Will wind development adversely impact North Atlantic right whales through an increase in vessel traffic?

by

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Executive Summary

The rapid expansion of offshore wind development along the United States east coast has raised concern over its potential effects on marine mammal populations. Potential increases in regional vessel traffic associated with wind energy development are of particular importance in this context because of the heightened vessel strike risk and additional noise exposure they present. Of particular concern, this could pose an increased threat to the critically endangered North Atlantic right whale. There are only an estimated 356 right whales remaining in the population. The species is at risk of extinction, largely because of mortality induced by entanglement and vessel strikes. To address this concern, we obtained monthly vessel density data before, during, and after the construction of three wind energy projects: the Block Island Wind Farm, Coastal Virginia Offshore Wind Pilot Project, and Vineyard Wind I. We analyzed these data to determine whether vessel density increased during the development process. Automatic Identification System (AIS) vessel data were synthesized and cleaned by the Global Marine Traffic Density Service. We conducted a spatiotemporal analysis of vessel density on monthly rasters of vessel occupancy time. The data included layers with all vessels aggregated together, and layers subset by vessel category. We then extrapolated potential outcomes of wind development in these areas based on the changes we observed. Our analysis found that vessel density increased between pre-construction and post-construction by 2.52 – 4.98 monthly hours on average. Substantially larger increases in vessel density occurred once construction started, but they were immediately offset once construction concluded. Overall, the risks to right whales imposed by offshore wind-related vessel density appear low, though continued monitoring in the future is critical to assess these impacts across longer operational periods and larger-scale wind farms.

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Introduction

Offshore wind is a rapidly growing industry within the United States, with new advancements occurring on a near-daily basis. This is a welcome and much-needed step for the U.S. to transition towards more renewable energy sources, but the impact that offshore wind installation and presence will have on the surrounding environment has yet to be fully understood. A variety of ecological concerns regarding the effects of offshore wind have arisen, including collision risks for birds and bats, negative acoustic impacts for hearing-dependent marine species, disturbance to habitat, and changes to the air-water energy exchange interface that could impact atmospheric and oceanic dynamics (EIA, 2022; Farr et al., 2021). These concerns vary widely in terms of their legitimacy and severity. Most legitimate points have been shown to be rectifiable with appropriate mitigation practices (Farr et al., 2021). However, the novel nature of this industry, the speed at which it is developing, and the resultant lack of robust, large-scale data documenting its impacts hamper our ability to evaluate the potential environmental effects of offshore wind (Galparsoro et al., 2022).

To date, relatively few studies have attempted to quantify the impacts of offshore wind on marine mammals in the United States. Most existing work has focused on characterizing the occurrence of whales within specific offshore wind lease sites, and/or quantifying the stressors that those lease sites present (Amaral et al., 2020; Estabrook et al., 2022; Leiter et al, 2017; Quintana-Rizzo et al., 2021). Alternatively, broader-scale studies have examined the impacts of offshore wind from a greater marine ecosystem perspective (Bailey et al., 2014; Best and Halpin, 2019; Farr et al., 2021; Galparsoro et al., 2022).

The present study serves as a novel and crucial continuation of prior work as we performed a detailed investigation of changes in vessel traffic patterns and density resulting from offshore wind development. Apprehension currently surrounds vessel traffic increasing as a result of large-scale wind farm construction, given the numerous risks that heightened vessel activity may present to local marine mammal populations. Little is known about the impacts of offshore wind development on vessel traffic, with only one U.K.-based study examining the impact on traffic flow to date (Rawson and Rogers, 2015). Most offshore wind-related vessel traffic studies focus on collision risk assessment rather than traffic/density changes (Presencia and Shafiee, 2017; Vanderlaan et al., 2009; Yu et al., 2020). Furthermore, the studies that do exist are largely based on wind farms in other countries and therefore do not account for the ecological and logistical dynamics that affect U.S. wind farms. Here we present a new methodology for quantifying the impact of offshore wind on vessel traffic, describe the potential ecological implications of those impacts at U.S. wind lease sites for the first time, and extrapolate what those impacts might mean for impacted marine mammal populations.

Global vessel traffic, tonnage, and speed have increased rapidly over the past century and are projected to continue at an even higher rate in the future (Tournadre, 2014; Sardain et al., 2019; Vanderlaan et al., 2009). The risks to marine mammals caused by this increased traffic include a heightened probability of vessel strikes and increased sound exposure. Vessel strikes cause mortality in large whale populations worldwide, with nearshore populations potentially having a higher risk due to their increased range overlap with vessel traffic (van der Hoop et al., 2012; Vanderlaan and Taggart, 2006). The growth of global vessel traffic and speed is

particularly concerning in this context, as both factors have been highly correlated with increased vessel strike mortalities (Conn and Silber, 2013; van der Hoop, 2012; Vanderlaan and Taggart, 2006; Vanderlaan et al., 2009). Additionally, increased vessel presence, size, and speed, particularly concerning cargo ships, have led to substantial increases in low-frequency noise within the underwater soundscape (Findlay et al., 2023; Haver et al., 2021). While research is ongoing regarding the impacts of noise on large whale behavior, concerns include behavioral disruptions, masking, and chronic stress effects (Findlay et al., 3032; Moore et al., 2021). Notably, the low-frequency noise introduced by increasing shipping traffic may impact baleen whales to a larger degree due to the characteristics of their hearing ranges (Southall et al., 2019).

In the case of North Atlantic right whales (hereafter, "right whale"), these risks may be disproportionately higher, making them a species of particular concern within the context of offshore wind development. One of the most endangered baleen whale species in the world, the right whale population is currently estimated to consist of 356 individuals and has been declining since 2011 (Pettis et al., 2024). Mortalities and morbidities induced by vessel strikes and entanglements are the main factors that have been attributed to this decline, and an Unusual Mortality Event was declared in 2017 due to the rate and severity of these occurrences (Corkeron et al., 2018; NOAA Fisheries, 2024). Climate change is an indirect but potentially severe threat to the species as well (Meyer-Gutbrod et al., 2015). Warming waters have caused distribution shifts to occur within the whales' main prey species, limiting their amount of available prey and further resulting in reproductive difficulties within an already struggling population. Consequently, climate change also drove a distribution shift within the right whale population into waters that, at the time, had minimal protection. The shift brought devastating consequences as a result, including heightened vessel strike mortalities and entanglement risk (Crowe et al., 2021; Meyer-Gutbrod et al., 2021). Additional stressors, such as increasing levels of anthropogenic noise, may also pose substantial threats to the species (Moore et al., 2021).

Right whales utilize coastal waters off New England and Canada throughout the year, with a subset of the population performing an annual migration to the population's only known calving grounds in the Southeastern U.S. (Winn et al., 1986). These whales remain close to shore during this transit and pass through numerous high-density shipping lanes and fishing grounds in the process. This results in near-constant exposure to vessel strike and entanglement risk, as well as other anthropogenetic stressors (Knowlton and Kraus, 2001; Vanderlaan et al., 2009). Underscoring this concern, vessel strike mortalities within the species have been documented two orders of magnitude more frequently than other large whale species (Vanderlaan and Taggart, 2006). In the past eight years alone, 57.7% of mortalities with known causes were attributed to vessel strikes (NOAA Fisheries, 2024). With all these factors currently at play, the development of offshore wind has raised acute concern due to the additional noise and structural obstacles that it will introduce to the whales' environment. Collisions, entanglements, and noise pollution have been identified as some of the major threats that offshore wind may pose to marine mammals (Farr et al., 2021). Many questions exist regarding whether these outcomes will truly materialize in a harmful capacity. If so, they would likely add additional stressors to a population that is already stressed to a critical point.

Methods

To investigate changes in vessel density related to wind farm construction, our study sites consisted of three U.S. offshore wind farms: the Block Island Wind Farm ("Block Island"), the Coastal Virginia Pilot Project (CVOW), and Vineyard Wind I ("Vineyard Wind") (Figure 1). South Fork Wind, the final US wind farm currently under development at the time of writing, was not included in this analysis because construction began too recently for installed wind turbine generator (WTG) data to be publicly available. Due to these farms' relatively recent or ongoing installation, each site offered different benefits for its incorporation in this analysis. Block Island, completed in 2016, was the first U.S. wind farm to be constructed and therefore offered the most historical data for analyzing vessel density changes post-construction. However, the project is sited entirely in Rhode Island state waters, rather than the typical federal jurisdictions in which most future U.S. offshore wind projects will reside. In contrast, CVOW was built in federal waters but consists of only two relatively small WTGs . Vineyard Wind was the first offshore wind project in the U.S. to use full-size WTGs in federal waters, thereby providing the most representative example of what that scale of development might mean for regional vessel density. However, construction was not completed by the time this analysis was performed, meaning that the entire construction period was not captured in this analysis and no post-construction data could be analyzed.

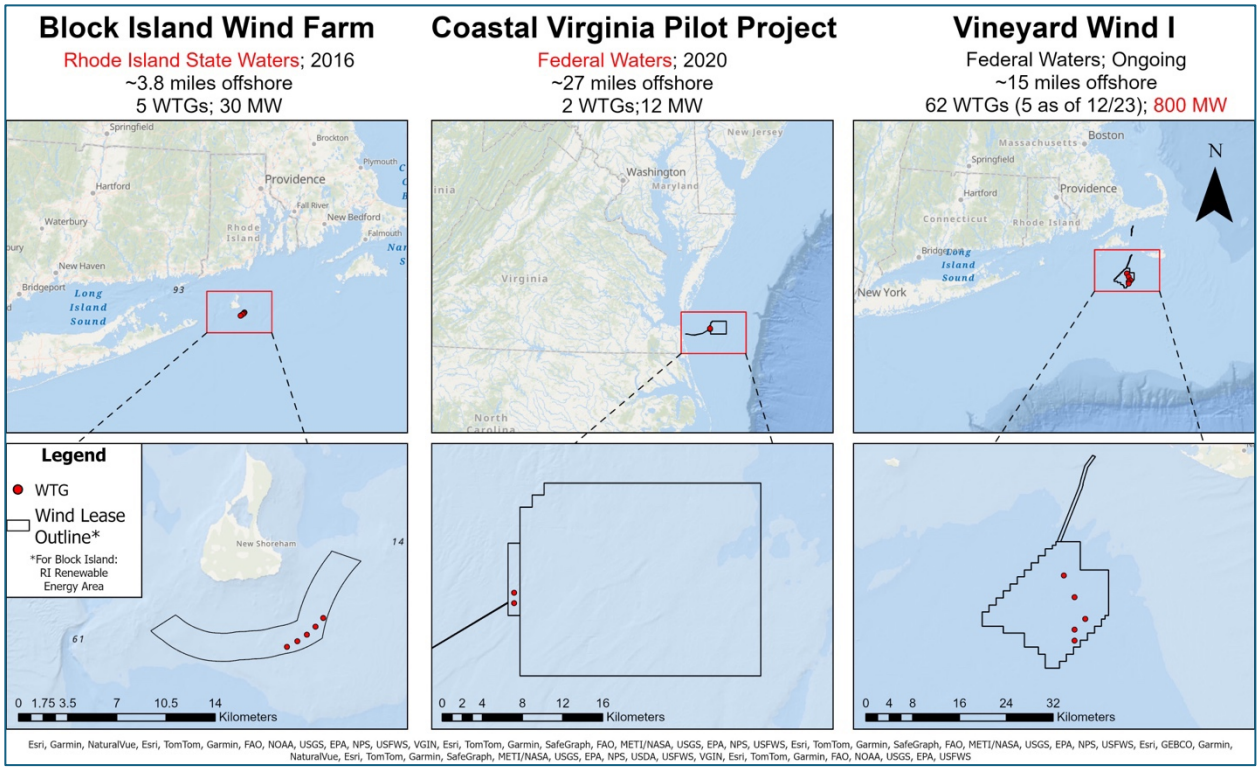


Figure 1. The three offshore wind farms used in this analysis are visualized relative to their location on the east coast of the United States. Each wind farm was displayed with its respective lease site for scale (or, in the case of Block Island, the Rhode Island Renewable Energy Area). Characteristics of each wind farm that may have uniquely impacted the vessel traffic required for wind farm construction are highlighted in red.

1. Data Sources

1.1. WTGs

The locations of each wind farm's WTGs were provided by the U.S. Geological Survey's (USGS) United States Wind Turbine Database (Hoen et al., 2023). The dataset contained the location of WTGs in both state and federal jurisdictions and therefore included Block Island and CVOW. However, the Vineyard Wind WTGs were still under construction at the time of this analysis and were not yet included in the USGS database. The location data for the Vineyard Wind WTGs instead came from the Bureau of Ocean Energy Management's Office of Renewable Energy Programs. The data for Vineyard Wind were updated through December 2023 at time of use. For more information on the WTGs used in this analysis, see Table 1.

Table 1. Installation, size, and energetic specifications of the WTGs used in this analysis (BOEM, 2023; Hoen et al., 2023).

Project	Number of WTGs Installed	Year Installed	WTG Maximum Height (m)	WTG Capacity (MW)
Block Island Wind Farm	5	2016	181.10	6
CVOW	2	2020	185.0	6
Vineyard Wind I	5 (62 planned)	2023 (ongoing)	247.5	13.6

1.2 Vessel Density

Vessel density data were provided by the Global Maritime Traffic Density Service (GMTDS), an organization that collects, cleans, and synthesizes Automated Identification System (AIS) data into time-based monthly vessel density rasters (GMTDS). AIS is a method of automatically transmitting a vessel's position and other relevant identifying information, including vessel type, course, draft, and speed, over a remote maritime communications system (GMTDS, n.d.a; USCG, n.d.). Carriage requirements vary by country; in the U.S., requirements cover large vessels, including commercial vessels that are greater than or equal to 65 feet in length and vessels certified to carry at least 150 passengers (Vessel Requirements for Notices of Arrival and Departure, 2015). Following transmission, each vessel's information is encoded and can be applied to a variety of research purposes.

To produce their monthly density rasters, GMTDS aggregated raw AIS data and removed any points considered anomalous or incorrect (GMTDS, n.d.b). Indicators of abnormal data included invalid vessel identification numbers, irregular speed, course, or location information, and questionable locations (ex: the reported vessel location was over land). Vessel tracks were then calculated from the cleaned location point data. Notably, points that were reported at least six hours or 30 km apart were not included in the trackline calculation and subsequent density calculations, as they were deemed "excessive time intervals" or "excessive distances". The monthly time components of each trackline were then summed across one km^2 grids, resulting in rasters that provided vessel density in terms of monthly hours per km^2. For more information regarding GMTDS methodology, see the GMTDS "Data" webpage or the EU Vessel Density

Map Detailed Method, from which GMTDS "closely modeled [their processes]" (GMTDS n.d.b; Falco et al., 2019).

The vessel density data consisted of one raster per month for the requested study periods. Vessel density data were provided for ten vessel categories: all vessels (aggregated), cargo, fishing, icebreakers, non-commercial, passenger, tankers, service ships, all vessels (other), and all vessels (unknown). All analyses were conducted on every vessel category, however, the results presented here *are for all vessels aggregated only.* Mention of specific vessel categories will be used only in an anecdotal or supplemental fashion to bolster the analysis. All vessel density data were provided by GMTDS in the geographic coordinate system WGS84, and all subsequent calculations using the data maintained the same coordinate reference system. When linear units were required for additional data layers, they were projected in WGS 84 UTM Zone 18 or 19, depending on where the wind farm was located.

2. Vessel Density Analysis

2.1 Calculating Change Over Time

To accurately analyze the change in vessel density over the course of each wind farm's development, each raster was recalculated to change all cells with a value of "No Data" to a value of "0". This was done to accurately represent cells where no vessels were detected in a given month. The monthly rasters within each wind farm's study period were subsequently divided into three development phases for comparison: "pre-construction", "construction", and "post-construction". To appropriately capture each wind farm's pre-construction period, we requested vessel density data up to five years before construction started. Data recorded earlier than five years prior to construction may have included outdated vessel densities that do not represent an accurate baseline for pre-construction marine traffic. The beginning of construction was defined as the first day that either offshore cable laying or piledriving began. Operational testing was included in the construction period. High-resolution geophysical surveys were excluded from the construction period due to the relatively small number of vessels they require. The post-construction phase began at the end of construction and captured as much of each wind farm's operational period as possible. The exact dates for each wind farm's development phases can be seen in Table 2.

Table 2. The dates and number of months for each development phase per wind farm.

Block Island	**Dates**	**Number of Months Per Development Phase**
Pre-construction	January 2011 – June 2015	54
Construction	July 2015 – November 2016	17
Post-construction	December 2016 – August 2023	81
CVOW		
Pre-construction	January 2015 – April 2020	64
Construction	May 2020 – September 2020	5
Post-construction	October 2020 – August 2023	35
Vineyard Wind I		
Pre-construction	January 2017 – October 2022	70
Construction	November 2022 – August 2023	10
Post-construction	N/A	N/A

Changes in vessel density over time were calculated on both annual and seasonal scales. Annual change was calculated by averaging every monthly vessel density raster within each of the three distinct development phases together, then subtracting the three resulting average vessel density rasters for each development phase from each other. When the subtraction was carried out, the earlier development phase was always subtracted from the later (ex: post-construction minus pre-construction). This resulted in difference rasters which summarized the average change in vessel density between each development phase. The same process and development phases were used to analyze changes in vessel density on a seasonal scale, but averages and differences were calculated for each month within each development phase individually, rather than aggregating all months together. This analysis resulted in both average and average difference vessel density rasters for every month within each development phase.

2.2 Sample Site Analysis

The resulting difference rasters from the annual and seasonal analyses described above covered substantially large areas, which did not allow for localized change at the scale of each wind farm to be determined. To rectify this oversimplification, localized study sites that exclusively covered the wind farms were created by buffering each wind farm by 2 km. The study sites were then replicated and randomly redistributed as many times as possible within a 75 km^2 area surrounding the wind farm to compare changes in vessel density detected at each wind farm to the area immediately surrounding them (Figure 2). Zonal statistics were then calculated, including mean and standard deviation, to extract the average changes and variance in vessel density within each sample site.

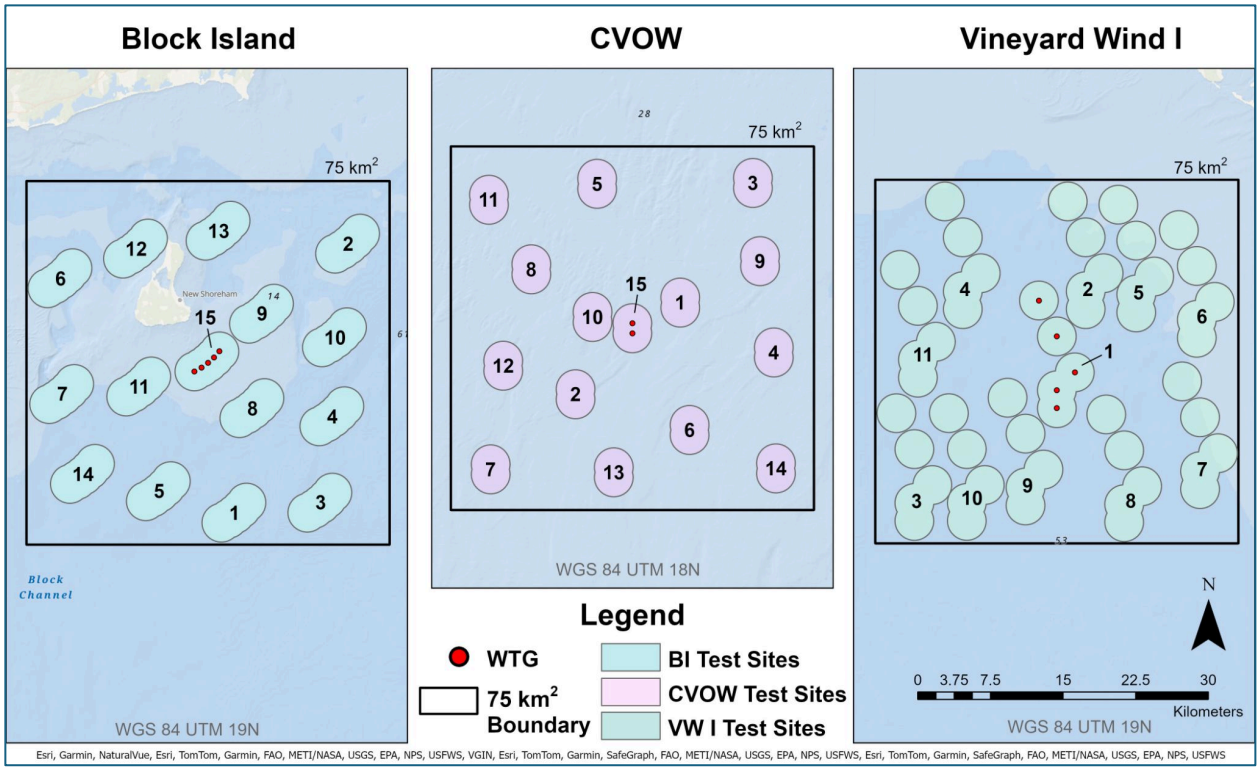


Figure 2. The shape, size, and distribution of each randomized sample site used in this analysis, along with the original wind farms and their 2 km buffers. The sample sites were exact copies of the original 2 km buffers in order to preserve their unique shape and scale.

The size of the resampling area was chosen to maximize the number of sample site replicates while remaining within the immediate area of the wind farm. As a result, the sites covered both inshore and offshore of the wind farms but had similar oceanographic conditions because of their proximity. Due to sample site size and shape varying by wind farm, it was not possible to have an equal number of resampling sites within each 75 km^2 boundary. As a result, there were 14 resampling sites for Block Island and CVOW, excluding the true wind farm sites, and ten for Vineyard Wind, whose WTG extent was substantially larger. This was the largest number of sample sites that could fit without overlap, although there was likely resampling of certain raster cells where buffers were close. The sample sites did not intersect any land.

3. *Analysis*

All raster analysis was done in ArcGIS Pro v3.2.0. All data visualizations were done in R v2023.12.1+402 (ESRI, 2023; Posit team, 2023).

Results

1. *Annual Change*

We received 152 vessel density rasters for each of the ten vessel categories covering the Block Island and Vineyard Wind study areas, and 104 rasters for each vessel category covering the CVOW study area. The vessel density data for the New England region ranged from 2011 – 2023 while the data for the Virginia coast ranged from 2015 – 2023. The New England and Virginia study areas covered 135,176 km^2 and 107,476 km^2, respectively. We designated the pre-construction phase as beginning five years before construction started, so there were 13 years of vessel density data analyzed over the course of Block Island's development, nine for CVOW, and seven for Vineyard Wind (Table 2). The average change in vessel density across all wind farms and development phase comparisons ranged from -33.89 (construction – post-construction) to 36.41 monthly hours (pre-construction – construction), both at CVOW.

Overall, vessel density increased slightly between pre-construction and post-construction across both wind farms for which we had post-construction data (Figure 3; Figure 4). There was a sharp increase in vessel density at Block Island between pre-construction and construction ($\overline{x}$ = 33.87 monthly hours), followed by an almost equally sharp decrease between construction and post-construction ($\overline{x}$ = -28.89 monthly hours), culminating in a mild increase overall ($\overline{x}$ = 4.98 monthly hours). CVOW displayed an identical pattern to Block Island over the development phases but had a larger initial increase in vessel density, followed by a larger subsequent decrease, and a lower increase in vessel density than Block Island overall ($\overline{x}$ = 36.41 monthly hours, -33.89 monthly hours, and 2.52 monthly hours, respectively). Vineyard Wind had a smaller increase in vessel density compared to the other two wind farms between pre-construction and post-construction ($\overline{x}$ = 6.82 monthly hours).

Construction typically includes a wide and numerous variety of vessels that install WTGs, bury cables, and carry crew. Once completed, a smaller number of maintenance and crew transfer vessels are used to facilitate the wind farm's operation. To investigate the spatial coverage of these vessels during each development phase, we looked at the variance associated with each phase comparison. Variances were substantially high across all wind farms, particularly during the two phases that included construction, indicating that large changes in vessel density were highly localized (Figure 3). The highest variance occurred between pre-construction and construction, with a range of 18.44 – 53.36 monthly hours. The maximum variance within the construction – post-construction comparison was slightly lower, with a range of 46.52 – 49.95 monthly hours. The localized change observed in the variance of the development phase comparisons was underscored by the fact that substantial increases in vessel density were almost exclusively localized to the 1 km^2 cells that directly surrounded the turbines (Figure 4). The pre-construction – post-construction comparison had substantially lower variance across wind farms, with a range of 3.57 – 9.55 monthly hours. Similarly to the other development phases, the highest increases observed within the buffered area were located at the cells that overlapped with the turbines (Figure 4).

The degree of change in vessel density that was exhibited by each wind farm was starkly different from what was exhibited by the random sample sites during comparison periods involving construction (Figure 3). For instance, the largest increase in vessel density experienced by a sample site near Block Island during wind farm construction was 2.27 monthly hours on

average, while in the same period, the wind farm itself experienced an average increase of 33.87 monthly hours. Similarly, the largest amount of change that a sample site near CVOW experienced was an average decrease of -9.63 monthly hours once construction ended. Over the same comparison period, the wind farm experienced an average decrease of -33.89 monthly hours. Notably, this trend ended once construction was not included in the comparison; between pre-construction and post-construction, the difference between Block Island's total change in vessel density and that of the sample site with the highest amount of change (#12) was less than one, while at CVOW, three sample sites experienced more change on average than the wind farm did (#4, #7, and #13; Figure 3).

These results summarize the findings for all vessel types aggregated together, but it is also important to consider the effect that vessel density changes from wind farm development may have on specific vessel types and industries. Overall, the vessel types that experienced the most change within the wind farm sample sites between pre-construction and post-construction, excluding the randomized sample sites, were "All Others" and "Cargo Ships". "All other" vessel density increased at Block Island and CVOW by 4.34 average monthly hours and 2.63 average monthly hours, respectively. Conversely, cargo ship vessel density experienced the biggest decrease at both wind farm sites, dropping by 0.32 and 0.21 average monthly hours, respectively. Excluding the more general vessel types ("all other" and "unknown), fishing and service ships were the industries that experienced the largest increases in vessel density after the completion of each wind farm. At Block Island, fishing vessel density increased by 0.27 average monthly hours, while service ship vessel density increased by 0.07 average monthly hours at CVOW.

The largest changes in vessel density experienced by any vessel type (excluding "all vessels aggregated") across all the sample sites were exhibited by "all other" vessels at Block Island during the pre-construction – construction and construction – post-construction comparison periods (+32.61 monthly hours and -28.26 monthly hours, respectively). Regarding specific industries, the highest degrees of change were exhibited by passenger ships at the CVOW wind farm site (+8.06 monthly hours between pre-construction and construction, and -8.04 monthly hours between construction and post-construction. In general, passenger and cargo ship vessel density increased the most (though still extremely marginally) between pre-construction and construction of wind farms across the entire study area. Those industries also had the greatest, and almost perfectly inverse, decreases in vessel density between construction and post-construction.

Between pre-construction and post-construction, cargo ships almost exclusively experienced the highest increases in vessel density across the entire wind farm and sample site study area, with the singular exception of high fishing vessel presence observed at a sample site near Block Island (Site #13; Figure 2). However, it is important to note that a substantial increase in vessel density (>15 monthly hours) was only observed twice, during the aforementioned increase of "all other" vessel types at the Block Island Wind Farm and CVOW during construction. No other substantial changes in vessel density were observed across any vessel type or specific industry throughout the study period. For more details regarding the changes in vessel density for each vessel type, see the Appendix (Table 1).

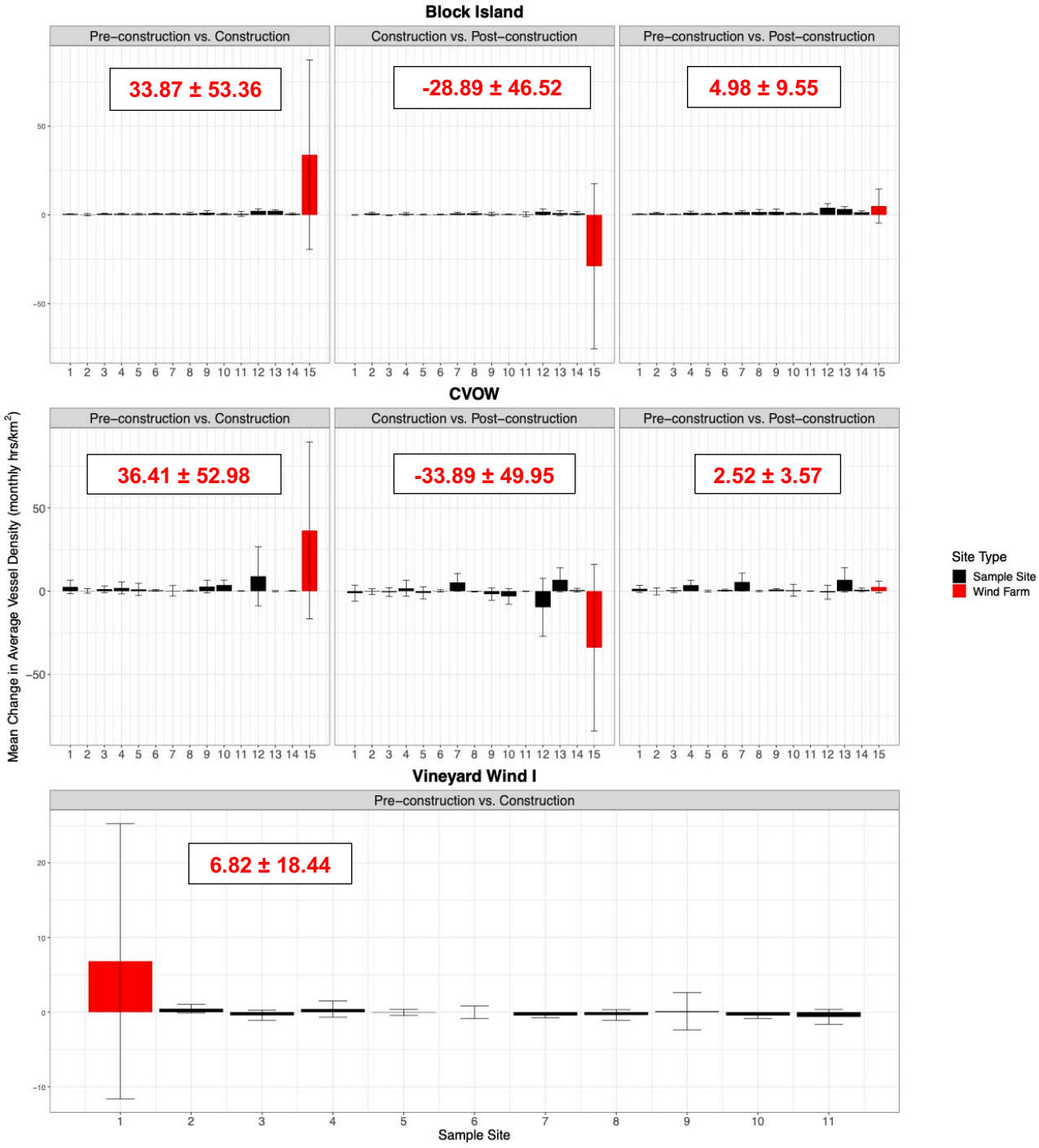


Figure 3. The mean change and variance in vessel density at each sample site across the three development phases, by wind farm. The true wind farm sites are shown in red, and the randomized sample sites are shown in black.

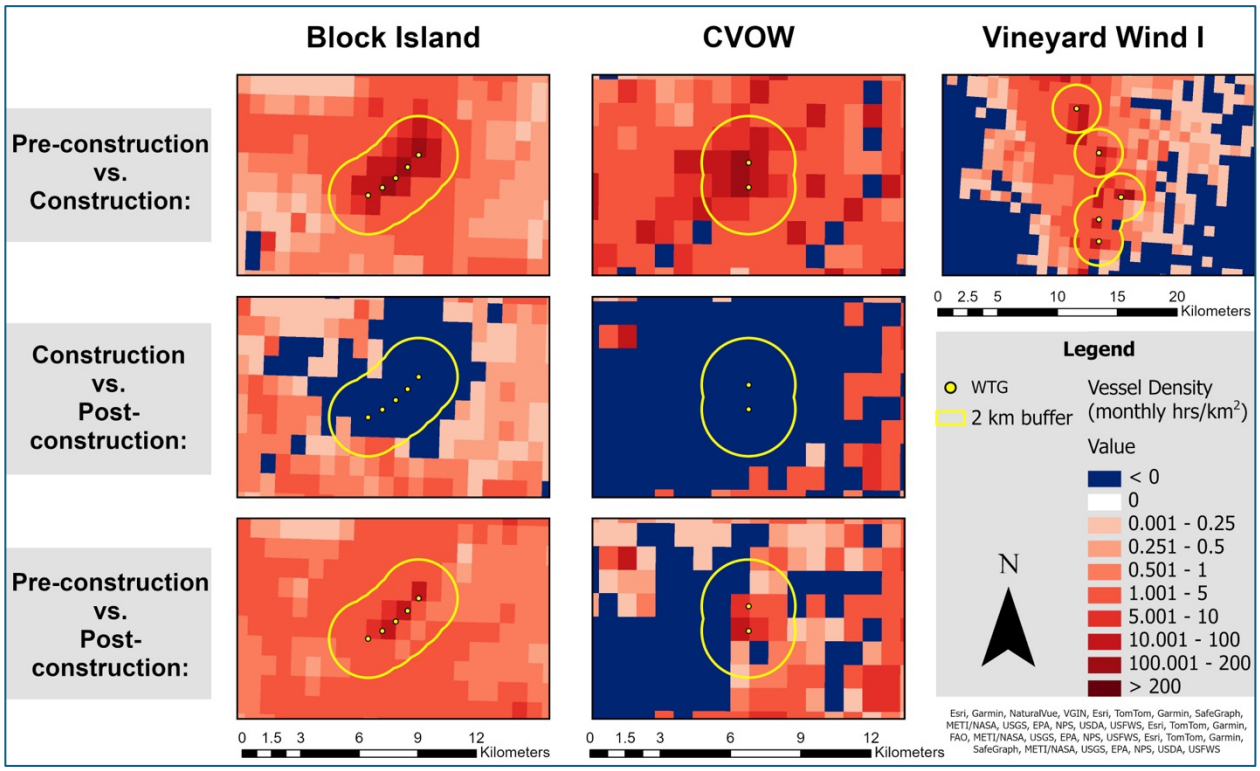


Figure 4. The average change in vessel density, in monthly hours per km^2, between each wind farm's development phases. Wind lease outlines and WTGs were included as reference points. Note the legend's exponential increase in value; light pink/red coloration represents small amounts of change (0 – 5 monthly hours), while the darkest reds represent changes an order of magnitude higher (100+ monthly hours).

2. Seasonal Change and Variance

We considered seasonality for two reasons: first, to examine changes in vessel density throughout development with more granularity, and second, to examine any pre-existing patterns that may have existed within the data that were tied to a seasonal scale. If our study areas had regular fluctuations in vessel traffic that were indeed tied to a seasonal timescale, this underlying pattern may have biased any changes observed during wind farm construction that we detected on an annual scale. Seasonality was an inextricable factor within the construction phase; each wind farm analyzed in this analysis had different lengths of construction time, and each construction period was carried out over different seasons. Block Island's construction lasted 17 months, beginning in the summer and ending in the late fall, while CVOW's construction lasted 5 months, and was carried out over the summer. Vineyard Wind's construction is ongoing as of writing, but ten months of its construction which began in the late fall were captured here.

2.1 Seasonal Change

Analyzing changes in vessel density on a monthly scale allowed for a more detailed investigation of the fluctuations that occurred over the course of development at each wind farm. Similarly to the results from the annual analysis, the wind farm sites experienced substantially larger changes in vessel density during development than the surrounding sample sites did,

indicating that significant changes in vessel density were most likely a direct result of development (Figure 5). There was one exception at CVOW, where one of the sample sites (#12) mirrored the wind farm site's sharp increase and subsequent decrease in vessel density in June. Notably, the site is located close to the CVOW export cable route (Figure 1, Figure 2).

The Block Island wind farm site experienced a sharp increase in vessel density in May between pre-construction and construction that plateaued at a significantly high level (between 47.9 and 57.68 monthly hours) through August, until vessel density began to quickly drop off and held near zero throughout the fall and winter (Figure 5). That pattern was nearly perfectly reflected between construction and post-construction; every increase in vessel density in the pre-construction – construction comparison phase had a corresponding decrease in vessel density in the construction – post-comparison phase. Overall, the post-construction vessel density at the wind farm site did not stand out very significantly from the average change experienced across all sample sites. The largest increase in post-construction vessel density compared to pre-construction occurred in July, though the increase was only 11.74 average monthly hours, which was not considered significant.

Vessel density started at a significantly high level during the beginning of construction at CVOW, then increased to its highest peak in June before sharply dropping to near-average values by July (Figure 5). Similarly to Block Island, every increase in pre-construction – construction vessel density was offset by a decrease between construction and post-construction. Compared to pre-construction, post-construction values were extremely average across every month and did not substantially differ from the surrounding sample sites. The highest increase in pre-construction – post-construction traffic at the wind farm was in August, though again, the increase was not substantial (4.21 average monthly hours). Notably, there was relatively higher vessel density across all sample sites near CVOW between January – April.

Between pre-construction and construction, the Vineyard Wind site experienced a sharp increase in vessel density in June (Figure 5). Vessel density then decreased in July, before rebounding again in August. Following the dynamic changes experienced in the summer, vessel density at the site dropped to near zero and remained consistent through the rest of the year. Overall, there was no local seasonal fluctuation in vessel density across the sample sites, though there was a slight decrease in vessel density across multiple sample sites in August. However, the decrease was not substantial and rose back to near zero by November.

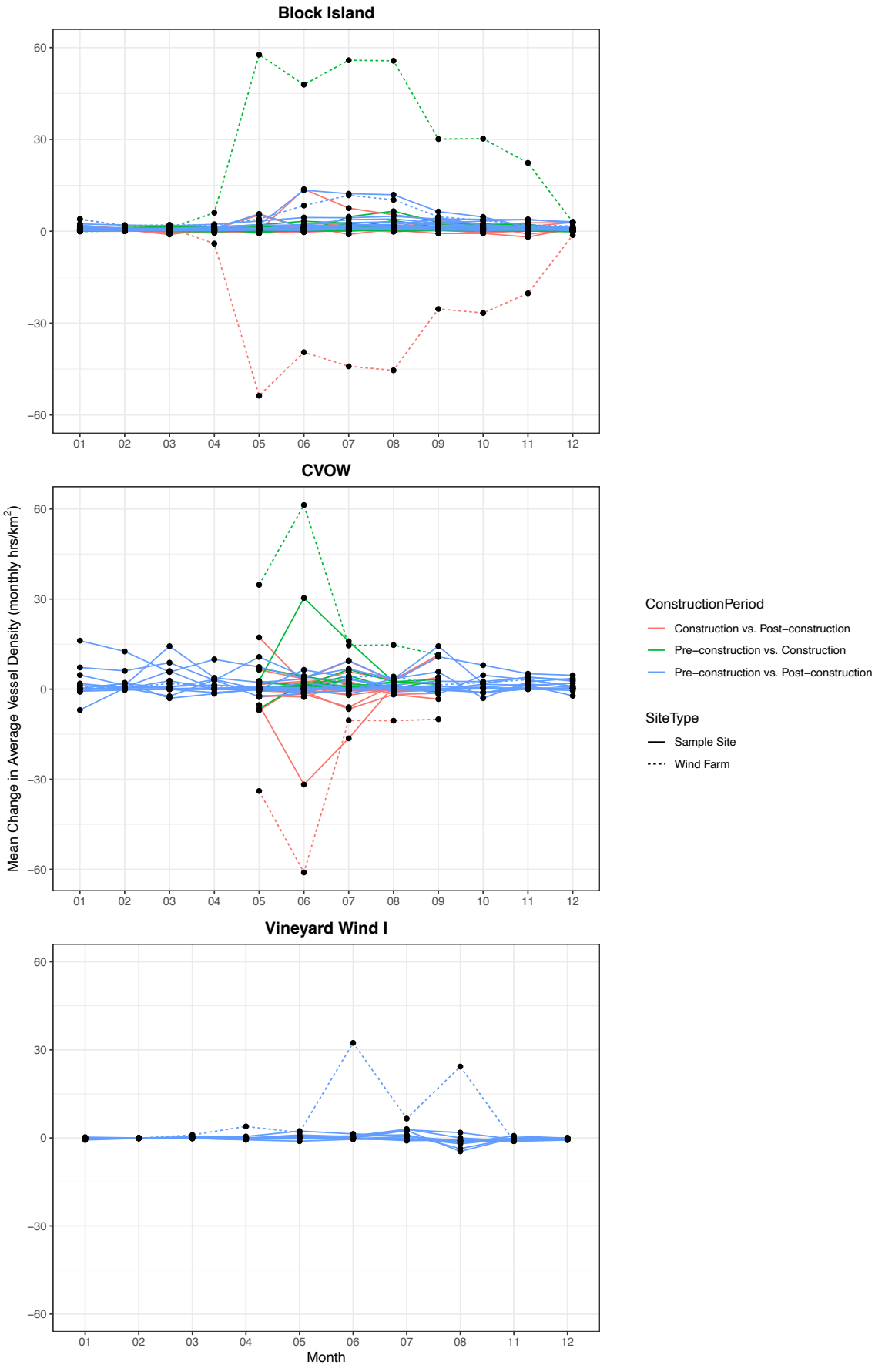
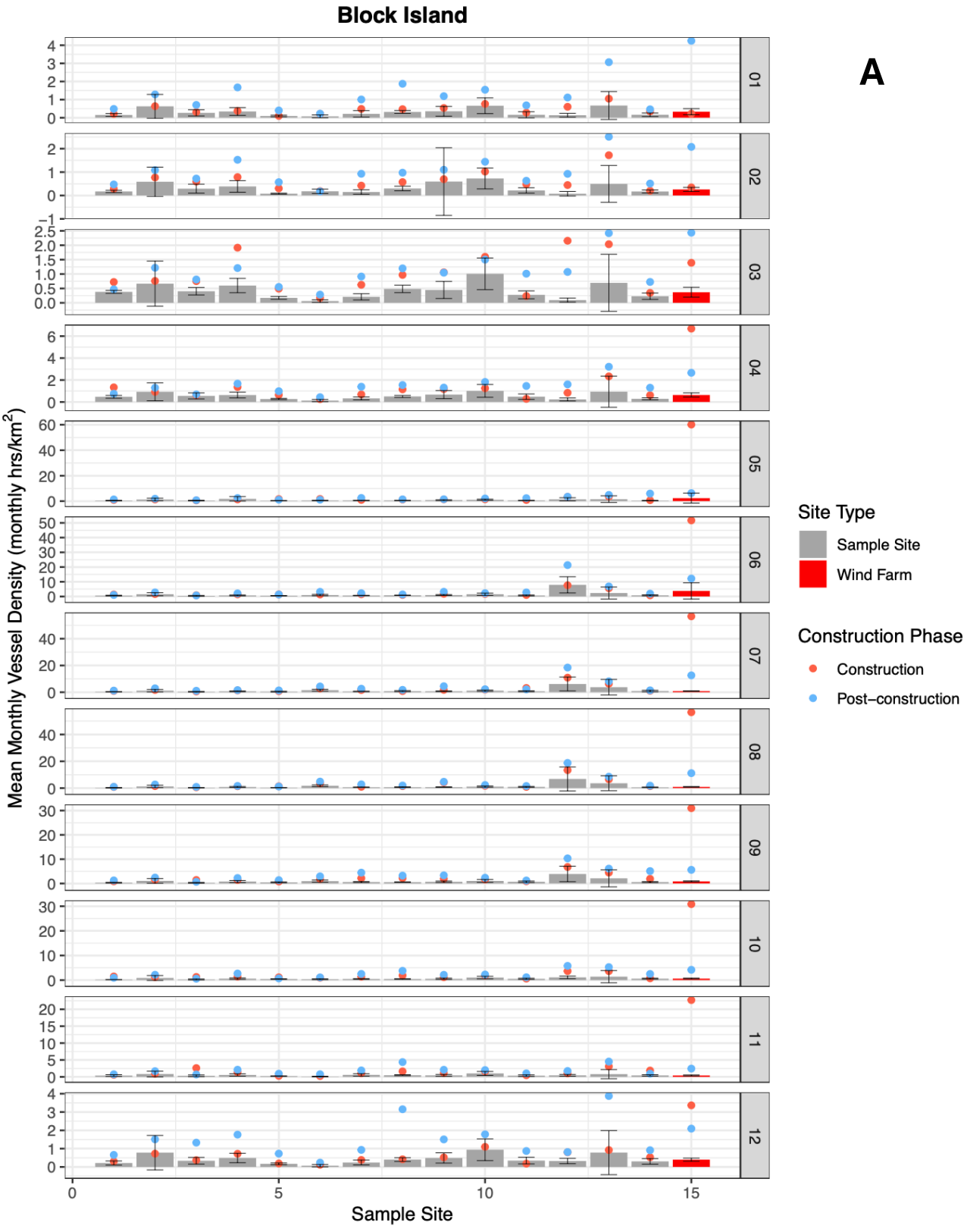

Block Island
CVOW
Vineyard Wind I
Mean Change in Average Vessel Density (monthly hrs/km^2)
60
30
0
−30
−60
01
02
03
04
05
06
07
08
09
10
11
12
Month
ConstructionPeriod
Construction vs. Post−construction
Pre−construction vs. Construction
Pre−construction vs. Post−construction
SiteType
Sample Site
Wind Farm

Figure 5. Mean change in vessel density at each sample site across the three development phases per wind farm, shown on a monthly scale. The true wind farm sites are connected by dashed lines, while the randomized sample sites are connected by solid lines.

2.2. Seasonal Variance

The average post-construction vessel density was higher than the pre-construction variance more frequently, and to higher degrees, than the average construction vessel density across the sample sites in every study area (Figure 6A – C). At Block Island, that trend reversed at the wind farm sites, where the average construction density was substantially higher than both the pre-construction variance and post-construction average nearly every month of the year (Figure 6A). This pattern was upheld even more consistently at CVOW, where the average construction vessel density was higher than both the pre-construction variance and post-construction average during every month where construction occurred at the wind farm site (Figure 6B). At Vineyard Wind, the average vessel density during construction was only significantly higher than the pre-construction variance at the wind farm site (Figure 6C). There did not appear to be any seasonal correlation with construction or post-construction averages falling outside of the pre-construction variance other than the wind farm development across all study areas.


Block Island
A
Mean Monthly Vessel Density (monthly hrs/km^2)
Sample Site
01
02
03
04
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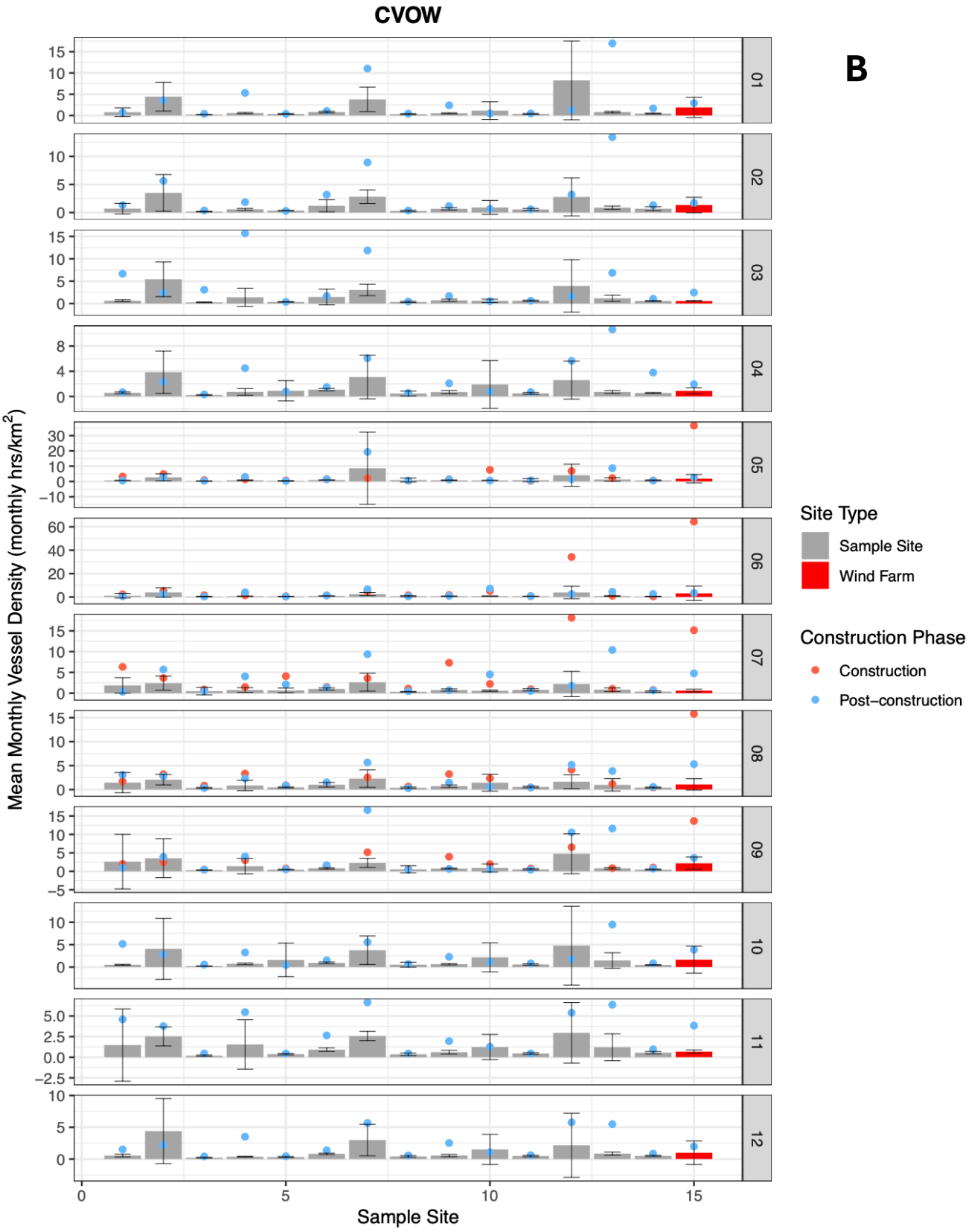
07
08
09
10
11
12
Site Type
Sample Site
Wind Farm
Construction Phase
Construction
Post−construction


CVOW
B
Mean Monthly Vessel Density (monthly hrs/km²)
Sample Site
01
02
03
04
05
06
07
08
09
10
11
12
Site Type
Sample Site
Wind Farm
Construction Phase
Construction
Post−construction

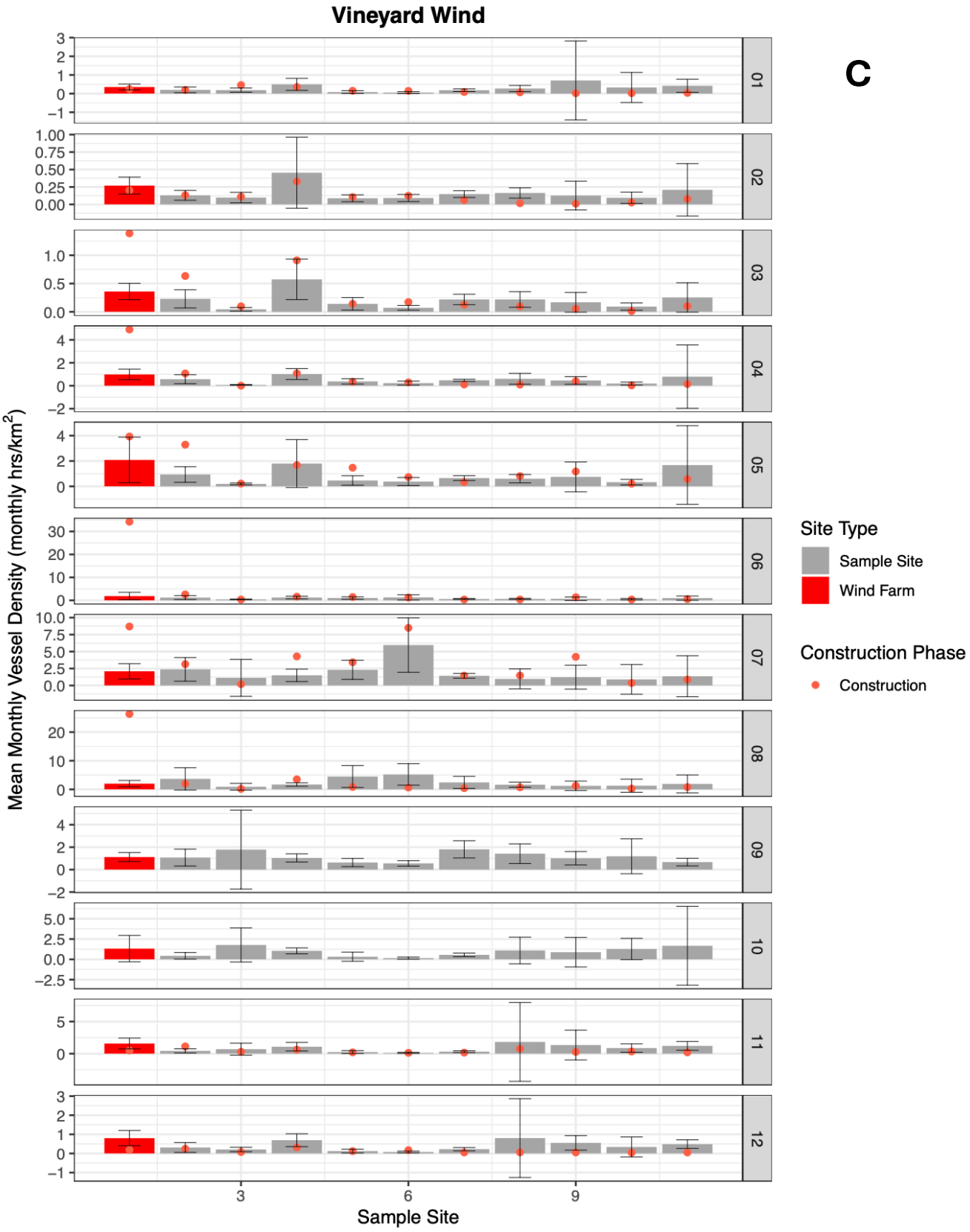

Vineyard Wind
C
Mean Monthly Vessel Density (monthly hrs/km²)
Sample Site
01
02
03
04
05
06
07
08
09
10
11
12
Site Type
Sample Site
Wind Farm
Construction Phase
Construction

Figure 6. Bar graphs showing the mean vessel density and associated variance per month within each wind farm's preconstruction period (A – C). The summary statistics from each randomized sample site were included for reference, with sample sites symbolized in gray bars and wind farm sites symbolized in red. The figures are faceted by month, with months labeled on the right side of the figure. The mean vessel densities per month within the construction and post-construction periods are overlaid on top of each bar, symbolized by points. The figure visually compares whether changes in vessel density fit within the variance of the original pre-construction period on a seasonal scale. Note the different values of each legend per facet.

Discussion

Wind Farm Development and Vessel Density

Offshore wind development was characterized by a sharp increase in vessel density once construction began that was immediately offset by a subsequent decrease in vessel density once construction ended. Overall, this resulted in only a slight increase in vessel density at each wind farm over the entire development period ($\overline{x}$ = 4.98 more monthly hours at Block Island, and $\overline{x}$ = 2.52 more monthly hours at CVOW). Furthermore, there were no substantial increases in vessel density observed within any other sample site surrounding the wind farm once construction was complete, or within specific vessel types. These findings indicate that offshore wind development did not have a lasting negative impact on local vessel density.

During construction, vessel density increased by 6.82 – 36.41 average monthly hours across the wind farms. Interestingly, the lowest increase (6.82) was exhibited by the largest wind farm of the three, Vineyard Wind. Vineyard Wind is larger in terms of both turbine coverage and individual turbine size, and while one might hypothesize that those parameters would result in higher vessel density to handle the installation of a larger operation, the results indicate that the opposite was true. This may have been because the buffers used in this analysis only captured the fully constructed turbines, rather than all foundations installed to date. However, this explanation is unlikely; the increase in vessel density exhibited at Vineyard Wind was highly localized to the five completed turbines and did not extend into other areas of the lease site (Figure 4). Furthermore, the randomized sample sites covered a large extent within the overall lease area, and those sites did not reflect the same level of change as the buffer area centered around the completed turbines. This indicates that Vineyard Wind construction did not require the same amount of vessel traffic as Block Island and CVOW within the period of construction that was analyzed. This may be because the Vineyard turbines are larger and take longer to install, thereby diluting the amount of construction-related vessel density over time, or because the increased turbine coverage requires a similar amount of vessels used for Block Island and CVOW dispersed across a larger area.

In comparison, Block Island and CVOW experienced more than four times the vessel density increase that Vineyard experienced during construction (33.87 and 36.41 average monthly hours, respectively). This was a significant increase, in that vessels were on the water for >30 more hours per month on average because of construction. However, these increases were also heavily localized to the turbine sites, similar to Vineyard Wind, and were counteracted as soon as construction ceased. The inverse relationship between high vessel density increases once construction began followed by nearly equal decreases once construction was completed

was consistent across this analysis; it was observed at every wind farm, on both an annual and monthly scale, across all vessel types. This indicates that any additional vessels put on the water due to wind farm construction are almost completely removed post-construction, and post-construction maintenance requirements do not cause a significant, lasting vessel presence.

Our findings lend themselves to mitigation efforts that could reduce the impact of offshore wind-related vessel impacts on right whales. The localization of the construction-related vessel traffic indicates that risks incurred by vessels during development exist only in highly specific areas, and thereby suggests that targeted restrictions to parameters such as speed and sound production would be highly impactful. Furthermore, the immediate and sharp decrease in vessel density that occurred once construction was completed indicates that temporal restrictions on construction are highly effective as well. When construction was not underway, vessel density within the wind farms dropped to near-baseline levels, indicating that halting construction is an effective means of eliminating vessel-related risks caused by wind farm development from an area. The seasonal analysis further underscored the efficacy of temporal restrictions on construction as a mitigation measure. The steep increases and decreases exhibited month-to-month during construction suggest that construction limitations enforced on a similar temporal scale are an effective measure for quickly taking vessels off the water. Therefore, continuing to structure construction moratoriums around right whale migration patterns will significantly reduce the vessel-related risk posed to the species.

Regarding the impact of offshore wind development on specific industries, the marginal increase in fishing presence that occurred near Block Island was a notable result that was not mirrored across the other wind farm sites. Fishing vessel presence increased across every sample site between pre-construction and post-construction at Block Island, and it was also the industry that experienced the largest increase in vessel density post-construction overall (excluding the more general vessel types “all others” and “unknown”). In comparison, fishing presence decreased post-construction at CVOW and was also decreasing once construction started at Vineyard Wind (Appendix Table 1A, 1C). A potential explanation for this phenomenon is that Block Island’s placement in state waters is much closer to shore and easier for fishers to access compared to CVOW or Vineyard Wind. Additionally, bathymetric and oceanographic dynamics in near-shore waters may stimulate fish productivity to a higher degree (Nixon et al., 1986). An alternative explanation might lie in the groups of fishers who can access the newfound productivity that is created by the turbines serving as artificial reefs: the turbines may be stimulating productivity equally, but only small-scale commercial fishers are able to navigate their vessels between the turbines to take advantage. This would explain the boost in near-shore fishing vessel density that was not shared by the wind farms constructed in federal waters, as small-scale fishers tend to stay within near-shore environments (Daw et al., 2012). While this may be a positive outcome for the fishing industry, it is critical to closely monitor any offshore wind-related increase in fishing effort that may lead to an even higher entanglement risk for right whales. According to the results of our analysis, that monitoring effort should be directed toward near-shore wind projects.

Overall, vessels spending 2 – 5 more hours per month at a wind farm site post-development do not present a substantial risk to right whales or any other large whale species in the area. Furthermore, the substantial vessel density increases that were observed during development were tightly coupled with wind farm construction, indicating that the vessels driving that increase were likely part of the construction fleet. Given that the National Oceanic

and Atmospheric Administration mandates a 10-knot speed restriction during development when large vessels are in use or whales are present, which has been shown to significantly reduce mortalities caused by vessel strikes, and many developers voluntarily agree to more comprehensive speed restrictions in good faith, the risks presented by the vessels driving this increase are even less than average (Laist et al., 2014; Takes of Marine Mammals Incidental to Specified Activities, 2021).

Limitations and Future Work

Vessel density has been steadily increasing over time, with global vessel traffic increasing fourfold between 1992 and 2012 (Tournadre, 2014). As the global economy and reliance on marine trade grow, this pattern is expected to continue, with new projections estimating that vessel traffic will continue to grow orders of magnitude higher by 2050 (Sardain et al., 2019). These trends were underlying the findings discussed here and may have impacted the results we observed. We found that vessel density increased over time across the full extent of the data at each study site and may have contributed to the increases in vessel traffic observed at each sample site over the study period (Figure 7). This pattern may have been exhibited within the seasonal variance results as well, where average post-construction vessel density was typically higher than the pre-construction variance more than average construction vessel density was (Figure 6A – C). Furthermore, in a considerable amount of sample sites, the post-construction average fell just above the pre-construction variance. This again indicates that vessel traffic may have been naturally increasing over time. Our analysis did not account for this underlying effect, and it would be beneficial for future work to examine how this global increase may impact vessel density trends on local or regional scales.

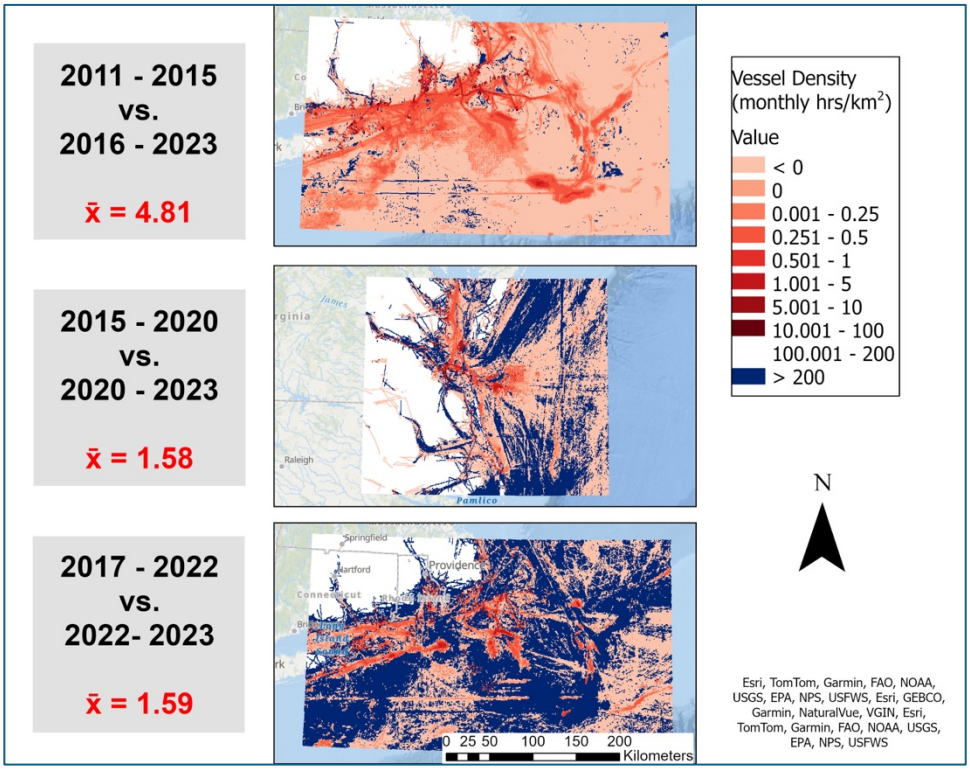


Figure 7. The average change in vessel density, in monthly hours per km^2, between pre-construction and post-construction across the full extent of the data covering each wind farm. The upper and lower panes cover New England waters surrounding Block Island and Vineyard Wind, while the middle pane covers the waters off of coastal Virginia. Note the legend's exponential increase in value; light pink/red coloration represents small amounts of change (0 – 5 monthly hours), while the darkest reds represent changes an order of magnitude higher (100+ monthly hours).

Our work includes a few limitations related to the data used here and the status of offshore wind development within the U.S. First, bias was inherently included in this analysis through the use of AIS data. Small vessels are not required to use AIS and were likely underrepresented in our dataset as a result (Vessel Requirements for Notices of Arrival and Departure, 2015). We also did not analyze vessel speed, which is a critical component of understanding the risk that a vessel's presence may pose. Future investigation into how vessel speed relates to the density changes observed here would be fruitful. Furthermore, Vineyard Wind was not completed at the time of writing, so there was not a post-construction phase that could be considered in this analysis. Its construction phase was also not completed, and the data used in this analysis did not fully capture the vessel traffic implications of that wind farm's construction.

The vessel density data was time-based, meaning that it captured vessels transiting over long distances as well as those that remained in one localized area for extended periods of time. This has important implications for assessing vessel-induced risk, as different risks are presented by moving vs. stationary vessels. Stationary vessels present a negligible vessel strike risk, but they may create other problems (Conn and Silber, 2013). For instance, if a stationary vessel uses dynamic positioning to maintain its position in the water, a large amount of noise will be introduced into the environment (Küsel et al., 2023). It is therefore important to analyze the risk presented by each type of vessel separately, which we were not able to do here. Future analyses would benefit from quantifying the differences in vessel strike risk that exist based on vessel traffic tendencies.

Given the unprecedented size and scale of Vineyard Wind, there may be new conclusions that could be drawn from its construction later in the process that could not be accounted for here. This analysis concluded with the two federal offshore wind farms, CVOW and Vineyard Wind, having drastically different levels of vessel density increase during construction that could not be fully analyzed. Furthermore, Vineyard Wind was the first wind farm in this analysis to require a construction moratorium during development, and the direct impacts of that regulation were also not able to be analyzed here. More monitoring of vessel density during construction, both at Vineyard Wind and beyond, will be critical for getting a sense of the impact that full-scale offshore wind projects have on local vessel density, as well as the efficacy of mitigation measures on projects of that scale.

Conclusion

Our analysis found that, to date, offshore wind development in the U.S. has not caused a significant increase in vessel density over the long term. When increases in vessel traffic occurred during construction, they were restricted to discrete periods in localized areas.

Furthermore, these increases were almost completely offset once construction was complete, likely because vessels involved in construction departed the area. Our findings support the success of ongoing mitigation efforts, including time-based construction moratoriums and lease-specific vessel speed restrictions, and provide further evidence that these measures significantly reduce risk when implemented effectively. Overall, our results are a cause for optimism regarding the long-term implications of offshore wind development and its potential impact on vulnerable marine mammal species like the North Atlantic right whale. This analysis showed that there is no sustained risk caused by vessel presence related to the offshore wind industry, and the development of renewable energy in the U.S. does not counteract conservation goals for one of the country's most protected marine mammal species.

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Appendix

Tables 1A – C. The mean change and variance in vessel density for each vessel type across all sample sites. Table 1A summarizes the results for the pre-construction vs. construction comparison phase, Table 1B summarizes the construction vs. post-construction comparison phase, and Table 1C summarizes the pre-construction vs. post-construction comparison phase. Note: icebreakers were excluded from these results due to their negligible presence within all study areas.

A.

Wind Farm	Vessel Type	Site ID	Site Type	Mean	Standard Deviation	Development Phase Comparison
BIWF	All Others	1	Sample Site	0.71	0.13	Pre-construction vs. Construction
BIWF	All Others	2	Sample Site	0.70	0.72	Pre-construction vs. Construction
BIWF	All Others	3	Sample Site	0.83	0.23	Pre-construction vs. Construction
BIWF	All Others	4	Sample Site	0.96	0.40	Pre-construction vs. Construction
BIWF	All Others	5	Sample Site	0.63	0.38	Pre-construction vs. Construction
BIWF	All Others	6	Sample Site	1.05	0.33	Pre-construction vs. Construction
BIWF	All Others	7	Sample Site	0.92	0.38	Pre-construction vs. Construction
BIWF	All Others	8	Sample Site	1.05	0.73	Pre-construction vs. Construction
BIWF	All Others	9	Sample Site	1.45	1.07	Pre-construction vs. Construction
BIWF	All Others	10	Sample Site	1.23	0.65	Pre-construction vs. Construction
BIWF	All Others	11	Sample Site	0.84	1.42	Pre-construction vs. Construction
BIWF	All Others	12	Sample Site	3.09	1.54	Pre-construction vs. Construction
BIWF	All Others	13	Sample Site	3.96	2.73	Pre-construction vs. Construction
BIWF	All Others	14	Sample Site	0.86	0.53	Pre-construction vs. Construction
BIWF	All Others	15	Wind Farm	32.61	52.47	Pre-construction vs. Construction
BIWF	Cargo Ships	1	Sample Site	-0.04	0.01	Pre-construction vs. Construction
BIWF	Cargo Ships	2	Sample Site	-0.13	0.24	Pre-construction vs. Construction
BIWF	Cargo Ships	3	Sample Site	-0.11	0.07	Pre-construction vs. Construction
BIWF	Cargo Ships	4	Sample Site	-0.16	0.11	Pre-construction vs. Construction
BIWF	Cargo Ships	5	Sample Site	-0.01	0.01	Pre-construction vs. Construction
BIWF	Cargo Ships	6	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Cargo Ships	7	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Cargo Ships	8	Sample Site	-0.05	0.04	Pre-construction vs. Construction
BIWF	Cargo Ships	9	Sample Site	0.02	0.33	Pre-construction vs. Construction
BIWF	Cargo Ships	10	Sample Site	-0.20	0.19	Pre-construction vs. Construction
BIWF	Cargo Ships	11	Sample Site	0.00	0.02	Pre-construction vs. Construction
BIWF	Cargo Ships	12	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Cargo Ships	13	Sample Site	-0.03	0.04	Pre-construction vs. Construction
BIWF	Cargo Ships	14	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Cargo Ships	15	Wind Farm	1.58	2.80	Pre-construction vs. Construction

BIWF	Fishing	1	Sample Site	-0.07	0.02	Pre-construction vs. Construction
BIWF	Fishing	2	Sample Site	-0.04	0.01	Pre-construction vs. Construction
BIWF	Fishing	3	Sample Site	0.00	0.05	Pre-construction vs. Construction
BIWF	Fishing	4	Sample Site	-0.08	0.06	Pre-construction vs. Construction
BIWF	Fishing	5	Sample Site	-0.05	0.02	Pre-construction vs. Construction
BIWF	Fishing	6	Sample Site	-0.03	0.02	Pre-construction vs. Construction
BIWF	Fishing	7	Sample Site	-0.07	0.02	Pre-construction vs. Construction
BIWF	Fishing	8	Sample Site	-0.08	0.05	Pre-construction vs. Construction
BIWF	Fishing	9	Sample Site	-0.05	0.01	Pre-construction vs. Construction
BIWF	Fishing	10	Sample Site	-0.05	0.01	Pre-construction vs. Construction
BIWF	Fishing	11	Sample Site	-0.04	0.01	Pre-construction vs. Construction
BIWF	Fishing	12	Sample Site	-0.10	0.04	Pre-construction vs. Construction
BIWF	Fishing	13	Sample Site	-0.05	0.02	Pre-construction vs. Construction
BIWF	Fishing	14	Sample Site	-0.08	0.05	Pre-construction vs. Construction
BIWF	Fishing	15	Wind Farm	-0.04	0.01	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	1	Sample Site	-0.01	0.00	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	2	Sample Site	-0.01	0.01	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	3	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	4	Sample Site	-0.01	0.00	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	5	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	6	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	7	Sample Site	-0.02	0.02	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	8	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	9	Sample Site	0.00	0.01	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	10	Sample Site	-0.01	0.01	Pre-construction vs. Construction

BIWF	Non-Commercial Ships	11	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	12	Sample Site	-0.01	0.01	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	13	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	14	Sample Site	-0.01	0.00	Pre-construction vs. Construction
BIWF	Non-Commercial Ships	15	Wind Farm	0.00	0.00	Pre-construction vs. Construction
BIWF	Passenger Ships	1	Sample Site	-0.04	0.01	Pre-construction vs. Construction
BIWF	Passenger Ships	2	Sample Site	-0.07	0.05	Pre-construction vs. Construction
BIWF	Passenger Ships	3	Sample Site	-0.02	0.01	Pre-construction vs. Construction
BIWF	Passenger Ships	4	Sample Site	-0.05	0.03	Pre-construction vs. Construction
BIWF	Passenger Ships	5	Sample Site	-0.03	0.01	Pre-construction vs. Construction
BIWF	Passenger Ships	6	Sample Site	-0.18	0.09	Pre-construction vs. Construction
BIWF	Passenger Ships	7	Sample Site	-0.06	0.02	Pre-construction vs. Construction
BIWF	Passenger Ships	8	Sample Site	-0.04	0.01	Pre-construction vs. Construction
BIWF	Passenger Ships	9	Sample Site	-0.05	0.01	Pre-construction vs. Construction
BIWF	Passenger Ships	10	Sample Site	-0.06	0.03	Pre-construction vs. Construction
BIWF	Passenger Ships	11	Sample Site	-0.04	0.01	Pre-construction vs. Construction
BIWF	Passenger Ships	12	Sample Site	-0.61	0.42	Pre-construction vs. Construction
BIWF	Passenger Ships	13	Sample Site	-1.47	2.45	Pre-construction vs. Construction
BIWF	Passenger Ships	14	Sample Site	-0.04	0.01	Pre-construction vs. Construction
BIWF	Passenger Ships	15	Wind Farm	-0.06	0.02	Pre-construction vs. Construction
BIWF	Service Ships	1	Sample Site	0.00	0.01	Pre-construction vs. Construction

BIWF	Service Ships	2	Sample Site	-0.23	0.57	Pre-construction vs. Construction
BIWF	Service Ships	3	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Service Ships	4	Sample Site	0.00	0.02	Pre-construction vs. Construction
BIWF	Service Ships	5	Sample Site	-0.05	0.01	Pre-construction vs. Construction
BIWF	Service Ships	6	Sample Site	-0.01	0.01	Pre-construction vs. Construction
BIWF	Service Ships	7	Sample Site	-0.04	0.03	Pre-construction vs. Construction
BIWF	Service Ships	8	Sample Site	-0.11	0.05	Pre-construction vs. Construction
BIWF	Service Ships	9	Sample Site	-0.09	0.03	Pre-construction vs. Construction
BIWF	Service Ships	10	Sample Site	-0.21	0.06	Pre-construction vs. Construction
BIWF	Service Ships	11	Sample Site	-0.15	0.11	Pre-construction vs. Construction
BIWF	Service Ships	12	Sample Site	-0.06	0.11	Pre-construction vs. Construction
BIWF	Service Ships	13	Sample Site	-0.01	0.01	Pre-construction vs. Construction
BIWF	Service Ships	14	Sample Site	-0.10	0.07	Pre-construction vs. Construction
BIWF	Service Ships	15	Wind Farm	-0.18	0.09	Pre-construction vs. Construction
BIWF	Tankers	1	Sample Site	-0.02	0.01	Pre-construction vs. Construction
BIWF	Tankers	2	Sample Site	-0.08	0.13	Pre-construction vs. Construction
BIWF	Tankers	3	Sample Site	-0.05	0.04	Pre-construction vs. Construction
BIWF	Tankers	4	Sample Site	-0.08	0.05	Pre-construction vs. Construction
BIWF	Tankers	5	Sample Site	-0.01	0.00	Pre-construction vs. Construction
BIWF	Tankers	6	Sample Site	-0.01	0.01	Pre-construction vs. Construction
BIWF	Tankers	7	Sample Site	-0.01	0.02	Pre-construction vs. Construction
BIWF	Tankers	8	Sample Site	-0.04	0.03	Pre-construction vs. Construction
BIWF	Tankers	9	Sample Site	-0.06	0.05	Pre-construction vs. Construction
BIWF	Tankers	10	Sample Site	-0.12	0.11	Pre-construction vs. Construction
BIWF	Tankers	11	Sample Site	-0.01	0.01	Pre-construction vs. Construction
BIWF	Tankers	12	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Tankers	13	Sample Site	-0.08	0.08	Pre-construction vs. Construction
BIWF	Tankers	14	Sample Site	-0.01	0.01	Pre-construction vs. Construction
BIWF	Tankers	15	Wind Farm	-0.02	0.01	Pre-construction vs. Construction
BIWF	Unknown	1	Sample Site	-0.01	0.00	Pre-construction vs. Construction
BIWF	Unknown	2	Sample Site	-0.01	0.00	Pre-construction vs. Construction

BIWF	Unknown	3	Sample Site	0.00	0.00	Pre-construction vs. Construction
BIWF	Unknown	4	Sample Site	-0.01	0.00	Pre-construction vs. Construction
BIWF	Unknown	5	Sample Site	-0.01	0.01	Pre-construction vs. Construction
BIWF	Unknown	6	Sample Site	-0.03	0.01	Pre-construction vs. Construction
BIWF	Unknown	7	Sample Site	-0.02	0.01	Pre-construction vs. Construction
BIWF	Unknown	8	Sample Site	-0.01	0.00	Pre-construction vs. Construction
BIWF	Unknown	9	Sample Site	-0.01	0.00	Pre-construction vs. Construction
BIWF	Unknown	10	Sample Site	-0.01	0.00	Pre-construction vs. Construction
BIWF	Unknown	11	Sample Site	-0.01	0.01	Pre-construction vs. Construction
BIWF	Unknown	12	Sample Site	-0.06	0.04	Pre-construction vs. Construction
BIWF	Unknown	13	Sample Site	-0.06	0.09	Pre-construction vs. Construction
BIWF	Unknown	14	Sample Site	-0.02	0.01	Pre-construction vs. Construction
BIWF	Unknown	15	Wind Farm	-0.02	0.01	Pre-construction vs. Construction
CVOW	All Others	1	Sample Site	1.93	3.89	Pre-construction vs. Construction
CVOW	All Others	2	Sample Site	-1.22	1.34	Pre-construction vs. Construction
CVOW	All Others	3	Sample Site	0.33	0.99	Pre-construction vs. Construction
CVOW	All Others	4	Sample Site	1.32	3.50	Pre-construction vs. Construction
CVOW	All Others	5	Sample Site	0.09	0.45	Pre-construction vs. Construction
CVOW	All Others	6	Sample Site	0.00	0.31	Pre-construction vs. Construction
CVOW	All Others	7	Sample Site	-0.22	1.70	Pre-construction vs. Construction
CVOW	All Others	8	Sample Site	-0.13	0.35	Pre-construction vs. Construction
CVOW	All Others	9	Sample Site	1.81	3.33	Pre-construction vs. Construction
CVOW	All Others	10	Sample Site	0.69	1.71	Pre-construction vs. Construction
CVOW	All Others	11	Sample Site	-0.14	0.11	Pre-construction vs. Construction
CVOW	All Others	12	Sample Site	-1.46	2.14	Pre-construction vs. Construction
CVOW	All Others	13	Sample Site	-0.21	0.19	Pre-construction vs. Construction
CVOW	All Others	14	Sample Site	-0.01	0.12	Pre-construction vs. Construction
CVOW	All Others	15	Wind Farm	27.23	44.04	Pre-construction vs. Construction
CVOW	Cargo Ships	1	Sample Site	0.47	0.52	Pre-construction vs. Construction
CVOW	Cargo Ships	2	Sample Site	-0.07	0.51	Pre-construction vs. Construction
CVOW	Cargo Ships	3	Sample Site	0.79	1.46	Pre-construction vs. Construction
CVOW	Cargo Ships	4	Sample Site	0.55	0.29	Pre-construction vs. Construction
CVOW	Cargo Ships	5	Sample Site	0.94	3.68	Pre-construction vs. Construction
CVOW	Cargo Ships	6	Sample Site	0.45	0.22	Pre-construction vs. Construction
CVOW	Cargo Ships	7	Sample Site	0.61	1.54	Pre-construction vs. Construction
CVOW	Cargo Ships	8	Sample Site	0.26	0.18	Pre-construction vs. Construction
CVOW	Cargo Ships	9	Sample Site	0.87	1.82	Pre-construction vs. Construction
CVOW	Cargo Ships	10	Sample Site	0.35	1.04	Pre-construction vs. Construction
CVOW	Cargo Ships	11	Sample Site	0.10	0.10	Pre-construction vs. Construction
CVOW	Cargo Ships	12	Sample Site	7.35	18.00	Pre-construction vs. Construction
CVOW	Cargo Ships	13	Sample Site	0.12	0.20	Pre-construction vs. Construction

CVOW	Cargo Ships	14	Sample Site	0.16	0.13	Pre-construction vs. Construction
CVOW	Cargo Ships	15	Wind Farm	0.26	0.36	Pre-construction vs. Construction
CVOW	Fishing	1	Sample Site	0.00	0.01	Pre-construction vs. Construction
CVOW	Fishing	2	Sample Site	0.00	0.01	Pre-construction vs. Construction
CVOW	Fishing	3	Sample Site	0.01	0.02	Pre-construction vs. Construction
CVOW	Fishing	4	Sample Site	0.00	0.01	Pre-construction vs. Construction
CVOW	Fishing	5	Sample Site	0.02	0.03	Pre-construction vs. Construction
CVOW	Fishing	6	Sample Site	0.00	0.01	Pre-construction vs. Construction
CVOW	Fishing	7	Sample Site	0.02	0.04	Pre-construction vs. Construction
CVOW	Fishing	8	Sample Site	0.01	0.02	Pre-construction vs. Construction
CVOW	Fishing	9	Sample Site	-0.01	0.02	Pre-construction vs. Construction
CVOW	Fishing	10	Sample Site	-0.01	0.01	Pre-construction vs. Construction
CVOW	Fishing	11	Sample Site	0.03	0.04	Pre-construction vs. Construction
CVOW	Fishing	12	Sample Site	0.00	0.02	Pre-construction vs. Construction
CVOW	Fishing	13	Sample Site	0.02	0.02	Pre-construction vs. Construction
CVOW	Fishing	14	Sample Site	0.01	0.01	Pre-construction vs. Construction
CVOW	Fishing	15	Wind Farm	-0.01	0.01	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	1	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	2	Sample Site	0.00	0.01	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	3	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	4	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	5	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	6	Sample Site	0.00	0.01	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	7	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	8	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	9	Sample Site	0.00	0.00	Pre-construction vs. Construction

CVOW	Non-Commercial Ships	10	Sample Site	0.00	0.01	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	11	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	12	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	13	Sample Site	0.00	0.01	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	14	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Non-Commercial Ships	15	Wind Farm	0.01	0.02	Pre-construction vs. Construction
CVOW	Passenger Ships	1	Sample Site	0.16	0.21	Pre-construction vs. Construction
CVOW	Passenger Ships	2	Sample Site	1.49	1.13	Pre-construction vs. Construction
CVOW	Passenger Ships	3	Sample Site	0.01	0.01	Pre-construction vs. Construction
CVOW	Passenger Ships	4	Sample Site	0.03	0.02	Pre-construction vs. Construction
CVOW	Passenger Ships	5	Sample Site	0.01	0.02	Pre-construction vs. Construction
CVOW	Passenger Ships	6	Sample Site	0.01	0.02	Pre-construction vs. Construction
CVOW	Passenger Ships	7	Sample Site	0.24	0.18	Pre-construction vs. Construction
CVOW	Passenger Ships	8	Sample Site	0.14	0.10	Pre-construction vs. Construction
CVOW	Passenger Ships	9	Sample Site	0.06	0.06	Pre-construction vs. Construction
CVOW	Passenger Ships	10	Sample Site	2.57	2.05	Pre-construction vs. Construction
CVOW	Passenger Ships	11	Sample Site	0.07	0.06	Pre-construction vs. Construction
CVOW	Passenger Ships	12	Sample Site	3.16	2.36	Pre-construction vs. Construction
CVOW	Passenger Ships	13	Sample Site	0.02	0.02	Pre-construction vs. Construction
CVOW	Passenger Ships	14	Sample Site	0.01	0.01	Pre-construction vs. Construction

CVOW	Passenger Ships	15	Wind Farm	8.06	8.32	Pre-construction vs. Construction
CVOW	Service Ships	1	Sample Site	0.01	0.01	Pre-construction vs. Construction
CVOW	Service Ships	2	Sample Site	0.01	0.03	Pre-construction vs. Construction
CVOW	Service Ships	3	Sample Site	0.03	0.04	Pre-construction vs. Construction
CVOW	Service Ships	4	Sample Site	0.01	0.01	Pre-construction vs. Construction
CVOW	Service Ships	5	Sample Site	0.01	0.01	Pre-construction vs. Construction
CVOW	Service Ships	6	Sample Site	0.01	0.02	Pre-construction vs. Construction
CVOW	Service Ships	7	Sample Site	0.05	0.02	Pre-construction vs. Construction
CVOW	Service Ships	8	Sample Site	0.06	0.05	Pre-construction vs. Construction
CVOW	Service Ships	9	Sample Site	0.01	0.01	Pre-construction vs. Construction
CVOW	Service Ships	10	Sample Site	0.07	0.09	Pre-construction vs. Construction
CVOW	Service Ships	11	Sample Site	0.01	0.02	Pre-construction vs. Construction
CVOW	Service Ships	12	Sample Site	0.02	0.03	Pre-construction vs. Construction
CVOW	Service Ships	13	Sample Site	-0.01	0.01	Pre-construction vs. Construction
CVOW	Service Ships	14	Sample Site	0.00	0.01	Pre-construction vs. Construction
CVOW	Service Ships	15	Wind Farm	0.86	1.68	Pre-construction vs. Construction
CVOW	Tankers	1	Sample Site	-0.01	0.01	Pre-construction vs. Construction
CVOW	Tankers	2	Sample Site	-0.08	0.45	Pre-construction vs. Construction
CVOW	Tankers	3	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Tankers	4	Sample Site	0.02	0.01	Pre-construction vs. Construction
CVOW	Tankers	5	Sample Site	0.00	0.05	Pre-construction vs. Construction
CVOW	Tankers	6	Sample Site	0.04	0.02	Pre-construction vs. Construction
CVOW	Tankers	7	Sample Site	-0.43	1.95	Pre-construction vs. Construction
CVOW	Tankers	8	Sample Site	0.01	0.02	Pre-construction vs. Construction
CVOW	Tankers	9	Sample Site	0.01	0.01	Pre-construction vs. Construction
CVOW	Tankers	10	Sample Site	0.00	0.01	Pre-construction vs. Construction
CVOW	Tankers	11	Sample Site	0.01	0.01	Pre-construction vs. Construction
CVOW	Tankers	12	Sample Site	-0.11	0.26	Pre-construction vs. Construction
CVOW	Tankers	13	Sample Site	0.05	0.02	Pre-construction vs. Construction

CVOW	Tankers	14	Sample Site	0.01	0.02	Pre-construction vs. Construction
CVOW	Tankers	15	Wind Farm	-0.01	0.01	Pre-construction vs. Construction
CVOW	Unknown	1	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	2	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	3	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	4	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	5	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	6	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	7	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	8	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	9	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	10	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	11	Sample Site	0.00	0.01	Pre-construction vs. Construction
CVOW	Unknown	12	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	13	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	14	Sample Site	0.00	0.00	Pre-construction vs. Construction
CVOW	Unknown	15	Wind Farm	0.00	0.00	Pre-construction vs. Construction
VW I	All Others	1	Wind Farm	3.74	13.67	Pre-construction vs. Construction
VW I	All Others	2	Sample Site	0.34	0.45	Pre-construction vs. Construction
VW I	All Others	3	Sample Site	-0.31	0.67	Pre-construction vs. Construction
VW I	All Others	4	Sample Site	0.51	0.95	Pre-construction vs. Construction
VW I	All Others	5	Sample Site	0.14	0.36	Pre-construction vs. Construction
VW I	All Others	6	Sample Site	0.67	0.66	Pre-construction vs. Construction
VW I	All Others	7	Sample Site	-0.05	0.25	Pre-construction vs. Construction
VW I	All Others	8	Sample Site	-0.20	0.59	Pre-construction vs. Construction
VW I	All Others	9	Sample Site	-0.06	1.76	Pre-construction vs. Construction
VW I	All Others	10	Sample Site	-0.33	0.39	Pre-construction vs. Construction
VW I	All Others	11	Sample Site	-0.55	0.97	Pre-construction vs. Construction
VW I	Cargo Ships	1	Wind Farm	0.65	1.67	Pre-construction vs. Construction
VW I	Cargo Ships	2	Sample Site	0.00	0.06	Pre-construction vs. Construction
VW I	Cargo Ships	3	Sample Site	-0.02	0.03	Pre-construction vs. Construction
VW I	Cargo Ships	4	Sample Site	0.00	0.03	Pre-construction vs. Construction
VW I	Cargo Ships	5	Sample Site	-0.01	0.04	Pre-construction vs. Construction
VW I	Cargo Ships	6	Sample Site	-0.02	0.02	Pre-construction vs. Construction
VW I	Cargo Ships	7	Sample Site	-0.01	0.02	Pre-construction vs. Construction
VW I	Cargo Ships	8	Sample Site	0.01	0.07	Pre-construction vs. Construction
VW I	Cargo Ships	9	Sample Site	0.04	0.13	Pre-construction vs. Construction
VW I	Cargo Ships	10	Sample Site	0.00	0.04	Pre-construction vs. Construction
VW I	Cargo Ships	11	Sample Site	0.01	0.02	Pre-construction vs. Construction
VW I	Fishing	1	Wind Farm	0.64	0.46	Pre-construction vs. Construction
VW I	Fishing	2	Sample Site	-0.01	0.28	Pre-construction vs. Construction

VW I	Fishing	3	Sample Site	-0.10	0.05	Pre-construction vs. Construction
VW I	Fishing	4	Sample Site	-0.16	0.25	Pre-construction vs. Construction
VW I	Fishing	5	Sample Site	-0.19	0.26	Pre-construction vs. Construction
VW I	Fishing	6	Sample Site	-0.64	0.52	Pre-construction vs. Construction
VW I	Fishing	7	Sample Site	-0.38	0.13	Pre-construction vs. Construction
VW I	Fishing	8	Sample Site	-0.28	0.11	Pre-construction vs. Construction
VW I	Fishing	9	Sample Site	-0.02	0.18	Pre-construction vs. Construction
VW I	Fishing	10	Sample Site	-0.13	0.06	Pre-construction vs. Construction
VW I	Fishing	11	Sample Site	-0.15	0.04	Pre-construction vs. Construction
VW I	Non-Commercial Ships	1	Wind Farm	1.06	1.67	Pre-construction vs. Construction
VW I	Non-Commercial Ships	2	Sample Site	0.04	0.08	Pre-construction vs. Construction
VW I	Non-Commercial Ships	3	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Non-Commercial Ships	4	Sample Site	0.03	0.04	Pre-construction vs. Construction
VW I	Non-Commercial Ships	5	Sample Site	0.01	0.03	Pre-construction vs. Construction
VW I	Non-Commercial Ships	6	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Non-Commercial Ships	7	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Non-Commercial Ships	8	Sample Site	0.02	0.06	Pre-construction vs. Construction
VW I	Non-Commercial Ships	9	Sample Site	0.15	0.67	Pre-construction vs. Construction
VW I	Non-Commercial Ships	10	Sample Site	0.00	0.02	Pre-construction vs. Construction
VW I	Non-Commercial Ships	11	Sample Site	0.03	0.03	Pre-construction vs. Construction
VW I	Passenger Ships	1	Wind Farm	0.06	0.09	Pre-construction vs. Construction
VW I	Passenger Ships	2	Sample Site	0.00	0.02	Pre-construction vs. Construction

VW I	Passenger Ships	3	Sample Site	-0.01	0.02	Pre-construction vs. Construction
VW I	Passenger Ships	4	Sample Site	0.00	0.03	Pre-construction vs. Construction
VW I	Passenger Ships	5	Sample Site	-0.01	0.01	Pre-construction vs. Construction
VW I	Passenger Ships	6	Sample Site	-0.01	0.01	Pre-construction vs. Construction
VW I	Passenger Ships	7	Sample Site	-0.01	0.01	Pre-construction vs. Construction
VW I	Passenger Ships	8	Sample Site	-0.01	0.01	Pre-construction vs. Construction
VW I	Passenger Ships	9	Sample Site	0.00	0.02	Pre-construction vs. Construction
VW I	Passenger Ships	10	Sample Site	-0.01	0.01	Pre-construction vs. Construction
VW I	Passenger Ships	11	Sample Site	0.00	0.03	Pre-construction vs. Construction
VW I	Service Ships	1	Wind Farm	0.17	0.40	Pre-construction vs. Construction
VW I	Service Ships	2	Sample Site	0.09	0.47	Pre-construction vs. Construction
VW I	Service Ships	3	Sample Site	0.01	0.01	Pre-construction vs. Construction
VW I	Service Ships	4	Sample Site	0.03	0.05	Pre-construction vs. Construction
VW I	Service Ships	5	Sample Site	0.00	0.01	Pre-construction vs. Construction
VW I	Service Ships	6	Sample Site	0.00	0.01	Pre-construction vs. Construction
VW I	Service Ships	7	Sample Site	0.00	0.01	Pre-construction vs. Construction
VW I	Service Ships	8	Sample Site	0.06	0.24	Pre-construction vs. Construction
VW I	Service Ships	9	Sample Site	0.02	0.03	Pre-construction vs. Construction
VW I	Service Ships	10	Sample Site	0.01	0.01	Pre-construction vs. Construction
VW I	Service Ships	11	Sample Site	0.02	0.04	Pre-construction vs. Construction
VW I	Tankers	1	Wind Farm	0.00	0.00	Pre-construction vs. Construction
VW I	Tankers	2	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Tankers	3	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Tankers	4	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Tankers	5	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Tankers	6	Sample Site	0.00	0.00	Pre-construction vs. Construction

VW I	Tankers	7	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Tankers	8	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Tankers	9	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Tankers	10	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Tankers	11	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Unknown	1	Wind Farm	0.49	4.25	Pre-construction vs. Construction
VW I	Unknown	2	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Unknown	3	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Unknown	4	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Unknown	5	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Unknown	6	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Unknown	7	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Unknown	8	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Unknown	9	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Unknown	10	Sample Site	0.00	0.00	Pre-construction vs. Construction
VW I	Unknown	11	Sample Site	0.00	0.00	Pre-construction vs. Construction

B.

Wind Farm	Vessel Type	Site ID	Site Type	Mean	Standard Deviation	Development Phase Comparison
BIWF	All Others	1	Sample Site	-0.46	0.15	Construction vs. Post-construction
BIWF	All Others	2	Sample Site	-0.31	0.57	Construction vs. Post-construction
BIWF	All Others	3	Sample Site	-0.60	0.27	Construction vs. Post-construction
BIWF	All Others	4	Sample Site	-0.43	0.46	Construction vs. Post-construction
BIWF	All Others	5	Sample Site	-0.33	0.24	Construction vs. Post-construction
BIWF	All Others	6	Sample Site	-0.27	0.14	Construction vs. Post-construction
BIWF	All Others	7	Sample Site	-0.03	0.24	Construction vs. Post-construction
BIWF	All Others	8	Sample Site	-0.06	0.41	Construction vs. Post-construction
BIWF	All Others	9	Sample Site	-0.41	0.59	Construction vs. Post-construction
BIWF	All Others	10	Sample Site	-0.73	0.57	Construction vs. Post-construction
BIWF	All Others	11	Sample Site	-0.24	1.41	Construction vs. Post-construction
BIWF	All Others	12	Sample Site	-0.11	1.43	Construction vs. Post-construction
BIWF	All Others	13	Sample Site	-2.03	3.16	Construction vs. Post-construction
BIWF	All Others	14	Sample Site	0.00	1.05	Construction vs. Post-construction
BIWF	All Others	15	Wind Farm	-28.26	46.34	Construction vs. Post-construction
BIWF	Cargo Ships	1	Sample Site	0.05	0.01	Construction vs. Post-construction
BIWF	Cargo Ships	2	Sample Site	0.20	0.40	Construction vs. Post-construction
BIWF	Cargo Ships	3	Sample Site	0.17	0.07	Construction vs. Post-construction
BIWF	Cargo Ships	4	Sample Site	0.22	0.13	Construction vs. Post-construction
BIWF	Cargo Ships	5	Sample Site	0.05	0.04	Construction vs. Post-construction
BIWF	Cargo Ships	6	Sample Site	0.00	0.00	Construction vs. Post-construction

BIWF	Cargo Ships	7	Sample Site	0.03	0.04	Construction vs. Post-construction
BIWF	Cargo Ships	8	Sample Site	0.06	0.04	Construction vs. Post-construction
BIWF	Cargo Ships	9	Sample Site	-0.01	0.34	Construction vs. Post-construction
BIWF	Cargo Ships	10	Sample Site	0.31	0.24	Construction vs. Post-construction
BIWF	Cargo Ships	11	Sample Site	0.00	0.02	Construction vs. Post-construction
BIWF	Cargo Ships	12	Sample Site	0.02	0.01	Construction vs. Post-construction
BIWF	Cargo Ships	13	Sample Site	0.03	0.05	Construction vs. Post-construction
BIWF	Cargo Ships	14	Sample Site	0.06	0.06	Construction vs. Post-construction
BIWF	Cargo Ships	15	Wind Farm	-1.90	2.80	Construction vs. Post-construction
BIWF	Fishing	1	Sample Site	0.36	0.09	Construction vs. Post-construction
BIWF	Fishing	2	Sample Site	0.39	0.06	Construction vs. Post-construction
BIWF	Fishing	3	Sample Site	0.13	0.05	Construction vs. Post-construction
BIWF	Fishing	4	Sample Site	0.50	0.32	Construction vs. Post-construction
BIWF	Fishing	5	Sample Site	0.32	0.07	Construction vs. Post-construction
BIWF	Fishing	6	Sample Site	0.17	0.07	Construction vs. Post-construction
BIWF	Fishing	7	Sample Site	0.53	0.45	Construction vs. Post-construction
BIWF	Fishing	8	Sample Site	0.36	0.12	Construction vs. Post-construction
BIWF	Fishing	9	Sample Site	0.35	0.14	Construction vs. Post-construction
BIWF	Fishing	10	Sample Site	0.36	0.07	Construction vs. Post-construction
BIWF	Fishing	11	Sample Site	0.36	0.19	Construction vs. Post-construction
BIWF	Fishing	12	Sample Site	0.50	0.19	Construction vs. Post-construction
BIWF	Fishing	13	Sample Site	1.10	0.63	Construction vs. Post-construction
BIWF	Fishing	14	Sample Site	0.63	0.23	Construction vs. Post-construction
BIWF	Fishing	15	Wind Farm	0.31	0.11	Construction vs. Post-construction
BIWF	Non-Commercial Ships	1	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Non-Commercial Ships	2	Sample Site	0.01	0.01	Construction vs. Post-construction
BIWF	Non-Commercial Ships	3	Sample Site	0.01	0.01	Construction vs. Post-construction
BIWF	Non-Commercial Ships	4	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Non-Commercial Ships	5	Sample Site	0.02	0.03	Construction vs. Post-construction
BIWF	Non-Commercial Ships	6	Sample Site	0.00	0.00	Construction vs. Post-construction

BIWF	Non-Commercial Ships	7	Sample Site	0.04	0.06	Construction vs. Post-construction
BIWF	Non-Commercial Ships	8	Sample Site	0.01	0.00	Construction vs. Post-construction
BIWF	Non-Commercial Ships	9	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Non-Commercial Ships	10	Sample Site	0.01	0.00	Construction vs. Post-construction
BIWF	Non-Commercial Ships	11	Sample Site	0.01	0.00	Construction vs. Post-construction
BIWF	Non-Commercial Ships	12	Sample Site	0.01	0.01	Construction vs. Post-construction
BIWF	Non-Commercial Ships	13	Sample Site	0.01	0.01	Construction vs. Post-construction
BIWF	Non-Commercial Ships	14	Sample Site	0.02	0.03	Construction vs. Post-construction
BIWF	Non-Commercial Ships	15	Wind Farm	0.01	0.00	Construction vs. Post-construction
BIWF	Passenger Ships	1	Sample Site	0.03	0.01	Construction vs. Post-construction
BIWF	Passenger Ships	2	Sample Site	0.14	0.06	Construction vs. Post-construction
BIWF	Passenger Ships	3	Sample Site	0.03	0.01	Construction vs. Post-construction
BIWF	Passenger Ships	4	Sample Site	0.14	0.31	Construction vs. Post-construction
BIWF	Passenger Ships	5	Sample Site	0.07	0.08	Construction vs. Post-construction
BIWF	Passenger Ships	6	Sample Site	0.35	0.13	Construction vs. Post-construction
BIWF	Passenger Ships	7	Sample Site	0.23	0.20	Construction vs. Post-construction
BIWF	Passenger Ships	8	Sample Site	0.41	0.64	Construction vs. Post-construction
BIWF	Passenger Ships	9	Sample Site	0.44	0.62	Construction vs. Post-construction
BIWF	Passenger Ships	10	Sample Site	0.16	0.16	Construction vs. Post-construction

BIWF	Passenger Ships	11	Sample Site	0.14	0.08	Construction vs. Post-construction
BIWF	Passenger Ships	12	Sample Site	1.29	0.92	Construction vs. Post-construction
BIWF	Passenger Ships	13	Sample Site	1.81	2.73	Construction vs. Post-construction
BIWF	Passenger Ships	14	Sample Site	0.06	0.01	Construction vs. Post-construction
BIWF	Passenger Ships	15	Wind Farm	0.26	0.34	Construction vs. Post-construction
BIWF	Service Ships	1	Sample Site	-0.01	0.01	Construction vs. Post-construction
BIWF	Service Ships	2	Sample Site	0.31	0.77	Construction vs. Post-construction
BIWF	Service Ships	3	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Service Ships	4	Sample Site	0.00	0.01	Construction vs. Post-construction
BIWF	Service Ships	5	Sample Site	0.02	0.01	Construction vs. Post-construction
BIWF	Service Ships	6	Sample Site	0.02	0.01	Construction vs. Post-construction
BIWF	Service Ships	7	Sample Site	0.04	0.02	Construction vs. Post-construction
BIWF	Service Ships	8	Sample Site	0.07	0.05	Construction vs. Post-construction
BIWF	Service Ships	9	Sample Site	0.05	0.02	Construction vs. Post-construction
BIWF	Service Ships	10	Sample Site	0.17	0.05	Construction vs. Post-construction
BIWF	Service Ships	11	Sample Site	0.05	0.07	Construction vs. Post-construction
BIWF	Service Ships	12	Sample Site	0.07	0.05	Construction vs. Post-construction
BIWF	Service Ships	13	Sample Site	0.02	0.01	Construction vs. Post-construction
BIWF	Service Ships	14	Sample Site	0.09	0.05	Construction vs. Post-construction
BIWF	Service Ships	15	Wind Farm	0.07	0.10	Construction vs. Post-construction
BIWF	Tankers	1	Sample Site	0.02	0.01	Construction vs. Post-construction
BIWF	Tankers	2	Sample Site	0.08	0.15	Construction vs. Post-construction
BIWF	Tankers	3	Sample Site	0.07	0.03	Construction vs. Post-construction
BIWF	Tankers	4	Sample Site	0.10	0.06	Construction vs. Post-construction
BIWF	Tankers	5	Sample Site	0.01	0.00	Construction vs. Post-construction
BIWF	Tankers	6	Sample Site	0.00	0.00	Construction vs. Post-construction

BIWF	Tankers	7	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Tankers	8	Sample Site	0.04	0.03	Construction vs. Post-construction
BIWF	Tankers	9	Sample Site	0.06	0.05	Construction vs. Post-construction
BIWF	Tankers	10	Sample Site	0.13	0.11	Construction vs. Post-construction
BIWF	Tankers	11	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Tankers	12	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Tankers	13	Sample Site	0.07	0.08	Construction vs. Post-construction
BIWF	Tankers	14	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Tankers	15	Wind Farm	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	1	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	2	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	3	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	4	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	5	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	6	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	7	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	8	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	9	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	10	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	11	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	12	Sample Site	0.01	0.02	Construction vs. Post-construction
BIWF	Unknown	13	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	14	Sample Site	0.00	0.00	Construction vs. Post-construction
BIWF	Unknown	15	Wind Farm	0.62	3.63	Construction vs. Post-construction
CVOW	All Others	1	Sample Site	-1.16	4.15	Construction vs. Post-construction
CVOW	All Others	2	Sample Site	0.14	1.03	Construction vs. Post-construction
CVOW	All Others	3	Sample Site	-0.38	0.96	Construction vs. Post-construction
CVOW	All Others	4	Sample Site	-1.44	3.46	Construction vs. Post-construction
CVOW	All Others	5	Sample Site	-0.34	0.29	Construction vs. Post-construction
CVOW	All Others	6	Sample Site	-0.31	0.22	Construction vs. Post-construction
CVOW	All Others	7	Sample Site	-0.83	1.48	Construction vs. Post-construction
CVOW	All Others	8	Sample Site	-0.07	0.13	Construction vs. Post-construction
CVOW	All Others	9	Sample Site	-1.59	3.35	Construction vs. Post-construction
CVOW	All Others	10	Sample Site	-1.07	1.67	Construction vs. Post-construction
CVOW	All Others	11	Sample Site	-0.08	0.07	Construction vs. Post-construction
CVOW	All Others	12	Sample Site	-0.42	0.20	Construction vs. Post-construction
CVOW	All Others	13	Sample Site	-0.21	0.14	Construction vs. Post-construction
CVOW	All Others	14	Sample Site	-0.16	0.11	Construction vs. Post-construction
CVOW	All Others	15	Wind Farm	-24.60	41.01	Construction vs. Post-construction
CVOW	Cargo Ships	1	Sample Site	-0.26	0.84	Construction vs. Post-construction
CVOW	Cargo Ships	2	Sample Site	0.81	0.66	Construction vs. Post-construction

CVOW	Cargo Ships	3	Sample Site	-0.19	2.13	Construction vs. Post-construction
CVOW	Cargo Ships	4	Sample Site	2.16	2.27	Construction vs. Post-construction
CVOW	Cargo Ships	5	Sample Site	-0.73	3.69	Construction vs. Post-construction
CVOW	Cargo Ships	6	Sample Site	0.47	0.51	Construction vs. Post-construction
CVOW	Cargo Ships	7	Sample Site	6.18	4.97	Construction vs. Post-construction
CVOW	Cargo Ships	8	Sample Site	-0.17	0.23	Construction vs. Post-construction
CVOW	Cargo Ships	9	Sample Site	-0.42	1.82	Construction vs. Post-construction
CVOW	Cargo Ships	10	Sample Site	0.54	3.76	Construction vs. Post-construction
CVOW	Cargo Ships	11	Sample Site	0.03	0.05	Construction vs. Post-construction
CVOW	Cargo Ships	12	Sample Site	-6.24	17.41	Construction vs. Post-construction
CVOW	Cargo Ships	13	Sample Site	6.52	6.19	Construction vs. Post-construction
CVOW	Cargo Ships	14	Sample Site	0.77	1.08	Construction vs. Post-construction
CVOW	Cargo Ships	15	Wind Farm	-0.47	0.36	Construction vs. Post-construction
CVOW	Fishing	1	Sample Site	0.02	0.02	Construction vs. Post-construction
CVOW	Fishing	2	Sample Site	-0.01	0.01	Construction vs. Post-construction
CVOW	Fishing	3	Sample Site	-0.03	0.02	Construction vs. Post-construction
CVOW	Fishing	4	Sample Site	0.00	0.01	Construction vs. Post-construction
CVOW	Fishing	5	Sample Site	-0.03	0.04	Construction vs. Post-construction
CVOW	Fishing	6	Sample Site	0.00	0.01	Construction vs. Post-construction
CVOW	Fishing	7	Sample Site	-0.04	0.03	Construction vs. Post-construction
CVOW	Fishing	8	Sample Site	-0.02	0.02	Construction vs. Post-construction
CVOW	Fishing	9	Sample Site	0.00	0.01	Construction vs. Post-construction
CVOW	Fishing	10	Sample Site	0.00	0.01	Construction vs. Post-construction
CVOW	Fishing	11	Sample Site	-0.03	0.05	Construction vs. Post-construction
CVOW	Fishing	12	Sample Site	-0.01	0.02	Construction vs. Post-construction
CVOW	Fishing	13	Sample Site	-0.02	0.02	Construction vs. Post-construction
CVOW	Fishing	14	Sample Site	-0.01	0.01	Construction vs. Post-construction
CVOW	Fishing	15	Wind Farm	0.01	0.02	Construction vs. Post-construction
CVOW	Non-Commercial Ships	1	Sample Site	0.02	0.01	Construction vs. Post-construction
CVOW	Non-Commercial Ships	2	Sample Site	0.11	0.03	Construction vs. Post-construction
CVOW	Non-Commercial Ships	3	Sample Site	0.03	0.01	Construction vs. Post-construction
CVOW	Non-Commercial Ships	4	Sample Site	0.02	0.01	Construction vs. Post-construction
CVOW	Non-Commercial Ships	5	Sample Site	0.07	0.04	Construction vs. Post-construction

CVOW	Non-Commercial Ships	6	Sample Site	0.04	0.01	Construction vs. Post-construction
CVOW	Non-Commercial Ships	7	Sample Site	0.12	0.03	Construction vs. Post-construction
CVOW	Non-Commercial Ships	8	Sample Site	0.09	0.13	Construction vs. Post-construction
CVOW	Non-Commercial Ships	9	Sample Site	0.02	0.01	Construction vs. Post-construction
CVOW	Non-Commercial Ships	10	Sample Site	0.04	0.02	Construction vs. Post-construction
CVOW	Non-Commercial Ships	11	Sample Site	0.07	0.03	Construction vs. Post-construction
CVOW	Non-Commercial Ships	12	Sample Site	0.09	0.02	Construction vs. Post-construction
CVOW	Non-Commercial Ships	13	Sample Site	0.05	0.02	Construction vs. Post-construction
CVOW	Non-Commercial Ships	14	Sample Site	0.04	0.01	Construction vs. Post-construction
CVOW	Non-Commercial Ships	15	Wind Farm	0.01	0.02	Construction vs. Post-construction
CVOW	Passenger Ships	1	Sample Site	-0.16	0.21	Construction vs. Post-construction
CVOW	Passenger Ships	2	Sample Site	-1.48	1.13	Construction vs. Post-construction
CVOW	Passenger Ships	3	Sample Site	-0.01	0.01	Construction vs. Post-construction
CVOW	Passenger Ships	4	Sample Site	-0.03	0.02	Construction vs. Post-construction
CVOW	Passenger Ships	5	Sample Site	-0.02	0.02	Construction vs. Post-construction
CVOW	Passenger Ships	6	Sample Site	0.00	0.02	Construction vs. Post-construction
CVOW	Passenger Ships	7	Sample Site	-0.20	0.18	Construction vs. Post-construction
CVOW	Passenger Ships	8	Sample Site	-0.15	0.10	Construction vs. Post-construction

CVOW	Passenger Ships	9	Sample Site	-0.06	0.06	Construction vs. Post-construction
CVOW	Passenger Ships	10	Sample Site	-2.57	2.04	Construction vs. Post-construction
CVOW	Passenger Ships	11	Sample Site	-0.07	0.06	Construction vs. Post-construction
CVOW	Passenger Ships	12	Sample Site	-3.12	2.35	Construction vs. Post-construction
CVOW	Passenger Ships	13	Sample Site	-0.02	0.02	Construction vs. Post-construction
CVOW	Passenger Ships	14	Sample Site	-0.01	0.01	Construction vs. Post-construction
CVOW	Passenger Ships	15	Wind Farm	-8.04	8.27	Construction vs. Post-construction
CVOW	Service Ships	1	Sample Site	0.23	0.49	Construction vs. Post-construction
CVOW	Service Ships	2	Sample Site	0.13	0.16	Construction vs. Post-construction
CVOW	Service Ships	3	Sample Site	-0.02	0.03	Construction vs. Post-construction
CVOW	Service Ships	4	Sample Site	0.50	0.46	Construction vs. Post-construction
CVOW	Service Ships	5	Sample Site	0.00	0.02	Construction vs. Post-construction
CVOW	Service Ships	6	Sample Site	0.00	0.02	Construction vs. Post-construction
CVOW	Service Ships	7	Sample Site	-0.01	0.03	Construction vs. Post-construction
CVOW	Service Ships	8	Sample Site	0.00	0.04	Construction vs. Post-construction
CVOW	Service Ships	9	Sample Site	0.28	0.35	Construction vs. Post-construction
CVOW	Service Ships	10	Sample Site	-0.06	0.09	Construction vs. Post-construction
CVOW	Service Ships	11	Sample Site	0.00	0.02	Construction vs. Post-construction
CVOW	Service Ships	12	Sample Site	0.02	0.01	Construction vs. Post-construction
CVOW	Service Ships	13	Sample Site	0.02	0.01	Construction vs. Post-construction
CVOW	Service Ships	14	Sample Site	0.00	0.01	Construction vs. Post-construction
CVOW	Service Ships	15	Wind Farm	-0.78	1.68	Construction vs. Post-construction
CVOW	Tankers	1	Sample Site	0.16	0.61	Construction vs. Post-construction
CVOW	Tankers	2	Sample Site	0.01	0.03	Construction vs. Post-construction

CVOW	Tankers	3	Sample Site	0.00	0.01	Construction vs. Post-construction
CVOW	Tankers	4	Sample Site	0.48	1.26	Construction vs. Post-construction
CVOW	Tankers	5	Sample Site	0.00	0.01	Construction vs. Post-construction
CVOW	Tankers	6	Sample Site	0.00	0.03	Construction vs. Post-construction
CVOW	Tankers	7	Sample Site	0.03	0.03	Construction vs. Post-construction
CVOW	Tankers	8	Sample Site	0.00	0.02	Construction vs. Post-construction
CVOW	Tankers	9	Sample Site	-0.01	0.01	Construction vs. Post-construction
CVOW	Tankers	10	Sample Site	0.01	0.01	Construction vs. Post-construction
CVOW	Tankers	11	Sample Site	0.01	0.01	Construction vs. Post-construction
CVOW	Tankers	12	Sample Site	0.05	0.09	Construction vs. Post-construction
CVOW	Tankers	13	Sample Site	0.47	1.64	Construction vs. Post-construction
CVOW	Tankers	14	Sample Site	0.01	0.02	Construction vs. Post-construction
CVOW	Tankers	15	Wind Farm	0.00	0.01	Construction vs. Post-construction
CVOW	Unknown	1	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	2	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	3	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	4	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	5	Sample Site	0.01	0.02	Construction vs. Post-construction
CVOW	Unknown	6	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	7	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	8	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	9	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	10	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	11	Sample Site	0.00	0.01	Construction vs. Post-construction
CVOW	Unknown	12	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	13	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	14	Sample Site	0.00	0.00	Construction vs. Post-construction
CVOW	Unknown	15	Wind Farm	0.00	0.00	Construction vs. Post-construction

C.

Wind Farm	Vessel Type	Site ID	Site Type	Mean	Standard Deviation	Development Phase Comparison
BIWF	All Others	1	Sample Site	0.25	0.07	Pre-construction vs. Post-construction
BIWF	All Others	2	Sample Site	0.39	0.20	Pre-construction vs. Post-construction
BIWF	All Others	3	Sample Site	0.23	0.12	Pre-construction vs. Post-construction
BIWF	All Others	4	Sample Site	0.53	0.56	Pre-construction vs. Post-construction
BIWF	All Others	5	Sample Site	0.30	0.26	Pre-construction vs. Post-construction
BIWF	All Others	6	Sample Site	0.77	0.27	Pre-construction vs. Post-construction
BIWF	All Others	7	Sample Site	0.89	0.47	Pre-construction vs. Post-construction
BIWF	All Others	8	Sample Site	1.00	0.84	Pre-construction vs. Post-construction
BIWF	All Others	9	Sample Site	1.04	0.92	Pre-construction vs. Post-construction

BIWF	All Others	10	Sample Site	0.50	0.13	Pre-construction vs. Post-construction
BIWF	All Others	11	Sample Site	0.60	0.21	Pre-construction vs. Post-construction
BIWF	All Others	12	Sample Site	2.98	2.11	Pre-construction vs. Post-construction
BIWF	All Others	13	Sample Site	1.93	0.80	Pre-construction vs. Post-construction
BIWF	All Others	14	Sample Site	0.86	0.76	Pre-construction vs. Post-construction
BIWF	All Others	15	Wind Farm	4.34	7.14	Pre-construction vs. Post-construction
BIWF	Cargo Ships	1	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
BIWF	Cargo Ships	2	Sample Site	0.07	0.16	Pre-construction vs. Post-construction
BIWF	Cargo Ships	3	Sample Site	0.06	0.02	Pre-construction vs. Post-construction
BIWF	Cargo Ships	4	Sample Site	0.06	0.04	Pre-construction vs. Post-construction
BIWF	Cargo Ships	5	Sample Site	0.03	0.04	Pre-construction vs. Post-construction
BIWF	Cargo Ships	6	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Cargo Ships	7	Sample Site	0.02	0.04	Pre-construction vs. Post-construction
BIWF	Cargo Ships	8	Sample Site	0.01	0.02	Pre-construction vs. Post-construction
BIWF	Cargo Ships	9	Sample Site	0.01	0.03	Pre-construction vs. Post-construction
BIWF	Cargo Ships	10	Sample Site	0.11	0.06	Pre-construction vs. Post-construction
BIWF	Cargo Ships	11	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Cargo Ships	12	Sample Site	0.02	0.01	Pre-construction vs. Post-construction
BIWF	Cargo Ships	13	Sample Site	0.01	0.02	Pre-construction vs. Post-construction
BIWF	Cargo Ships	14	Sample Site	0.05	0.06	Pre-construction vs. Post-construction
BIWF	Cargo Ships	15	Wind Farm	-0.32	0.75	Pre-construction vs. Post-construction
BIWF	Fishing	1	Sample Site	0.29	0.09	Pre-construction vs. Post-construction
BIWF	Fishing	2	Sample Site	0.35	0.06	Pre-construction vs. Post-construction
BIWF	Fishing	3	Sample Site	0.13	0.04	Pre-construction vs. Post-construction
BIWF	Fishing	4	Sample Site	0.42	0.30	Pre-construction vs. Post-construction
BIWF	Fishing	5	Sample Site	0.26	0.06	Pre-construction vs. Post-construction
BIWF	Fishing	6	Sample Site	0.14	0.06	Pre-construction vs. Post-construction
BIWF	Fishing	7	Sample Site	0.46	0.44	Pre-construction vs. Post-construction
BIWF	Fishing	8	Sample Site	0.28	0.09	Pre-construction vs. Post-construction
BIWF	Fishing	9	Sample Site	0.31	0.14	Pre-construction vs. Post-construction
BIWF	Fishing	10	Sample Site	0.31	0.07	Pre-construction vs. Post-construction
BIWF	Fishing	11	Sample Site	0.32	0.19	Pre-construction vs. Post-construction
BIWF	Fishing	12	Sample Site	0.40	0.16	Pre-construction vs. Post-construction
BIWF	Fishing	13	Sample Site	1.06	0.62	Pre-construction vs. Post-construction
BIWF	Fishing	14	Sample Site	0.55	0.20	Pre-construction vs. Post-construction
BIWF	Fishing	15	Wind Farm	0.27	0.11	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	1	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	2	Sample Site	0.00	0.00	Pre-construction vs. Post-construction

BIWF	Non-Commercial Ships	3	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	4	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	5	Sample Site	0.01	0.03	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	6	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	7	Sample Site	0.02	0.06	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	8	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	9	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	10	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	11	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	12	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	13	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	14	Sample Site	0.01	0.03	Pre-construction vs. Post-construction
BIWF	Non-Commercial Ships	15	Wind Farm	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Passenger Ships	1	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
BIWF	Passenger Ships	2	Sample Site	0.07	0.02	Pre-construction vs. Post-construction
BIWF	Passenger Ships	3	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
BIWF	Passenger Ships	4	Sample Site	0.09	0.31	Pre-construction vs. Post-construction

BIWF	Passenger Ships	5	Sample Site	0.03	0.08	Pre-construction vs. Post-construction
BIWF	Passenger Ships	6	Sample Site	0.17	0.06	Pre-construction vs. Post-construction
BIWF	Passenger Ships	7	Sample Site	0.17	0.19	Pre-construction vs. Post-construction
BIWF	Passenger Ships	8	Sample Site	0.37	0.64	Pre-construction vs. Post-construction
BIWF	Passenger Ships	9	Sample Site	0.39	0.63	Pre-construction vs. Post-construction
BIWF	Passenger Ships	10	Sample Site	0.10	0.15	Pre-construction vs. Post-construction
BIWF	Passenger Ships	11	Sample Site	0.10	0.08	Pre-construction vs. Post-construction
BIWF	Passenger Ships	12	Sample Site	0.67	0.61	Pre-construction vs. Post-construction
BIWF	Passenger Ships	13	Sample Site	0.34	0.50	Pre-construction vs. Post-construction
BIWF	Passenger Ships	14	Sample Site	0.02	0.01	Pre-construction vs. Post-construction
BIWF	Passenger Ships	15	Wind Farm	0.21	0.34	Pre-construction vs. Post-construction
BIWF	Service Ships	1	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Service Ships	2	Sample Site	0.07	0.23	Pre-construction vs. Post-construction
BIWF	Service Ships	3	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Service Ships	4	Sample Site	-0.01	0.01	Pre-construction vs. Post-construction
BIWF	Service Ships	5	Sample Site	-0.03	0.01	Pre-construction vs. Post-construction
BIWF	Service Ships	6	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
BIWF	Service Ships	7	Sample Site	0.00	0.02	Pre-construction vs. Post-construction
BIWF	Service Ships	8	Sample Site	-0.05	0.02	Pre-construction vs. Post-construction
BIWF	Service Ships	9	Sample Site	-0.04	0.03	Pre-construction vs. Post-construction
BIWF	Service Ships	10	Sample Site	-0.04	0.04	Pre-construction vs. Post-construction
BIWF	Service Ships	11	Sample Site	-0.10	0.08	Pre-construction vs. Post-construction
BIWF	Service Ships	12	Sample Site	0.01	0.12	Pre-construction vs. Post-construction

BIWF	Service Ships	13	Sample Site	0.01	0.02	Pre-construction vs. Post-construction
BIWF	Service Ships	14	Sample Site	-0.01	0.02	Pre-construction vs. Post-construction
BIWF	Service Ships	15	Wind Farm	-0.11	0.09	Pre-construction vs. Post-construction
BIWF	Tankers	1	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
BIWF	Tankers	2	Sample Site	0.00	0.03	Pre-construction vs. Post-construction
BIWF	Tankers	3	Sample Site	0.02	0.02	Pre-construction vs. Post-construction
BIWF	Tankers	4	Sample Site	0.02	0.01	Pre-construction vs. Post-construction
BIWF	Tankers	5	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Tankers	6	Sample Site	-0.01	0.01	Pre-construction vs. Post-construction
BIWF	Tankers	7	Sample Site	-0.01	0.02	Pre-construction vs. Post-construction
BIWF	Tankers	8	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
BIWF	Tankers	9	Sample Site	0.00	0.03	Pre-construction vs. Post-construction
BIWF	Tankers	10	Sample Site	0.01	0.03	Pre-construction vs. Post-construction
BIWF	Tankers	11	Sample Site	-0.01	0.01	Pre-construction vs. Post-construction
BIWF	Tankers	12	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Tankers	13	Sample Site	-0.01	0.02	Pre-construction vs. Post-construction
BIWF	Tankers	14	Sample Site	-0.01	0.01	Pre-construction vs. Post-construction
BIWF	Tankers	15	Wind Farm	-0.02	0.01	Pre-construction vs. Post-construction
BIWF	Unknown	1	Sample Site	-0.01	0.00	Pre-construction vs. Post-construction
BIWF	Unknown	2	Sample Site	-0.01	0.00	Pre-construction vs. Post-construction
BIWF	Unknown	3	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
BIWF	Unknown	4	Sample Site	-0.01	0.00	Pre-construction vs. Post-construction
BIWF	Unknown	5	Sample Site	-0.01	0.01	Pre-construction vs. Post-construction
BIWF	Unknown	6	Sample Site	-0.02	0.01	Pre-construction vs. Post-construction
BIWF	Unknown	7	Sample Site	-0.01	0.01	Pre-construction vs. Post-construction
BIWF	Unknown	8	Sample Site	-0.01	0.00	Pre-construction vs. Post-construction
BIWF	Unknown	9	Sample Site	-0.01	0.00	Pre-construction vs. Post-construction
BIWF	Unknown	10	Sample Site	-0.01	0.00	Pre-construction vs. Post-construction
BIWF	Unknown	11	Sample Site	-0.01	0.01	Pre-construction vs. Post-construction
BIWF	Unknown	12	Sample Site	-0.05	0.05	Pre-construction vs. Post-construction
BIWF	Unknown	13	Sample Site	-0.06	0.09	Pre-construction vs. Post-construction
BIWF	Unknown	14	Sample Site	-0.02	0.01	Pre-construction vs. Post-construction
BIWF	Unknown	15	Wind Farm	0.60	3.63	Pre-construction vs. Post-construction
CVOW	All Others	1	Sample Site	0.77	1.25	Pre-construction vs. Post-construction
CVOW	All Others	2	Sample Site	-1.08	1.61	Pre-construction vs. Post-construction
CVOW	All Others	3	Sample Site	-0.05	0.09	Pre-construction vs. Post-construction
CVOW	All Others	4	Sample Site	-0.11	0.43	Pre-construction vs. Post-construction
CVOW	All Others	5	Sample Site	-0.26	0.28	Pre-construction vs. Post-construction
CVOW	All Others	6	Sample Site	-0.32	0.20	Pre-construction vs. Post-construction

CVOW	All Others	7	Sample Site	-1.04	0.61	Pre-construction vs. Post-construction
CVOW	All Others	8	Sample Site	-0.19	0.29	Pre-construction vs. Post-construction
CVOW	All Others	9	Sample Site	0.22	0.43	Pre-construction vs. Post-construction
CVOW	All Others	10	Sample Site	-0.39	0.44	Pre-construction vs. Post-construction
CVOW	All Others	11	Sample Site	-0.21	0.11	Pre-construction vs. Post-construction
CVOW	All Others	12	Sample Site	-1.88	2.18	Pre-construction vs. Post-construction
CVOW	All Others	13	Sample Site	-0.42	0.23	Pre-construction vs. Post-construction
CVOW	All Others	14	Sample Site	-0.17	0.05	Pre-construction vs. Post-construction
CVOW	All Others	15	Wind Farm	2.63	3.55	Pre-construction vs. Post-construction
CVOW	Cargo Ships	1	Sample Site	0.21	0.85	Pre-construction vs. Post-construction
CVOW	Cargo Ships	2	Sample Site	0.74	0.79	Pre-construction vs. Post-construction
CVOW	Cargo Ships	3	Sample Site	0.60	1.34	Pre-construction vs. Post-construction
CVOW	Cargo Ships	4	Sample Site	2.71	2.13	Pre-construction vs. Post-construction
CVOW	Cargo Ships	5	Sample Site	0.21	0.52	Pre-construction vs. Post-construction
CVOW	Cargo Ships	6	Sample Site	0.92	0.49	Pre-construction vs. Post-construction
CVOW	Cargo Ships	7	Sample Site	6.79	4.83	Pre-construction vs. Post-construction
CVOW	Cargo Ships	8	Sample Site	0.09	0.10	Pre-construction vs. Post-construction
CVOW	Cargo Ships	9	Sample Site	0.44	0.18	Pre-construction vs. Post-construction
CVOW	Cargo Ships	10	Sample Site	0.89	3.48	Pre-construction vs. Post-construction
CVOW	Cargo Ships	11	Sample Site	0.13	0.10	Pre-construction vs. Post-construction
CVOW	Cargo Ships	12	Sample Site	1.11	2.94	Pre-construction vs. Post-construction
CVOW	Cargo Ships	13	Sample Site	6.64	6.27	Pre-construction vs. Post-construction
CVOW	Cargo Ships	14	Sample Site	0.93	1.06	Pre-construction vs. Post-construction
CVOW	Cargo Ships	15	Wind Farm	-0.21	0.12	Pre-construction vs. Post-construction
CVOW	Fishing	1	Sample Site	0.02	0.02	Pre-construction vs. Post-construction
CVOW	Fishing	2	Sample Site	-0.01	0.00	Pre-construction vs. Post-construction
CVOW	Fishing	3	Sample Site	-0.02	0.01	Pre-construction vs. Post-construction
CVOW	Fishing	4	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
CVOW	Fishing	5	Sample Site	-0.01	0.01	Pre-construction vs. Post-construction
CVOW	Fishing	6	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Fishing	7	Sample Site	-0.02	0.02	Pre-construction vs. Post-construction
CVOW	Fishing	8	Sample Site	-0.01	0.00	Pre-construction vs. Post-construction
CVOW	Fishing	9	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
CVOW	Fishing	10	Sample Site	-0.01	0.01	Pre-construction vs. Post-construction
CVOW	Fishing	11	Sample Site	0.00	0.03	Pre-construction vs. Post-construction
CVOW	Fishing	12	Sample Site	-0.01	0.00	Pre-construction vs. Post-construction
CVOW	Fishing	13	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Fishing	14	Sample Site	-0.01	0.00	Pre-construction vs. Post-construction
CVOW	Fishing	15	Wind Farm	0.00	0.02	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	1	Sample Site	0.02	0.01	Pre-construction vs. Post-construction

CVOW	Non-Commercial Ships	2	Sample Site	0.11	0.03	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	3	Sample Site	0.03	0.01	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	4	Sample Site	0.02	0.01	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	5	Sample Site	0.07	0.04	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	6	Sample Site	0.04	0.01	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	7	Sample Site	0.11	0.03	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	8	Sample Site	0.09	0.13	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	9	Sample Site	0.02	0.01	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	10	Sample Site	0.05	0.02	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	11	Sample Site	0.07	0.03	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	12	Sample Site	0.09	0.03	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	13	Sample Site	0.05	0.01	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	14	Sample Site	0.03	0.01	Pre-construction vs. Post-construction
CVOW	Non-Commercial Ships	15	Wind Farm	0.02	0.02	Pre-construction vs. Post-construction
CVOW	Passenger Ships	1	Sample Site	-0.01	0.01	Pre-construction vs. Post-construction
CVOW	Passenger Ships	2	Sample Site	0.01	0.01	Pre-construction vs. Post-construction

CVOW	Passenger Ships	3	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Passenger Ships	4	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
CVOW	Passenger Ships	5	Sample Site	-0.01	0.01	Pre-construction vs. Post-construction
CVOW	Passenger Ships	6	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
CVOW	Passenger Ships	7	Sample Site	0.04	0.02	Pre-construction vs. Post-construction
CVOW	Passenger Ships	8	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
CVOW	Passenger Ships	9	Sample Site	0.00	0.02	Pre-construction vs. Post-construction
CVOW	Passenger Ships	10	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
CVOW	Passenger Ships	11	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
CVOW	Passenger Ships	12	Sample Site	0.04	0.02	Pre-construction vs. Post-construction
CVOW	Passenger Ships	13	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
CVOW	Passenger Ships	14	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Passenger Ships	15	Wind Farm	0.03	0.06	Pre-construction vs. Post-construction
CVOW	Service Ships	1	Sample Site	0.24	0.49	Pre-construction vs. Post-construction
CVOW	Service Ships	2	Sample Site	0.13	0.15	Pre-construction vs. Post-construction
CVOW	Service Ships	3	Sample Site	0.01	0.02	Pre-construction vs. Post-construction
CVOW	Service Ships	4	Sample Site	0.51	0.45	Pre-construction vs. Post-construction
CVOW	Service Ships	5	Sample Site	0.01	0.02	Pre-construction vs. Post-construction
CVOW	Service Ships	6	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
CVOW	Service Ships	7	Sample Site	0.04	0.02	Pre-construction vs. Post-construction
CVOW	Service Ships	8	Sample Site	0.06	0.02	Pre-construction vs. Post-construction
CVOW	Service Ships	9	Sample Site	0.29	0.35	Pre-construction vs. Post-construction
CVOW	Service Ships	10	Sample Site	0.01	0.01	Pre-construction vs. Post-construction

CVOW	Service Ships	11	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
CVOW	Service Ships	12	Sample Site	0.03	0.02	Pre-construction vs. Post-construction
CVOW	Service Ships	13	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
CVOW	Service Ships	14	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
CVOW	Service Ships	15	Wind Farm	0.07	0.06	Pre-construction vs. Post-construction
CVOW	Tankers	1	Sample Site	0.15	0.61	Pre-construction vs. Post-construction
CVOW	Tankers	2	Sample Site	-0.07	0.45	Pre-construction vs. Post-construction
CVOW	Tankers	3	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
CVOW	Tankers	4	Sample Site	0.49	1.25	Pre-construction vs. Post-construction
CVOW	Tankers	5	Sample Site	0.00	0.05	Pre-construction vs. Post-construction
CVOW	Tankers	6	Sample Site	0.04	0.01	Pre-construction vs. Post-construction
CVOW	Tankers	7	Sample Site	-0.39	1.94	Pre-construction vs. Post-construction
CVOW	Tankers	8	Sample Site	0.01	0.01	Pre-construction vs. Post-construction
CVOW	Tankers	9	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Tankers	10	Sample Site	0.00	0.01	Pre-construction vs. Post-construction
CVOW	Tankers	11	Sample Site	0.02	0.01	Pre-construction vs. Post-construction
CVOW	Tankers	12	Sample Site	-0.05	0.28	Pre-construction vs. Post-construction
CVOW	Tankers	13	Sample Site	0.51	1.64	Pre-construction vs. Post-construction
CVOW	Tankers	14	Sample Site	0.02	0.02	Pre-construction vs. Post-construction
CVOW	Tankers	15	Wind Farm	-0.01	0.01	Pre-construction vs. Post-construction
CVOW	Unknown	1	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	2	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	3	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	4	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	5	Sample Site	0.01	0.02	Pre-construction vs. Post-construction
CVOW	Unknown	6	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	7	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	8	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	9	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	10	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	11	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	12	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	13	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	14	Sample Site	0.00	0.00	Pre-construction vs. Post-construction
CVOW	Unknown	15	Wind Farm	0.00	0.00	Pre-construction vs. Post-construction