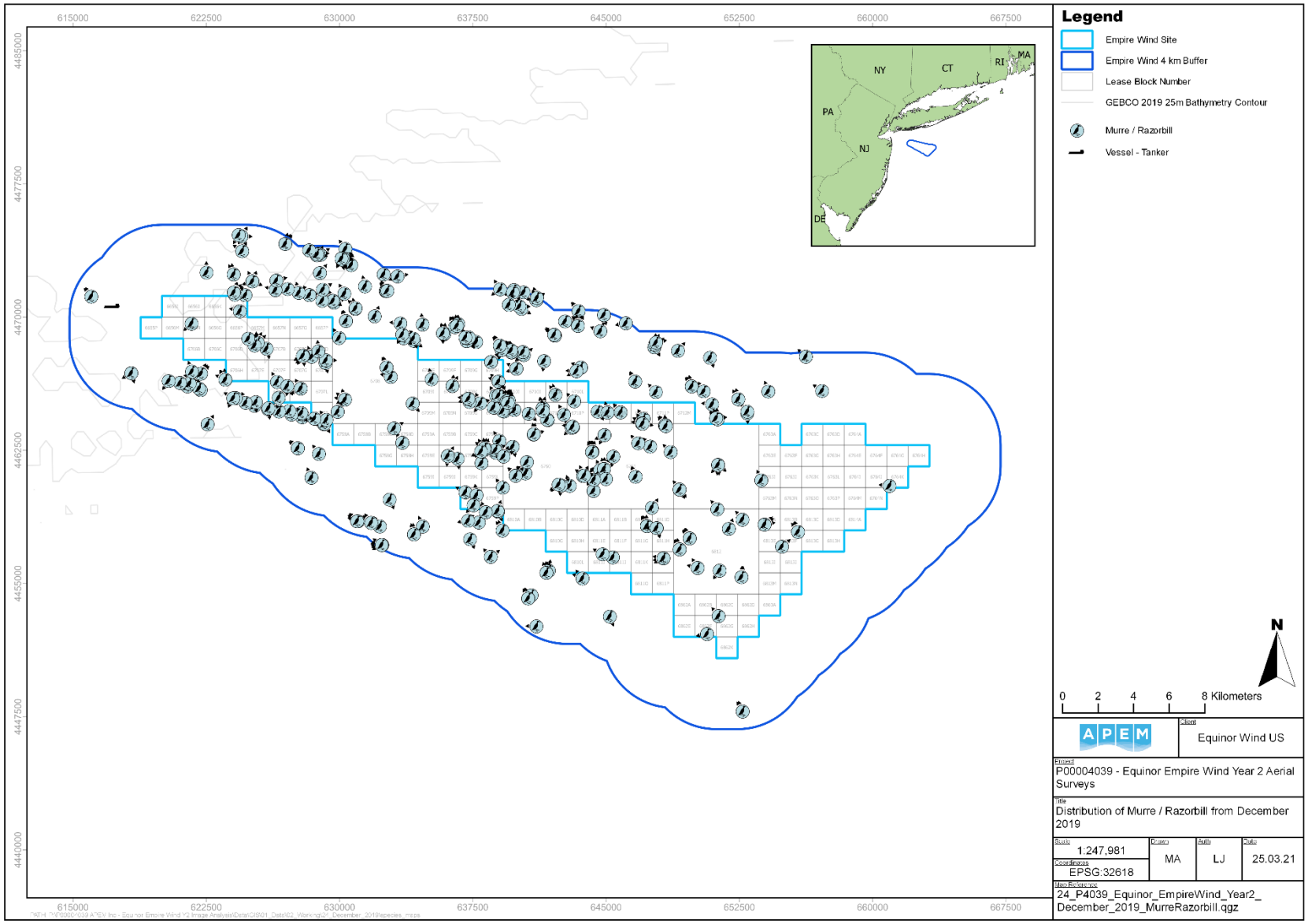

Figure 22 Distribution of murre / razorbills recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 24

4.7.5 Atlantic Puffin *Fratercula arctica*

Atlantic puffins recorded in Surveys 14, 15, and 23, with a grand total of 11. Highest numbers on a per-survey basis were recorded in Survey 14, totaling six (**Table 27**).

Overall, Atlantic puffins were loosely distributed across the Survey Area (**Figure 23**).

Table 27 **Total counts and behaviors of Atlantic puffins in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 14	0	6	**6**
Survey 15	0	2	**2**
Survey 23	0	3	**3**

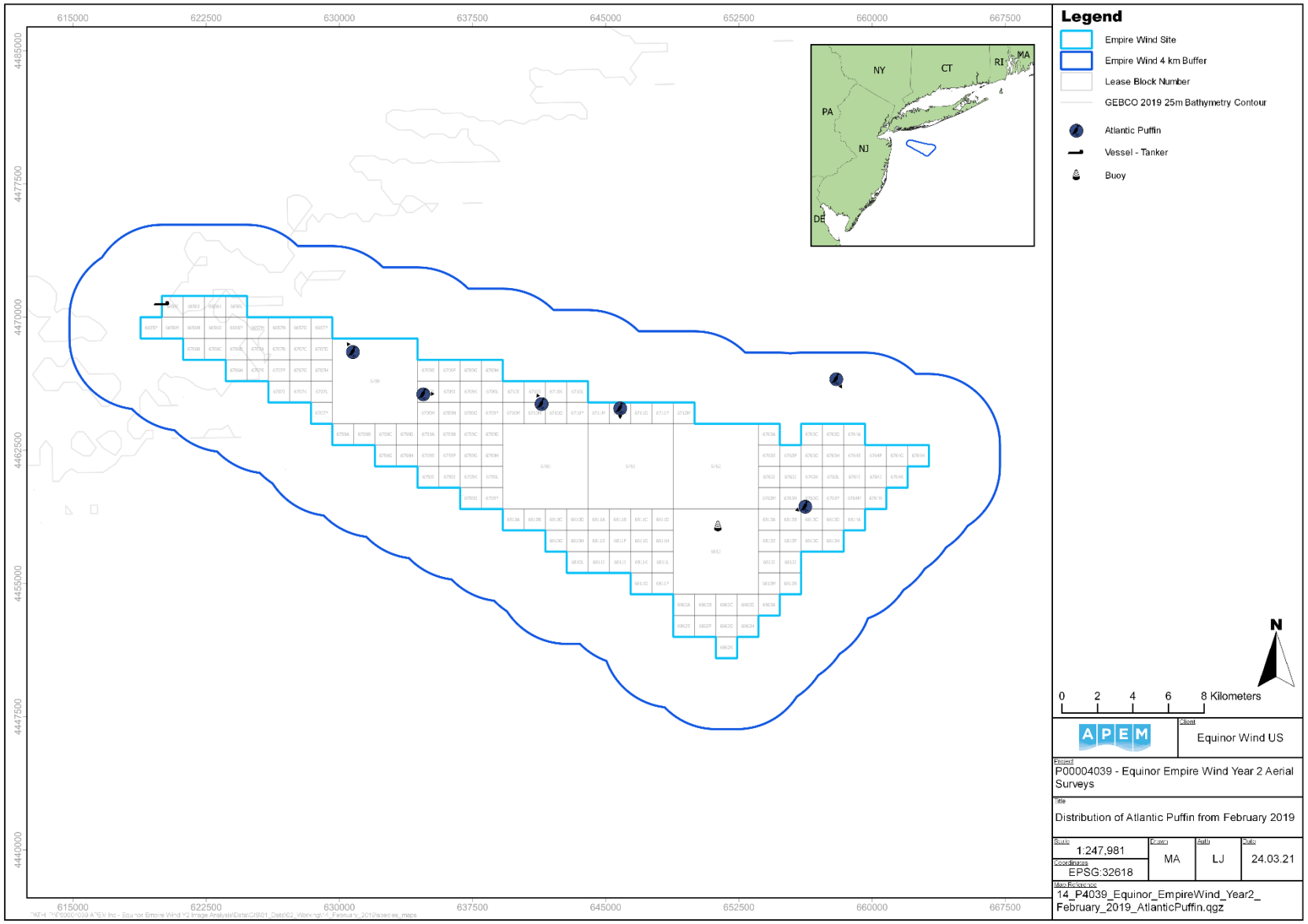

Figure 23 Distribution of Atlantic puffins recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 14

4.7.6 Auk species – Unidentified Alcidae

Unidentified auks were recorded in Surveys 14, 15, and 24, with a grand total of 11. Highest numbers on a per-survey basis were recorded in Survey 24, totaling seven (**Table 28**).

Overall, unidentified auks were loosely distributed across the Survey Area (**Figure 24**).

Table 28 **Total counts and behaviors of unidentified auks in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 14	0	2	**2**
Survey 15	0	2	**2**
Survey 24	0	7	**7**

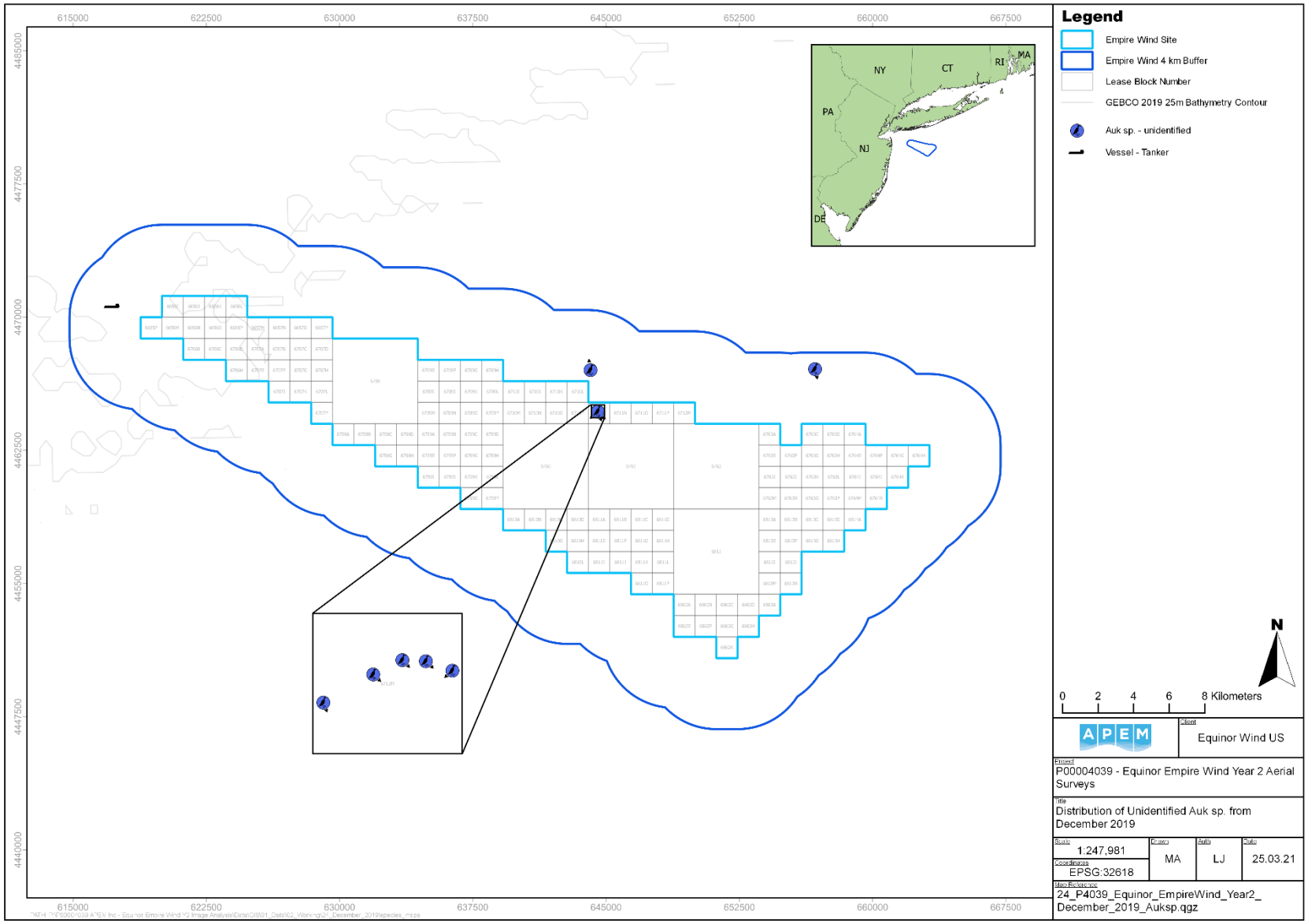

Figure 24 Distribution of unidentified auks recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 24

4.8 Gulls

4.8.1 Black-legged Kittiwake *Rissa tridactyla*

Black-legged kittiwakes were recorded in Survey 23 only, with a grand total of 17. Overall, 76% of kittiwakes were recorded as adults, and the remaining 24% did not have their age identified (**Table 29**).

Black-legged kittiwakes were predominantly distributed in the south to east of the Survey Area (**Figure 25**).

Table 29 **Total counts, behaviors, and ages of black-legged kittiwakes in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Age			Survey Total
	Flying	Sitting	Adult	Juvenile	Unknown	
Survey 23	12	5	13	0	4	**17**

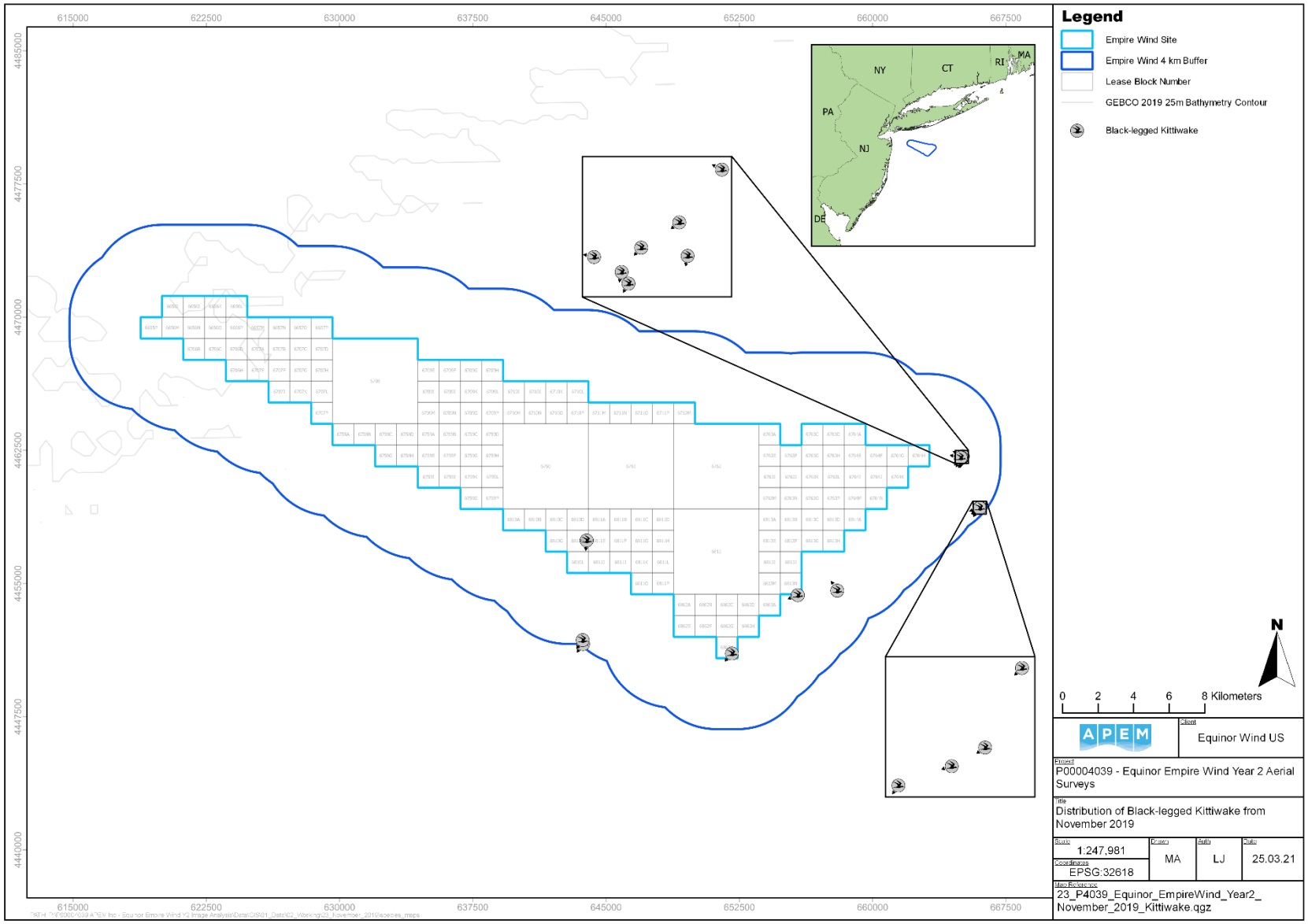

Figure 25 Distribution of black-legged kittiwakes recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 23

4.8.2 Bonaparte's Gull *Chroicocephalus philadelphia*

Bonaparte's gulls were recorded in Surveys 15 to 16 inclusive, as well as Surveys 23 and 24, with a grand total of 203. Highest numbers on a per-survey basis were recorded in Survey 23, totaling 124. Overall, 72% of Bonaparte's gulls were recorded as adults, 27% were not aged, and 1% were juveniles (**Table 30**).

Bonaparte's gulls were loosely distributed across the Survey Area throughout the surveys (**Figure 26**).

Table 30 **Total counts, behaviors, and ages of Bonaparte's gulls in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Age			Survey Total
	Flying	Sitting	Adult	Juvenile	Unknown	
Survey 14	4	13	4	0	13	**17**
Survey 15	2	0	2	0	0	**2**
Survey 16	21	0	0	0	21	**21**
Survey 23	97	27	102	3	19	**124**
Survey 24	37	2	38	0	1	**39**

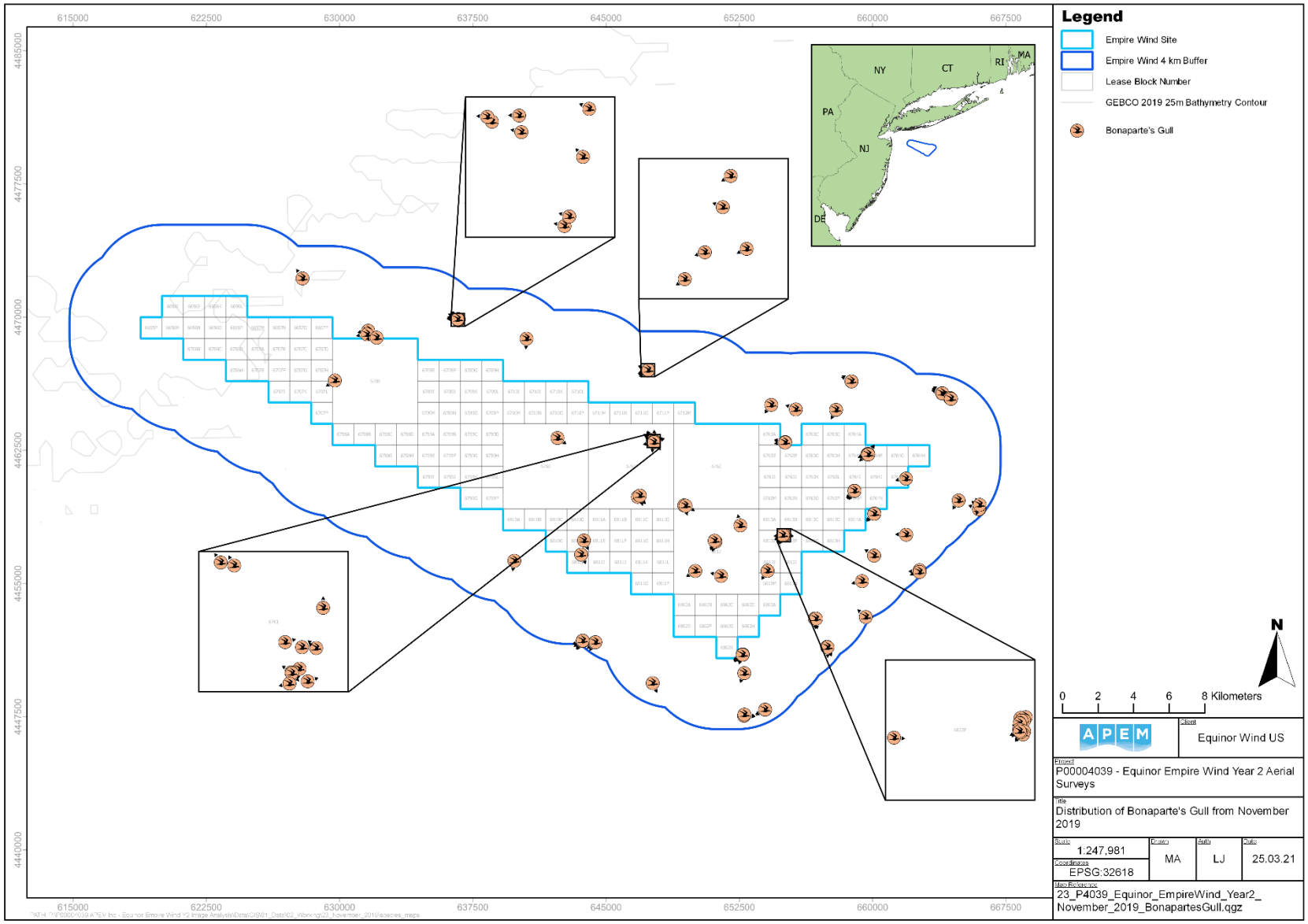

Figure 26 Distribution of Bonaparte's gull recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 23

4.8.3 Laughing gull *Leucophaeus atricilla*

Laughing gulls were recorded in Surveys 16, 19, and 20 to 22 inclusive, with a grand total of 39. Highest numbers on a per-survey basis were recorded in Survey 21, totaling 30. Overall, 72% of Bonaparte's gulls were recorded as adults, 27% were not aged, and 1% were juveniles (**Table 31**).

Laughing gulls were loosely distributed in the Survey Area, mostly towards the western half throughout the surveys (**Figure 27**).

Table 31 **Total counts, behaviors, and ages of laughing gulls in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Age			Survey Total
	Flying	Sitting	Adult	Juvenile	Unknown	
Survey 16	3	0	3	0	0	**3**
Survey 19	1	0	0	1	0	**1**
Survey 20	1	0	0	1	0	**1**
Survey 21	15	15	0	1	29	**30**
Survey 22	4	0	2	2	0	**4**

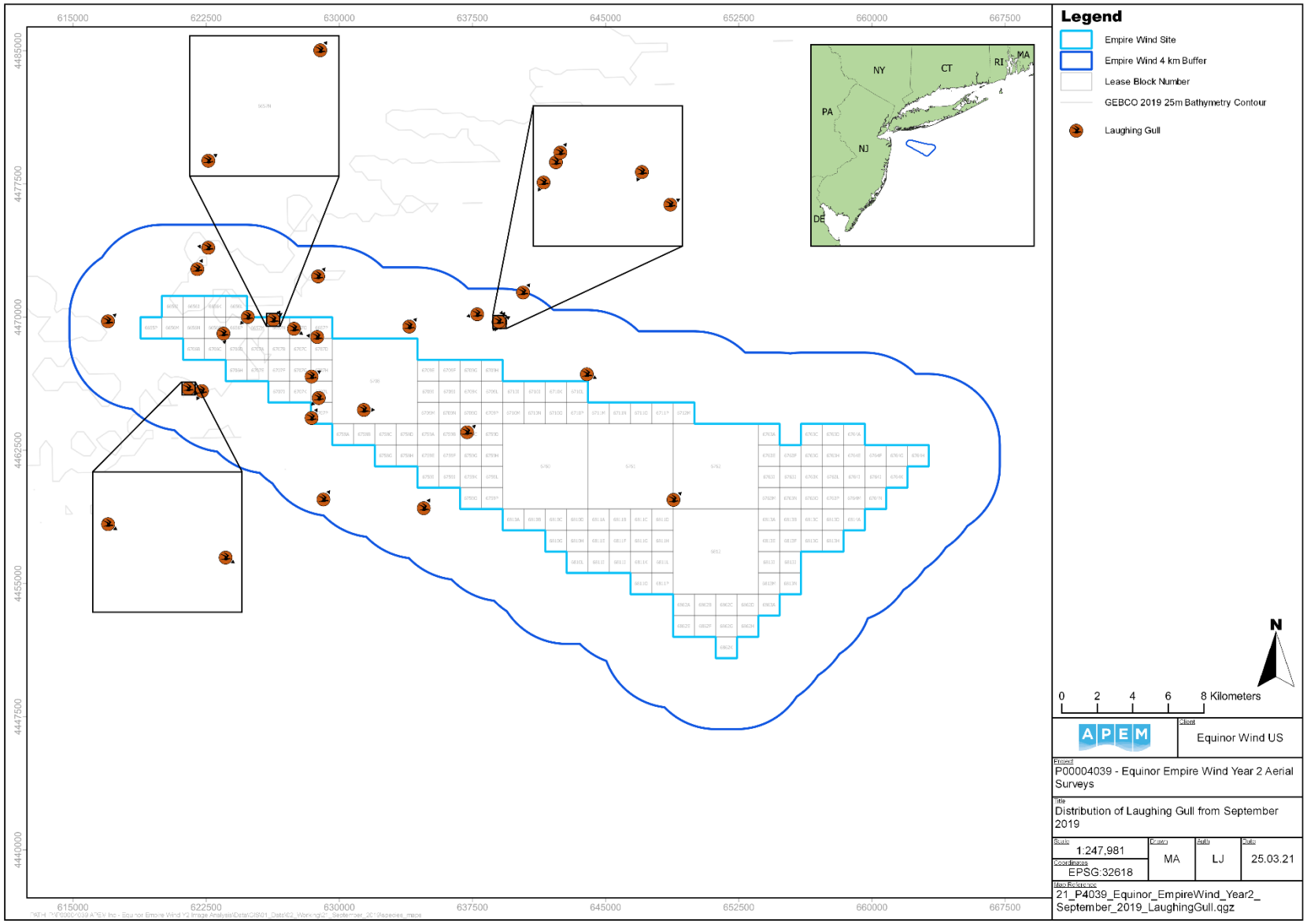

Figure 27 Distribution of laughing gull recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 21

4.8.4 Ring-billed Gull *Larus delawarensis*

Ring-billed gulls were recorded in Surveys 22 to 24 inclusive, with a grand total of three. Highest numbers on a per-survey basis were recorded in all three of the surveys as each recorded only one. Overall, 67% of ring-billed gulls were recorded as adults, and the remaining 33% were not aged (**Table 32**).

Ring-billed gulls were loosely distributed across the Survey Area throughout the surveys (**Figure 28**).

Table 32 **Total counts, behaviors, and ages of ring-billed gulls in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Age			Survey Total
	Flying	Sitting	Adult	Juvenile	Unknown	
Survey 22	1	0	0	0	1	**1**
Survey 23	1	0	1	0	0	**1**
Survey 24	1	0	1	0	0	**1**

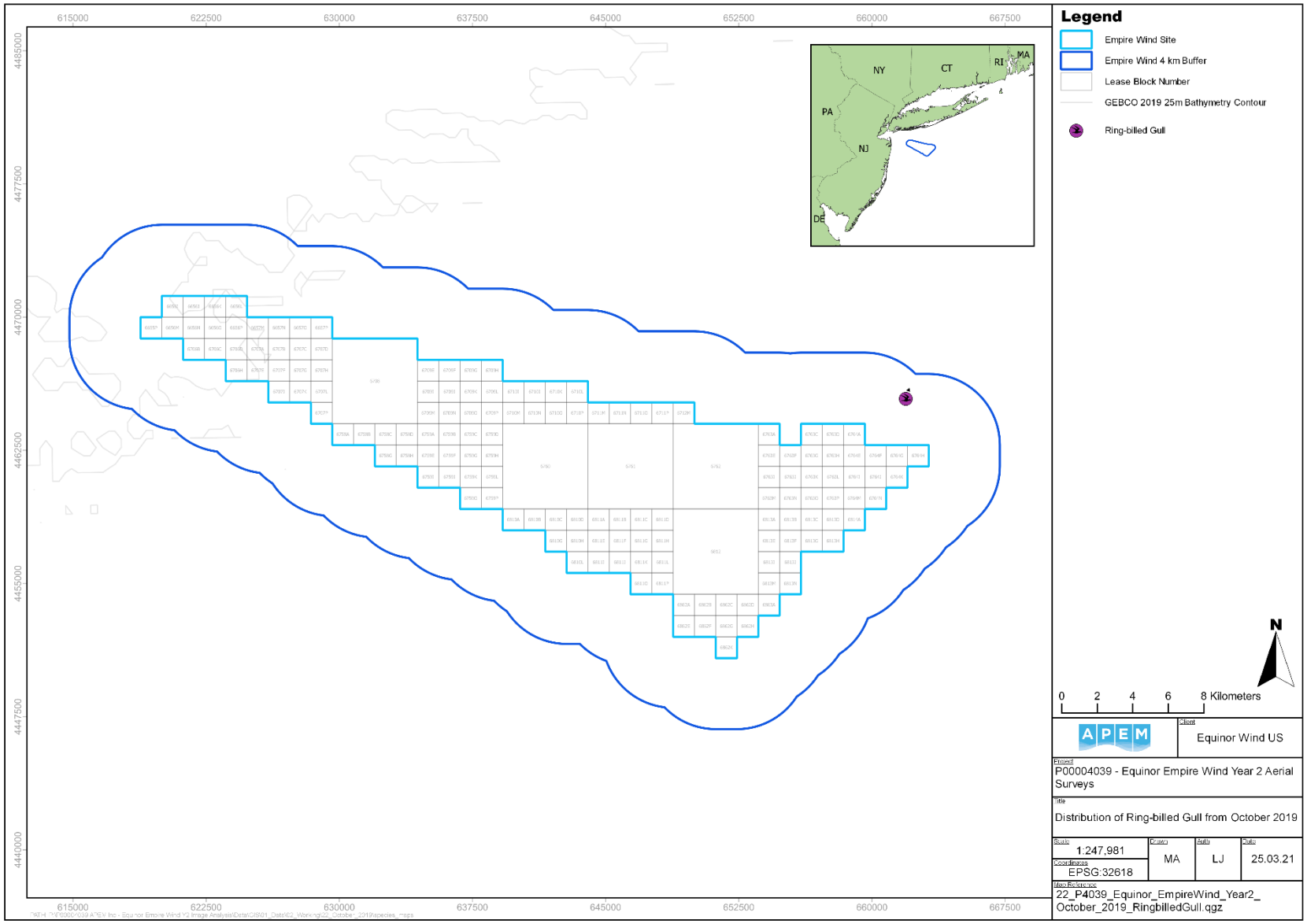

Figure 28 Distribution of ring-billed gull recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 22

4.8.5 Herring Gull *Larus argentatus*

Herring gulls were recorded in the majority of surveys, bar Surveys 18 and 20, with a grand total of 71. Highest numbers on a per-survey basis were recorded in Survey 23, totaling 24. Overall, 56% of herring gulls were recorded as adults, 26% were not aged, and the remaining 26% were juveniles (**Table 33**).

Herring gulls were loosely distributed across the Survey Area throughout the surveys (**Figure 29**).

Table 33 **Total counts, behaviors, and ages of herring gulls in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Age			Survey Total
	Flying	Sitting	Adult	Juvenile	Unknown	
Survey 13	5	2	6	0	1	**7**
Survey 14	1	1	1	0	1	**2**
Survey 15	7	3	8	2	0	**10**
Survey 16	4	0	2	0	2	**4**
Survey 17	1	1	2	0	0	**2**
Survey 19	0	1	0	0	1	**1**
Survey 21	1	0	0	0	1	**1**
Survey 22	10	5	4	7	4	**15**
Survey 23	13	11	14	2	8	**24**
Survey 24	4	1	3	2	0	**5**

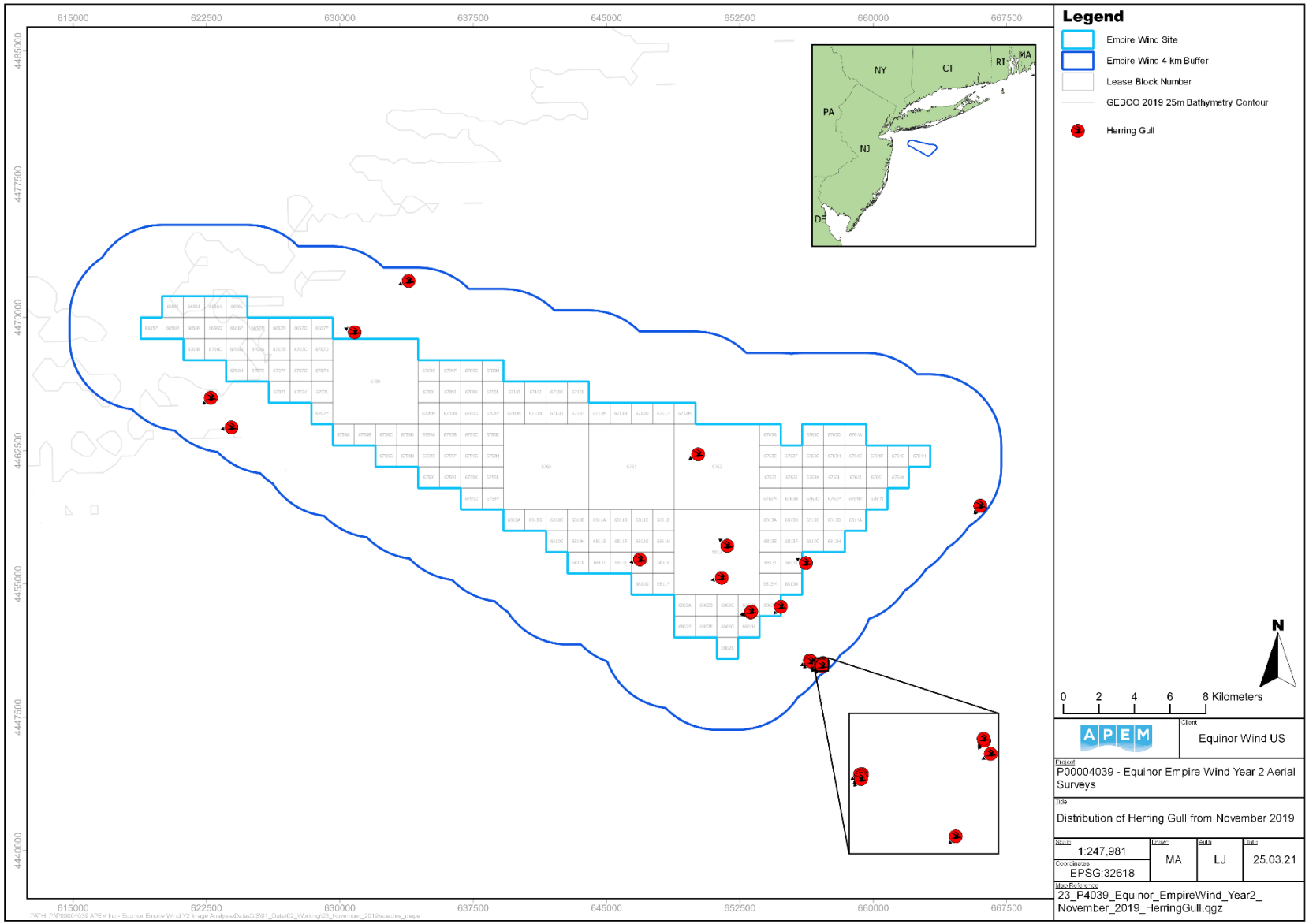

Figure 29 Distribution of herring gull recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 23

4.8.6 Lesser Black-backed Gull *Larus fuscus*

A single lesser black-backed gull was recorded in Survey 23 only, with a grand total of one, making 100% of recorded lesser black-backed gulls adults (**Table 34**).

The single lesser black-backed gull was located around the center of the Survey Area (**Figure 30**).

Table 34 Total counts, behaviors, and ages of lesser black-backed gulls in Lease Area OCS-A 0512 plus 4 km buffer

Survey	Behavior		Age			Survey Total
	Flying	Sitting	Adult	Juvenile	Unknown	
Survey 23	1	0	1	0	0	**1**

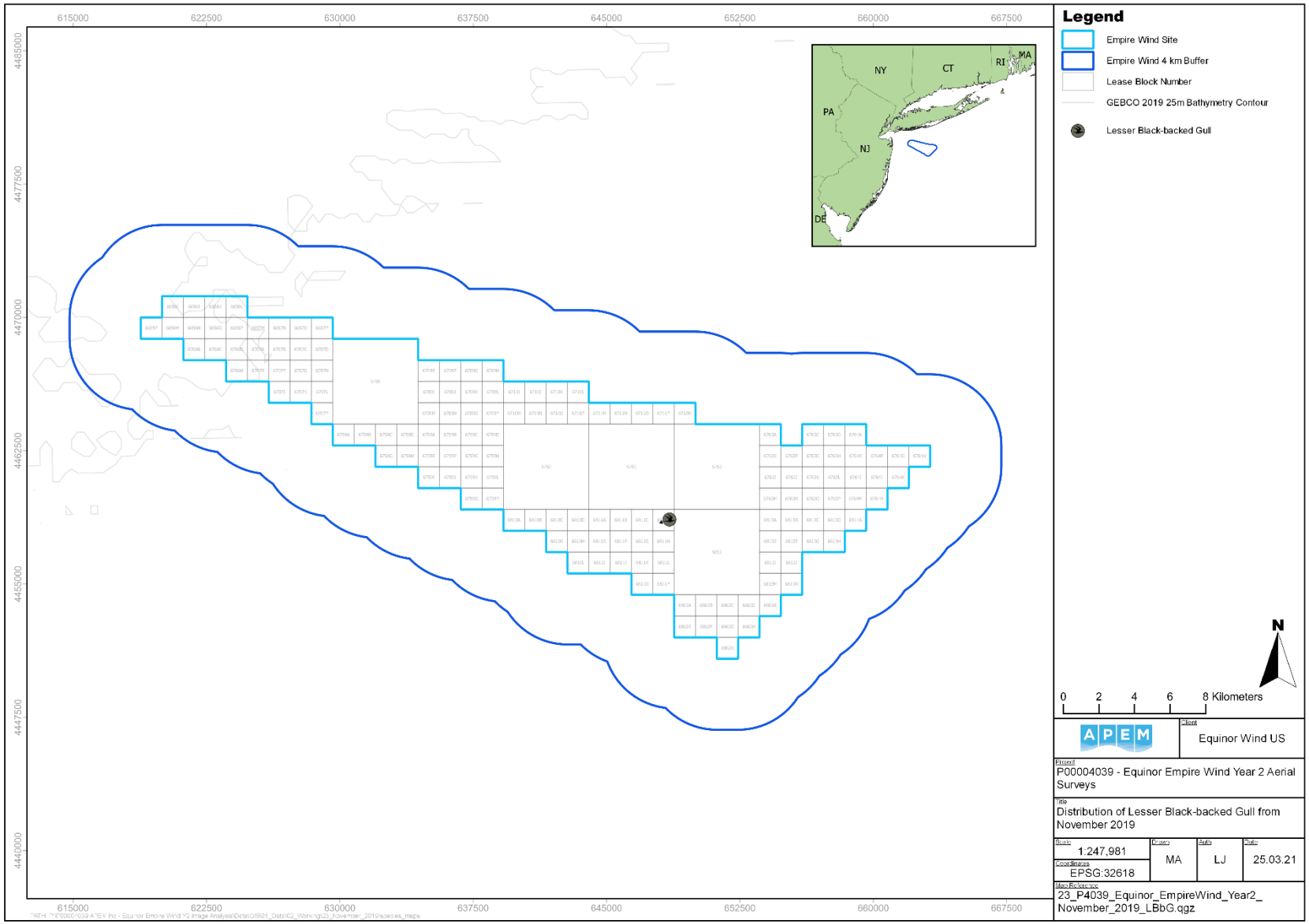

Figure 30 Distribution of lesser black-backed gull recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 23

4.8.7 Great Black-backed Gull *Larus marinus*

Great black-backed gulls were recorded in the majority of surveys bar 18, 19, and 21, with a grand total of 91. Highest numbers on a per-survey basis were recorded in Survey 13, totaling 20. Overall, 62% of recorded great black-backed gulls were adults, 22% were not aged, and the remaining 16% were juveniles (**Table 35**).

Great black-backed gulls were loosely distributed across the Survey Area (**Figure 31**).

Table 35 **Total counts, behaviors, and ages of great black-backed gulls in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Age			Survey Total
	Flying	Sitting	Adult	Juvenile	Unknown	
Survey 13	9	11	15	2	3	**20**
Survey 14	1	5	2	1	3	**6**
Survey 15	2	12	10	2	2	**14**
Survey 16	3	0	1	2	0	**3**
Survey 17	1	0	0	1	0	**1**
Survey 20	1	0	1	0	0	**1**
Survey 22	4	7	3	2	6	**11**
Survey 23	5	11	9	3	4	**16**
Survey 24	5	14	15	2	2	**19**

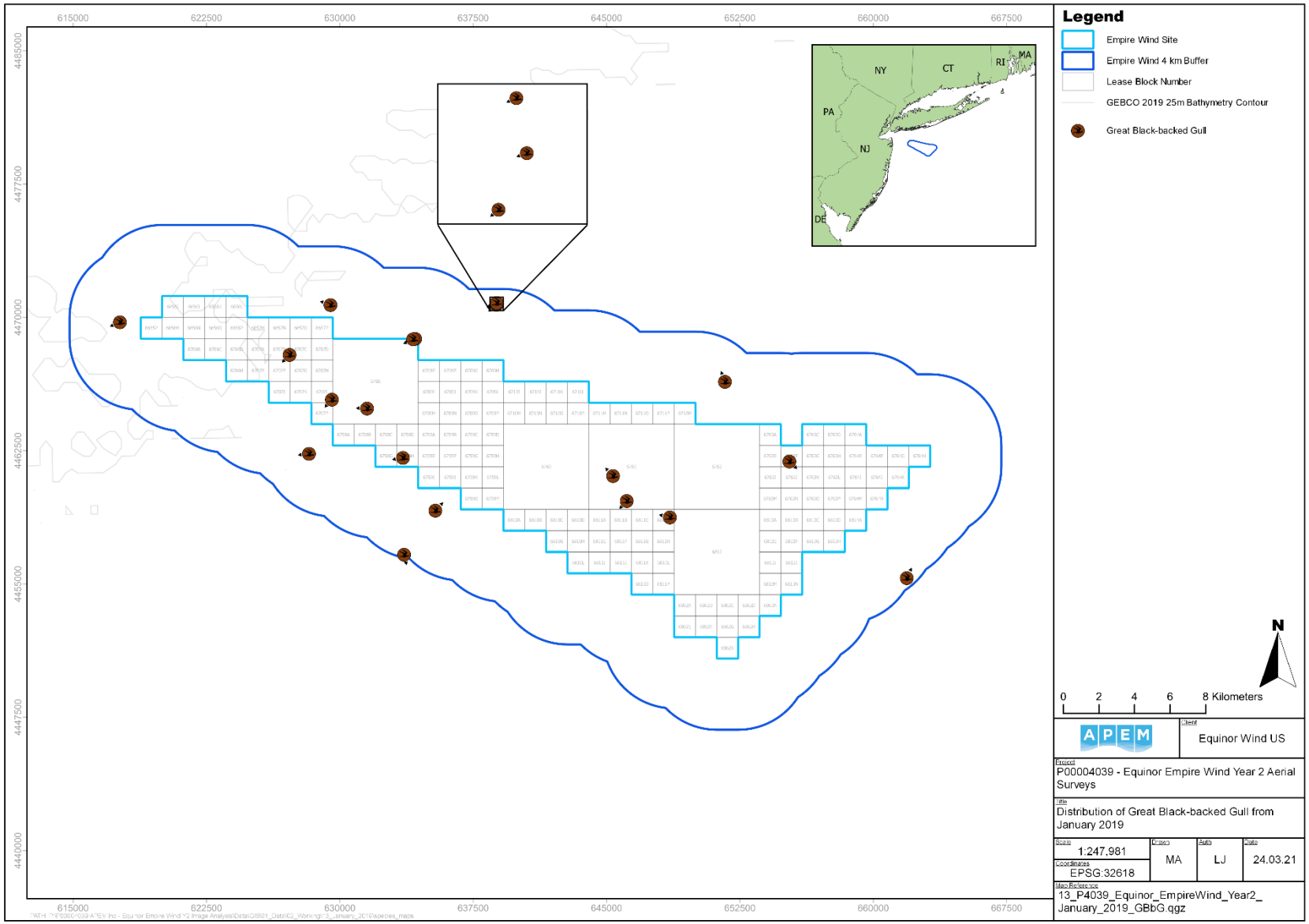

Figure 31 Distribution of great black-backed gull recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 13

4.8.8 Small Gull species – Unidentified Laridae

Unidentified small gulls were recorded in Surveys 14, 16, 18, 19, 21, 23, and 24, with a grand total of 30. Highest numbers on a per-survey basis were recorded in Survey 24, totaling 12. Overall, 60% of unidentified gulls were not aged, 33% were recorded as adults, and the remaining 7% were juveniles (**Table 36**).

Unidentified small gulls were loosely distributed across the Survey Area throughout the surveys (**Figure 32**).

Table 36 **Total counts, behaviors, and ages of unidentified small gulls in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Age			Survey Total
	Flying	Sitting	Adult	Juvenile	Unknown	
Survey 14	0	2	0	0	2	**2**
Survey 16	0	7	0	0	7	**7**
Survey 18	0	1	0	0	1	**1**
Survey 19	0	1	0	0	1	**1**
Survey 21	0	2	0	2	0	**2**
Survey 23	0	5	1	0	4	**5**
Survey 24	0	12	9	0	3	**12**

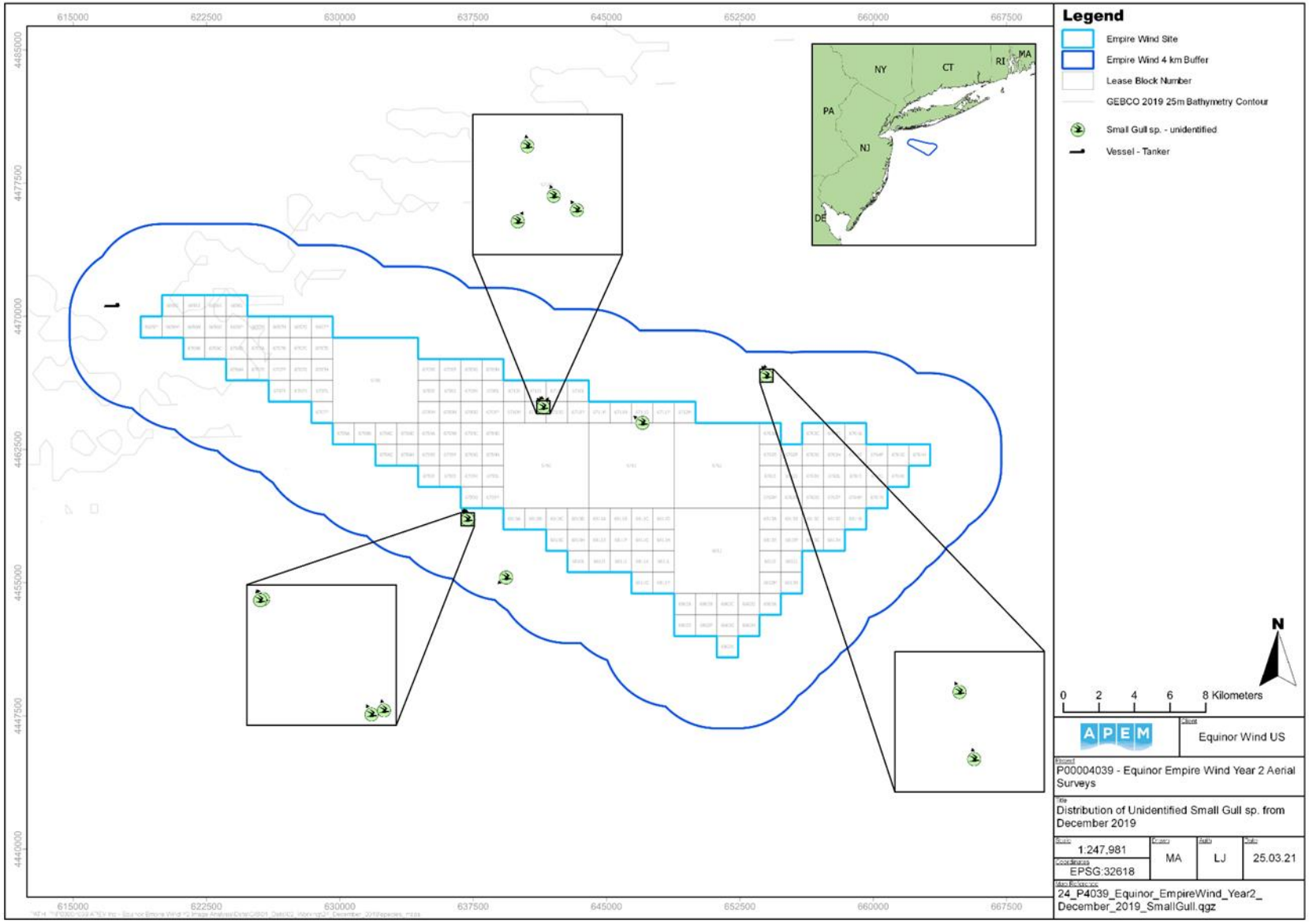

Figure 32 Distribution of unidentified small gulls recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 22

4.8.9 Large Gull species – Unidentified Laridae

Unidentified large gulls were recorded in Surveys 15, 16, 22 and 24, with a grand total of 10. Overall, 80% of recorded unidentified large gulls were not aged, and the remaining 20% were juveniles (**Table 37**).

Unidentified large gulls were loosely distributed across the Survey Area (**Figure 33**).

Table 37 **Total counts, behaviors, and ages of unidentified large gulls in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Age			Survey Total
	Flying	Sitting	Adult	Juvenile	Unknown	
Survey 15	0	1	0	0	1	**1**
Survey 16	0	1	0	0	1	**1**
Survey 22	2	4	0	2	4	**6**
Survey 24	0	2	0	0	2	**2**

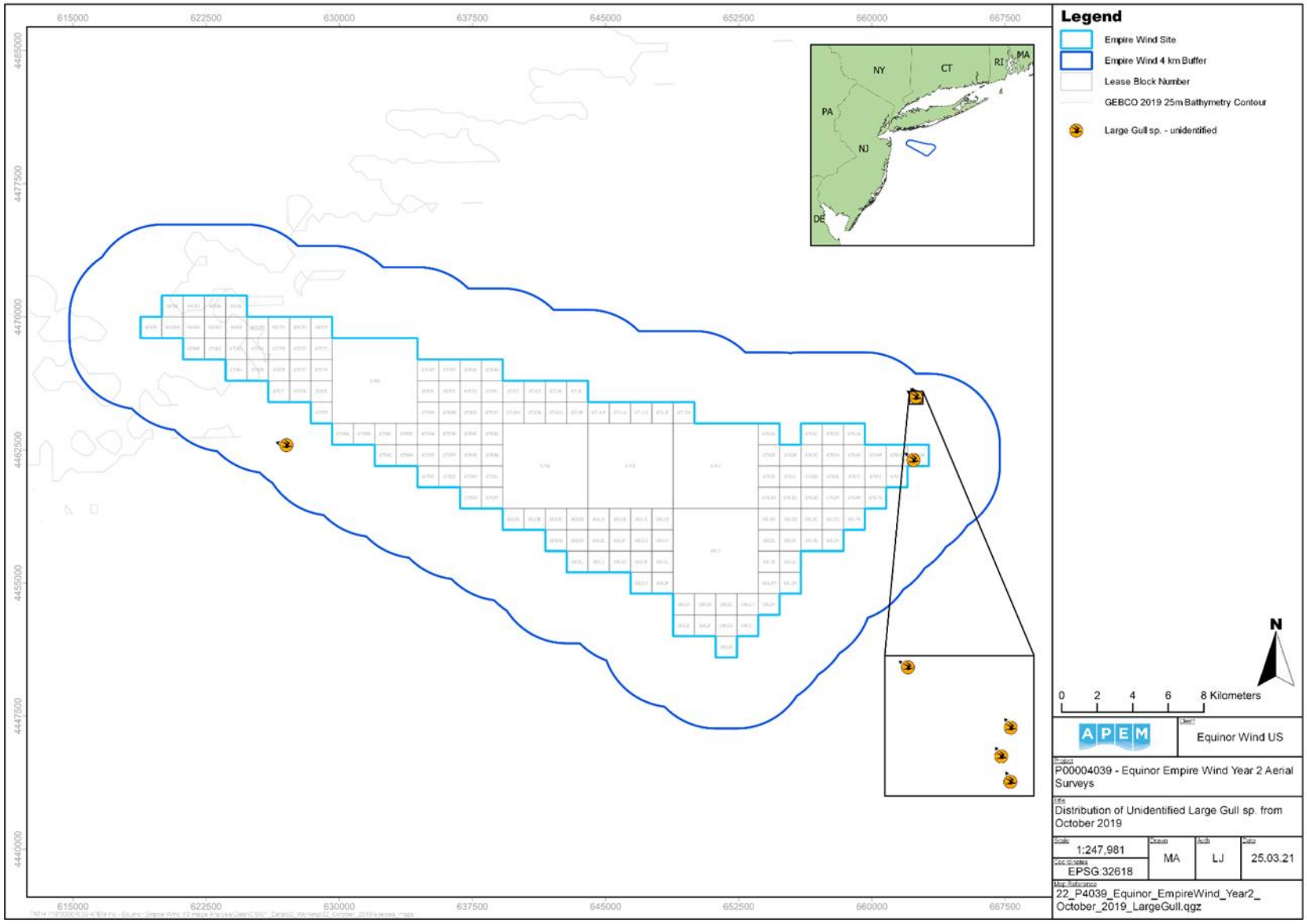

Figure 33 Distribution of unidentified large gulls recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 24

4.8.10 Gull Species – Unidentified Laridae

Unidentified gulls were recorded in Surveys 22 and 23, with a grand total of two. Highest numbers on a per-survey basis were recorded in both surveys as each survey totaled one individual. Overall, 50% of recorded unidentified gulls were adults, and 50% were not aged (**Table 38**).

An unidentified gull was located in the north and an unidentified gull was located in the east of the Survey Area for the two surveys (**Figure 34**).

Table 38 **Total counts, behaviors, and ages of unidentified gulls in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Age			Survey Total
	Flying	Sitting	Adult	Juvenile	Unknown	
Survey 22	1	0	0	0	1	**1**
Survey 23	0	1	1	0	0	**1**

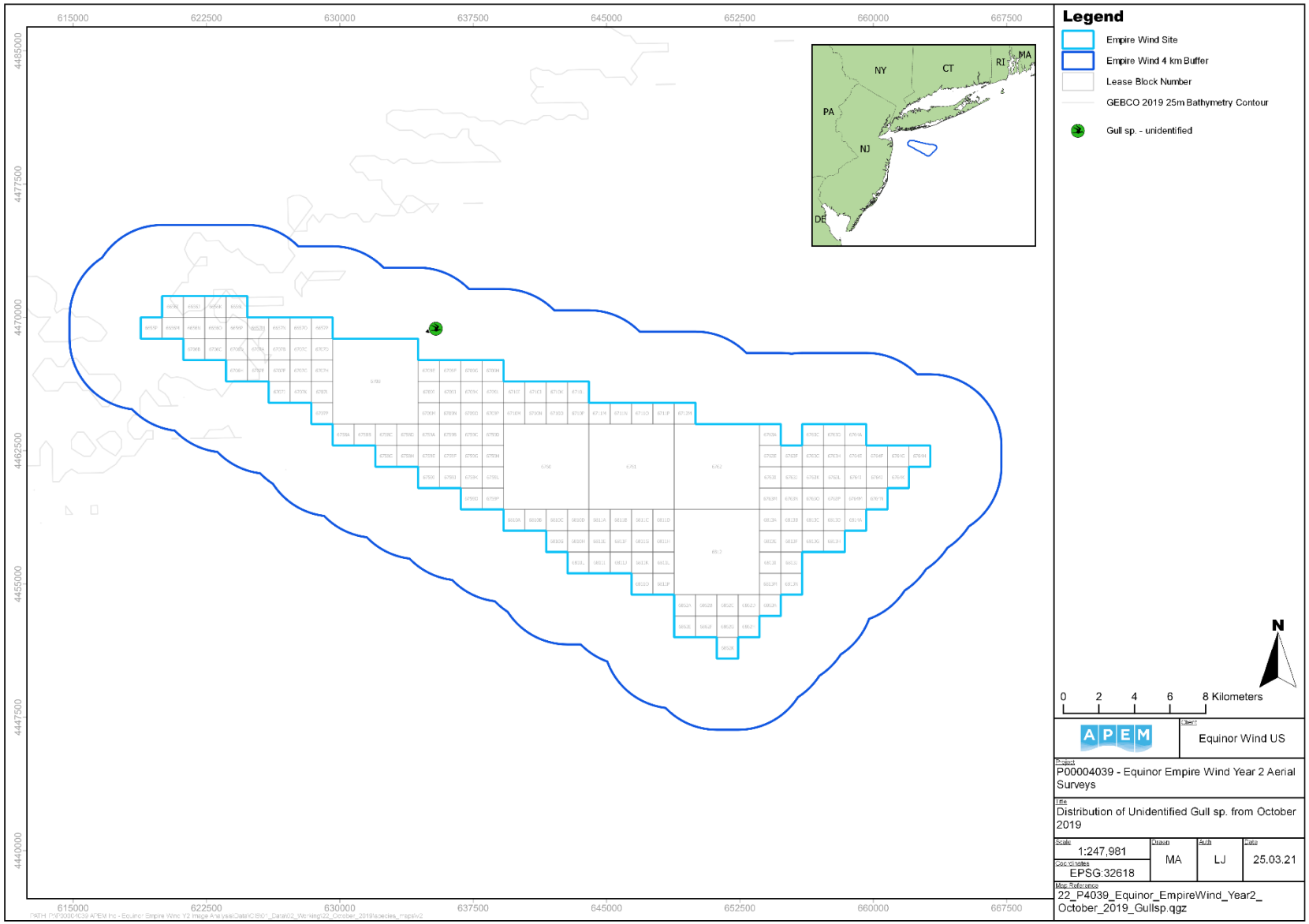

Figure 34 Distribution of unidentified gull recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 22

4.9 Terns

4.9.1 Least Tern *Sternula antillarum*

Least terns were recorded in Surveys 17 to 20 inclusive, with a grand total of 11. Highest numbers on a per-survey basis were recorded in Survey 18, totaling six (**Table 39**).

Least terns were loosely distributed towards the northwest for most surveys, including Survey 18 (**Figure 35**).

Table 39 **Total counts and behaviors of least terns in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Sitting	Flying	
Survey 17	0	2	**2**
Survey 18	0	6	**6**
Survey 19	0	2	**2**
Survey 20	0	1	**1**

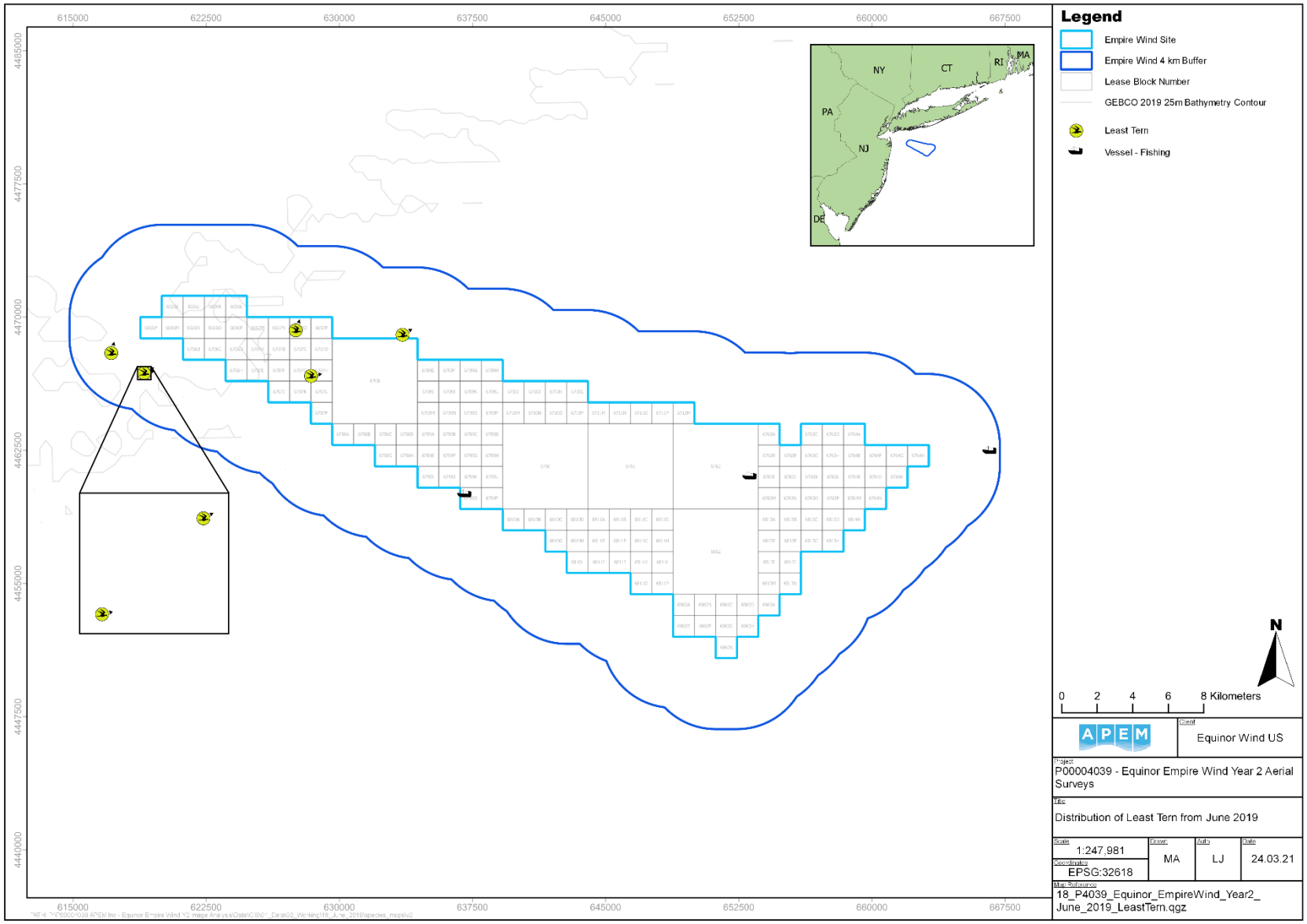

Figure 35 Distribution of least tern recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.9.2 Tern species – Unidentified Laridae

Unidentified terns were recorded in Survey 21 only, with a grand total of one (**Table 40**).

The single unidentified tern was located in the northwest of the Survey Area (**Figure 36**).

Table 40 **Total counts and behaviors of unidentified terns in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 21	1	0	**1**

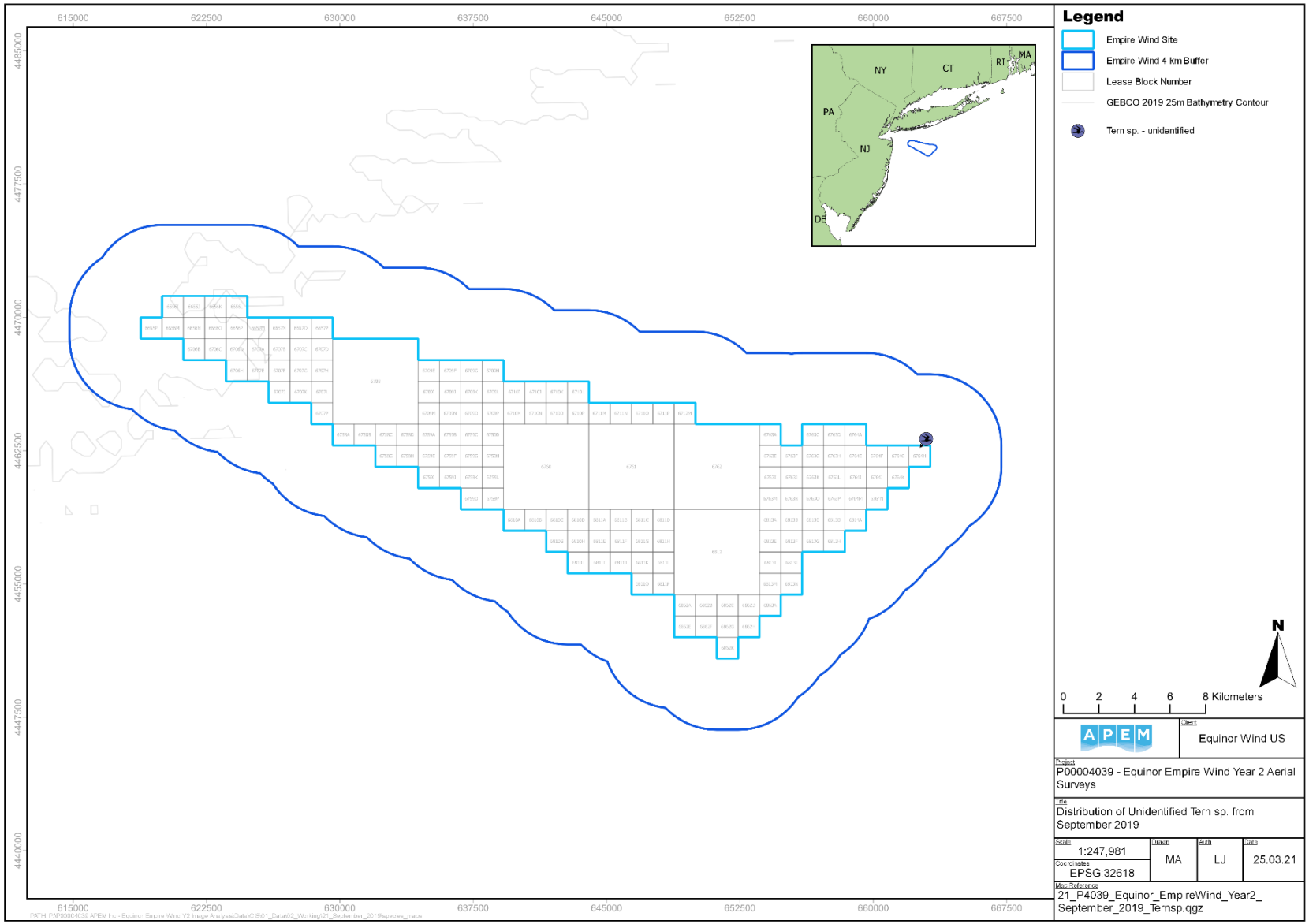

Figure 36 Distribution of unidentified tern recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 21

4.9.3 Common Tern *Sterna hirundo*

Common terns, like least terns, were also recorded in Surveys 17 to 20 inclusive, with a grand total of 24. Highest numbers recorded on a per-survey basis were seen in Survey 18, totaling 16 (**Table 41**).

Common terns were loosely distributed across the Survey Area for most surveys, with Survey 18 showing a higher concentration towards the northwest (**Figure 37**).

Table 41 **Total counts and behaviors of common terns in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Sitting	Flying	
Survey 17	0	4	**4**
Survey 18	0	16	**16**
Survey 19	0	3	**3**
Survey 20	0	1	**1**

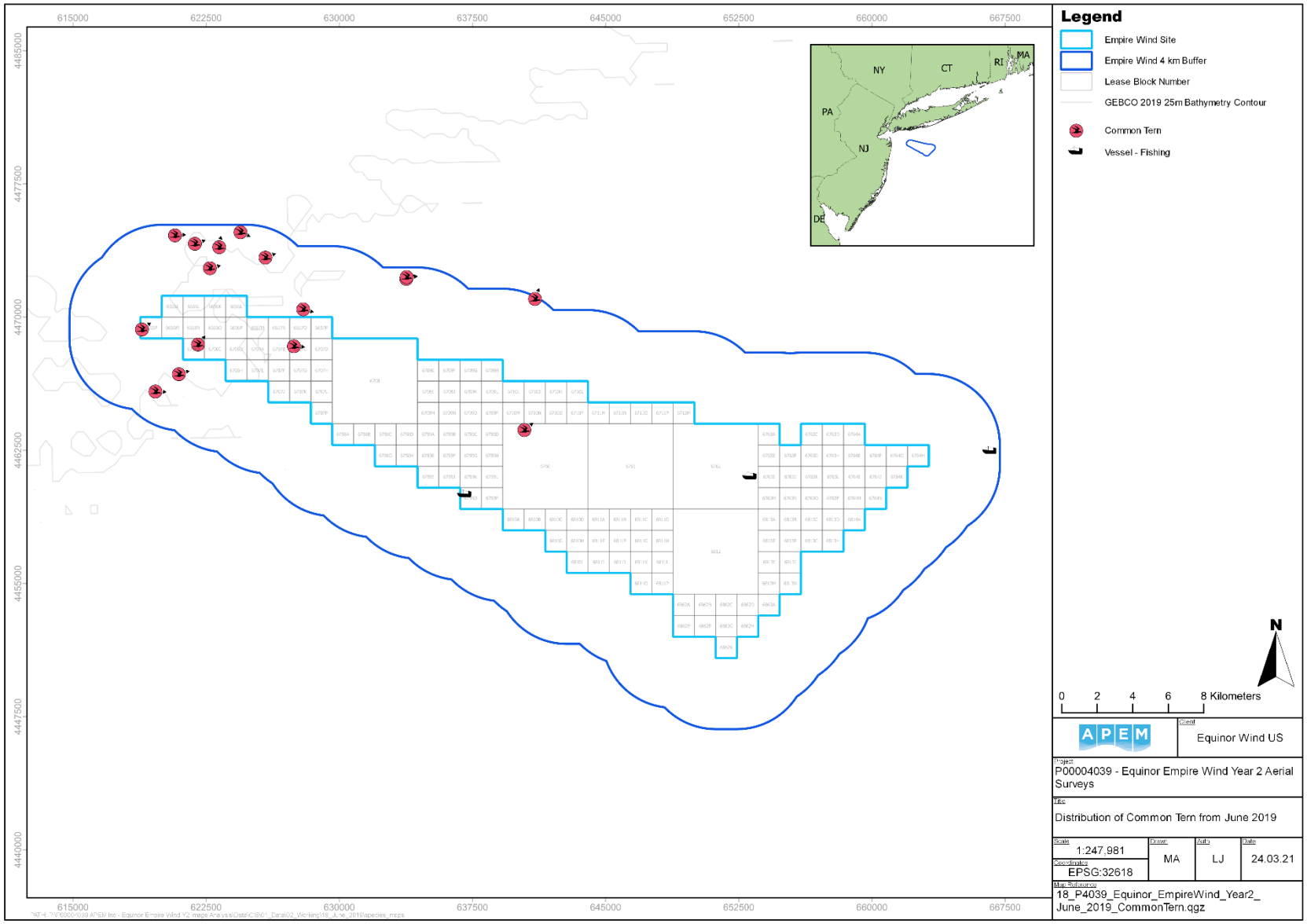

Figure 37 Distribution of common tern recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.9.4 Arctic Tern *Sterna paradisaea*

A single Arctic tern was recorded in Survey 17 only, with a grand total of one (**Table 42**).

The single Arctic tern was located in the east of the Survey Area (**Figure 38**).

Table 42 **Total counts and behaviors of Arctic terns in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 17	1	0	**1**

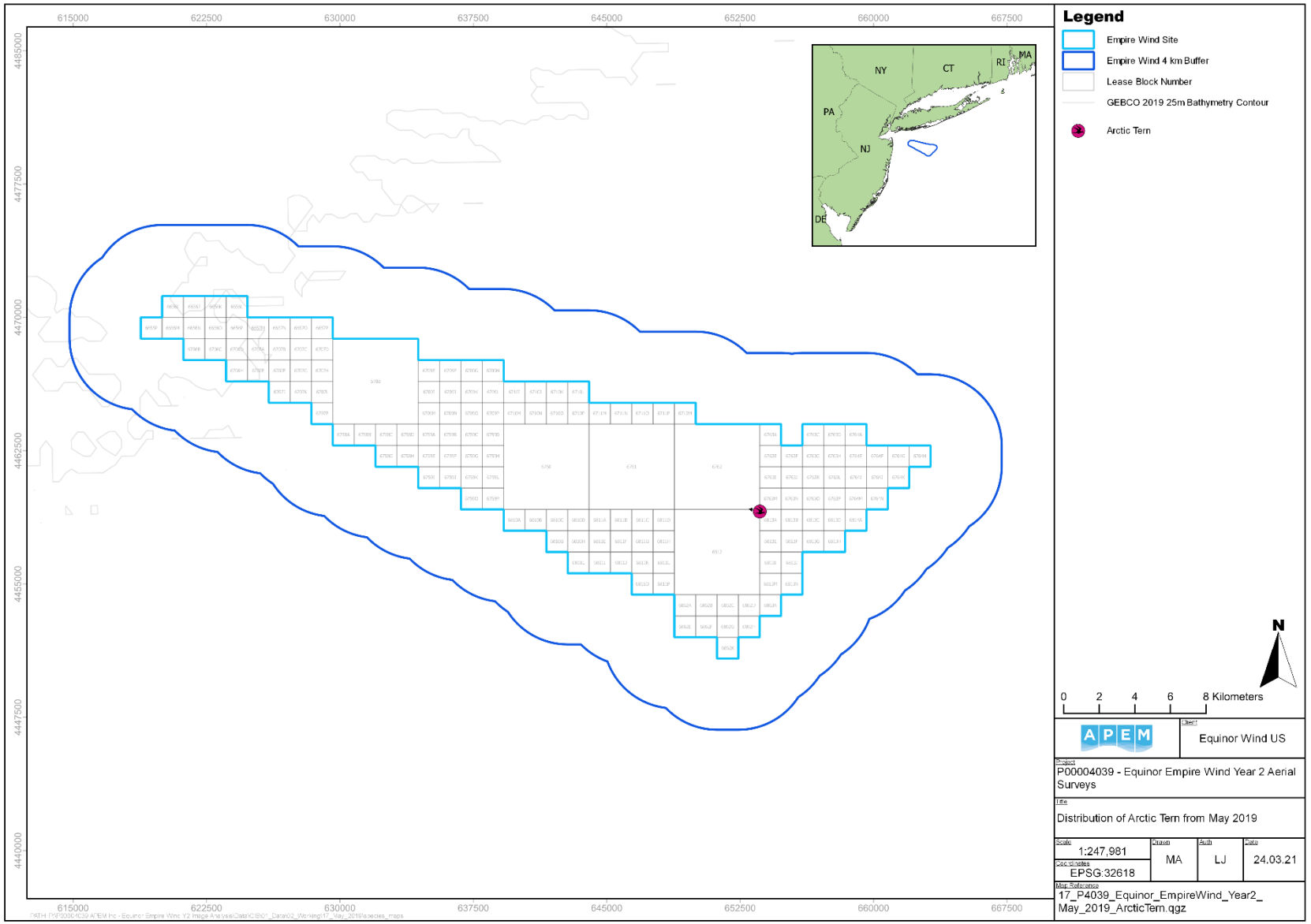

Figure 38 Distribution of Arctic tern recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 17

4.9.5 'Commic' [Common or Arctic] Tern *Sterna hirundo; paradisaea*

'Commic' terns were recorded in Survey 17 only, with a grand total of two (**Table 43**).

Both 'commic' terns were distributed in the center of the Survey Area for Survey 17 (**Figure 39**).

Table 43 **Total counts and behaviors of 'commic' terns in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Sitting	Flying	
Survey 17	0	2	**2**

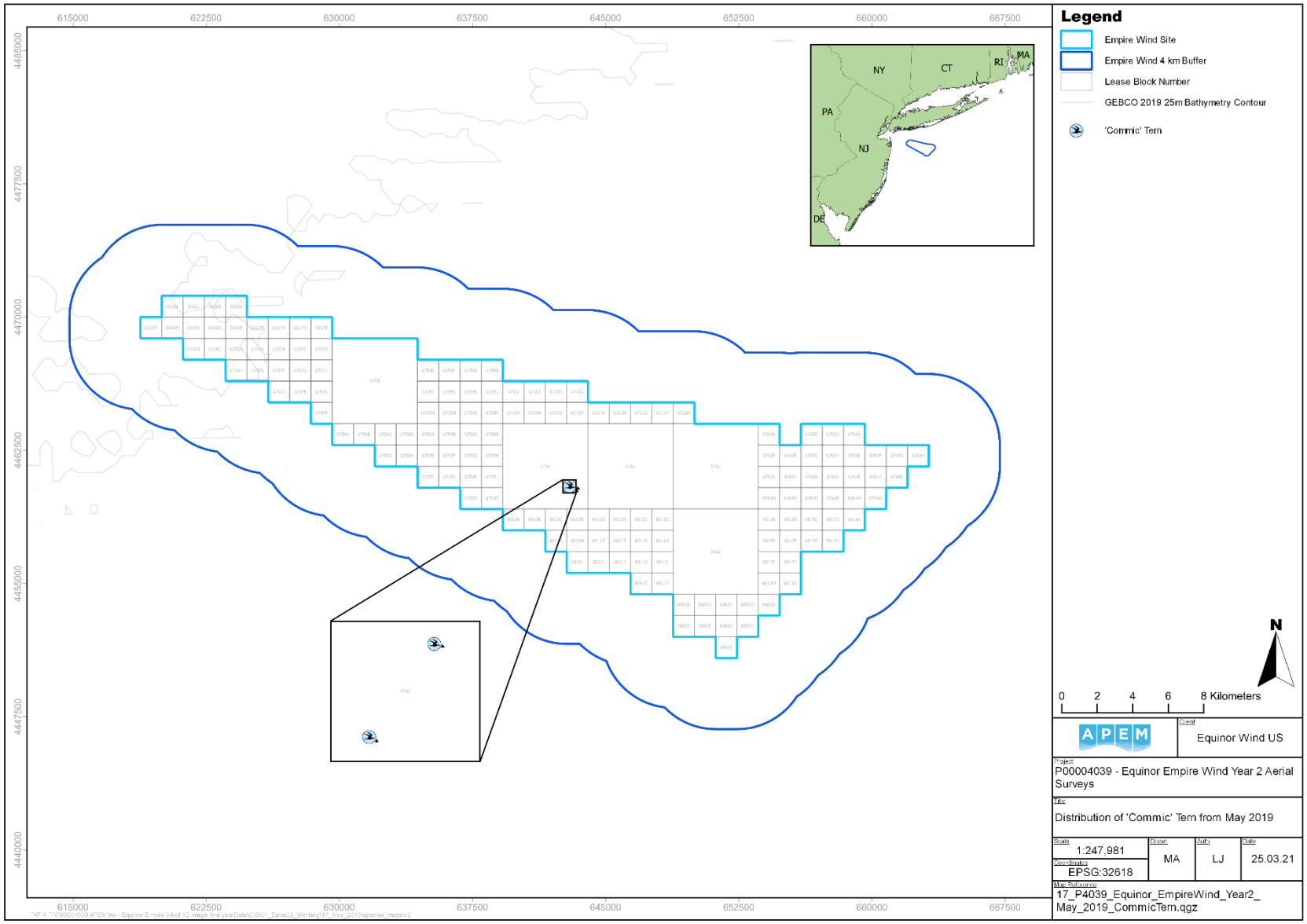

Figure 39 Distribution of 'commic' tern recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 17

4.9.6 'Commic' [Common or Arctic] / Forster's Tern *Sterna hirundo; paradisaea / forsteri*

'Commic' / Forster's terns were recorded in Surveys 16 to 19 inclusive, with a grand total of 42. Highest numbers on a per-survey basis were recorded in Survey 18, totaling 32 (**Table 44**).

'Commic' / Forster's terns were predominantly distributed in the northwest of the Survey Area for all surveys bar Survey 19, with only one tern located towards the center instead of the northwest for Survey 18 (**Figure 40**).

Table 44 **Total counts and behaviors of 'commic' / Forster's terns in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior			Survey Total
	Sitting	Flying	Perched	
Survey 16	0	4	0	**4**
Survey 17	0	4	0	**4**
Survey 18	0	32	1	**33**
Survey 19	0	2	0	**2**

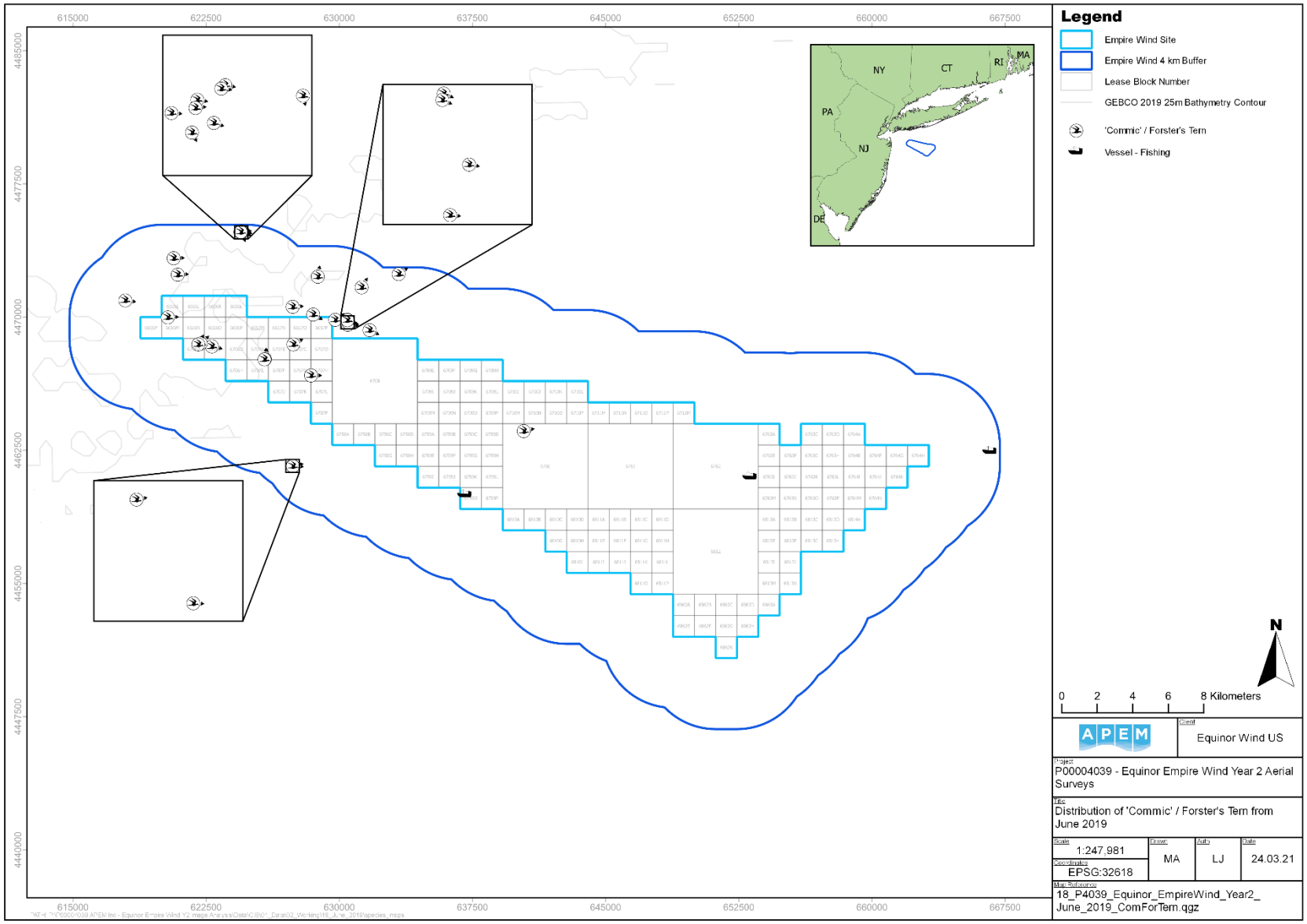

Figure 40 Distribution of 'commic' / Forster's tern recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.9.7 Forster's Tern *Sterna forsteri*

Forster's terns were recorded in Survey 18 only, with a grand total of three (**Table 45**).

All three Forster's terns were located in the northwest of the Survey Area (**Figure 41**).

Table 45 **Total counts and behaviors of Forster's terns in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 18	3	0	**3**

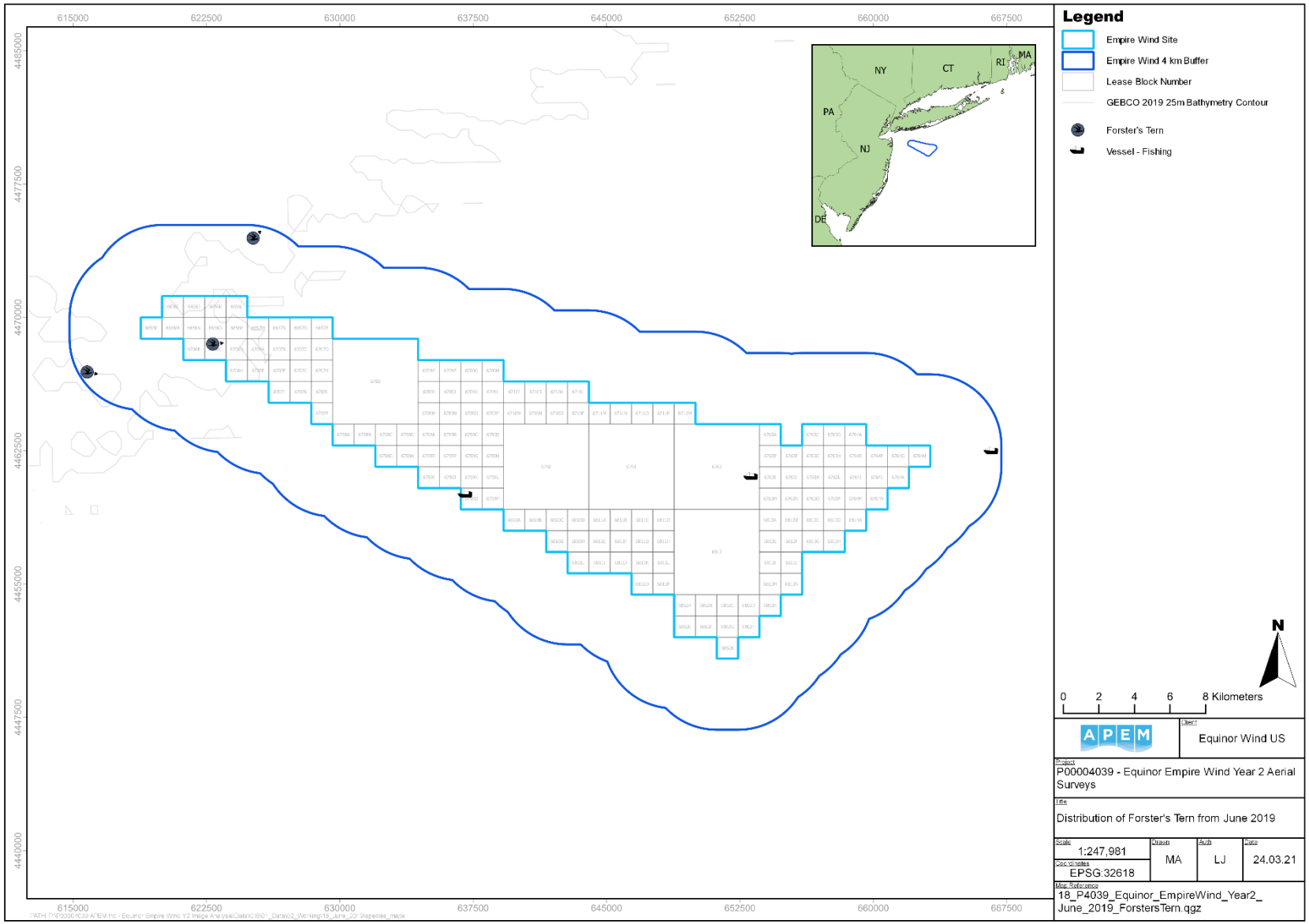

Figure 41 Distribution of Forster's tern recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.9.8 Sterna Tern – Unidentified *Sterna* spp.

Unidentified Sterna terns were recorded in Survey 17 and 18 only, with a grand total of three. Highest numbers on a per-survey basis were recorded in Survey 17, totaling two (**Table 46**).

For Survey 18, a single unidentified Sterna tern was located in the center of the Survey Area, and for Survey 17 both unidentified Sterna terns were distributed in the northwest of the Survey Area (**Figure 42**).

Table 46 **Total counts and behaviors of unidentified Sterna terns in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Sitting	Flying	
Survey 17	2	0	**2**
Survey 18	0	1	**1**

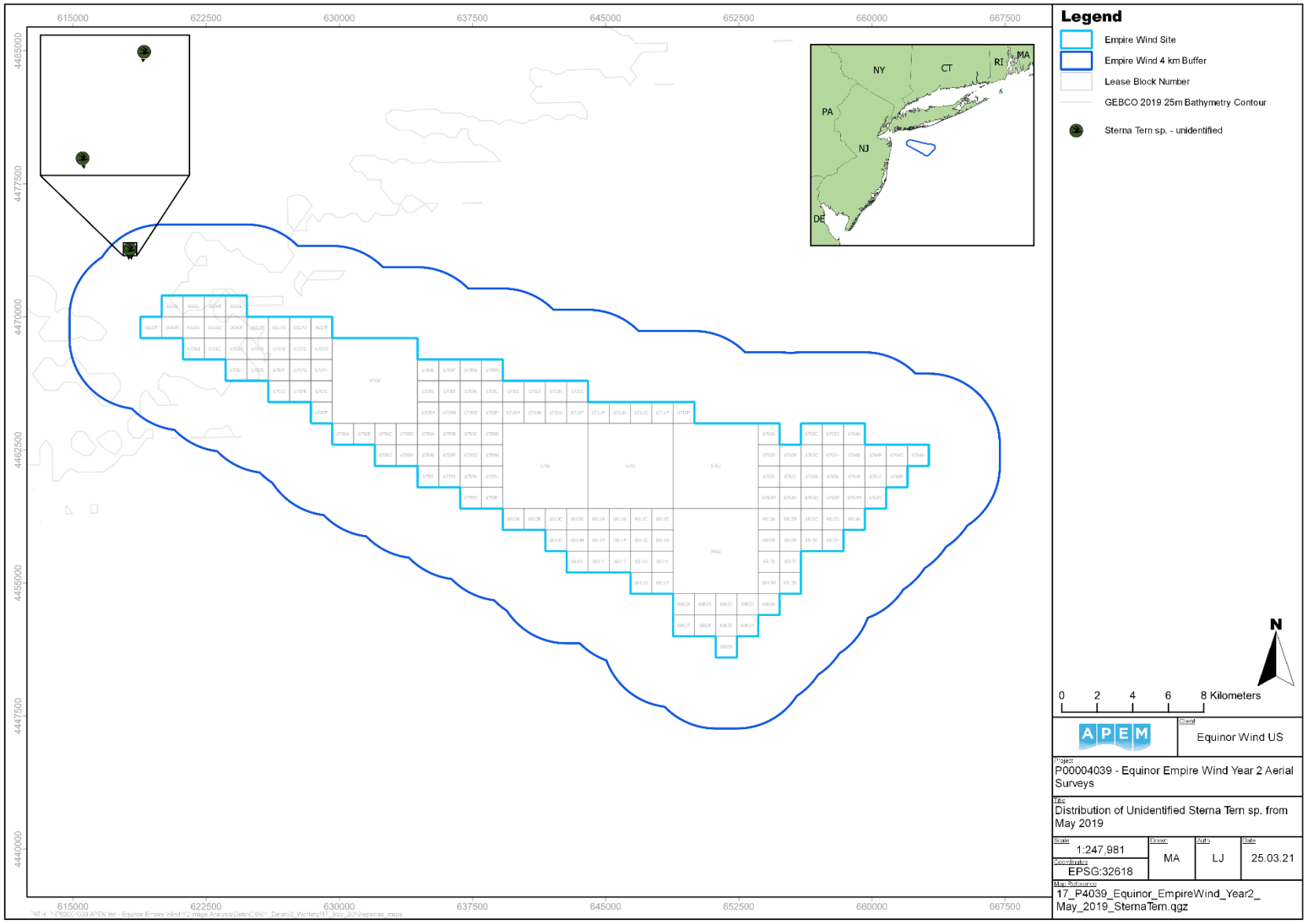

Figure 42 Distribution of unidentified Sterna tern recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 17

4.10 Other Avian

4.10.1 Passerine species – Unidentified Passeriformes

Unidentified passerines were recorded in Survey 19 only, with a grand total of three (**Table 47**).

Unidentified passerines were located in the center of the Survey Area (**Figure 43**).

Table 47 **Total counts and behaviors of unidentified passerines in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Flying	Sitting	
Survey 19	3	0	**3**

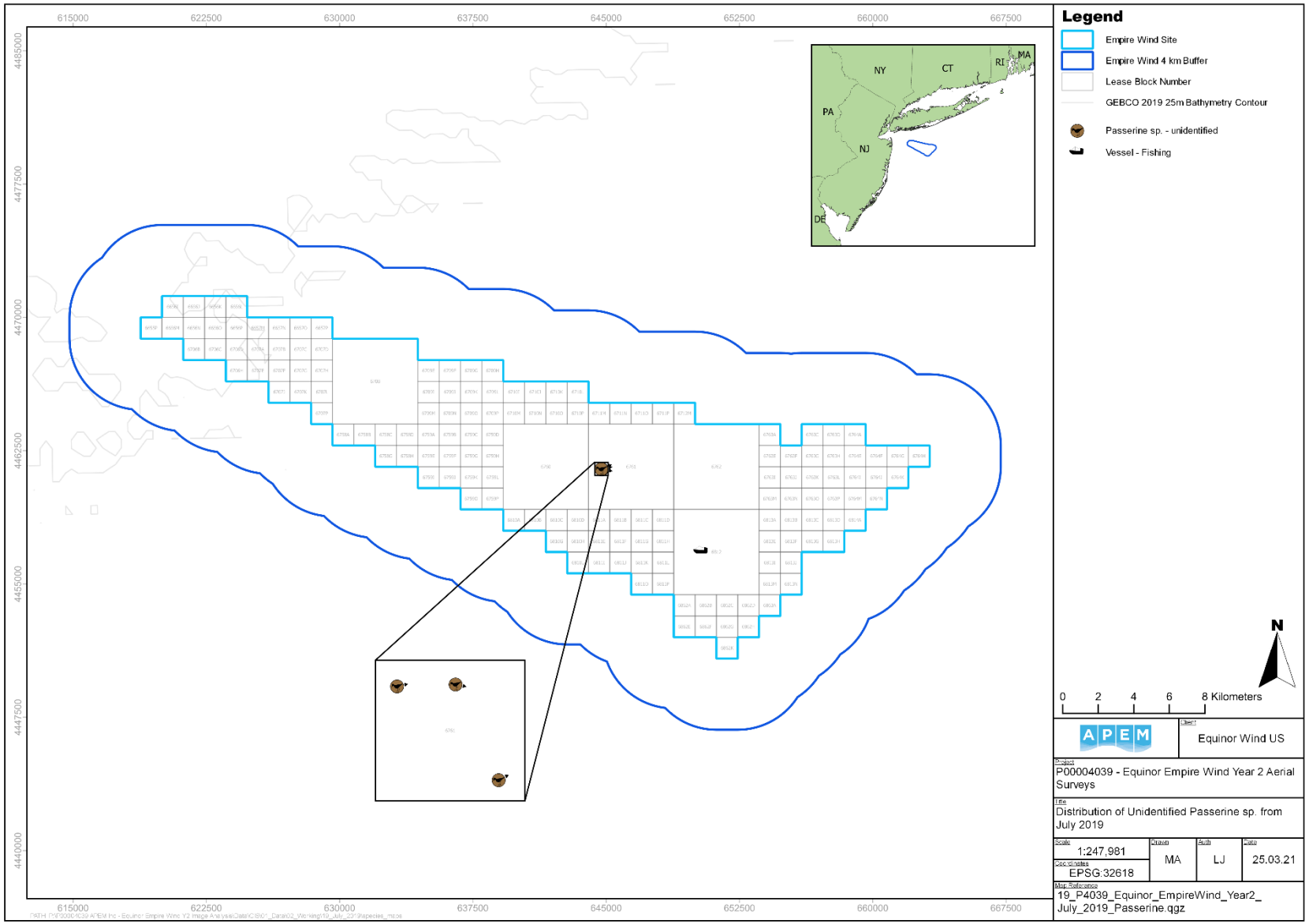

Figure 43 Distribution of unidentified passerine species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19

4.11 Reptiles

4.11.1 Loggerhead Turtle *Caretta caretta*

Loggerhead turtles were recorded in Surveys 18 to 22 inclusive, with a grand total of 25. Highest numbers on a per-survey basis were recorded in Survey 19, totaling nine (**Table 48**).

Loggerhead turtles were loosely distributed across the Survey Area for the majority of surveys, with Survey 20 exhibiting distribution restricted to the south. For Survey 19, distribution was loose across the Survey Area (**Figure 44**).

Table 48 **Total counts and behaviors of loggerhead turtles in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 18	4	0	**4**
Survey 19	9	0	**9**
Survey 20	6	0	**6**
Survey 21	5	0	**5**
Survey 22	1	0	**1**

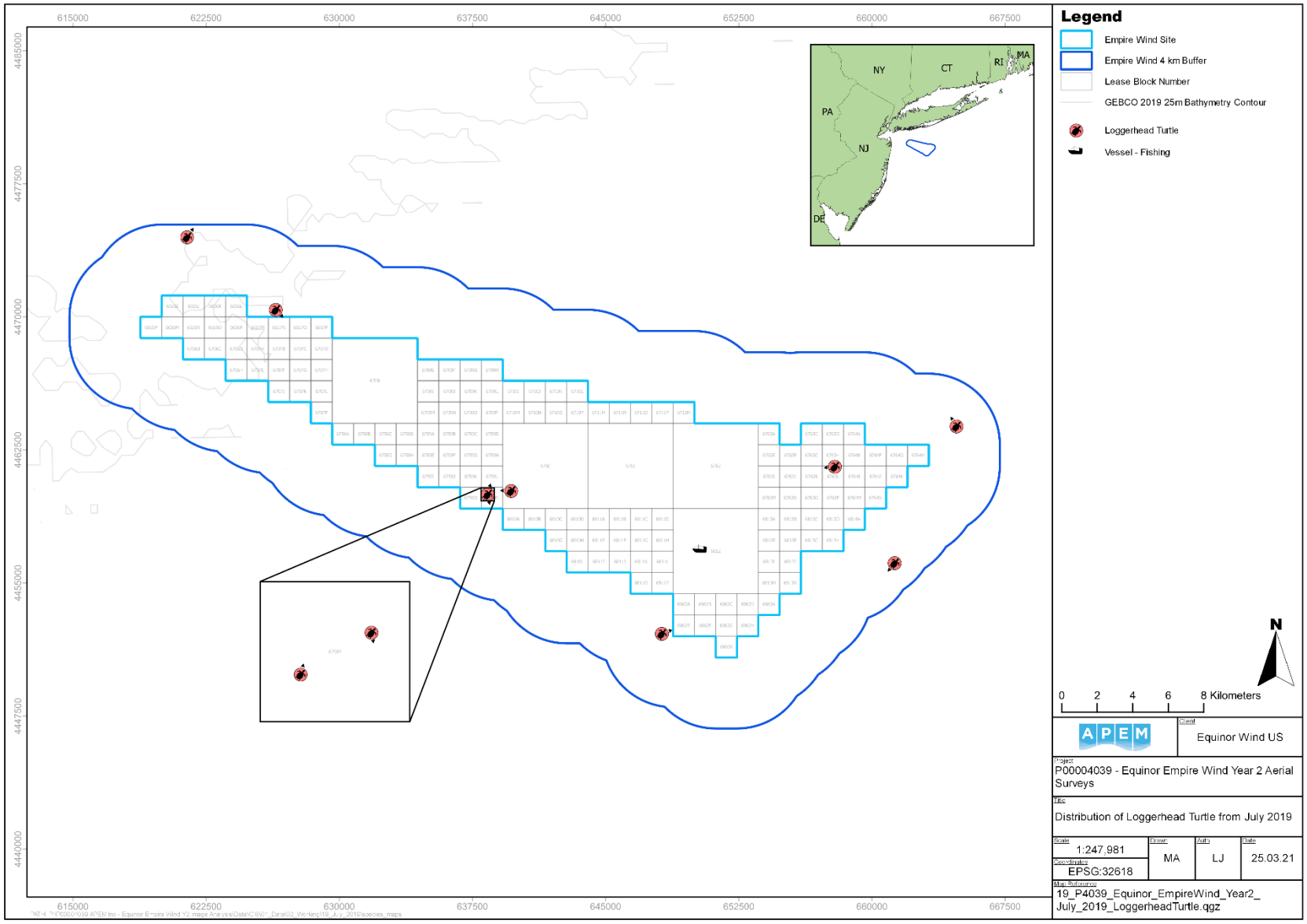

Figure 44 Distribution of loggerhead turtle recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19

4.11.2 Kemp's Ridley Turtle *Lepidochelys kempii*

Kemp's ridley turtles were recorded in Surveys 19 to 24 inclusive, with a grand total of 18. Highest numbers on a per-survey basis were recorded in Survey 21, totaling seven (**Table 49**).

Kemp's ridley turtles were loosely distributed across the Survey Area for all surveys, including Survey 21 (**Figure 45**).

Table 49 **Total counts and behaviors of Kemp's ridley turtles in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 19	4	0	**4**
Survey 20	3	0	**3**
Survey 21	7	0	**7**
Survey 22	2	0	**2**
Survey 23	1	0	**1**
Survey 24	1	0	**1**

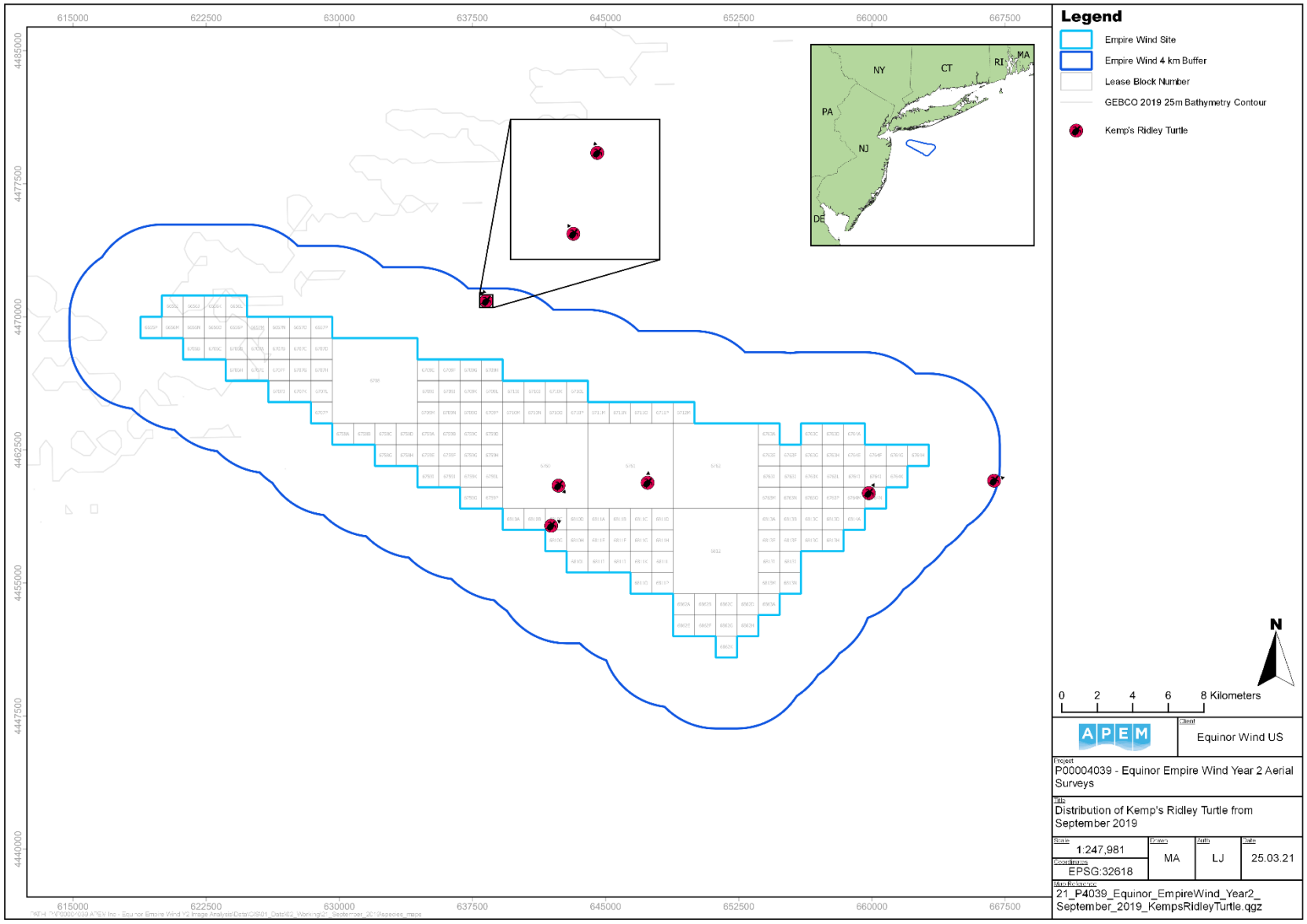

Figure 45 Distribution of Kemp's ridley turtle recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 21

4.11.3 Loggerhead / Kemp's Ridley Turtle *Caretta caretta / Lepidochelys kempii*

Loggerhead / Kemp's ridley turtles were recorded in Surveys 18 to 21 inclusive, with a grand total of 15. Highest numbers on a per-survey basis were recorded in Survey 18, totaling six (**Table 50**).

Loggerhead / Kemp's ridley turtles were loosely distributed across the Survey Area for all surveys, including Survey 18 (**Figure 46**).

Table 50 **Total counts and behaviors of loggerhead / Kemp's ridley turtles in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 18	6	0	**6**
Survey 19	4	0	**4**
Survey 20	2	0	**2**
Survey 21	3	1	**4**

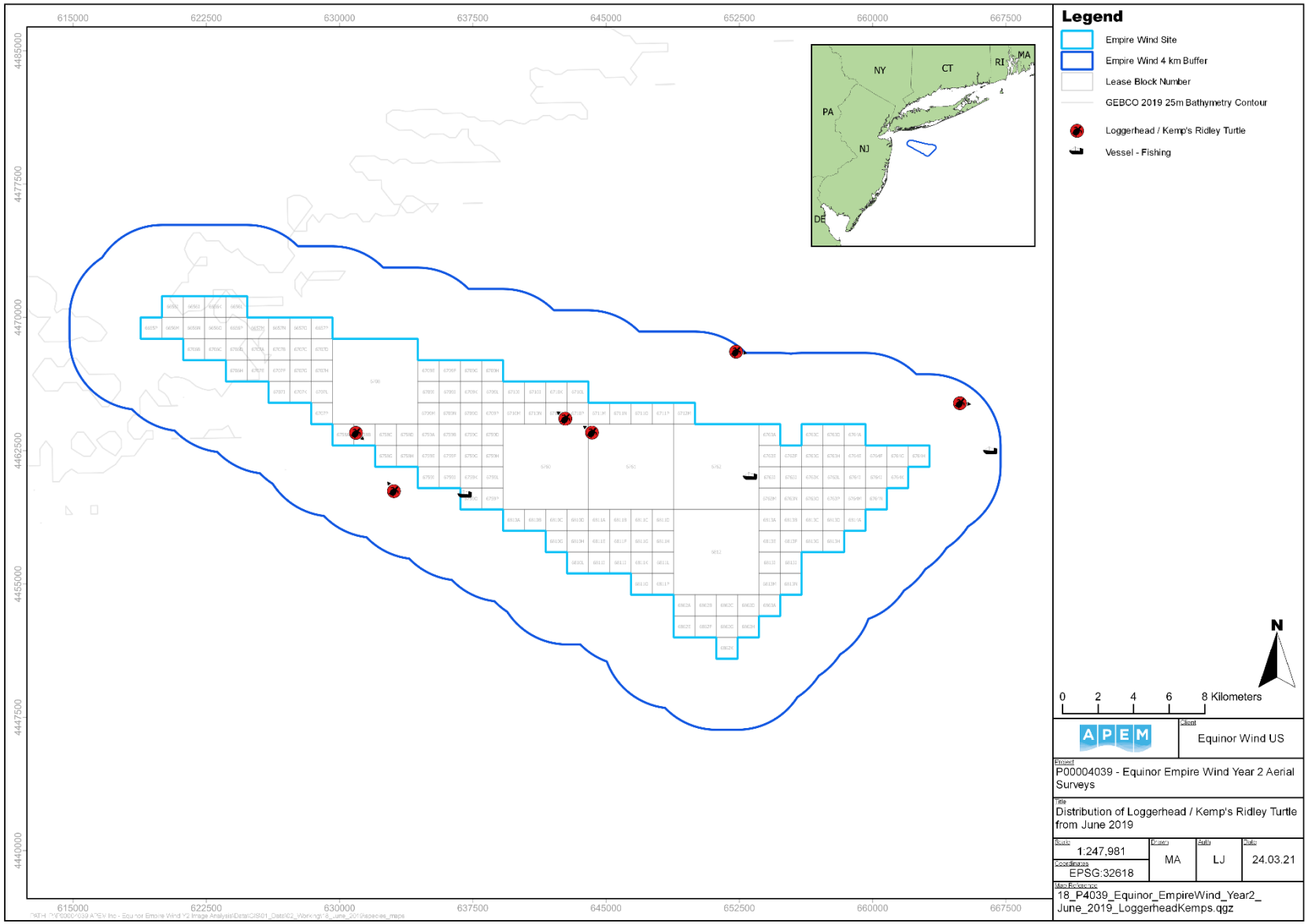

Figure 46 Distribution of loggerhead / Kemp's ridley turtle recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.11.4 Turtle Species – Unidentified Chelonioidea

Unidentified turtles were recorded in Surveys 19 to 21 inclusive, with a grand total of seven. Highest numbers on a per-survey basis were recorded in Survey 19, totaling five (**Table 51**).

Unidentified turtles were loosely distributed across the Survey Area for all surveys, including Survey 19 (**Figure 47**).

Table 51 **Total counts and behaviors of unidentified turtles in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 19	5	0	**5**
Survey 20	1	0	**1**
Survey 21	1	0	**1**

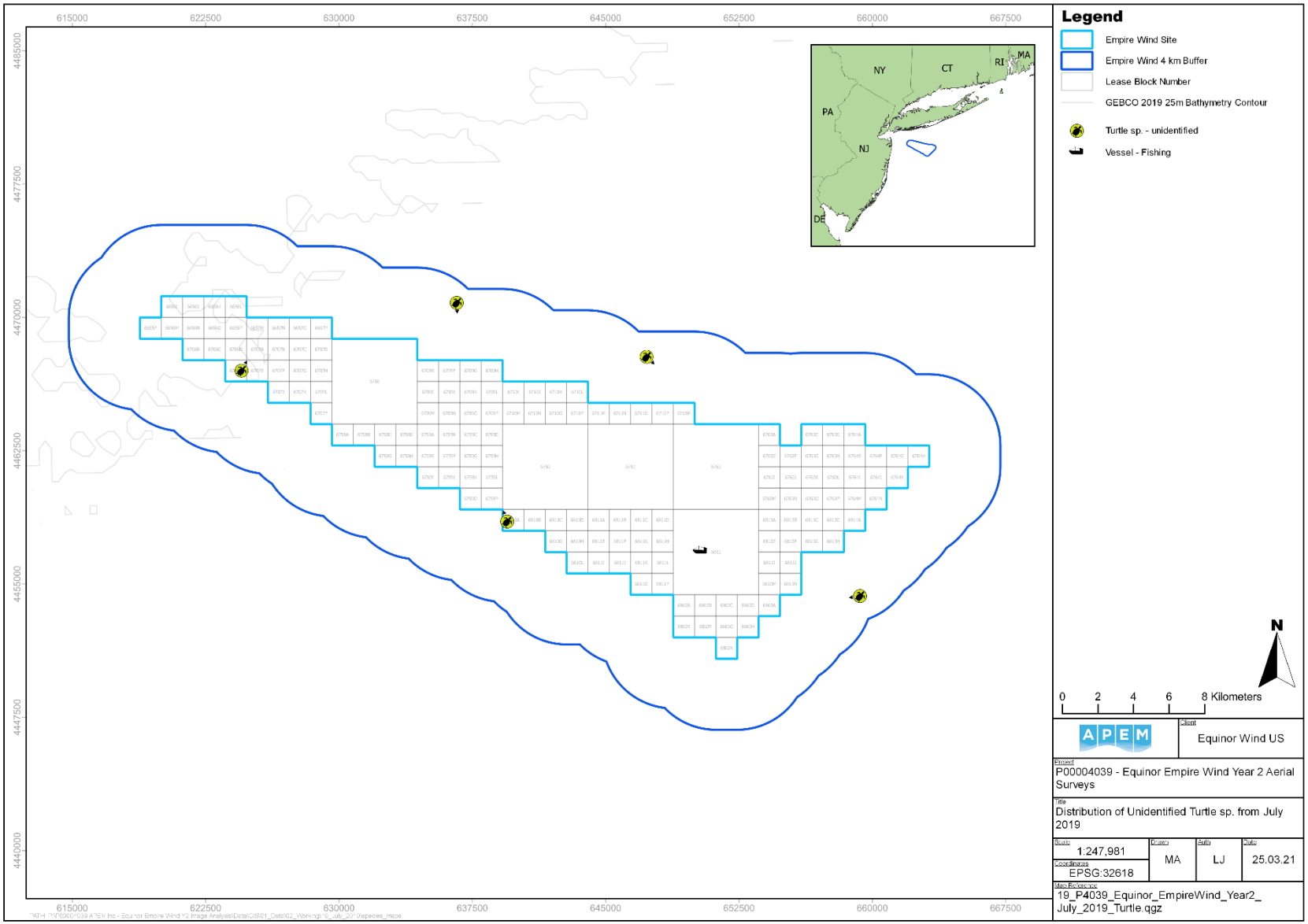

Figure 47 Distribution of unidentified turtle species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19

4.12 Marine Mammals

4.12.1 Seal species – Unidentified Phocidae

Unidentified seals were recorded in Surveys 13 and 24, with a grand total of three. The highest numbers on a per-survey basis were recorded in Survey 13, totaling two (**Table 52**).

Unidentified seals were loosely distributed across the Survey Area (**Figure 48**).

Table 52 **Total counts and behaviors of unidentified seals in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 13	2	0	**2**
Survey 24	1	0	**1**

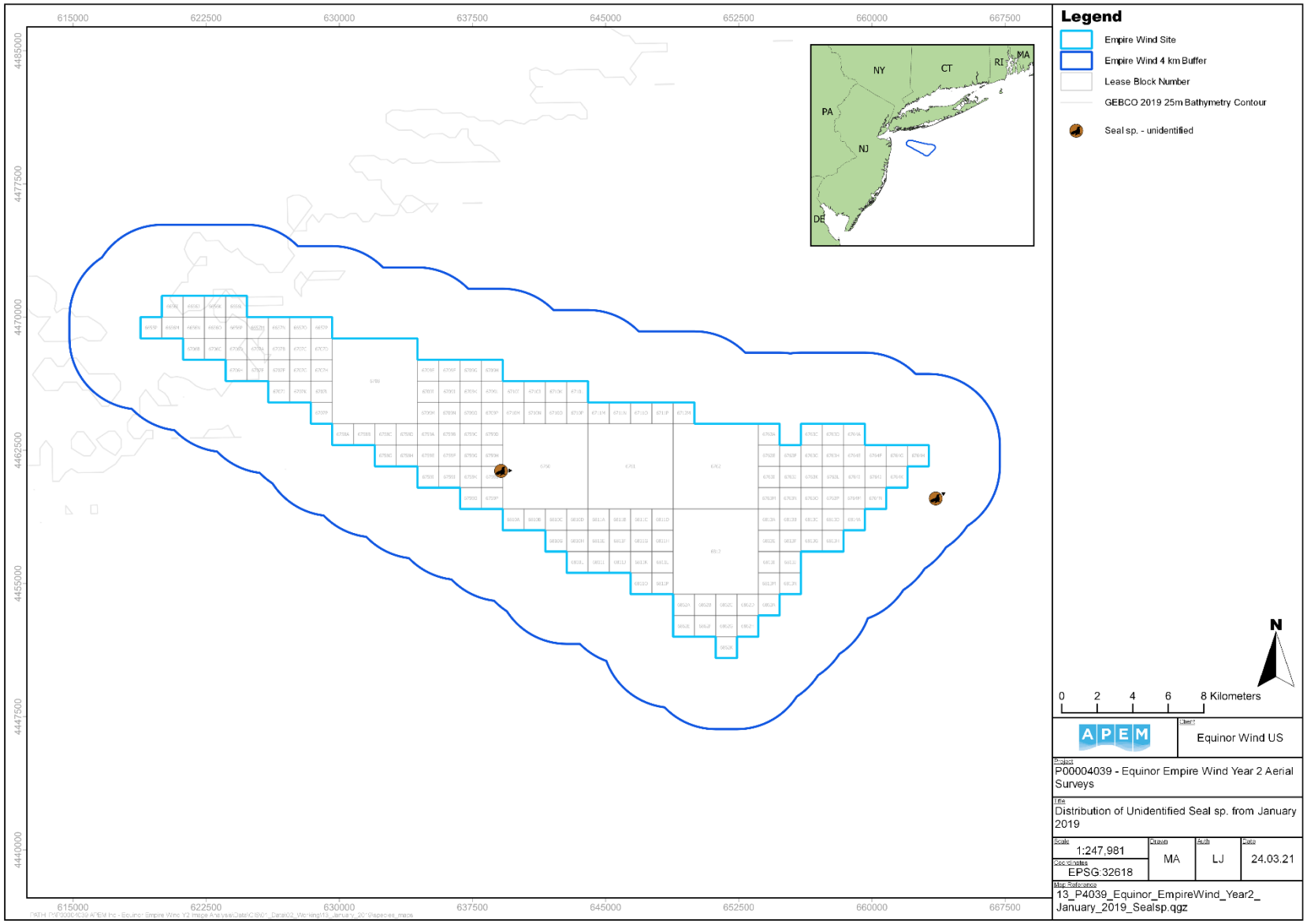

Figure 48 Distribution of unidentified seals recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 13

4.12.2 Common Minke Whale *Balaenoptera acutorostrata*

Common minke whales were recorded in Surveys 17 and 20 only, with a grand total of two. Highest numbers recorded on a per-survey basis were from both surveys as each survey totaled one (**Table 53**).

Common minke whales were located in the north and west of the Survey Area for Surveys 17 and 20 respectively (**Figure 49**).

Table 53 **Total counts and behaviors of common minke whales in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 17	1	0	**1**
Survey 20	1	0	**1**

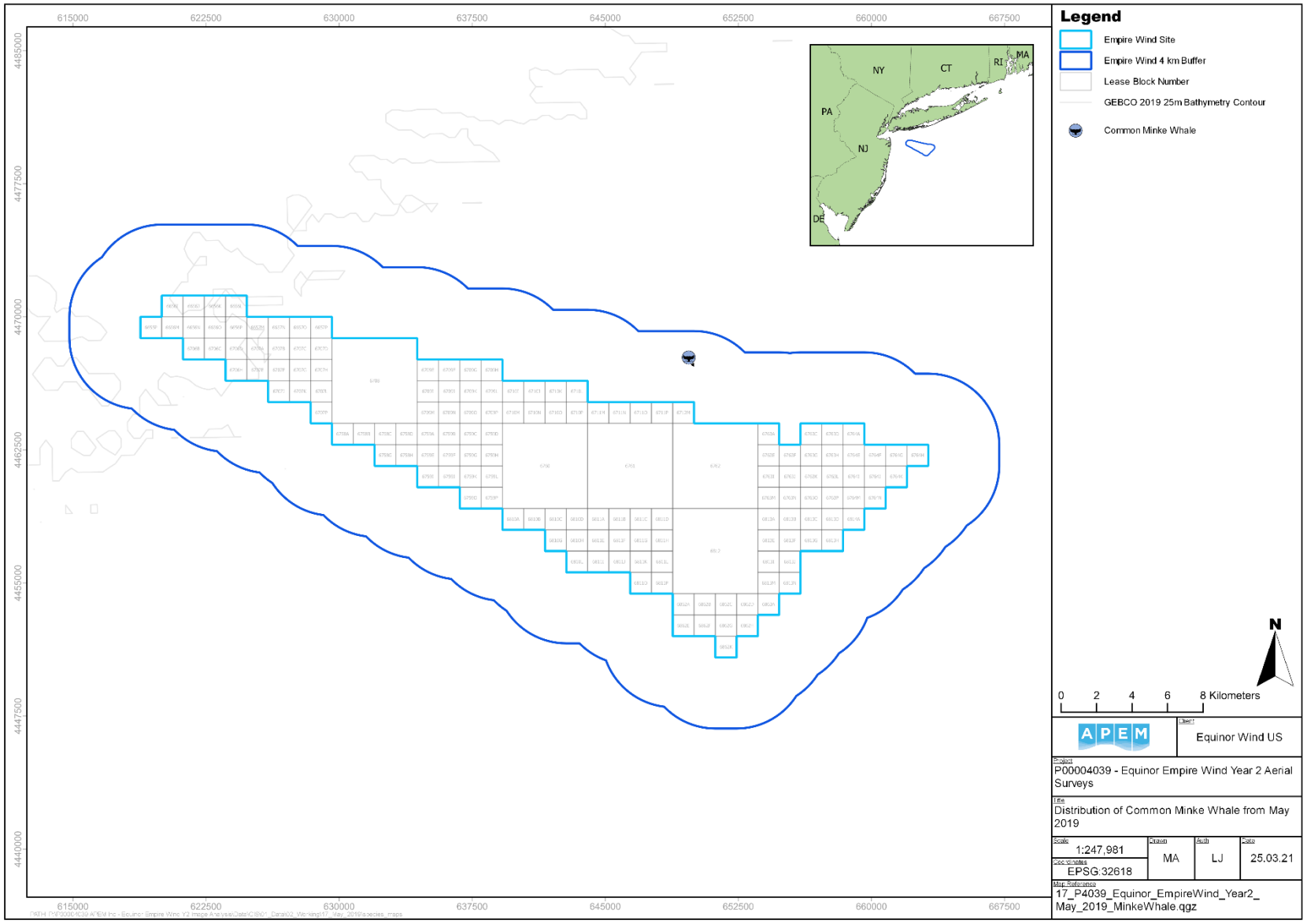

Figure 49 Distribution of common minke whale recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 17

4.12.3 Whale species – Unidentified Mysticeti / Physeteroidea

Unidentified whales were recorded in Survey 18 only, with a grand total of one individual (**Table 54**).

The single unidentified whale was located in the north of the Survey Area (**Figure 50**).

Table 54 **Total counts and behaviors of unidentified whales in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 18	1	0	**1**

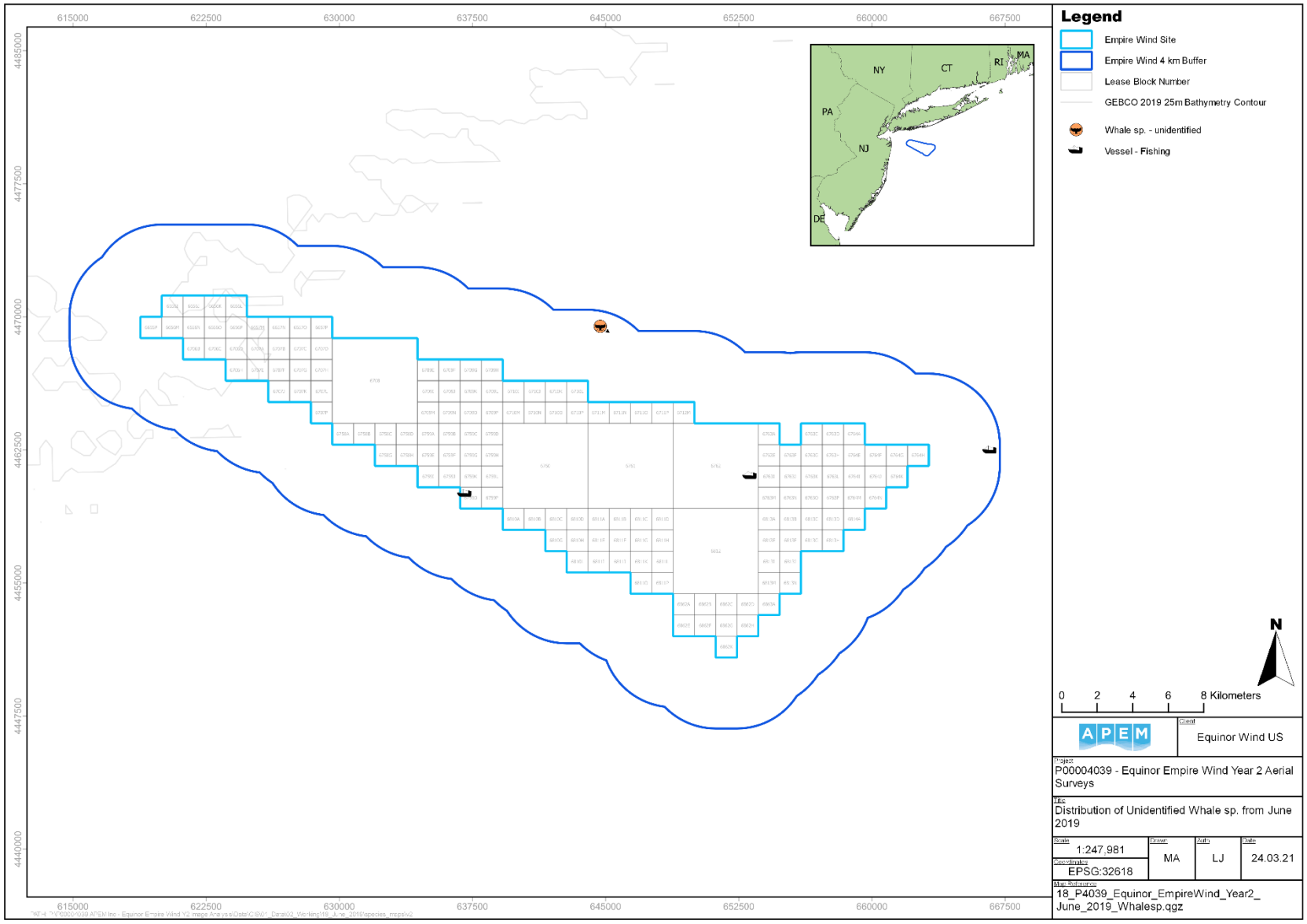

Figure 50 Distribution of unidentified whale species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.12.4 Common Dolphin *Delphinus delphis*

Common dolphins were recorded in Surveys 16, 18, 19, 21, 23, and 24, with a grand total of 128. The highest numbers on a per-survey basis were recorded in Survey 19, totaling 42 (**Table 55**).

For each of the surveys, common dolphins were located in groups predominantly in the southeastern half of the Survey Area (**Figure 51**).

Table 55 **Total counts and behaviors of common dolphins in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 16	6	0	**6**
Survey 18	15	3	**18**
Survey 19	38	4	**42**
Survey 21	28	10	**38**
Survey 23	2	0	**2**
Survey 24	21	1	**22**

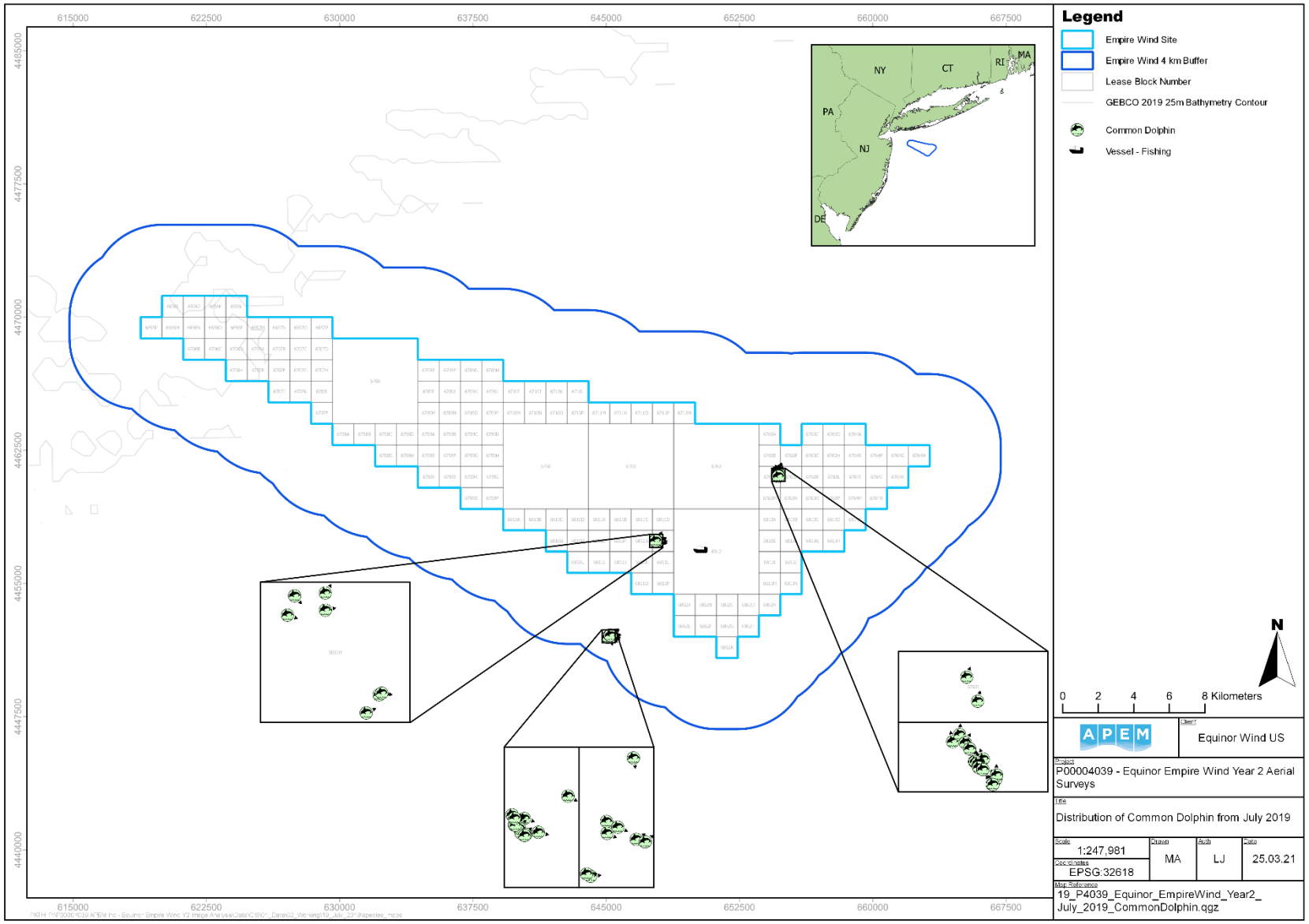

Figure 51 Distribution of common dolphin recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19

4.12.5 Common Bottlenose Dolphin *Tursiops truncatus*

Common bottlenose dolphins were recorded in Survey 18 only, with a grand total of three (**Table 56**).

Common bottlenose dolphins were located in a group in the northwest of the Survey Area (**Figure 52**).

Table 56 **Total counts and behaviors of common bottlenose dolphins in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 18	3	0	**3**

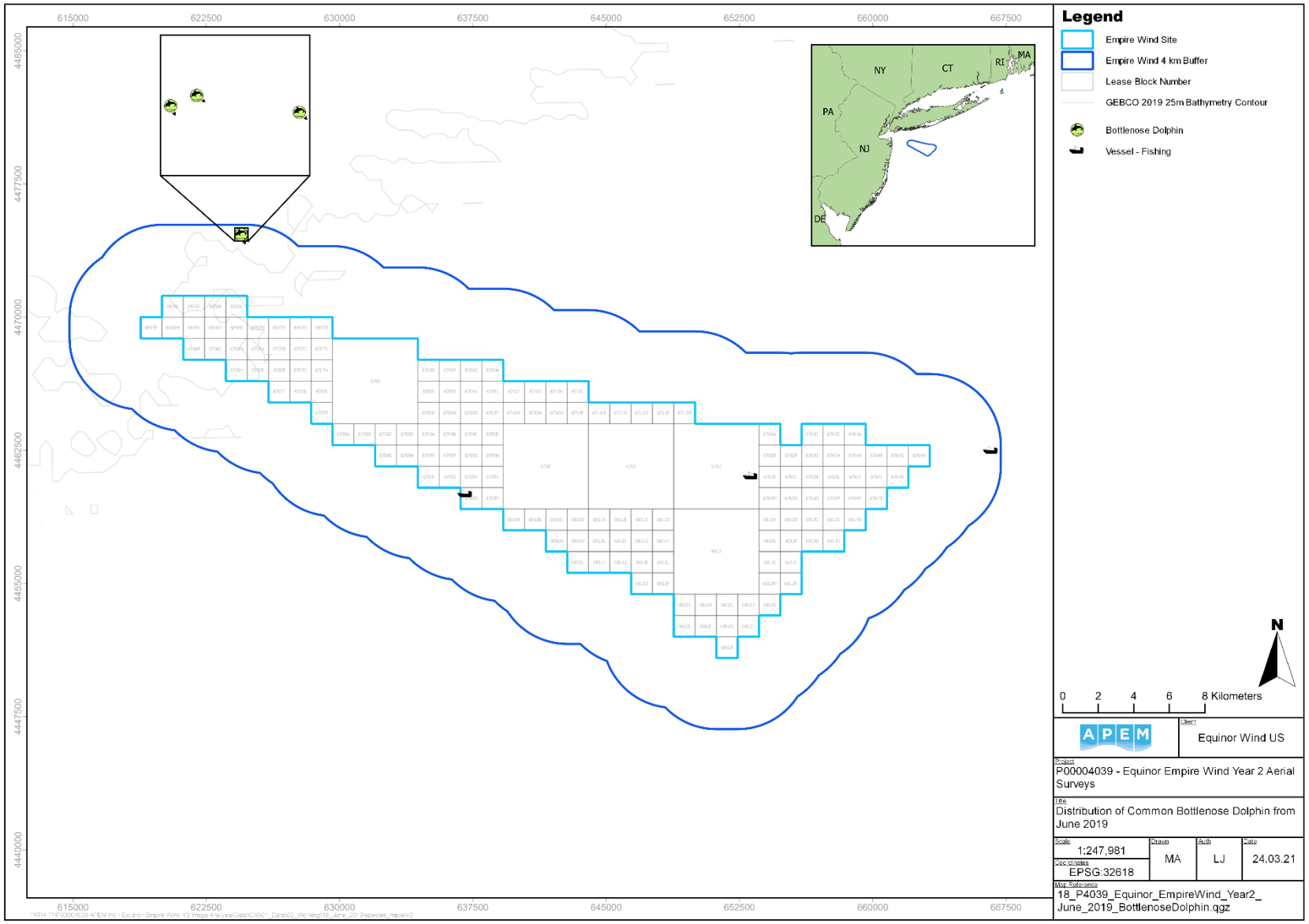

Figure 52 Distribution of common bottlenose dolphin recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.12.6 Common / Atlantic White-sided Dolphin *Delphinus delphis / Lagenorhynchus acutus*

Common / Atlantic white-sided dolphins were recorded in Survey 16 only, with a grand total of eight (**Table 57**).

Common / Atlantic white-sided dolphins were located in a group to the southeast of the center of the Survey Area (**Figure 53**).

Table 57 **Total counts and behaviors of common / Atlantic white-sided dolphins in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 16	8	0	**8**

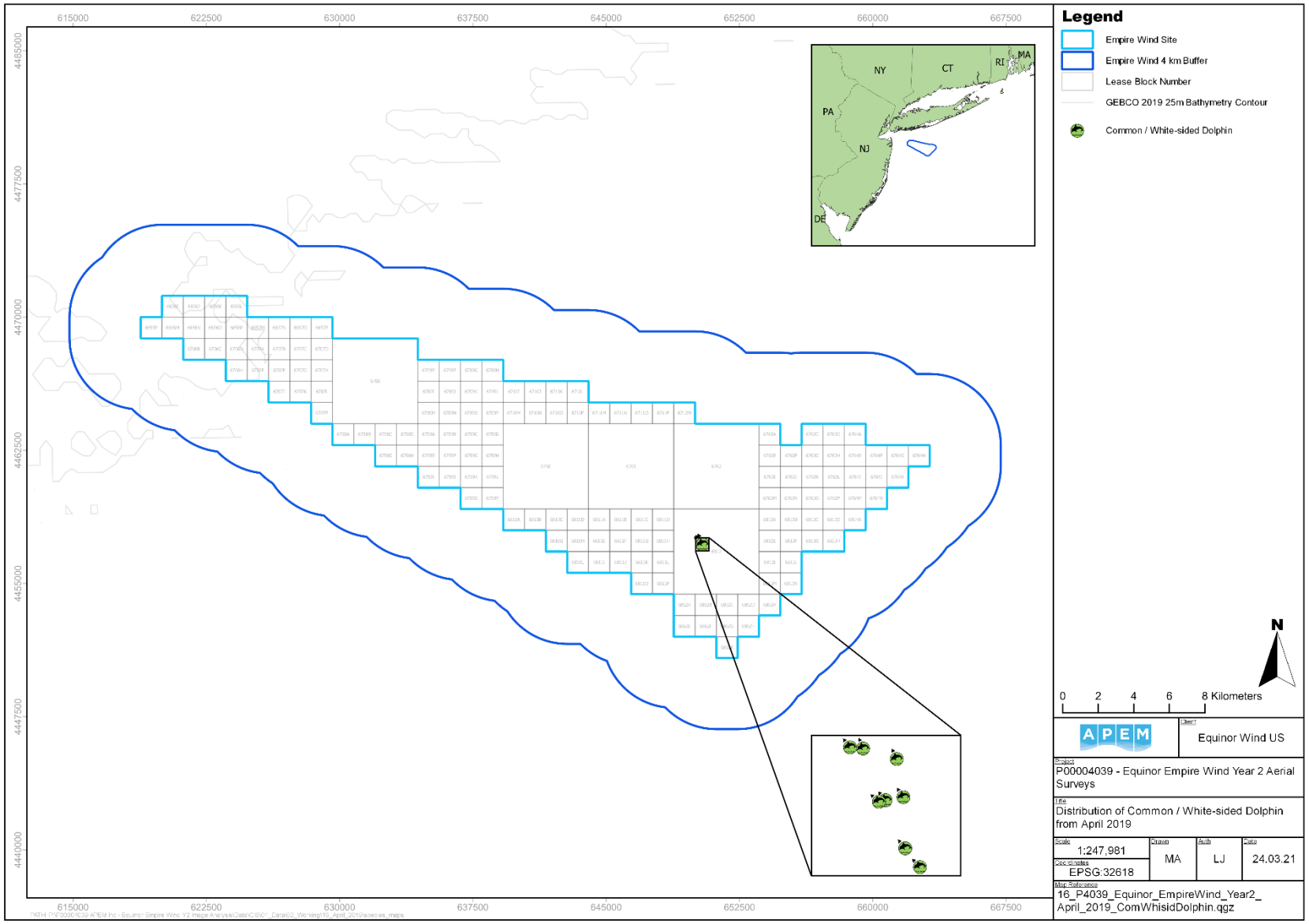

Figure 53 Distribution of common / Atlantic white-sided dolphin recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 16

4.12.7 Dolphin species – Unidentified Delphinidae

Unidentified dolphins were recorded in Surveys 18, 19, and 24, with a grand total of nine (**Table 58**).

Unidentified dolphins were located in two groups; one to the southeast of the center of the Survey Area, and one in the east of the Survey Area (**Figure 54**).

Table 58 **Total counts and behaviors of unidentified dolphins in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 18	3	0	**3**
Survey 19	1	0	**1**
Survey 24	5	0	**5**

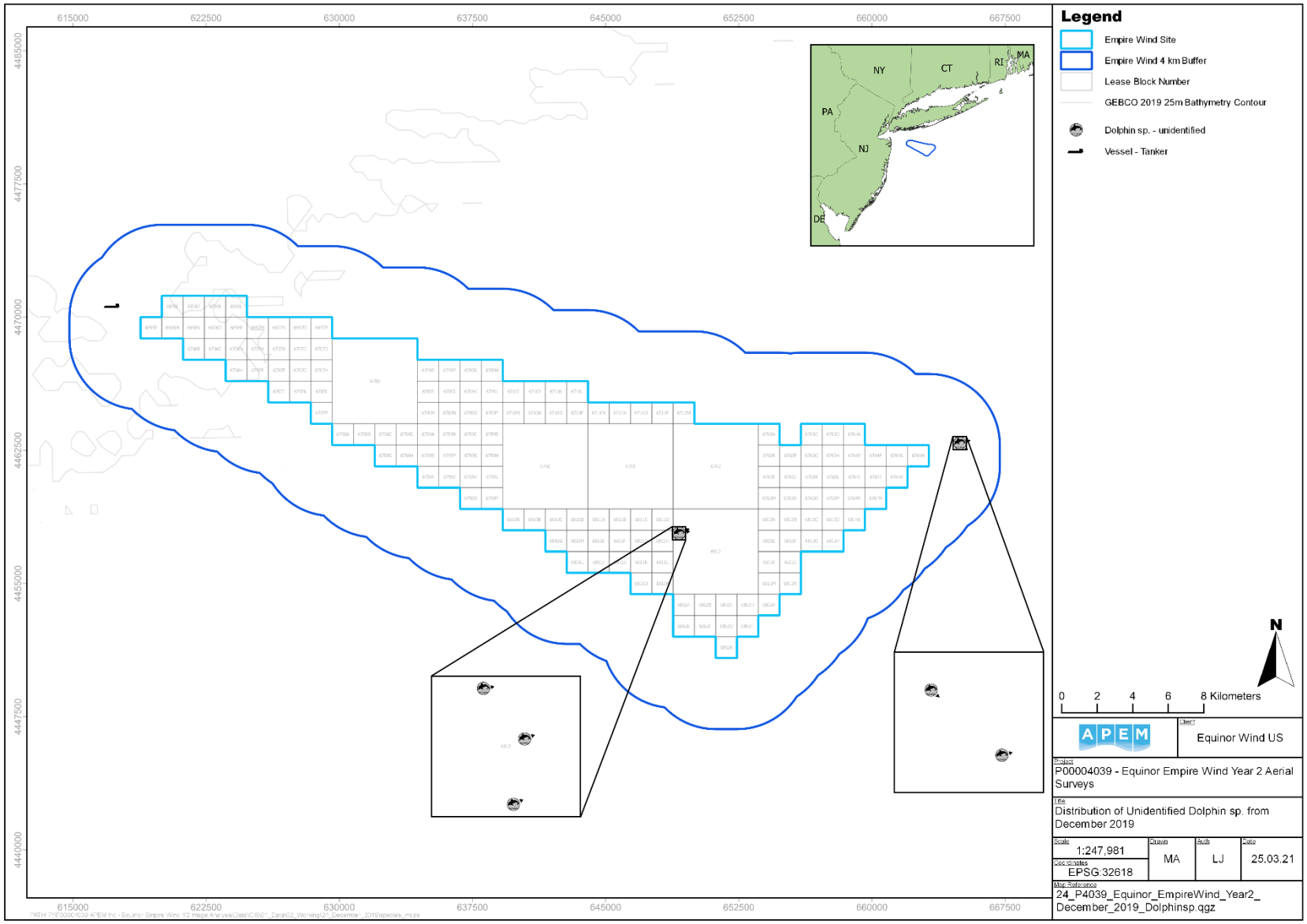

Figure 54 Distribution of unidentified dolphins recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 24

4.12.8 Harbor Porpoise *Phocoena phocoena*

Harbor porpoises were recorded in Surveys 13, 16, and 17, with a grand total of 13. Highest numbers on a per-survey basis were recorded in Survey 13, totaling seven (**Table 59**).

Harbor porpoises were distributed in the south to east for Surveys 16 and 17, and were predominantly located around the south of the Survey Area for Survey 13 (**Figure 55**).

Table 59 **Total counts and behaviors of harbor porpoises in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 13	7	0	**7**
Survey 16	2	0	**2**
Survey 17	4	0	**4**

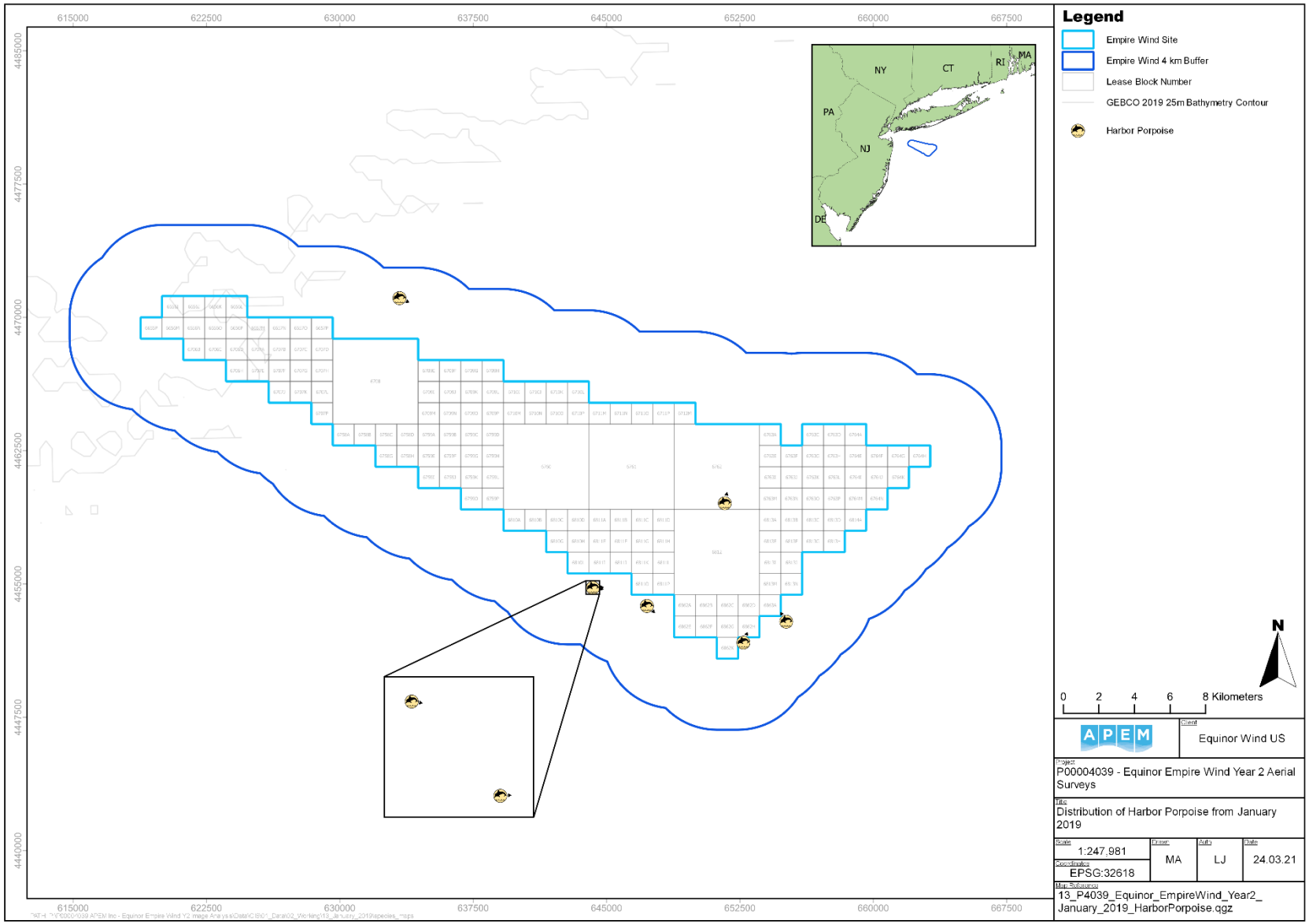

Figure 55 Distribution of harbor porpoise recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 13

4.12.9 Marine Mammal species – Unidentified Mammalia

Unidentified marine mammals were recorded in Surveys 14 and 19, with a grand total of 29. The highest numbers on a per-survey basis were recorded in Survey 14, totaling 28 (**Table 60**).

Unidentified marine mammals were loosely distributed across the Survey Area (**Figure 56**).

Table 60 **Total counts and behaviors of unidentified marine mammals in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 14	23	5	**28**
Survey 19	1	0	**1**

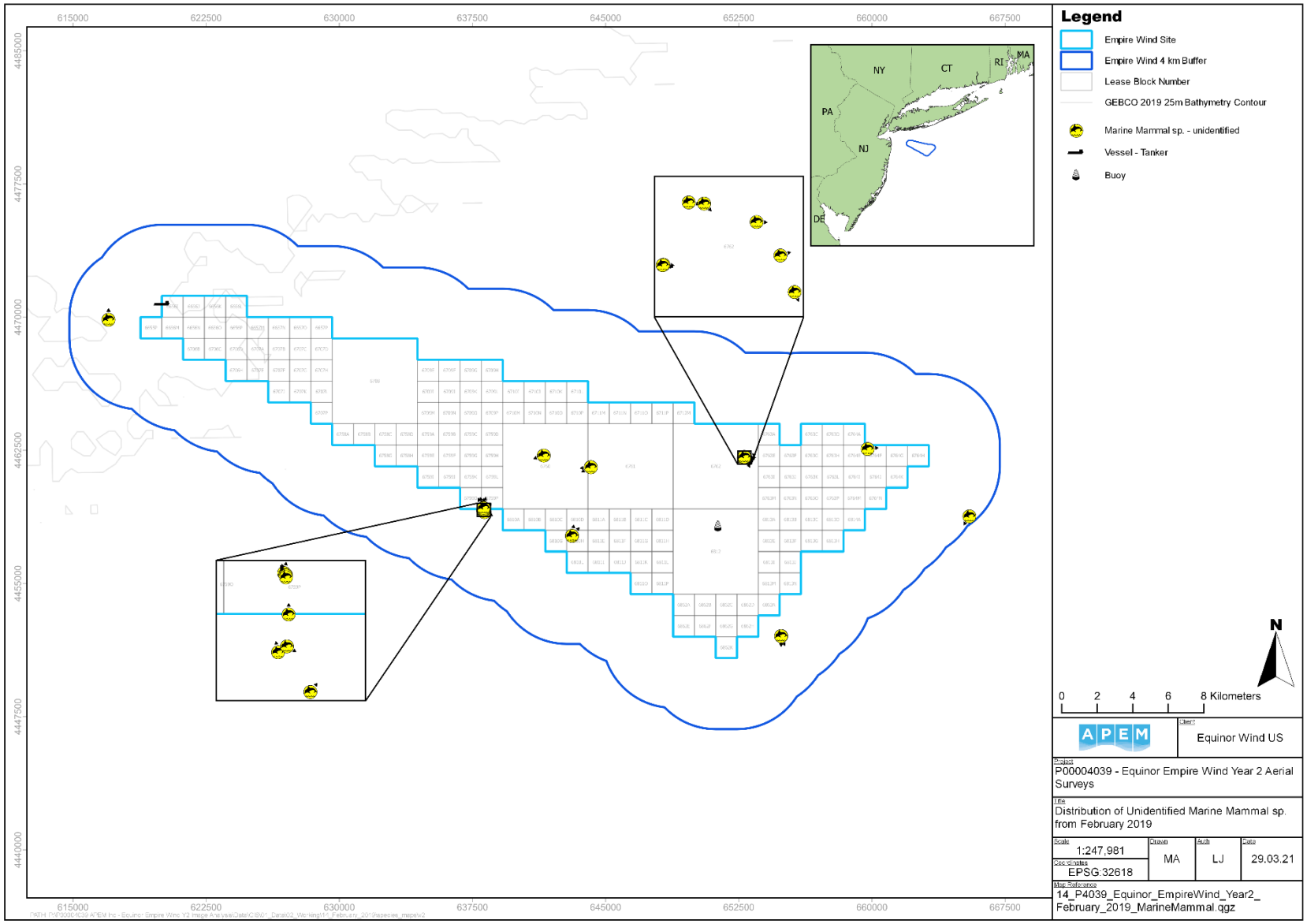

Figure 56 Distribution of unidentified marine mammals recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 14

4.13 Sharks & Rays

4.13.1 Cownose Ray *Rhinoptera bonasus*

Cownose rays were recorded in Survey 21 only, with a grand total of 812 (**Table 61**).

Cownose rays were predominantly distributed in various large shoals in the north of the Survey Area (**Figure 57**).

Table 61 **Total counts and behaviors of cownose rays in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 21	812	0	**812**

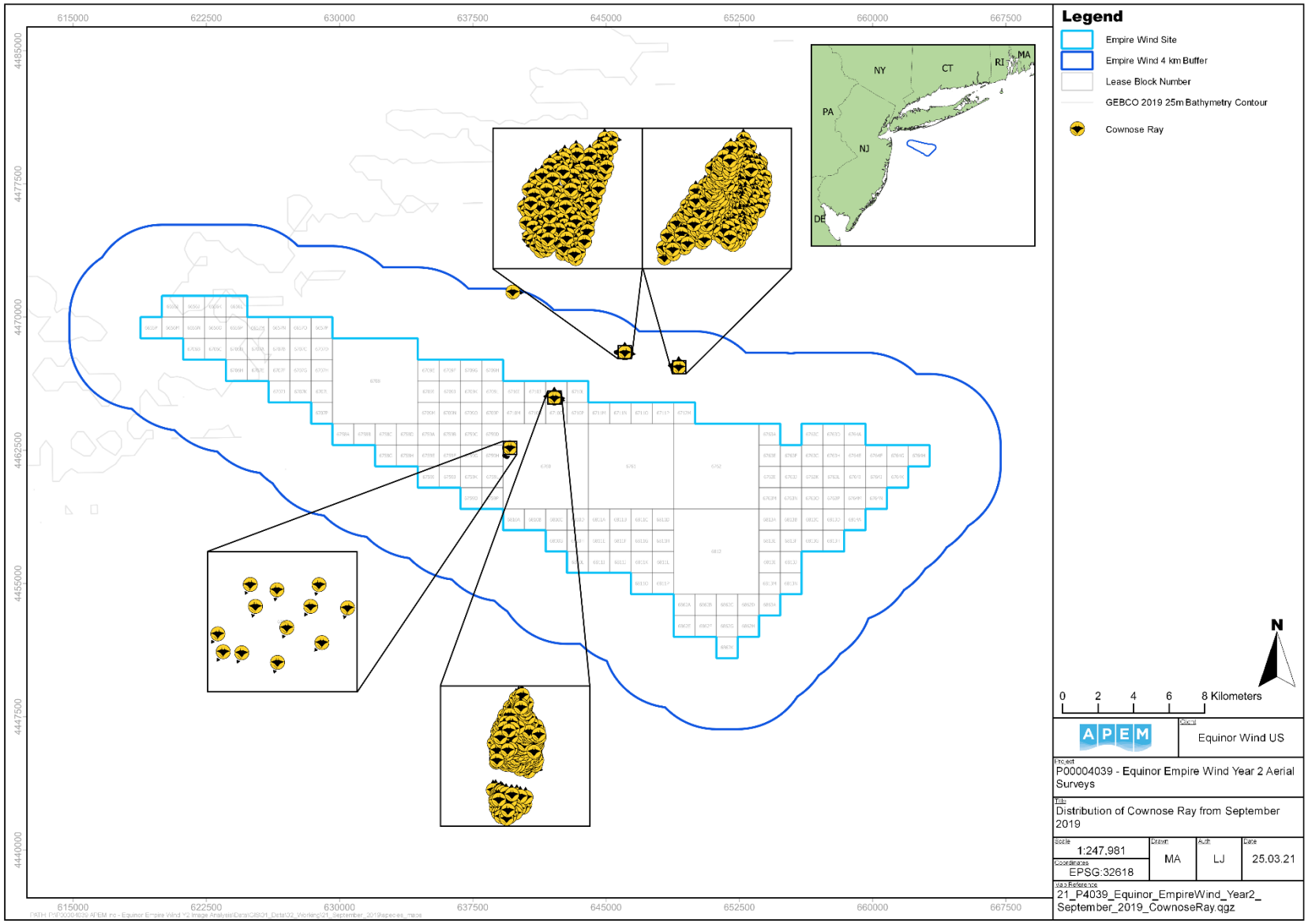

Figure 57 Distribution of cownose ray recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 21

4.13.2 Chilean Devil Ray *Mobula tarapacana*

A single Chilean devil ray was recorded in Survey 19 only (**Table 62**).

The single Chilean devil ray was located in the northeast of the Survey Area (**Figure 58**).

Table 62 **Total counts and behaviors of Chilean devil rays in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 19	1	0	**1**

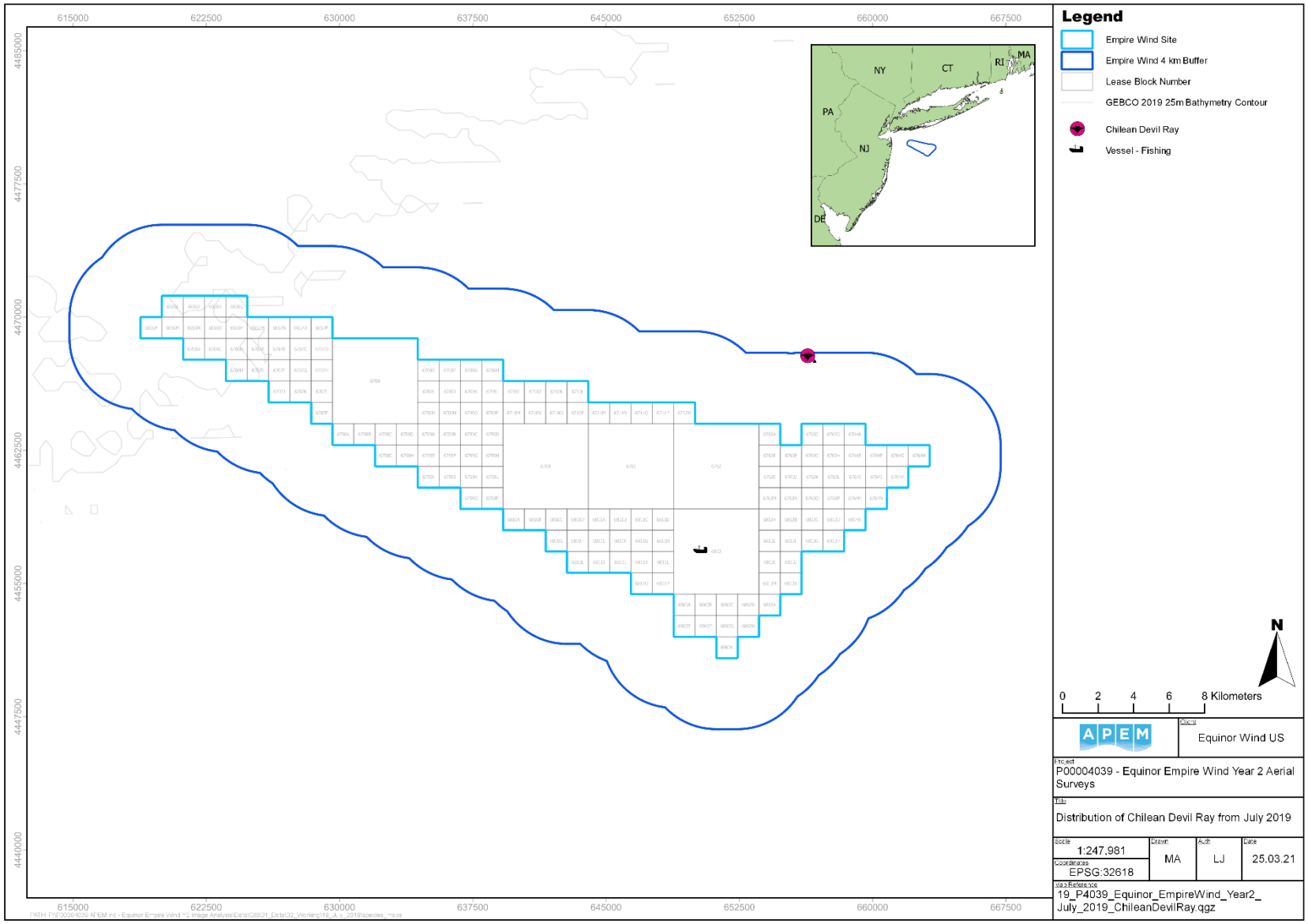

Figure 58 Distribution of Chilean devil ray recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19

4.13.3 Ray species – Unidentified Batoidea

A single unidentified ray was recorded in Survey 19 only (**Table 63**).

The single unidentified ray was located in the north-northeast of the Survey Area (**Figure 59**).

Table 63 **Total counts and behaviors of unidentified rays in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 19	1	0	**1**

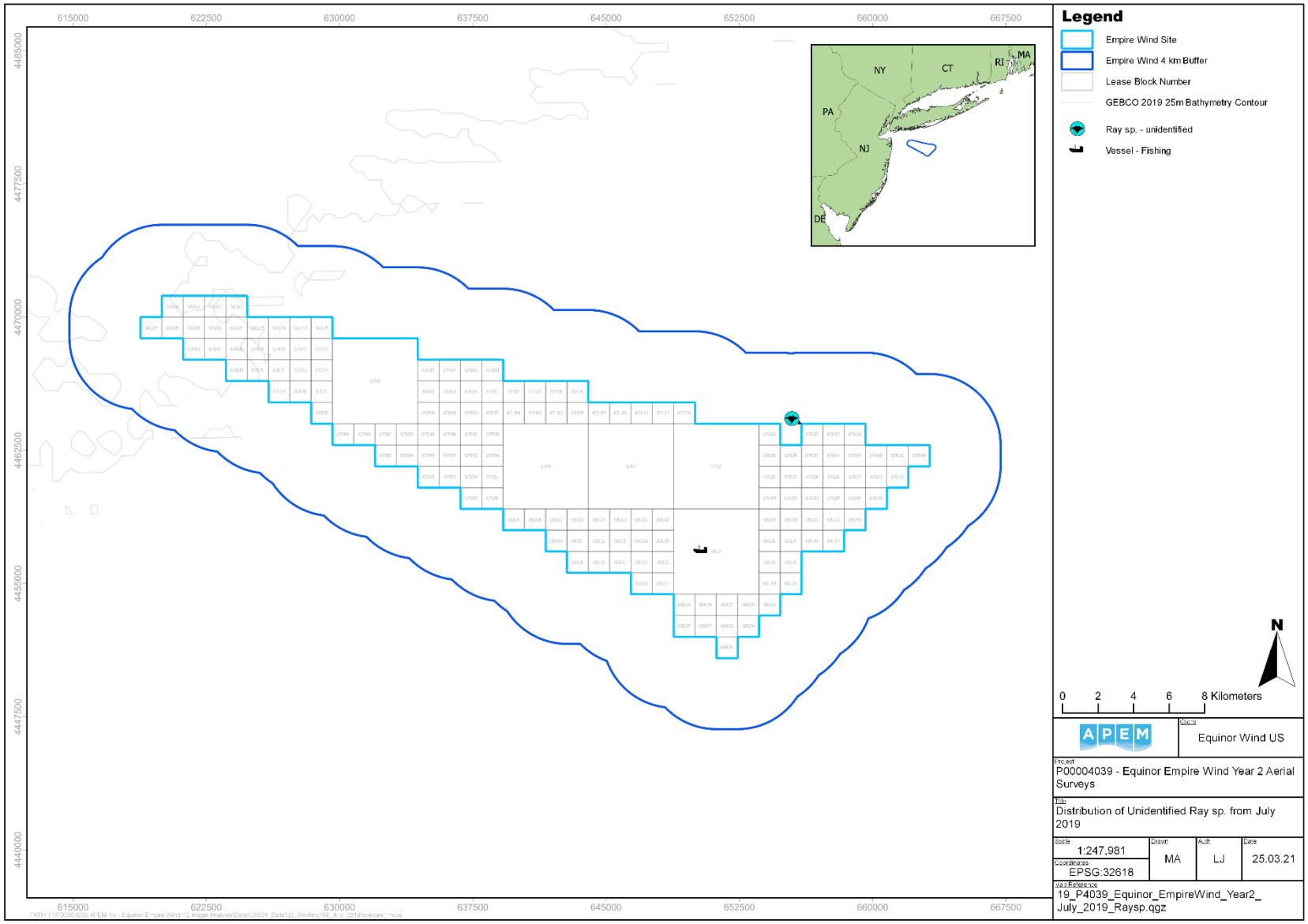

Figure 59 Distribution of unidentified ray species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19

4.13.4 Basking Shark *Cetorhinus maximus*

Basking sharks were recorded in Surveys 19, 21, and 22, with a grand total of three. The highest numbers on a per-survey basis were recorded in all three Surveys, as each totaled one (**Table 64**).

Basking sharks were loosely distributed across the Survey Area (**Figure 60**).

Table 64 **Total counts and behaviors of basking sharks in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 19	1	0	**1**
Survey 21	1	0	**1**
Survey 22	1	0	**1**

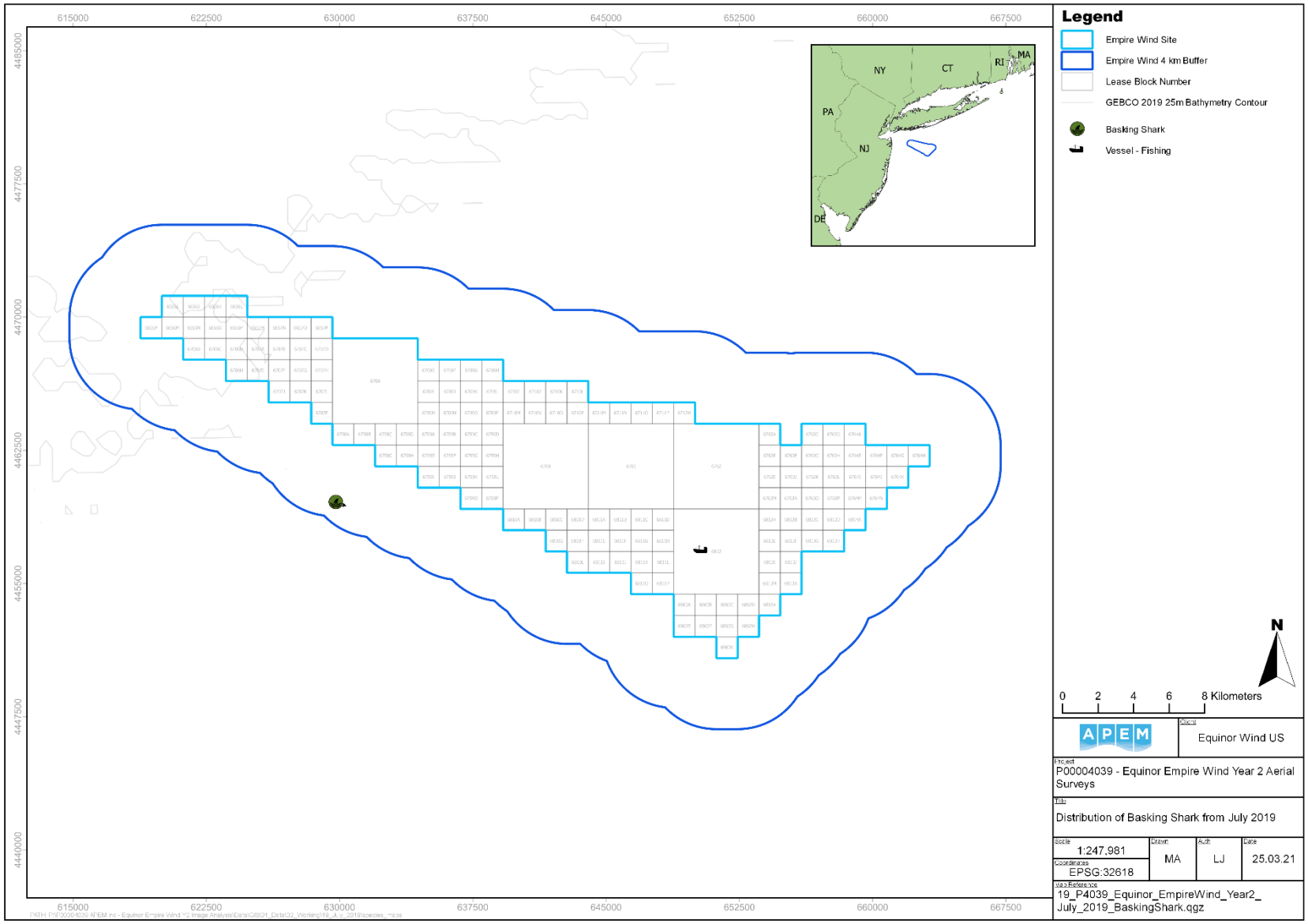

Figure 60 Distribution of basking shark recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19

4.13.5 White Shark *Carcharodon carcharias*

A single white shark was recorded in Survey 21 only (**Table 65**).

The single white shark was located northwest of the center of the Survey Area (**Figure 61**).

Table 65 **Total counts and behaviors of white sharks in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 21	1	0	**1**

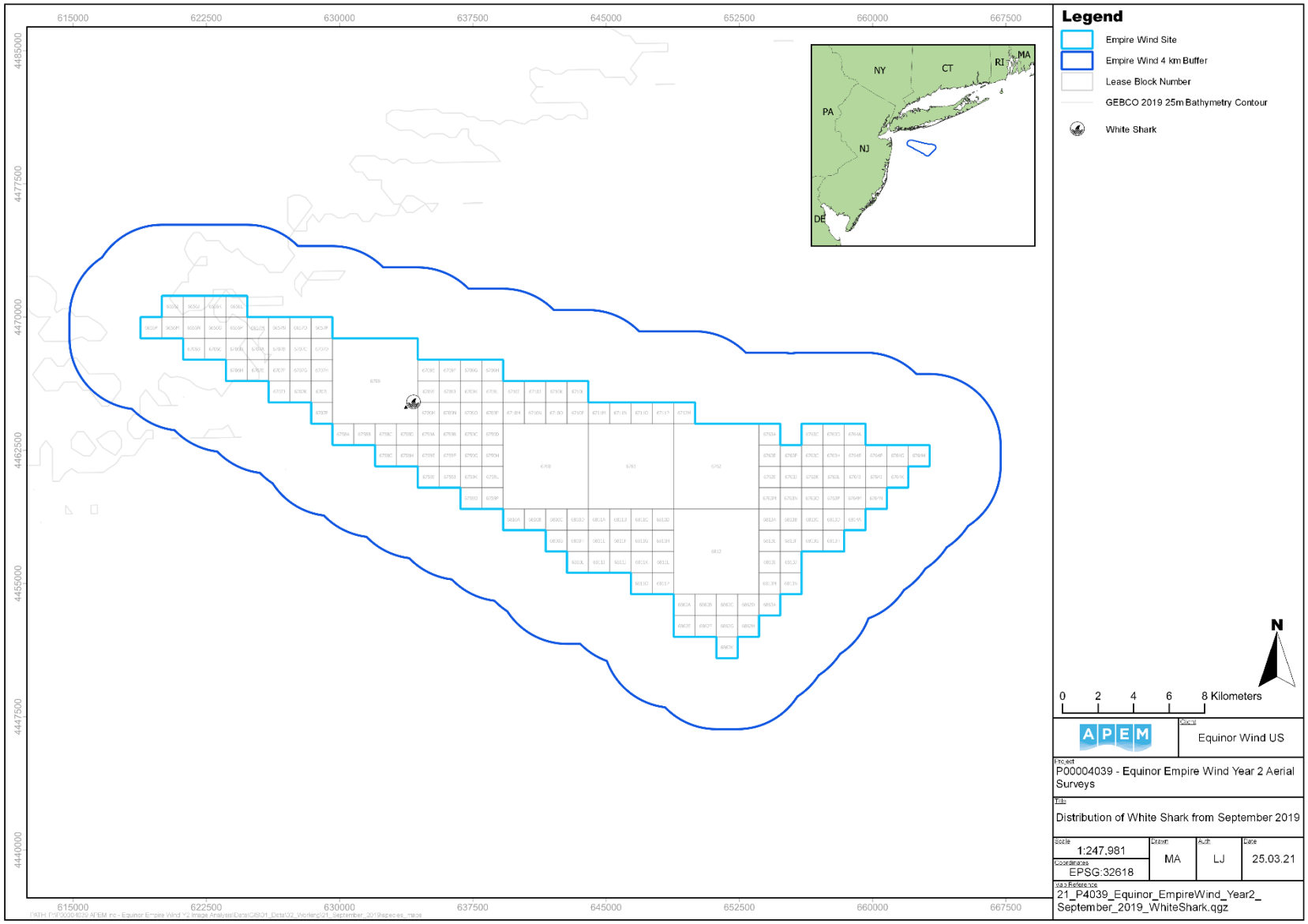

Figure 61 Distribution of white shark recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 21

4.13.6 Shortfin Mako *Isurus oxyrinchus*

A single shortfin mako was recorded in Survey 18 only (**Table 66**).

The single shortfin mako was located in the west-northwest of the Survey Area (**Figure 62**).

Table 66 **Total counts and behaviors of shortfin mako in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 18	1	0	**1**

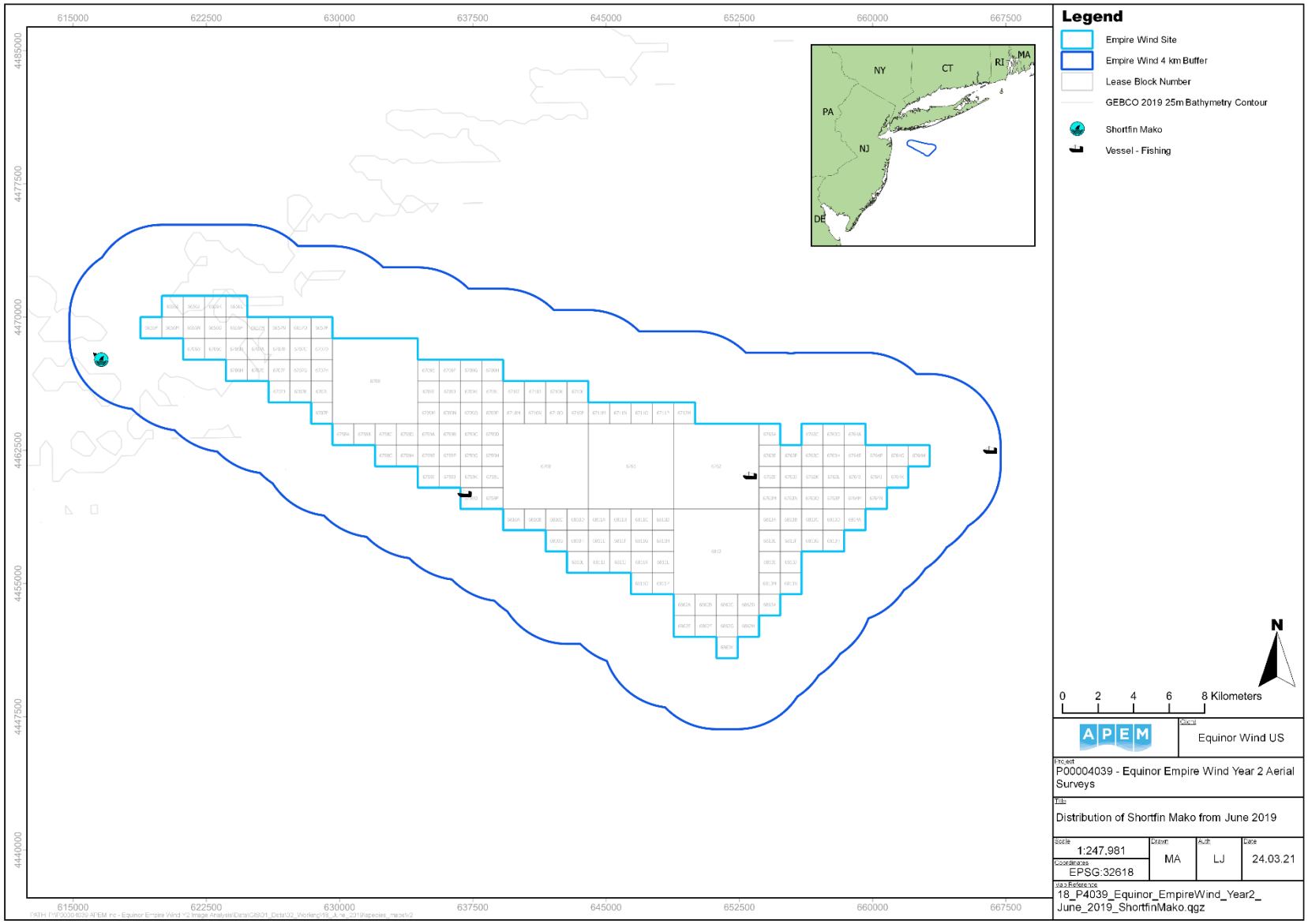

Figure 62 Distribution of shortfin mako recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.13.7 Blacktip Shark *Carcharhinus limbatus*

A single blacktip shark was recorded in Survey 20 only (**Table 67**).

The single blacktip shark was located in the north of the Survey Area (**Figure 63**).

Table 67 **Total counts and behaviors of blacktip sharks in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 20	1	0	**1**

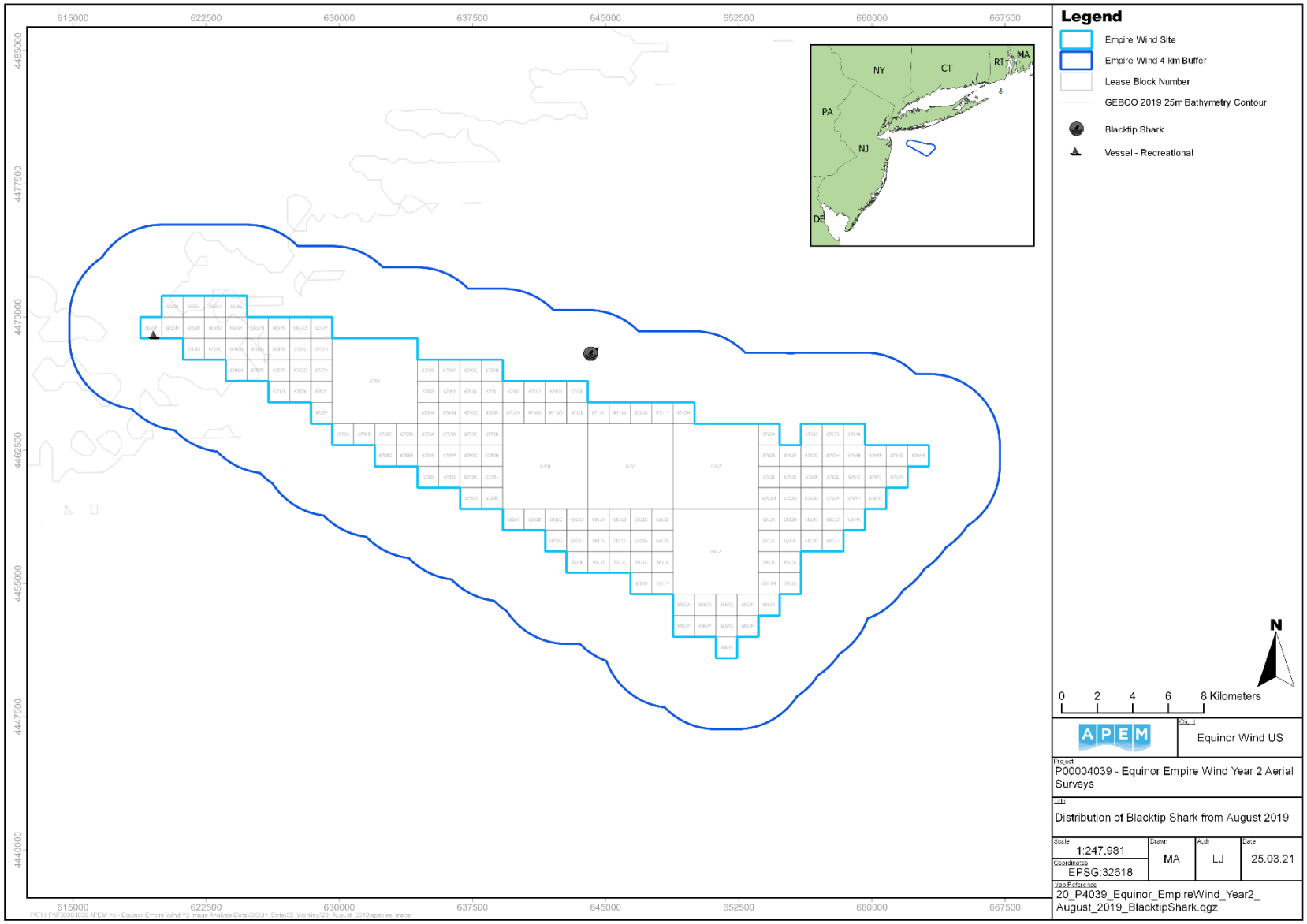

Figure 63 Distribution of blacktip shark recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 20

4.13.8 Blue Shark *Prionace glauca*

A single blue shark was recorded in Survey 18 only (**Table 68**).

The single blue shark was located in the center of the Survey Area (**Figure 64**).

Table 68 **Total counts and behaviors of blue sharks in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 18	1	0	**1**

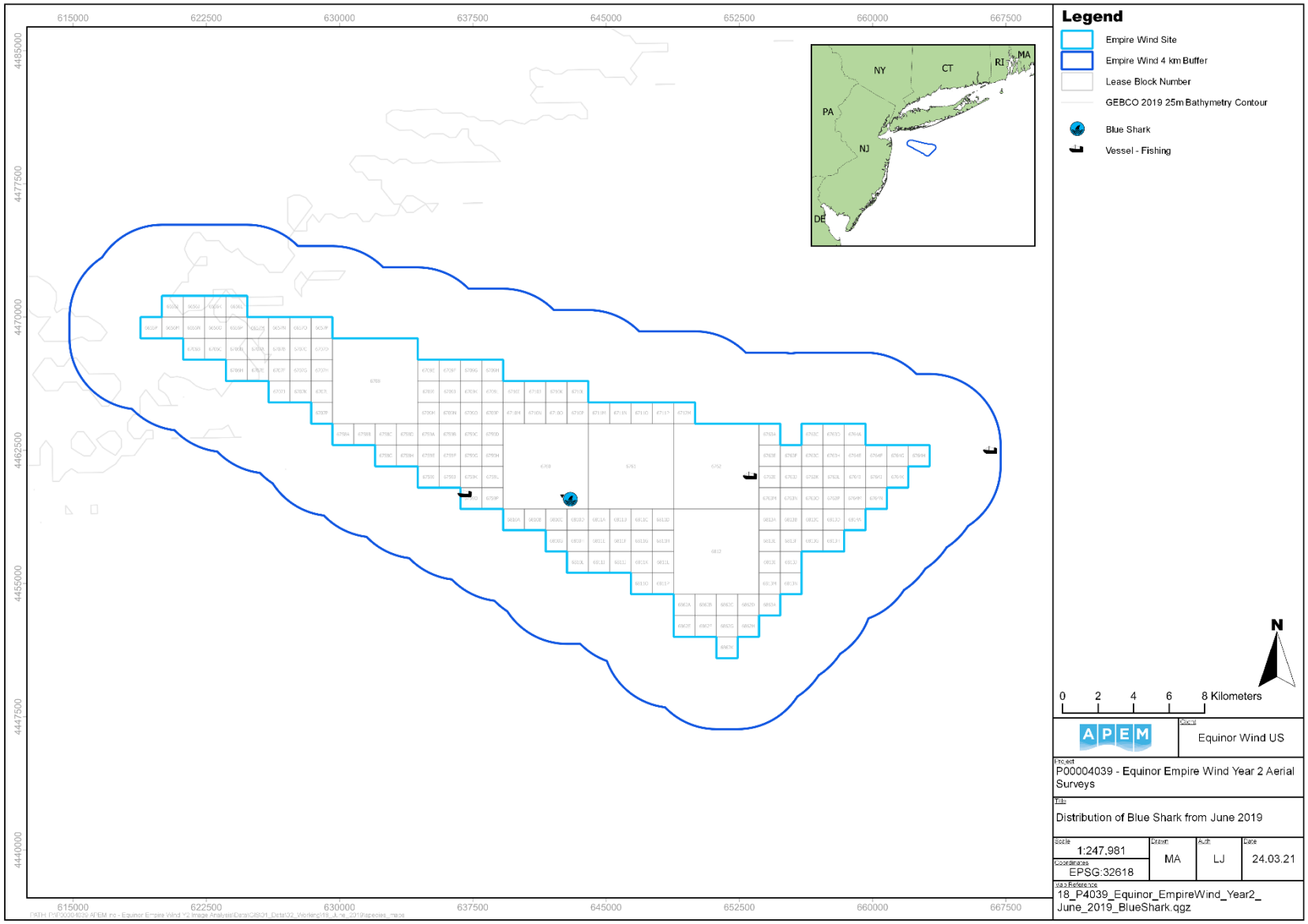

Figure 64 Distribution of blue shark recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.13.9 Carcharhinidae Shark species – Unidentified Carcharhinidae

Unidentified Carcharhinidae sharks were recorded in Surveys 19 and 21 only, with a grand total of five. The highest numbers on a per-survey basis were recorded in Survey 19, totaling four (**Table 69**).

Unidentified Carcharhinidae sharks were loosely distributed across the Survey Area (**Figure 65**).

Table 69 **Total counts and behaviors of unidentified Carcharhinidae sharks in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 19	4	0	**4**
Survey 21	1	0	**1**

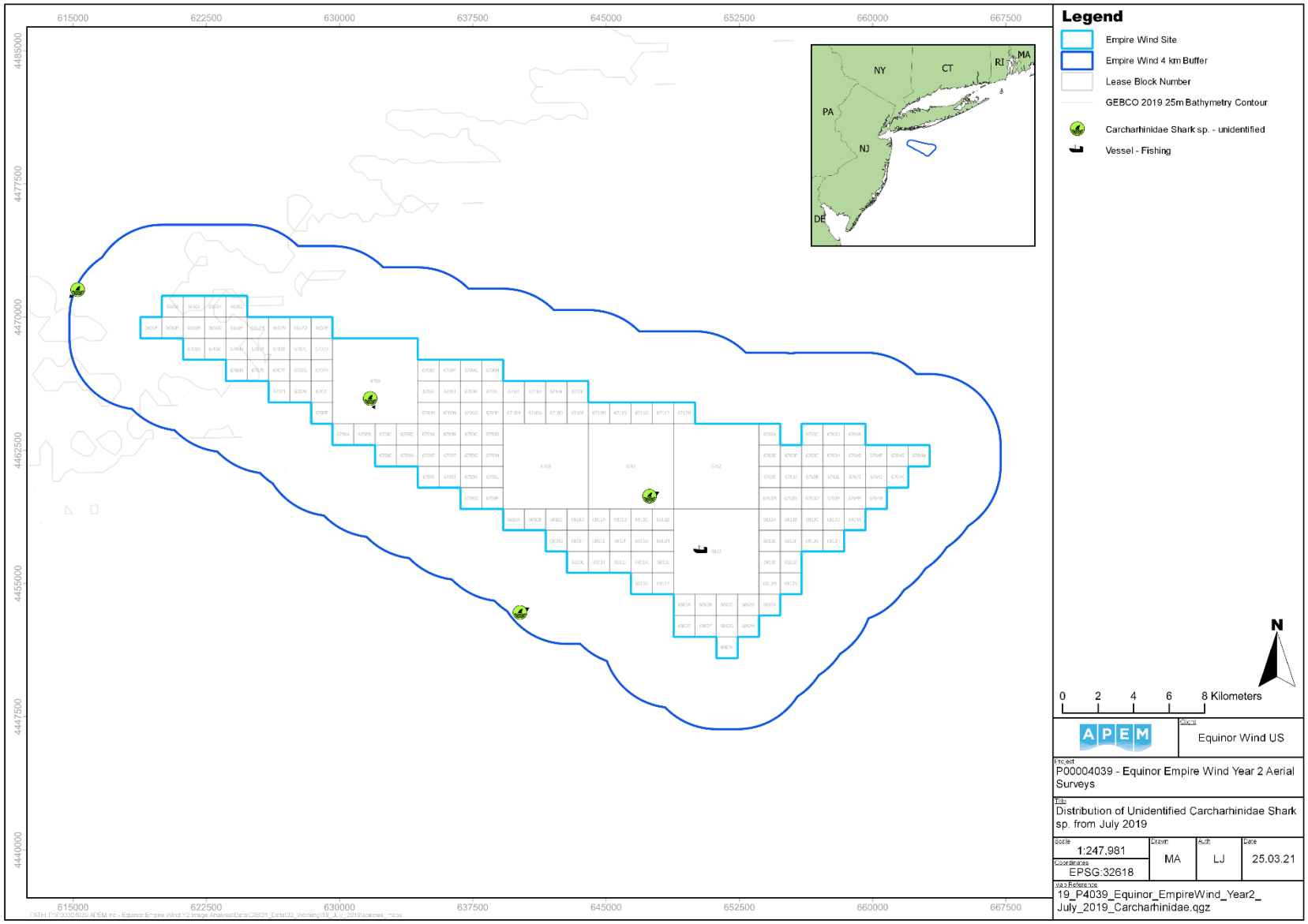

Figure 65 **Distribution of unidentified Carcharhinidae shark species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19**

4.13.10 Scalloped Hammerhead Shark *Sphyrna lewini*

Scalloped hammerhead sharks were recorded in Survey 21 only, with a grand total of two (**Table 70**).

The two scalloped hammerhead sharks were both located in the northwest of the Survey Area (**Figure 66**).

Table 70 **Total counts and behaviors of scalloped hammerhead sharks in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 21	2	0	**2**

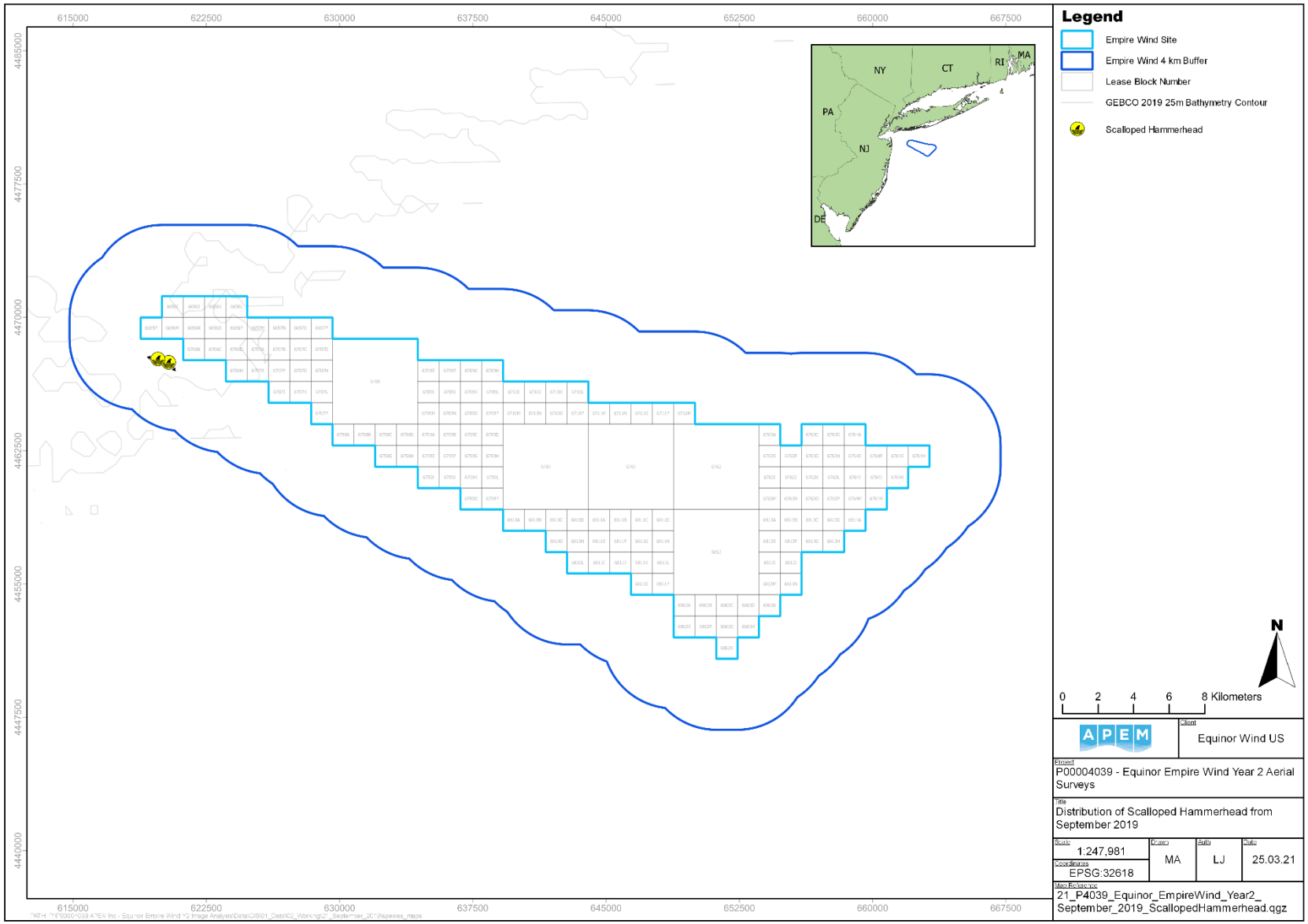

Figure 66 Distribution of scalloped hammerhead shark recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 21

4.13.11 Hammerhead Shark species – Unidentified *Sphyrna* spp.

Unidentified hammerhead sharks were recorded in Surveys 19 to 22 inclusive, with a grand total of five. Highest numbers on a per-survey basis were recorded in Survey 19, totaling three (**Table 71**).

Unidentified hammerhead sharks were loosely distributed across the Survey Area with the three individuals located towards the northeast for Survey 19 (**Figure 67**).

Table 71 **Total counts and behaviors of unidentified hammerhead sharks in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 19	3	0	**3**
Survey 21	1	0	**1**
Survey 22	1	0	**1**

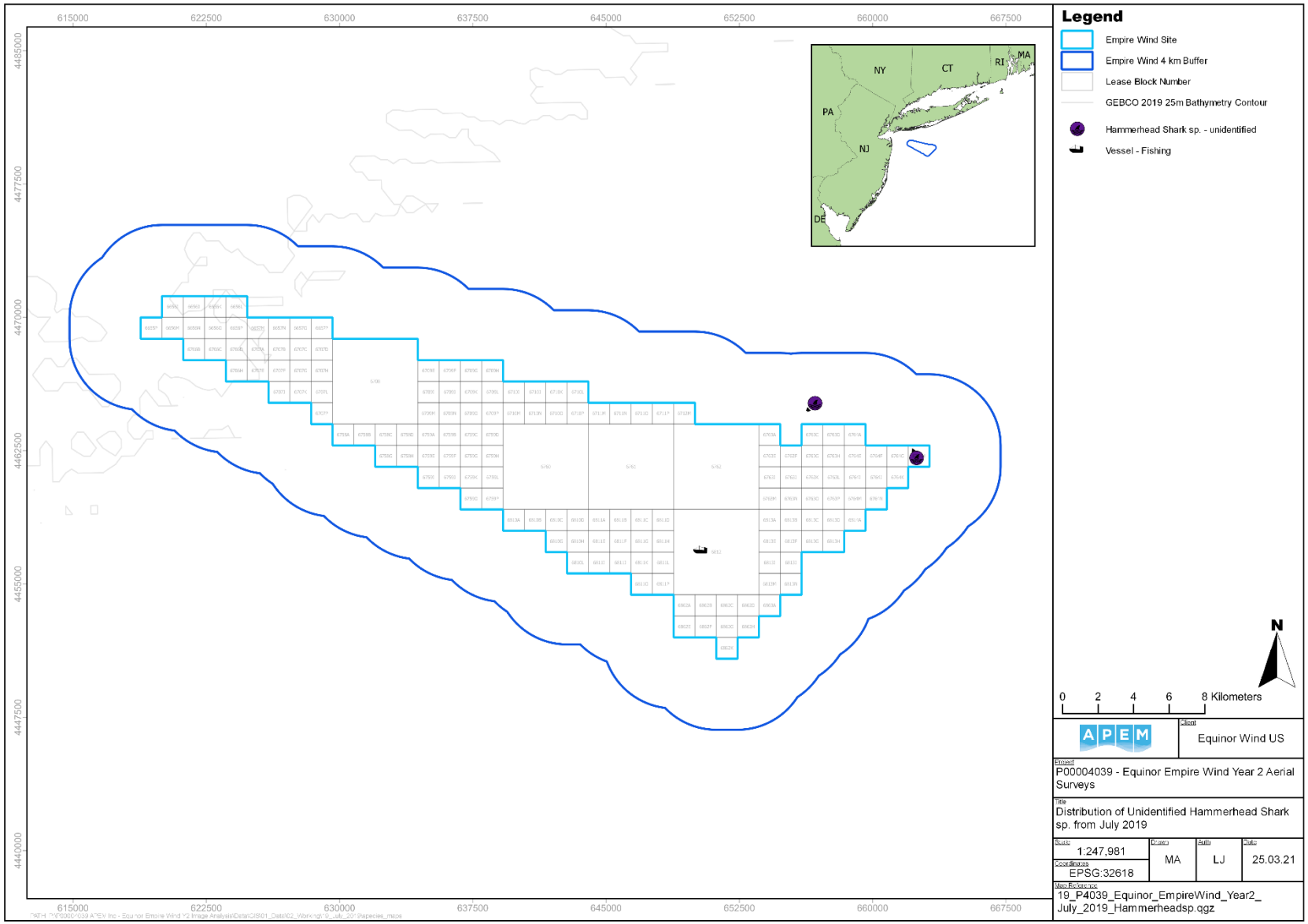

Figure 67 Distribution of unidentified hammerhead shark species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19

4.13.12 Shark species – Unidentified Selachimorpha

Unidentified sharks were recorded in Surveys 18 to 21 inclusive, with a grand total of 12. The highest numbers on a per-survey basis were recorded in Survey 19, totaling eight (**Table 72**).

Unidentified sharks were loosely distributed across the Survey Area (**Figure 68**).

Table 72 **Total counts and behaviors of unidentified sharks in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 18	2	0	**2**
Survey 19	8	0	**8**
Survey 20	1	0	**1**
Survey 21	1	0	**1**

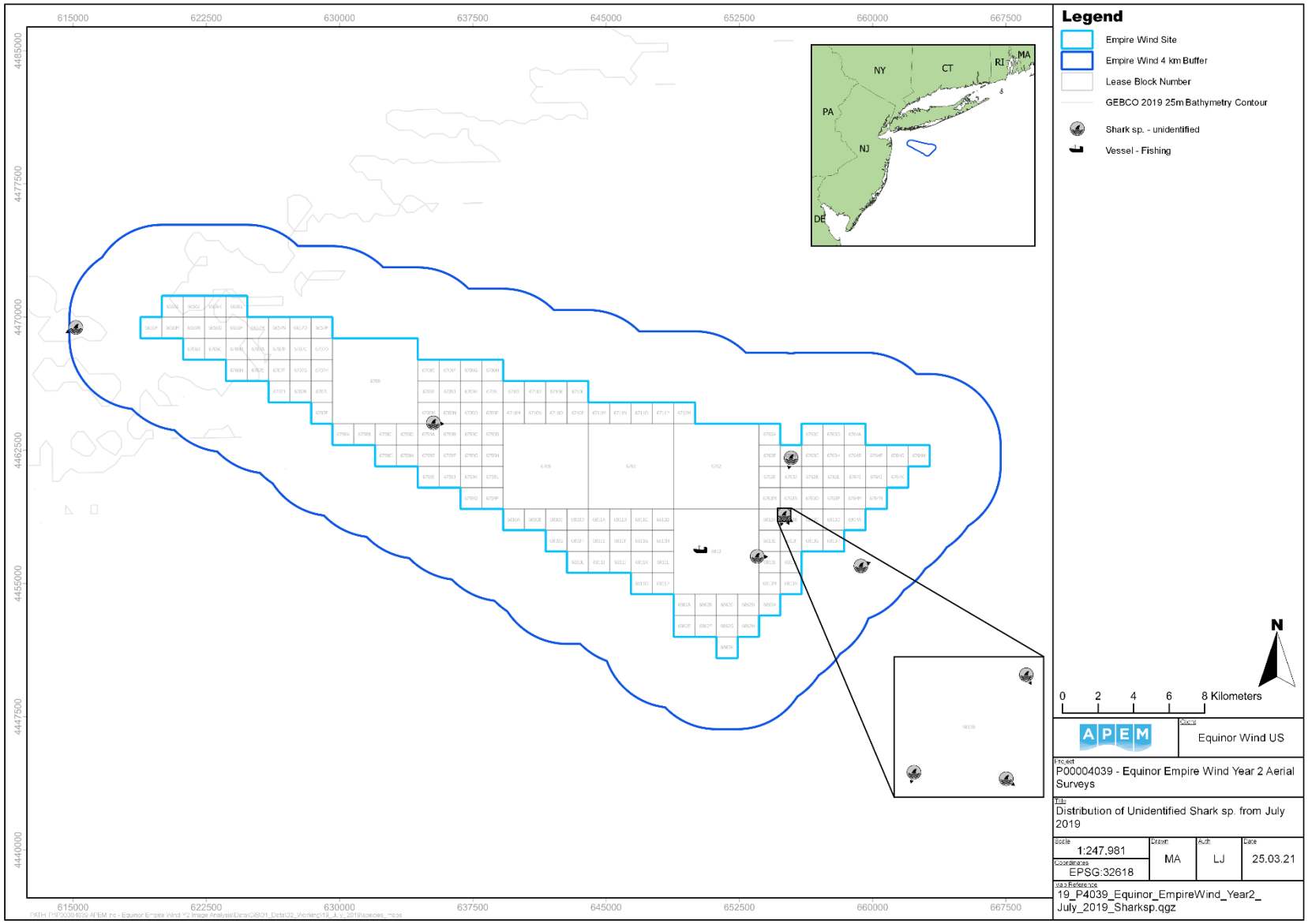

Figure 68 Distribution of unidentified shark species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.14 Large Bony Fish

4.14.1 Mahi-mahi *Coryphaena hippurus*

Mahi-mahi were recorded in Surveys 19 to 21 inclusive, with a grand total of three. The highest numbers on a per-survey basis were recorded in all three surveys, as each totaled one (**Table 73**).

Mahi-mahi were loosely distributed across the southeastern half of the Survey Area (**Figure 69**).

Table 73 **Total counts and behaviors of mahi-mahi in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 19	1	0	**1**
Survey 20	1	0	**1**
Survey 21	1	0	**1**

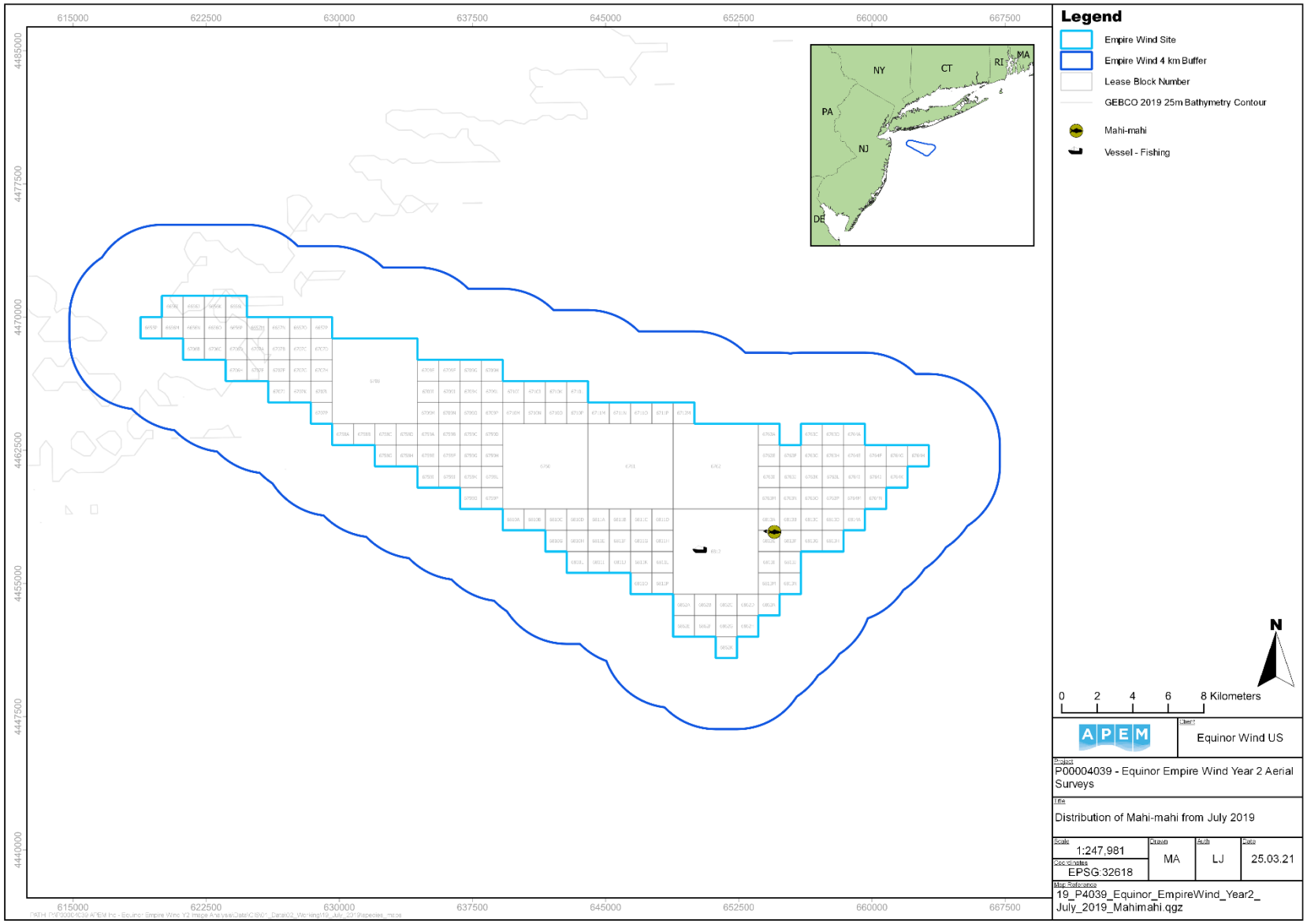

Figure 69 Distribution of mahi-mahi recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19

4.14.2 Atlantic Bluefin Tuna *Thunnus thynnus*

Atlantic bluefin tuna were recorded in Survey 17 only, with a grand total of 15 (**Table 74**).

Atlantic bluefin tuna were loosely distributed across the north to northwest of the Survey Area (**Figure 70**).

Table 74 **Total counts and behaviors of Atlantic bluefin tuna in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 17	15	0	**15**

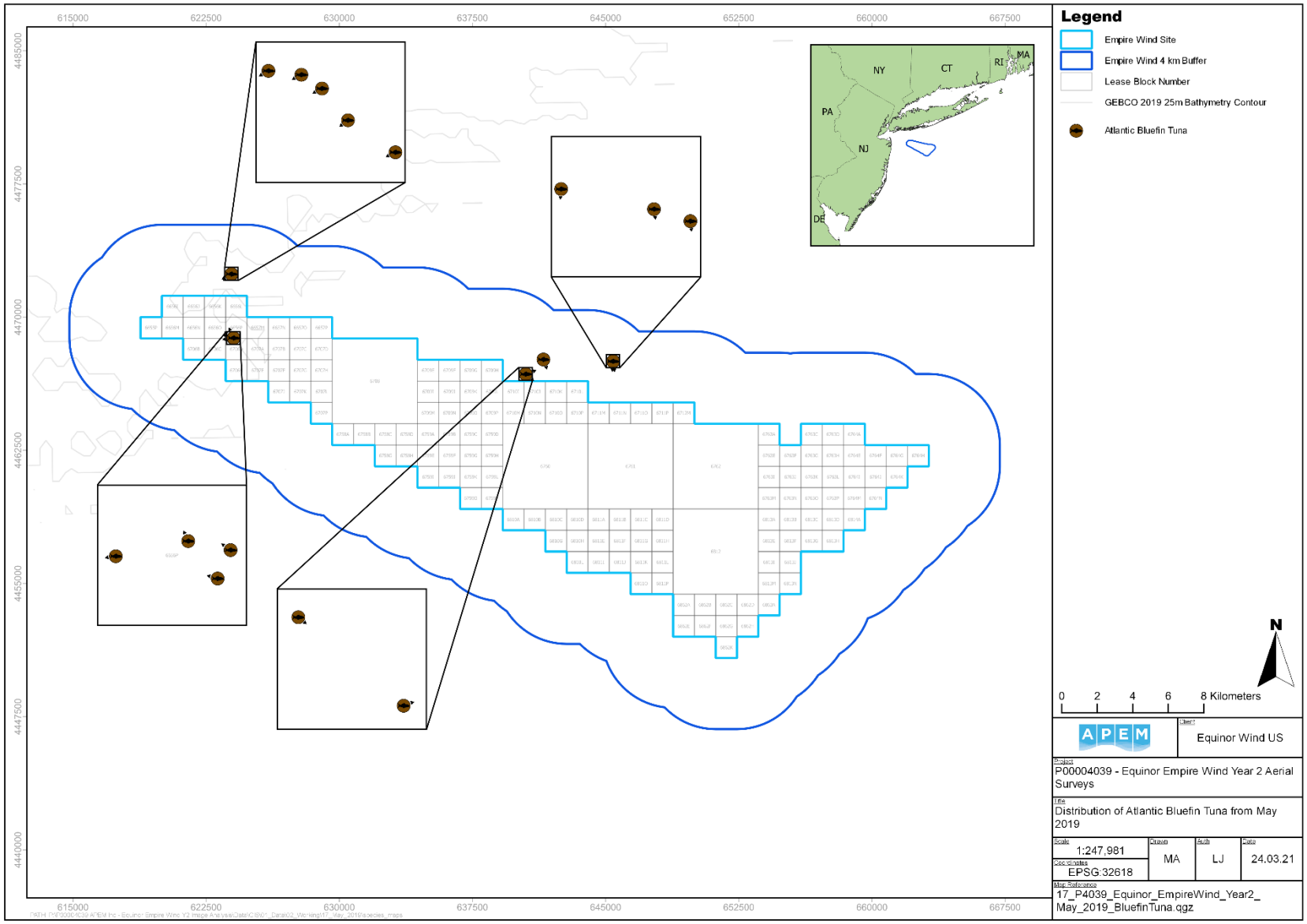

Figure 70 Distribution of Atlantic bluefin tuna recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 17

4.14.3 Tuna species – Unidentified Scombridae

Unidentified tuna were recorded in Surveys 15 and 18 only, with a grand total of eight. The highest numbers on a per-survey basis were recorded in Survey 18, totaling seven (**Table 75**).

Unidentified tuna were loosely distributed across the Survey Area (**Figure 71**).

Table 75 **Total counts and behaviors of unidentified tuna in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 15	1	0	**1**
Survey 18	7	0	**7**

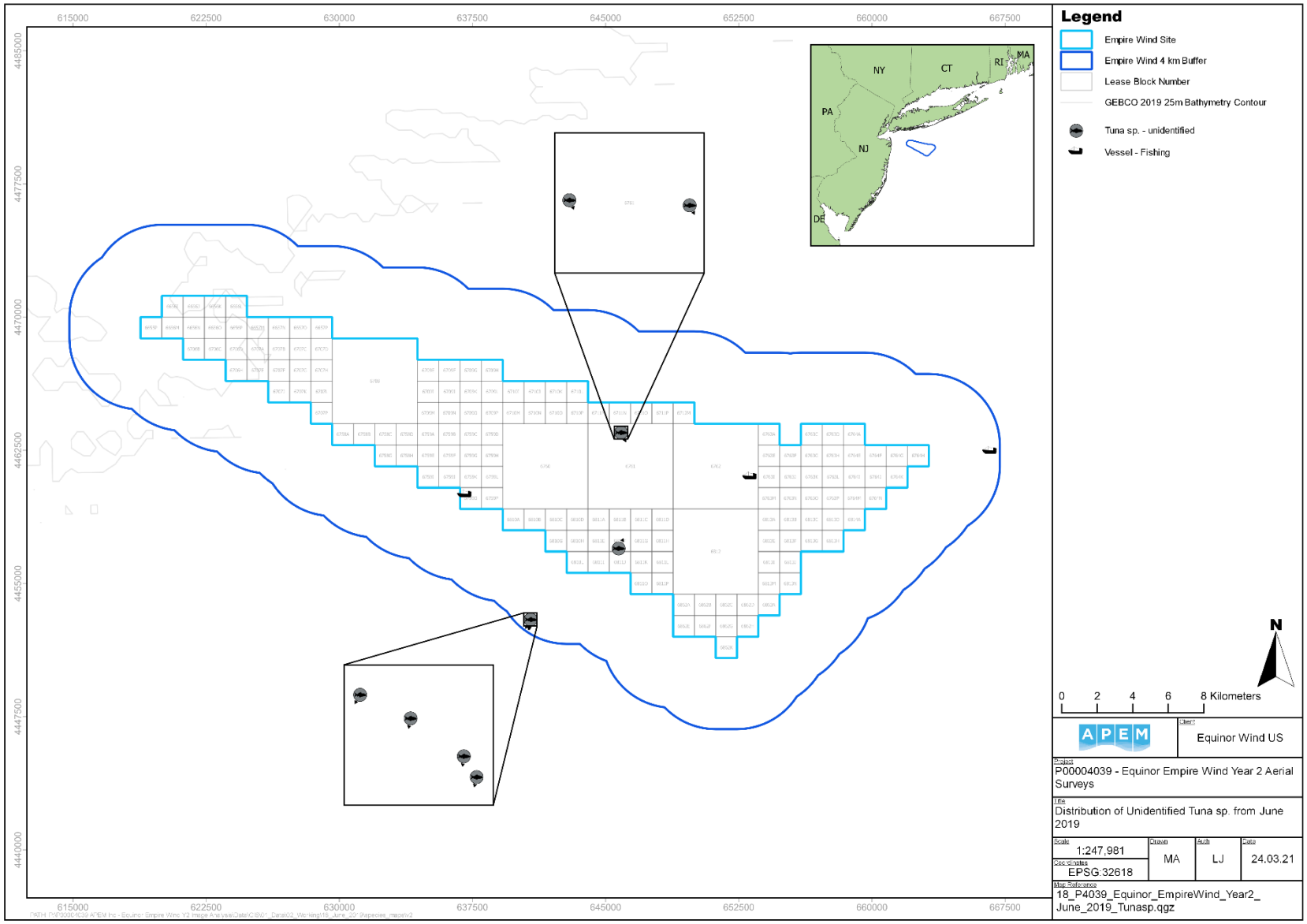

Figure 71 Distribution of unidentified tuna species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.14.4 Billfish species – Unidentified Istiophoridae / Xiphiidae

A single unidentified billfish was recorded in Survey 18 only (**Table 76**).

The single unidentified billfish was located in the northwest of the Survey Area (**Figure 72**).

Table 76 **Total counts and behaviors of unidentified billfish in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 18	1	0	**1**

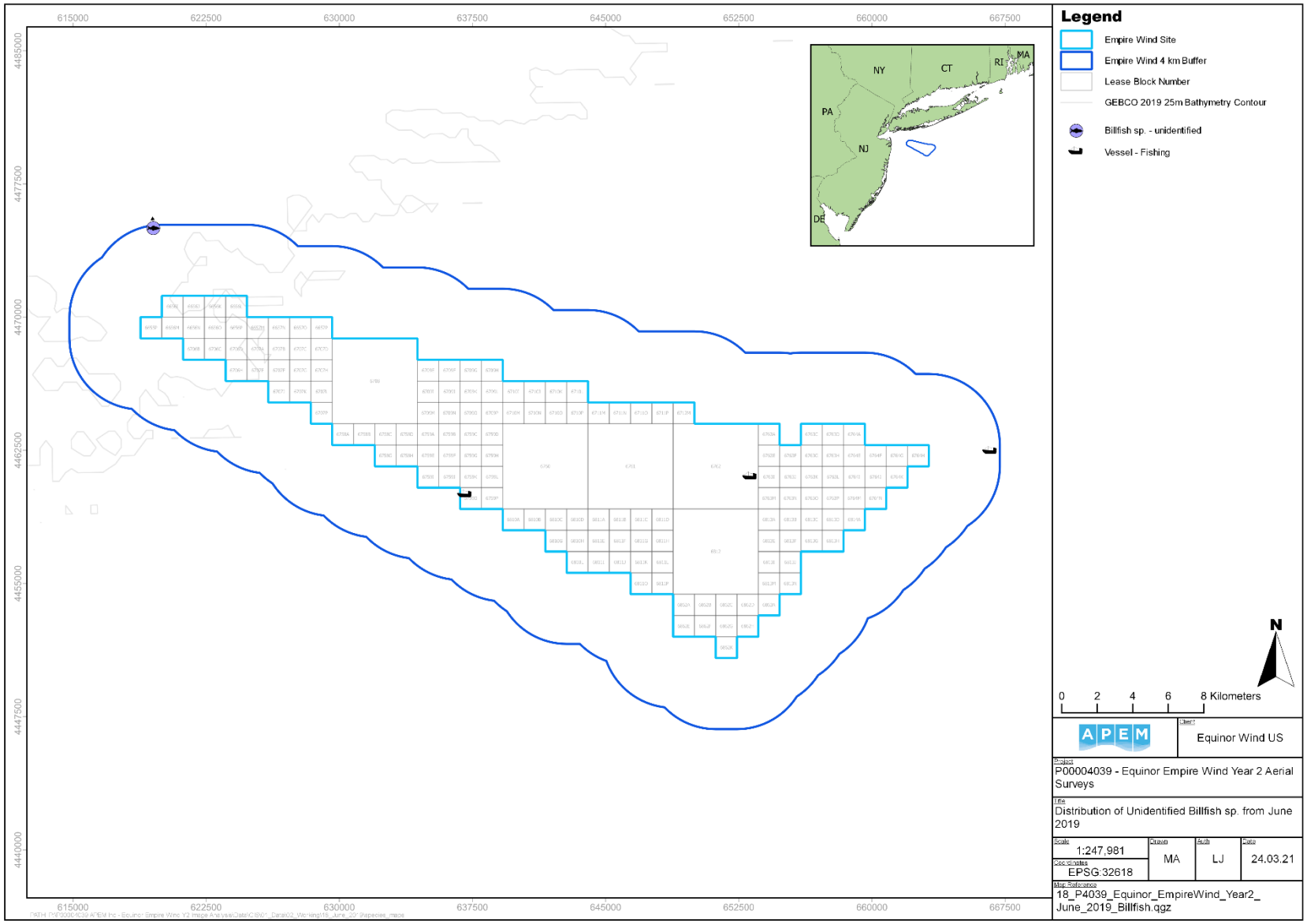

Figure 72 Distribution of unidentified billfish recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 18

4.14.5 Ocean Sunfish *Mola mola*

Ocean sunfish were recorded in Surveys 17 to 19 inclusive, as well as 21 and 22, with a grand total of 24. The highest numbers on a per-survey basis were recorded in Survey 22, totaling nine (**Table 77**).

Ocean sunfish were loosely distributed across the Survey Area (**Figure 73**).

Table 77 **Total counts and behaviors of ocean sunfish in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 17	1	0	**1**
Survey 18	5	0	**5**
Survey 19	6	0	**6**
Survey 21	3	0	**3**
Survey 22	9	0	**9**

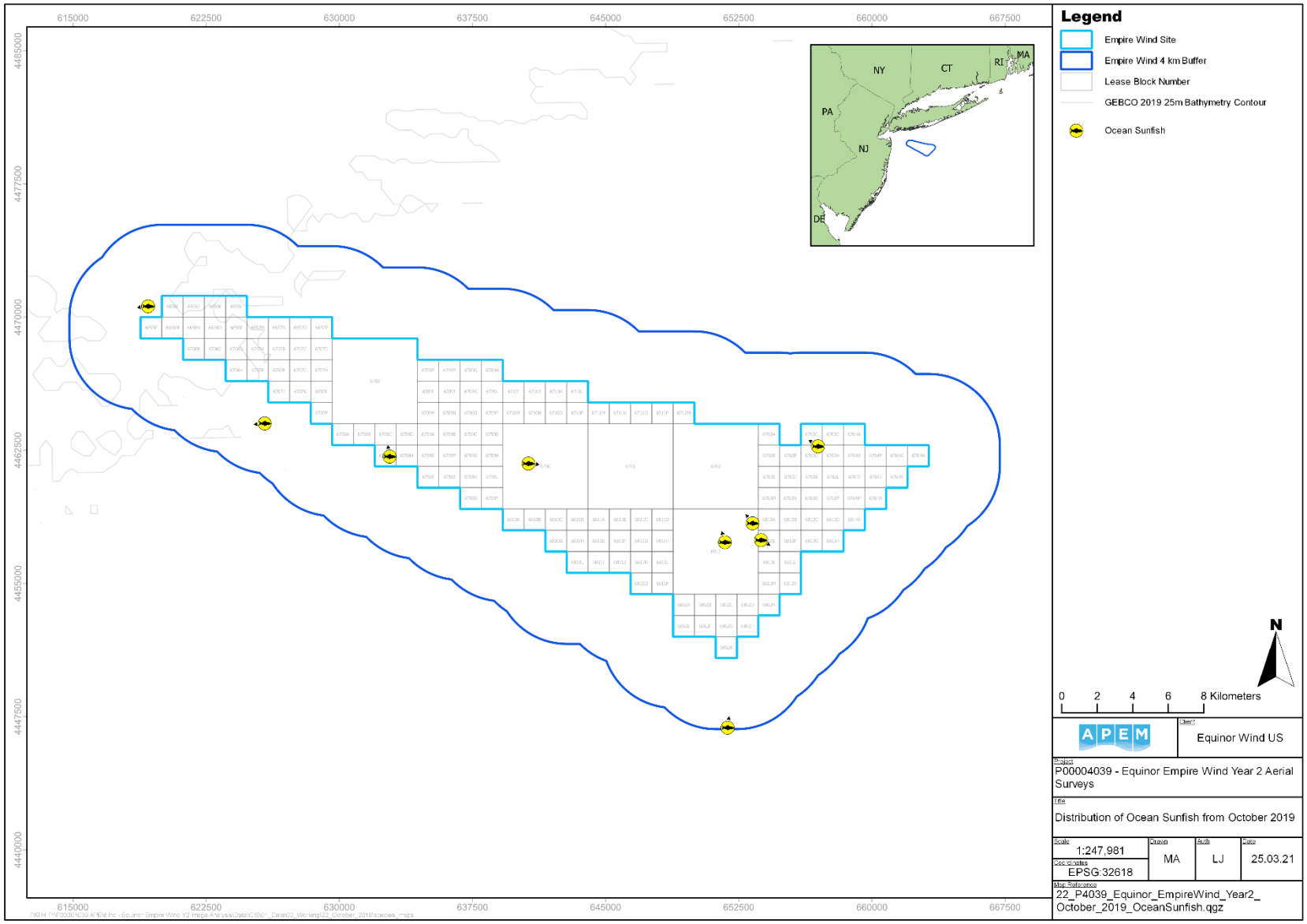

Figure 73 Distribution of ocean sunfish recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 22

4.14.6 Sunfish species – Unidentified Molidae

Unidentified sunfish were recorded in Surveys 19 and 20 only, with a grand total of five. The highest numbers on a per-survey basis were recorded in Survey 19, totaling four (**Table 78**).

Unidentified sunfish were loosely distributed across the Survey Area (**Figure 74**).

Table 78 **Total counts and behaviors of unidentified sunfish in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 19	4	0	**4**
Survey 20	1	0	**1**

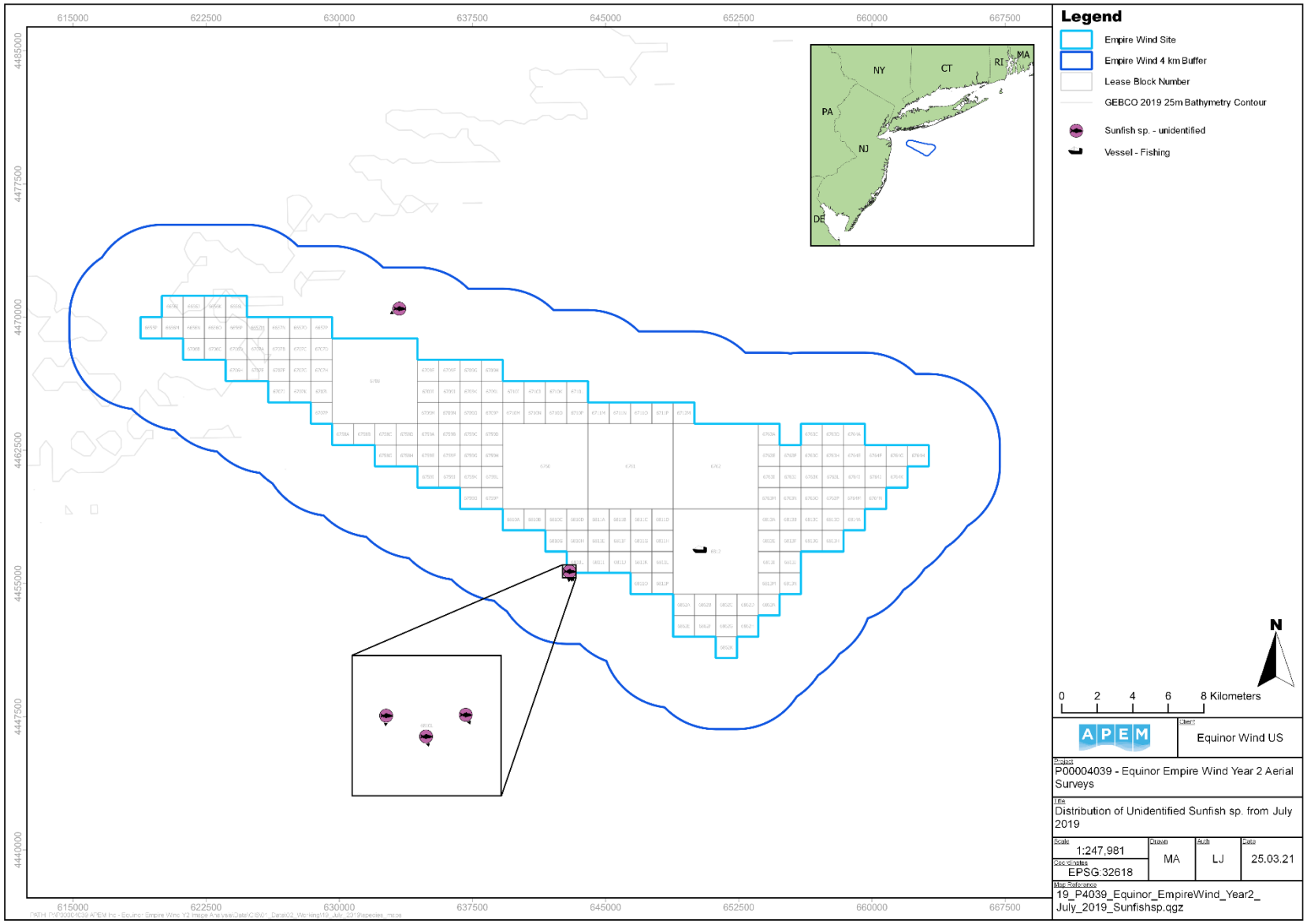

Figure 74 Distribution of unidentified sunfish species recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 19

4.14.7 Large Bony Fish species – Unidentified Osteichthyes

Unidentified large bony fish were recorded in Surveys 17, 18, and 20, with a grand total of ten. The highest numbers on a per-survey basis were recorded in Survey 17, totaling six (**Table 79**).

Unidentified large bony fish were loosely distributed across the Survey Area (**Figure 75**).

Table 79 **Total counts and behaviors of unidentified large bony fish in Lease Area OCS-A 0512 plus 4 km buffer**

Survey	Behavior		Survey Total
	Submerged	Surfacing	
Survey 17	6	0	**6**
Survey 18	3	0	**3**
Survey 20	1	0	**1**

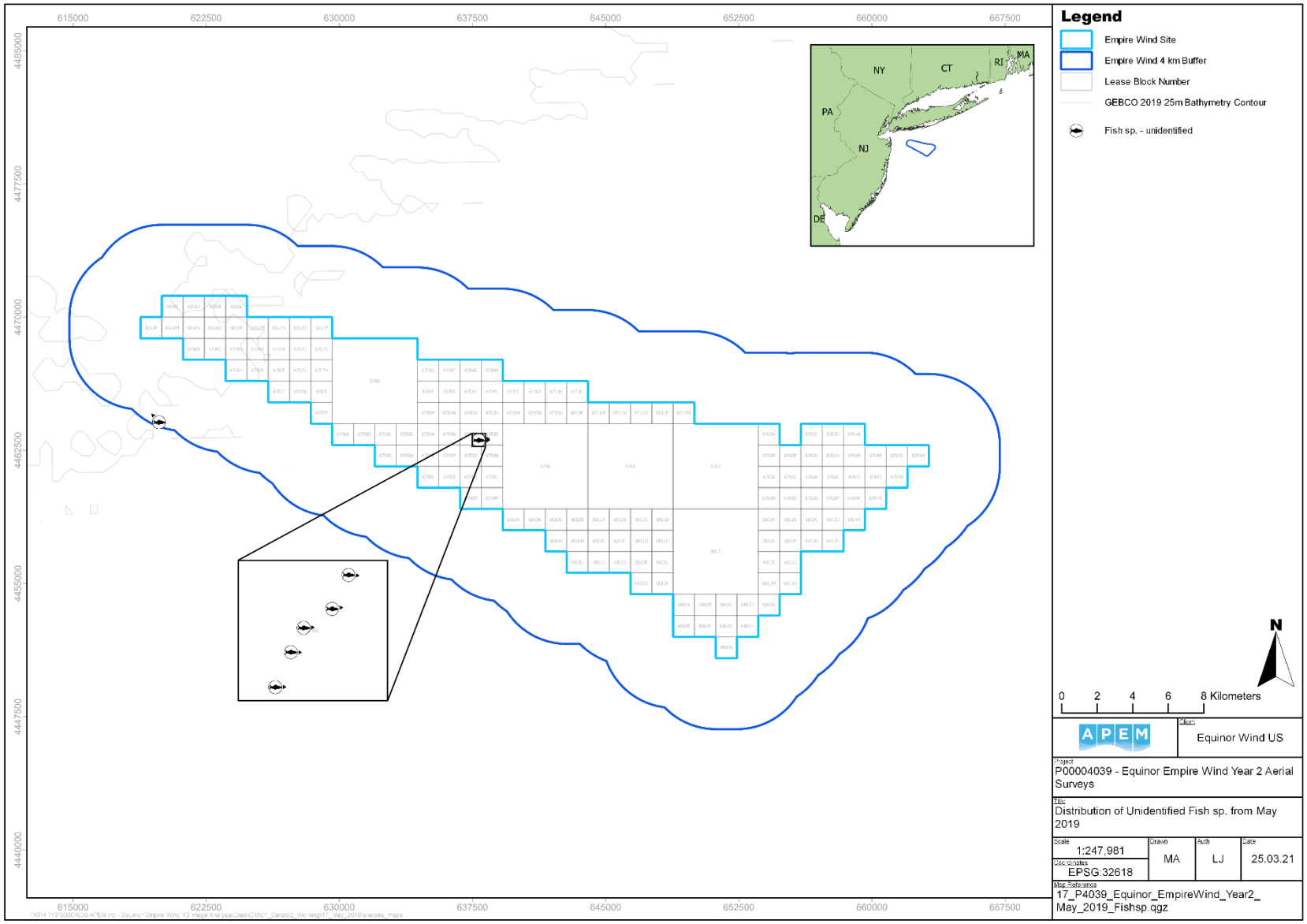

Figure 75 Distribution of unidentified large bony fish recorded in Lease Area OCS-A 0512 plus 4 km buffer from Survey 17

5. Abiotic Observations

For Surveys 13 and 21, no abiotic observations were recorded either from the imagery, or visually from the aircraft.

One vessel, identified as a tanker, and an additional marker buoy, were recorded in the imagery for Survey 14. Five vessels, identified as three cargo vessels, and two fishing vessels, were recorded visually from the aircraft.

No abiotic observations were recorded in the imagery for Survey 15. Three vessels, identified as one cargo vessel, one tanker, and one fishing vessel, were recorded visually from the aircraft.

No abiotic observations were recorded in the imagery for Survey 16. Five vessels, identified as four tankers and one fishing vessel, were recorded visually from the aircraft.

No abiotic observations were recorded in the imagery for Survey 17. Three vessels, identified as one tanker, one fishing vessel, and one unidentified vessel, were recorded visually from the aircraft.

Two vessels, both identified as fishing vessels, were recorded in the imagery for Survey 18. Two small vessels and an unidentified floating object were recorded visually from the aircraft.

One vessel, identified as a fishing vessel, was recorded in the imagery for Survey 19. Two vessels, identified as a cargo vessel and a dinghy, were recorded visually from the aircraft.

One vessel, identified as a recreational vessel, was recorded in the imagery for Survey 20. No additional abiotic observations were made visually from the aircraft.

No abiotic observations were recorded in the imagery for Survey 22. Three vessels, identified as a fishing vessel and two cargo vessels, were recorded visually from the aircraft.

No abiotic observations were recorded in the imagery for Survey 23. One vessel, identified as a small commercial vessel, was recorded visually from the aircraft.

One vessel, identified as a tanker, was recorded in the imagery for Survey 24. Six vessels, identified as three tankers, two fishing vessels, and one cargo vessel, were recorded visually from the aircraft.

6. Discussion

The findings of the Year 2 surveys have been summarised and compared with those of the Year 1 surveys to provide an overview of any noticeable changes in species records, whether this be continued observations of the same species, or new or absent species within the Survey Area.

6.1 Waterfowl

Waterfowl were only recorded at the start and end of the twelve surveys, aligning with the coming and going of winter. A total of 192 waterfowl were recorded from five species and species groupings. Three directly identified waterfowl species (white-winged scoter; black scoter; surf scoter) were recorded, the most numerous of which was black scoter (n=152), followed by white-winged scoter (n=32).

For the Year 1 surveys, a total of 295 waterfowl were recorded from six identified species and two species groupings, with waterfowl occurring in more surveys throughout the year. A decrease in both total numbers recorded and individual species recorded was therefore exhibited by the Year 2 surveys.

These findings suggest variability in the seasonality of use of the Survey Area by waterfowl as shown in **Figure 76**, where increased occurrence towards winter is apparent as well as a complete absence during summer. For both the Year 1 and Year 2 surveys, waterfowl, particularly the scoters, tended to occur in dense but disparate flocks throughout the Survey Area.

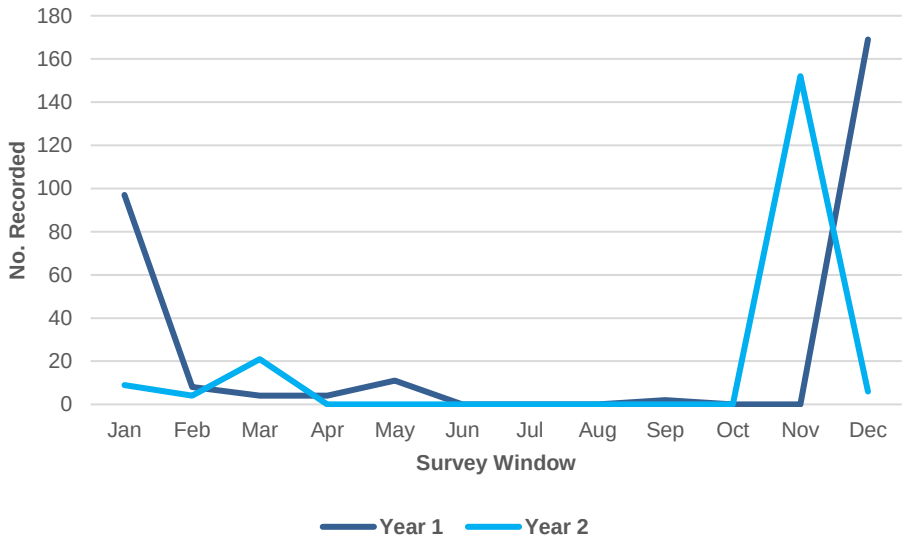

Figure 76 **Total monthly waterfowl records within the Survey area for the Year 1 and Year 2 survey periods**

6.2 Shorebird

Shorebirds were recorded intermittently throughout the year with highest numbers recorded in summer (n=184). A total of 201 shorebirds were recorded from four species and species groupings. Two directly identified species (black-bellied plover and red phalarope) were recorded, the most numerous of which was red phalarope (n=14), followed by black-bellied plover (n=2). The most numerous shorebird species group recorded however was unidentified shorebirds (n=182).

For the Year 1 surveys, a total of 82 shorebirds were recorded from one identified species and two species groupings. Red phalaropes were also the most numerous identified species for the Year 1 surveys, totalling 50. Overall, an increase in both total shorebirds recorded and total shorebird species recorded was exhibited by the Year 2 surveys.

Shorebirds exhibited little comparable seasonality as the Year 1 surveys recorded highest numbers in winter, whilst the Year 2 recorded highest in summer, though both showed lowest counts in spring (**Figure 77**). No clear distribution patterns were evident between the years as shorebirds tended to be located across the Survey Area in relatively low-density groups save for the July survey window for Year 2, where the majority of shorebirds were located in one flock. Due to shorebirds encompassing a large category of potential species, it can be expected that differences may occur between seasonality and distribution.

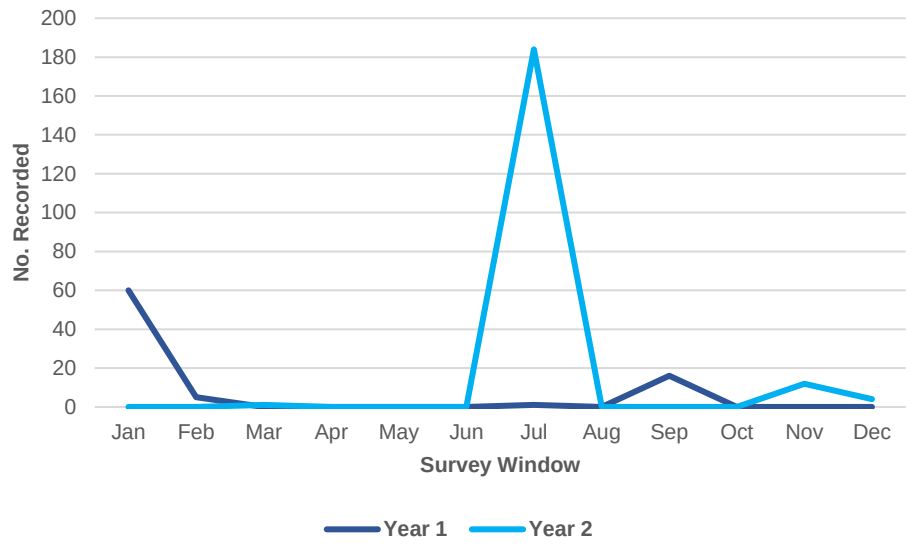

Figure 77 **Total monthly shorebird records within the Survey Area for the Year 1 and Year 2 survey periods**

6.3 Auk

Similar to waterfowl, auks were only recorded at the start and end of the twelve surveys, aligned with the occurrence of winter. A total of 830 auks were recorded from seven species and species groupings. Three directly identified auk species (dovekie, razorbill, and Atlantic puffin) were recorded, the most numerous of which was Atlantic puffin (n=11), followed by razorbill (n=9). The overall most numerous species grouping however was murre / razorbill (n=773).

For the Year 1 surveys, a total of 555 auks were recorded from one identified species and two species groupings. Dovekies were the most numerous directly identified species (n=3), but overall murre / razorbill was the most numerous species grouping (n=550). The Year 2 surveys therefore experienced an increase in both numbers of auks and numbers of auk species recorded.

The seasonality of auks began in a similar manner between the Year 1 and Year 2 surveys, with an increase in numbers towards the end of winter and a decrease towards mid-spring (**Figure 78**). However, whilst the Year 2 surveys continued with no auks recorded until mid-fall, the Year 1 surveys experienced a second surge in auk numbers between the end of spring and the onset of summer before auk presence declined to comparable levels with Year 2. Additionally, whilst the Year 2 surveys experienced a considerable increase in auk numbers by the start of winter, the Year 1 surveys showed no further increases following the summer spike. In terms of distribution, auks tended to be relatively loosely distributed alone or in small groups across the extent of the Survey Area.

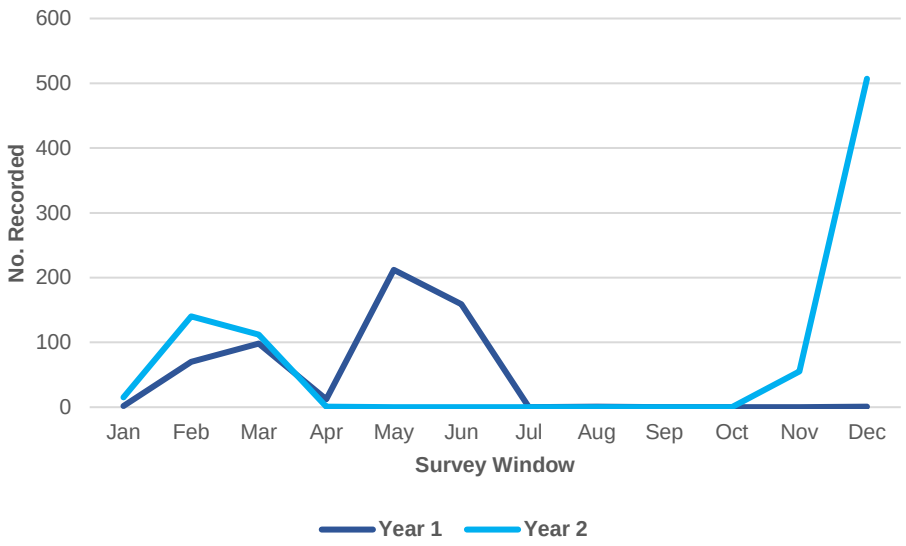

Figure 78 **Total monthly auk records within the Survey Area for the Year 1 and Year 2 survey periods**

6.4 Small Gull

Small gulls were recorded throughout the year with highest numbers recorded in fall (n=182). A total of 289 small gulls were recorded from four identified species and species groupings. Three directly identified small gull species (black-legged kittiwake, Bonaparte's gull, and laughing gull) were recorded, the most numerous of which was Bonaparte's gull (n=203), followed by laughing gull (n=39).

For the Year 1 surveys, small gull species and species groupings were the same, with black-legged kittiwake, Bonaparte's gull, and laughing gull being identified, and the species grouping of unidentified small gulls also being recorded. In total, small gulls were more numerous in the Year 1 surveys however, totalling 543. As with the Year 2 surveys, Bonaparte's gulls (n=479) were the most numerous, though black-legged kittiwakes (n=42) were the second most numerous species instead of laughing gulls. Overall, the Year 2 surveys witnessed a decrease in total small gull records, though recorded species remained the same.

Small gulls recorded highest peaks during different seasons between the Year 1 and Year 2 survey periods, with the Year 1 experiencing highest numbers in late winter and the Year 2 experiencing highest in late fall (**Figure 79**). Both survey years showed a degree of variation in small gull numbers between spring and mid fall, with mid to late summer being a consistent period of low to absent small gull presence. Distribution remained relatively loose across the extent of the Survey Area for small gulls, with denser groups recorded in the first year of surveys compared with the second, though no overall patterns were evident.

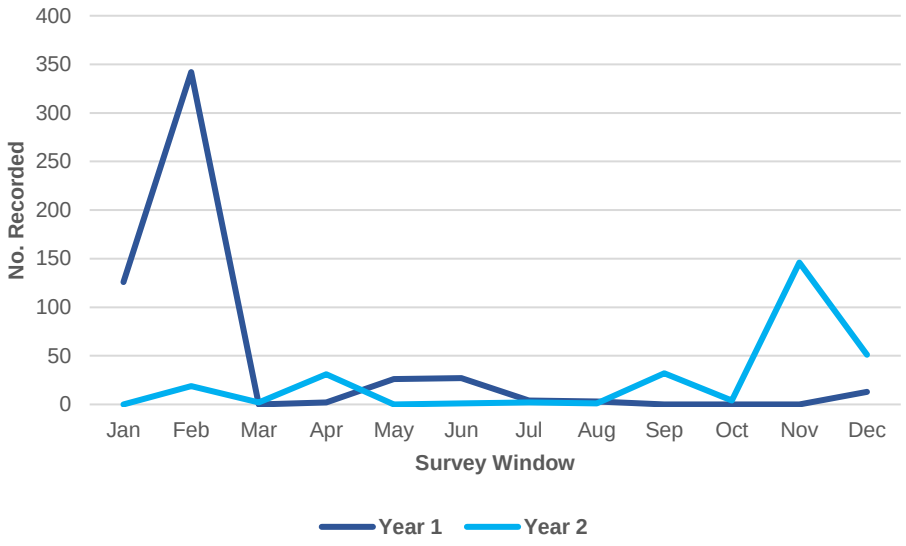

Figure 79 **Total monthly small gull records within the Survey Area for the Year 1 and Year 2 survey periods**

6.5 Large Gull

As with small gulls, large gulls were recorded throughout the year and experienced highest numbers in fall (n=76). A total of 176 large gulls were recorded from five species and species groupings. Four directly identified large gull species (ring-billed gull, great black-backed gull, herring gull, and lesser black-backed gull) were recorded, the most numerous of which was great black-backed gull (n=91), followed by herring gull (n=71).

As with small gulls, the Year 1 surveys recorded the same species and species groupings for large gulls. Large gulls were also more numerous in the Year 1 surveys (n=543) compared with the Year 2 (n=176), with the two most numerous species for Year 1 switched compared with Year 2; herring gull (n=105) being the most numerous, and great black-backed gull (n=42) the second most numerous. Overall, the Year 2 surveys witnessed a decrease in total large gull records, though recorded species once again remained the same.

Large gulls showed sporadic variations in seasonality between the two survey years, though both featured periods of highest records towards the end of the year during fall and the onset of winter (**Figure 80**). As with small gulls, distribution remained relatively loose across the extent of the Survey Area, with occasional low-density groups apparent.

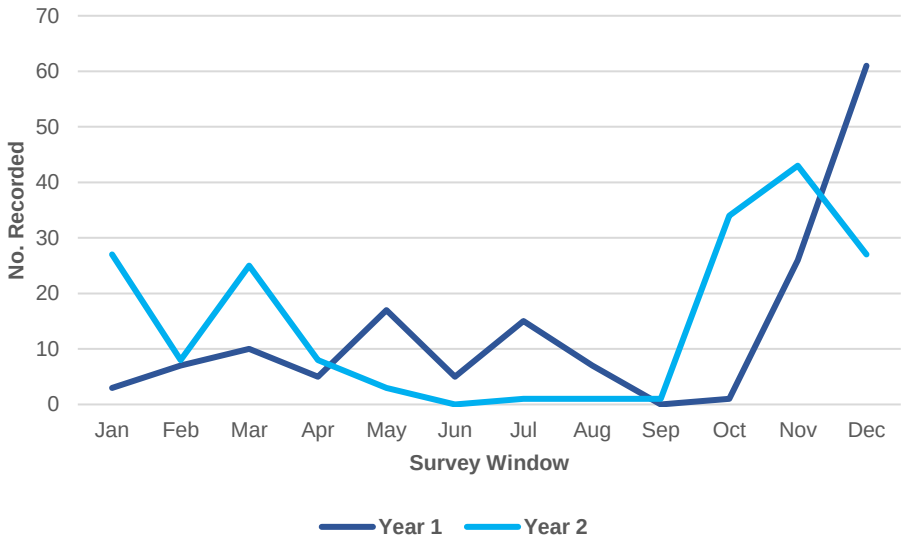

Figure 80 **Total monthly large gull records within the Survey Area for the Year 1 and Year 2 survey periods**

6.6 Tern

Terns were recorded in late spring to early fall, predominantly occurring in summer (n=68). A total of 88 terns were recorded from eight species and species groupings. Four directly identified terns (least tern, common tern, Arctic tern, and Forster's tern) were recorded, the most numerous of which was common tern (n=24), followed by least tern (n=11). The most numerous species grouping recorded however was 'commic' / Forster's tern (n=43).

For the Year 1 surveys, tern species and species groupings were similar, though only three tern species overall were directly identified (least tern, common tern, and Forster's tern). In total, 244 terns were recorded. Common terns were the most numerous directly identified species (n=8), followed by least tern (n=4), though 'commic' / Forster's terns (n=170) were the most numerous species grouping for Year 1 also. Overall, the Year 2 surveys experienced a reduction in total terns but an increase in the number of species and species groupings when compared to the Year 1 surveys.

Terns showed a strong seasonality in their utilisation of the Survey Area, particularly during the Year 1 surveys, with the majority of terns recorded during the two years occurring in summer (**Figure 81**). Terns also showed no overall pattern in distribution across the surveys, with loose distribution evident across the extent of the Survey Area.

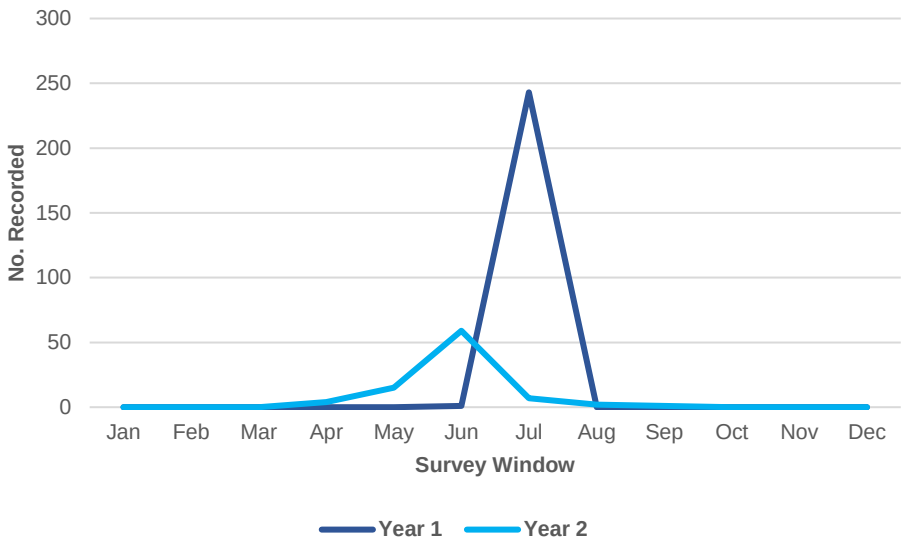

Figure 81 **Total monthly tern records within the Survey Area for the Year 1 and Year 2 survey periods**

6.7 Loon

Loons were recorded throughout the year, experiencing highest numbers in winter (n=137). A total of 271 loons were recorded from three species and species groupings. Two directly identified species (red-throated loon and common loon) were recorded, the most numerous of which was common loon (n=222), followed by red-throated loon (n=45).

For the Year 1 surveys, loon species and species groupings were the same, with common loon also being the most numerous (n=217), followed by red-throated loon (n=104). A total of 322 loons were recorded in the Year 1 surveys. Overall, loons saw a slight reduction in numbers for the Year 2 surveys, with red-throated loons alone seeing a more noticeable reduction.

Loons displayed a strong conformity in seasonal trends between the two years, though a spike in loon numbers was recorded during the summer of the Year 1 surveys that was absent during the second year (**Figure 82**). Highest numbers occurred at the start of the year, with a gradual drop off until mid-spring where numbers increased again. As addressed, loon numbers differed drastically in summer between the years, though by the end of summer, loons remained in low numbers until mid to late fall when numbers increased once more. Similar to gulls, loon distribution showed no seasonal distribution patterns, with loose loon distribution recorded across the extent of the Survey Area.

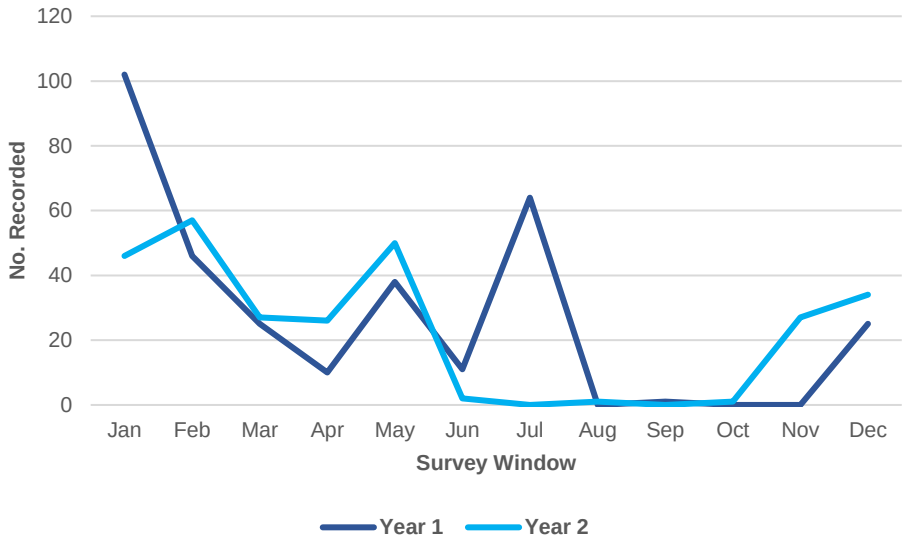

Figure 82 **Total monthly loon records within the Survey Area for the Year 1 and Year 2 survey periods**

6.8 Storm Petrel

Storm petrels were recorded in the summer only with a total of 390 from one species grouping: unidentified storm petrel species.

For the Year 1 surveys, storm petrels occurred in summer as well as early fall where highest numbers were recorded (n=32). A total of 38 storm petrels were recorded, all of which were from the same species grouping as Year 2. Overall, storm petrels therefore experienced a marked increase when compared with the results of the Year 1 surveys.

These results showed a seasonality for storm petrels within their respective years, with the Year 1 surveys seeing storm petrels recorded from late summer to the onset of fall, and during the summer only for the Year 2 surveys (**Figure 83**). Storm petrels occurred in large groups or as single individuals throughout the two survey years, with distribution seen across the extent of the Survey Area.

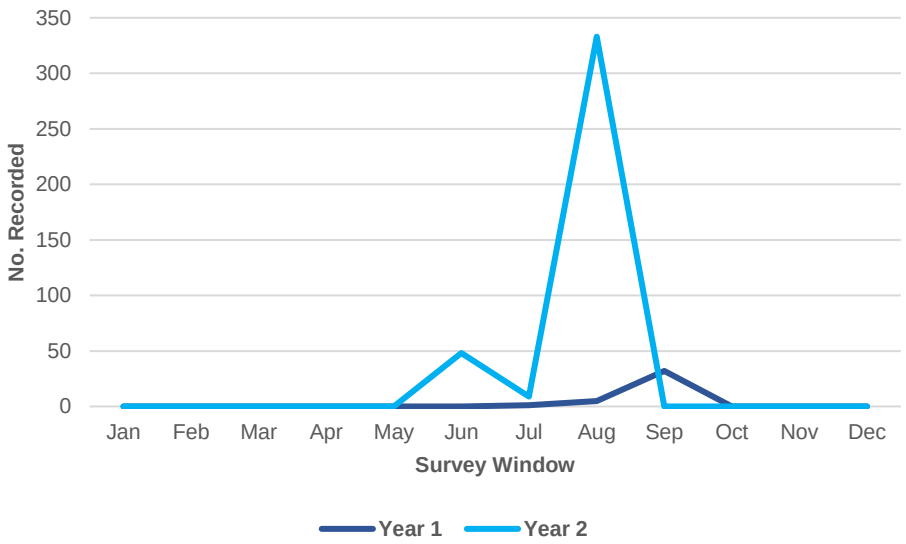

Figure 83 **Total monthly storm petrel records within the Survey Area for the Year 1 and Year 2 survey periods**

6.9 Shearwater

Shearwaters were recorded infrequently throughout the year with a total of 19 from two directly identified species (Manx shearwater and great shearwater). The most numerous species was great shearwater (n=13), then followed by the Manx shearwater (n=6).

For the Year 1 surveys, shearwaters occurred from mid-summer to the end of fall, with highest numbers recorded in summer (n=131). In total 193 shearwaters were recorded from six species and species groupings, of which Cory's shearwater were the most abundant species recorded (n=97), followed by great shearwater (n=37). The Year 1 surveys featured two additional identified species (sooty shearwater and Cory's shearwater) compared with Year 2, as well as a further two species groupings (unidentified small shearwaters and unidentified large shearwaters). Overall, shearwaters showed a decrease in both total number of individuals and total number of species recorded in the Year 2 surveys.

Shearwater seasonality remained relatively consistent between the two survey years, though as described in this section, a notable difference in total shearwaters occurred between the two years (**Figure 84**). Despite this, shearwaters were mostly absent for the first half of both years, with an increase and peak in late summer from which a decline was experienced until late fall where numbers increased once more. Between the two years, shearwaters tended to occur throughout the extent of the Survey Area, though the northwest of the Survey Area appeared to be an area of more consistent density across the two-year survey period.

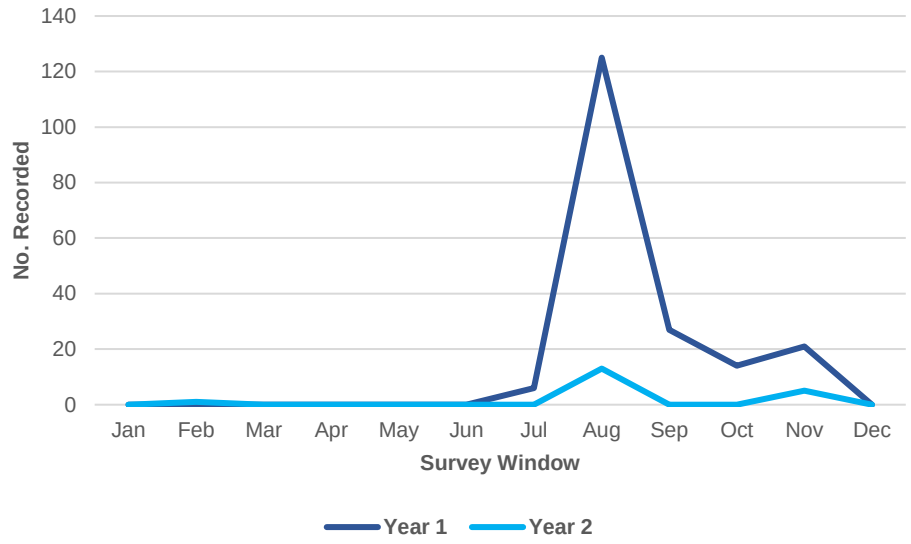

Figure 84 **Total monthly shearwater records within the Survey Area for the Year 1 and Year 2 survey periods**

6.10 Gannet

Northern gannets were recorded throughout the year, though were expectedly almost entirely absent during summer. A total of 241 northern gannets were recorded, the highest proportion of which were recorded in winter (n=177).

For the Year 1 surveys, similar seasonal patterns were observed, with highest numbers recorded in winter (n=292). A total of 371 northern gannets were recorded in Year 1. Overall, northern gannets saw a decrease compared with Year 1, though seasonality remained comparable.

Major gannet seasonality remained consistent, with the peak numbers evident during the winter, though spring to mid-summer seasonality differed to a degree between the two years (**Figure 85**). However, lowest numbers occurring from mid-summer to mid-fall remained consistent between both years. As with shearwaters, distribution occurred throughout the extent of the Survey Area between the two years with a distribution preference evident for the north-western half of the Survey Area also evident for both years.

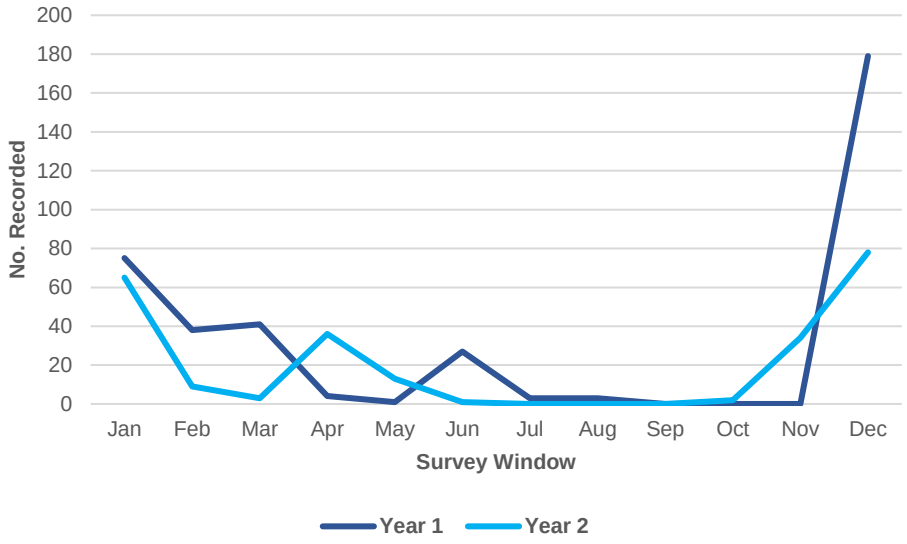

Figure 85 **Total monthly gannet records within the Survey Area for the Year 1 and Year 2 survey periods**

6.11 Other Avian

Unidentified passerines and unclassified gulls (neither unidentified small nor unidentified large) were recorded. Unidentified passerines totalled three and were present in the summer only, whilst unclassified gulls totalled two and were recorded in fall only.

For the Year 1 surveys, neither unidentified passerines nor unclassified gulls were recorded, though there were records of other species absent from the Year 2 surveys. These consisted of grebes (n=1), cormorant / shags (n=41), gadfly petrels (n=3), Ardeidae (n=1), and raptors (n=1). Of these, cormorant / shags would perhaps be the most notable absence from the Year 2 surveys.

As the group contains a collection of unassociated avian species, no comparison graph has been included between the two survey years.

6.12 Marine Mammal

Marine mammals were recorded throughout the year, with highest numbers recorded in summer (n=70), closely followed by winter (n=65). A total of 196 marine mammals were recorded from nine species and species groups. Four directly identified species (common minke whale, common dolphin, common bottlenose dolphin, and harbor porpoise) were recorded, of which common dolphin was the most numerous (n=128), followed by harbor porpoise (n=13).

For the Year 1 surveys, a total of 150 marine mammals were recorded from seven species and species groupings. As with the Year 2 surveys, common dolphins were the most numerous marine mammal species (n=95), though common bottlenose dolphins instead were the second most numerous (n=30). Overall, the Year 2 surveys witnessed an increase in both total number of marine mammals, as well as number of marine mammal species and species groupings.

Marine mammals maintained a relatively consistent seasonality between the two survey years, with peaks in the winter and highest records occurring in summer (**Figure 86**). Though the group encompasses a wide range of species, it is expected that marine mammals would overall conform to seasonal variations. Distribution showed no overall patterns, with marine mammals occurring in small groups or as single individuals in various locations throughout the Survey Area for both years.

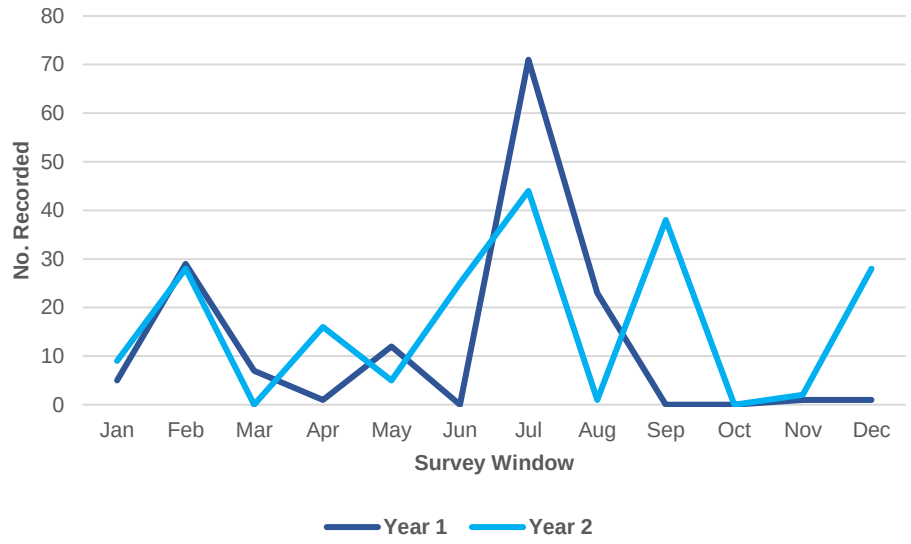

Figure 86 **Total monthly marine mammal records within the Survey Area for the Year 1 and Year 2 survey periods**

6.13 Turtle

Turtles were recorded from summer to mid-winter, with highest numbers recorded in summer (n=44). A total of 66 turtles were recorded from four species and species groupings. Two directly identified turtle species (loggerhead turtle and Kemp's ridley turtle) were recorded, of which loggerhead turtle was the most numerous (n=25), followed by Kemp's ridley turtle (n=18).

For the Year 1 surveys, the same four species and species groupings were recorded, with the same species also being the most numerous; loggerhead turtle (n=23) followed by Kemp's ridley turtle (n=8). Overall, the Year 2 surveys witnessed an increase in the number of turtles recorded though species and species groupings recorded were the same.

Turtles showed a similar seasonal pattern between the two survey years, though occurrence and peak counts were staggered, with first occurrence in late summer and peak numbers in mid-fall for Year 1, and first occurrence in early summer and peak numbers in mid-summer for Year 2 (**Figure 87**). Turtles were absent until the onset of summer for both years, and both experienced a decrease in numbers from the end of fall. Turtle distribution was loose throughout the extent of the Survey Area for both survey years, with the majority of turtles recorded alone, with occasional observations of two individuals in close proximity.

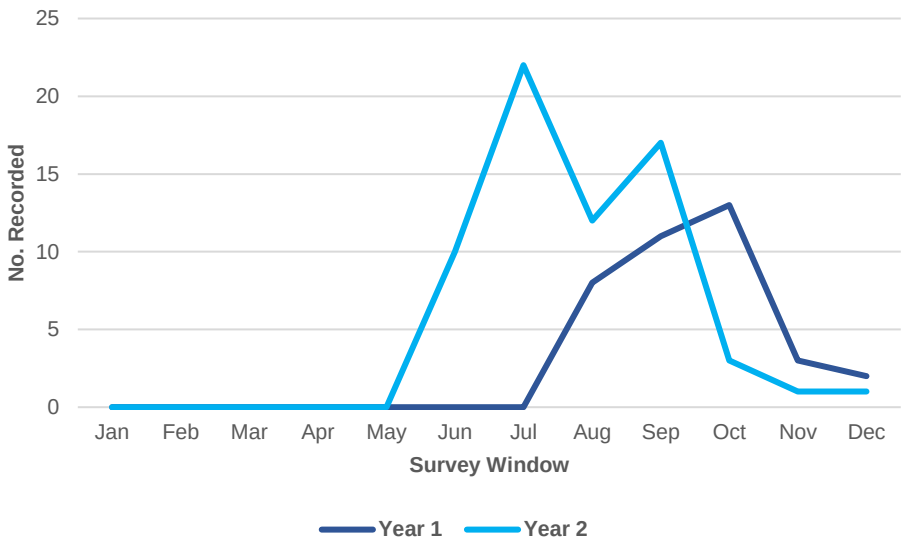

Figure 87 **Total monthly turtle records within the Survey Area for the Year 1 and Year 2 survey periods**

6.14 Large Bony Fish

Large bony fish were recorded from spring to fall, with peak numbers recorded in summer (n=30), followed by spring (n=23). A total of 66 large bony fish were recorded from seven species and species groupings. Three directly identified species were recorded (mahi-mahi, ocean sunfish, and Atlantic bluefin tuna), of which ocean sunfish was the most abundant (n=24), followed by Atlantic bluefin tuna (n=15).

For the Year 1 surveys, a total of 190 large bony fish were recorded, with mahi-mahi also being the most abundant identified species recorded (n=131), followed by ocean sunfish (n=16). Unidentified tuna species were otherwise the second most numerous (n=24). Overall, large bony fish were less numerous in the Year 2 surveys, though recorded an increase in the number of species groupings compared with Year 1 through the addition of unidentified sunfish species and unidentified billfish species.

Large bony fish showed relatively unassociated seasonality between the two survey years, with highest numbers in mid-summer for Year 1 and highest numbers in late spring for Year 2 (**Figure 88**). Additionally, the Year 1 surveys only experienced a further increase at the beginning of winter, whilst the second year only experienced a further increase during mid-fall. Large bony fish occurred throughout the extent of the Survey Area for both survey years, with the larger species such as ocean sunfish recorded as single individuals, and the smaller species such as mahi-mahi occurring in loosely distributed shoals of varying sizes.

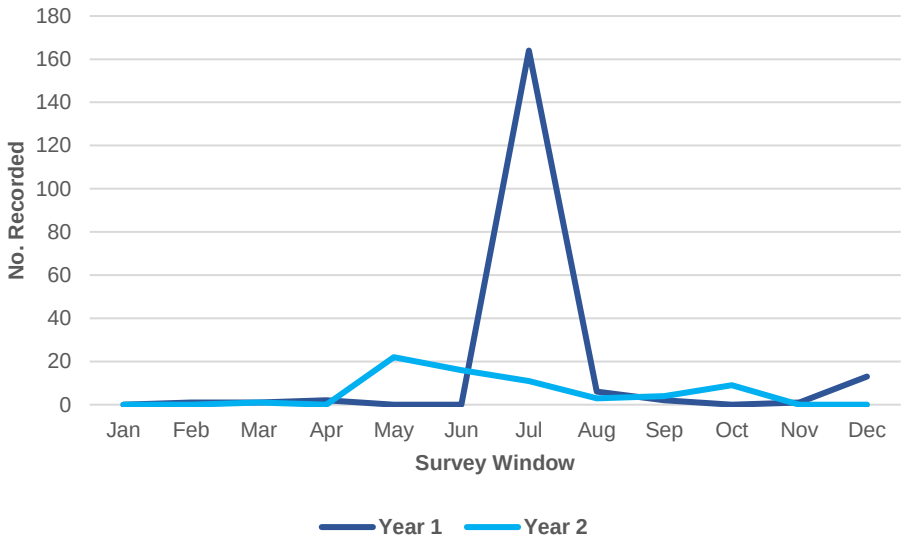

Figure 88 **Total monthly large bony fish records within the Survey Area for the Year 1 and Year 2 survey periods**

6.15 Shark

Sharks were recorded from summer to mid-fall, with highest numbers recorded in summer (n=22). A total of 31 sharks were recorded from nine species and species groupings. Six directly identified species (basking shark, shortfin mako, blue shark, blacktip shark, white shark, and scalloped hammerhead) were recorded, of which basking shark were the most numerous (n=3), followed by scalloped hammerhead (n=2). Unidentified sharks (n=12), and unidentified Carcharhinidae (n=5) and hammerhead (n=5) sharks were otherwise the most numerous.

For the Year 1 surveys, a total of 19 sharks were recorded with blue shark being the most numerous identified species (n=6), followed by scalloped hammerhead (n=2). Both a reduction in species and changes in recorded species were witnessed in the Year 1 surveys, with the occurrence of tiger shark (n=1) but the absence of basking shark, shortfin mako, and blacktip shark. Overall, the Year 2 surveys experienced an increase in both the number of sharks recorded and the number of shark species recorded, though the absence of one species was also observed.

Both the Year 1 and Year 2 surveys exhibited shark seasonality of presence within the Survey Area during the fall, whilst the year 2 surveys also recorded presence from the start of summer, with shark numbers peaking in mid-summer (**Figure 89**). Both survey years recorded no sharks during winter and spring. Few instances of sharks occurring in groups were observed during both survey years, with the majority recorded as single individuals exhibiting loose distribution across the extent of the Survey Area.

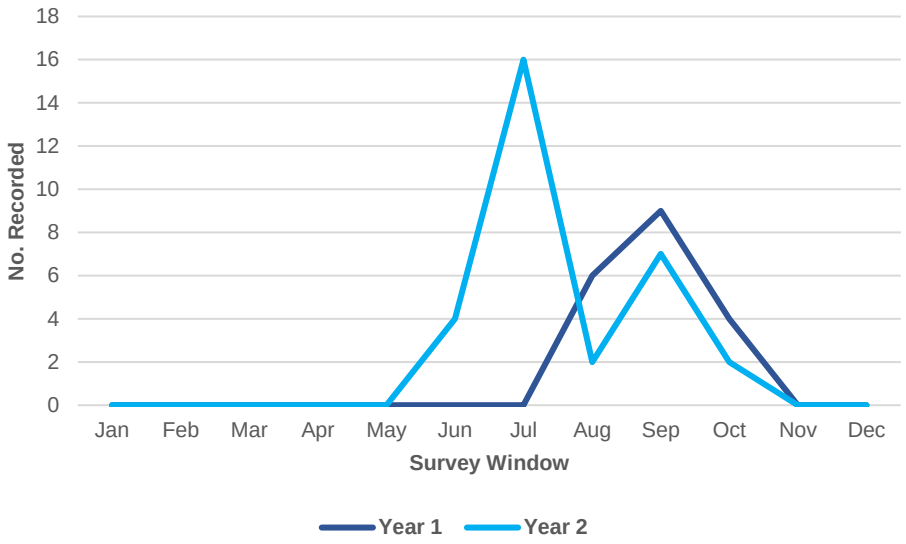

Figure 89 **Total monthly shark records within the Survey Area for the Year 1 and Year 2 survey periods**

6.16 Ray

Rays were recorded in summer and fall, though almost exclusively in fall as 812 individuals were recorded compared with two in summer. A total therefore of 814 rays were recorded from three species and species groupings. Two directly identified ray species (cownose ray and Chilean devil ray) were recorded, of which cownose ray was the most numerous (n=812), followed by Chilean devil ray (n=1). Unidentified rays were otherwise also joint second numerous (n=1).

For the Year 1 surveys, cownose rays alone were recorded with a total of 506, with one ray also recorded in winter. Overall, the Year 2 surveys experienced both an increase in the number of rays and the number of ray species and species groupings recorded.

Rays exhibited a strong seasonality in presence within the Survey Area, with the vast majority of rays recorded during the fall (**Figure 90**). For the first year of surveys, rays were recorded mostly in large shoals in the northeast of the Survey Area, whilst for the Year 2 surveys, rays were mostly recorded in large shoals in the north of the Survey Area.

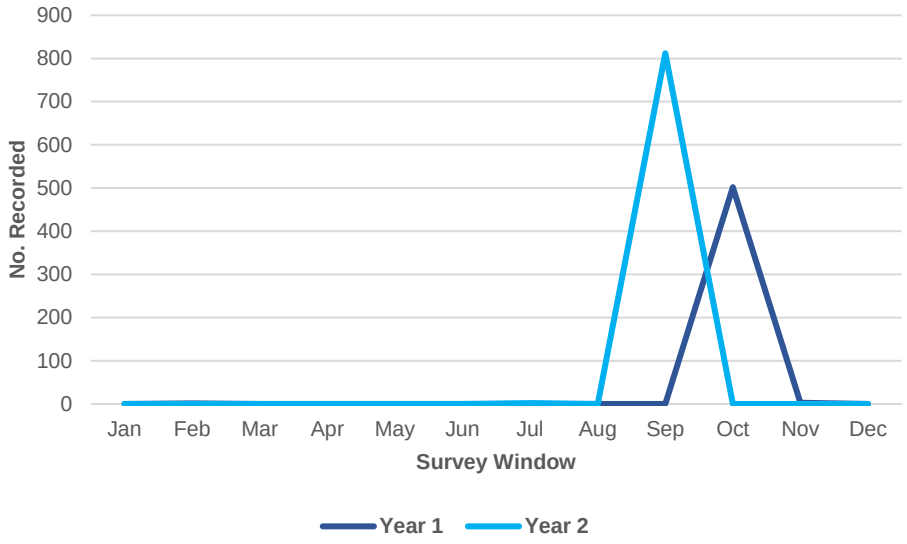

Figure 90 **Total monthly ray records within the Survey Area for the Year 1 and Year 2 survey periods**

7. Conclusions

A program of 12 monthly digital aerial wildlife surveys of the Bureau of Ocean Energy Management (BOEM) Lease Area Outer Continental Shelf – Atlantic (OCS-A) 0512 in the New York Bight, were conducted between February 2019 and December 2019, using APEM Inc.'s high-resolution camera system to capture digital still imagery.

Auks were the most numerous species group overall (n=830), as well as therefore being the most numerous group of birds recorded. The group was predominantly recorded in the winter months, with Survey 24 (December 2019) featuring the highest overall total (n=507) and exhibited distribution throughout the extent of the Survey Area. Auks continued to be recorded into the start of spring before being absent until the end of fall. Rays were the second most numerous species group (n=814), with almost all records occurring in Survey 21 (September 2019) in shoals in the north of the Survey Area. Survey 19 (August 2019) was the only other survey to feature rays, with a total of two individuals. Gulls were the second most numerous group of birds (n=467), featuring at least one record for each survey throughout the survey period, with highest numbers in winter and lowest numbers in fall. As with auks, gulls tended to be found throughout the extent of the Survey Area.

Overall, the number of species records and the number of species and species groupings recorded were similar to those in the Year 1 surveys, though some species experienced a reduction, and others experienced an increase in records between the two years. A difference in identified species presence between the two years was also recorded, as for instance shearwaters showed a decrease in recorded species, whilst sharks exhibited an increase.