## SIMULATIONS

# 014 Atlantic Beach

## Late Afternoon

**VISUALIZATION STUDY** FOR **OFFSHORE NORTH CAROLINA**

**014 Atlantic Beach Simulation, Late Afternoon,** Existing Conditions

T. J. Boyle Associates
landscape architects • planning consultants

# SIMULATION

## 014 Atlantic Beach

**Late Afternoon**

Siemens SWT-3.6-107

10 nm

Simulation

# 014 Atlantic Beach

## Late Afternoon

Siemens SWT-3.6-107

10 nm

## GENERAL INFORMATION

**Base Photograph**

Photo Name: ABA_0112-Polarized2-contrast
Date: April 20, 2012
Time: 3:53 PM
GPS Coordinates[1]: lat 34.697845°, long -76.739219°
Viewpoint Elevation: 9'

**Sun and Weather**

Sun Angle/Azimuth: 260°
Sun Elevation: 35°
Lighting Angle: Back lit
Weather Conditions: Partly cloudy
Visibility[2] : 10 mi
Wave Height: 2 - 3'
Period: 10 sec.

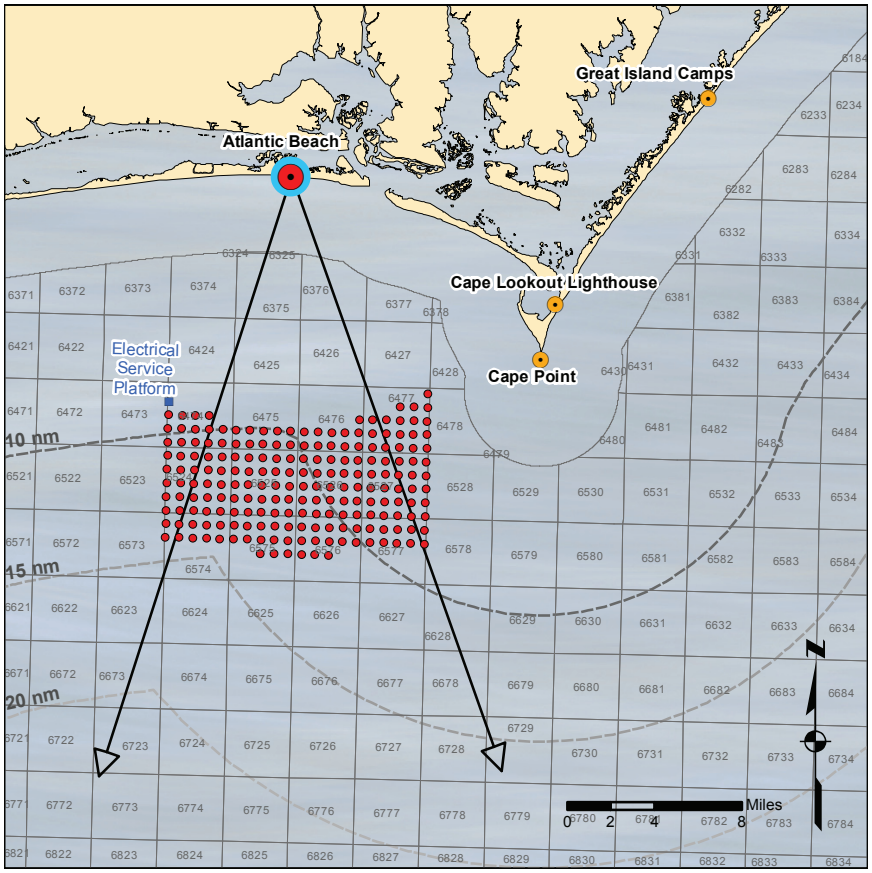
**Camera**

Camera Make/Model: Nikon D7000
Sensor Dimensions: 23.6 mm X 15.6 mm
Lens Make/Model: Nikkor DX AF-S 35 mm
Lens Focal Length: 35 mm
35 mm Equivalent Focal Length: 52.5 mm
Horizontal and Vertical Angles of View:
37.3° wide and 25.3° high
Camera Height: 1.5 m (5')
Camera Azimuth[3] : 176°

**Wind Turbine Information**

Number: 200
Make and Model: Siemens SWT-3.6-107
Height/Dimensions:
Support Structure/Monopile Ht.: 13 m (43')
Hub Ht. (above Monopile): 80 m (262')
Rotor Diameter: 107 m (351')
Total Height to Tip of Blade: 147 m (481')
Service Platform: A bldg. 50'H X 100'W X 200' L elevated 50' above the water

## CONTEXT MAP




## VIEWING INSTRUCTIONS

The simulation is properly printed on an 11" X 17" sheet at actual size. If viewed on a computer monitor, use the highest screen resolution.
The simulated image is at the proper perspective when viewed at 23.5" from the eye, or at a distance of approximately twice the image height.

## NOTES

- The image was taken with a polarized filter.
- Image RGB levels were adjusted in Photoshop.
- Refraction Coefficient[4](k) = .075

## PANORAMA

Simulation location within the panorama view (190° X 60°) from the Atlantic Beach site

T. J. Boyle Associates
landscape architects • planning consultants

**VISUALIZATION STUDY** FOR **OFFSHORE NORTH CAROLINA**

**014 Atlantic Beach Simulation, Late Afternoon,** Siemens SWT-3.6-107, 10 nm

T. J. Boyle Associates
landscape architects • planning consultants

# SIMULATION

## 014 Atlantic Beach

**Late Afternoon**

Siemens SWT-3.6-107

15 nm

Simulation

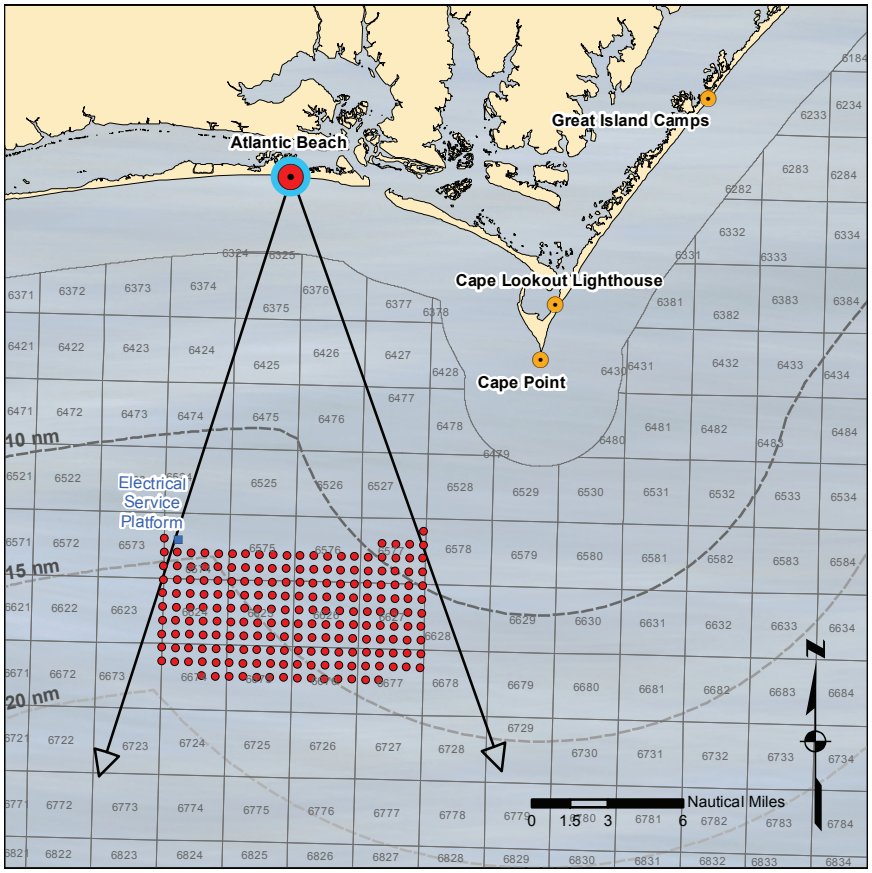
# 014 Atlantic Beach

## Late Afternoon

Siemens SWT-3.6-107

15 nm

## CONTEXT MAP

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**VISUALIZATION STUDY** FOR **OFFSHORE NORTH CAROLINA**

**014 Atlantic Beach Simulation, Late Afternoon,** Siemens SWT-3.6-107, 15 nm

T. J. Boyle Associates
landscape architects • planning consultants

# SIMULATION

## 014 Atlantic Beach

**Late Afternoon**

Siemens SWT-3.6-107

20 nm

Simulation

# 014 Atlantic Beach

## Late Afternoon

Siemens SWT-3.6-107

20 nm

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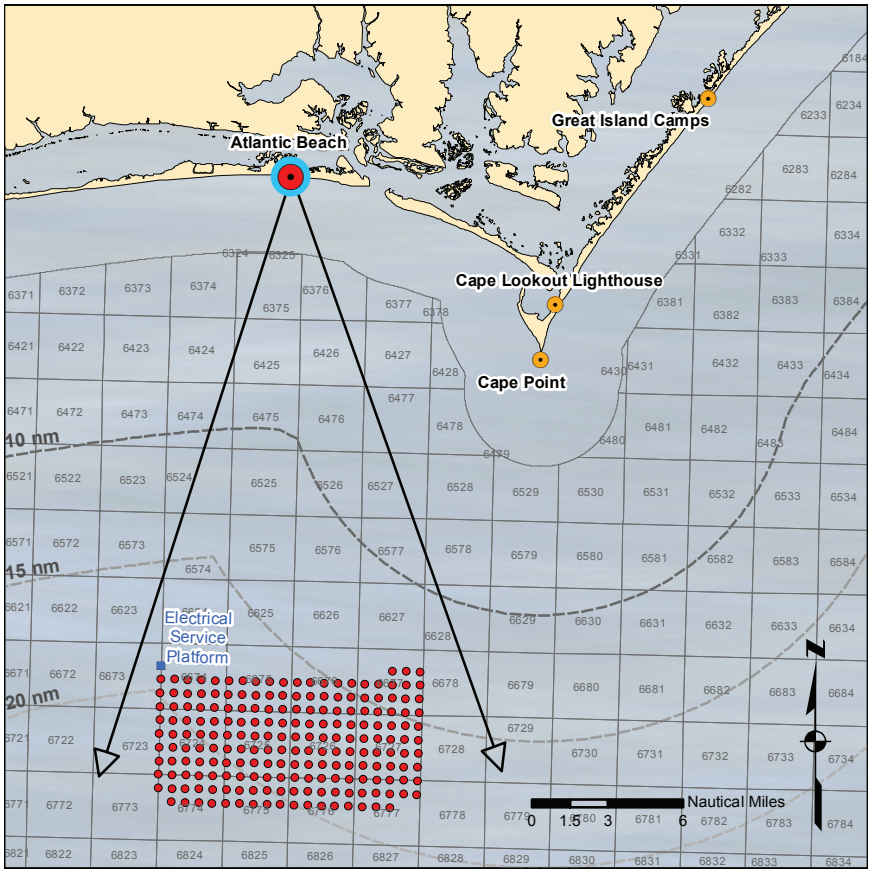


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**014 Atlantic Beach Simulation, Late Afternoon,** Siemens SWT-3.6-107, 20 nm

T. J. Boyle Associates
landscape architects • planning consultants

# SIMULATION

## 014 Atlantic Beach

### Late Afternoon

Vestas V164-7.0 MW

10 nm

Simulation

# 014 Atlantic Beach

## Late Afternoon

Vestas V164-7.0 MW

10 nm

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Horizontal and Vertical Angles of View:
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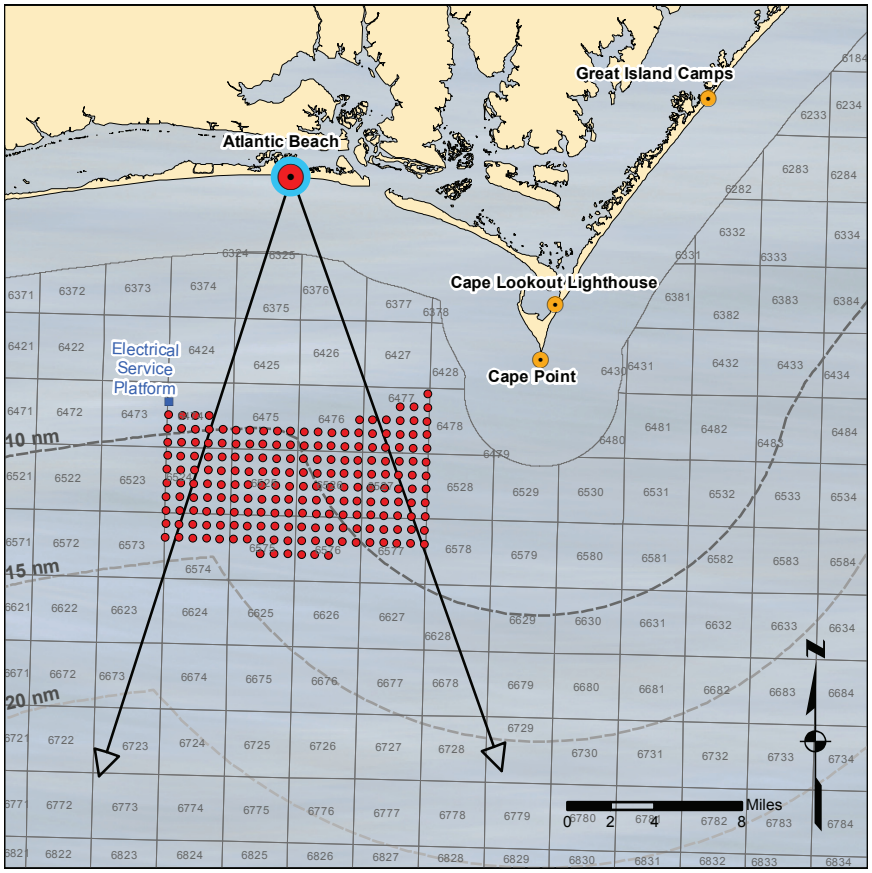
Camera Height: 1.5 m (5')
Camera Azimuth[3] : 176°

**Wind Turbine Information**

Number: 200
Make and Model: Vestas V164-7.0 MW
Height/Dimensions:
Support Structure/Monopile Ht.: 13 m (43')
Hub Ht. (above Monopile): 105 m (345')
Rotor Diameter: 164 m (538')
Total Height to Tip of Blade: 200 m (656')
Service Platform: A bldg. 50'H X 100'W X 200' L elevated 50' above the water

## CONTEXT MAP

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**014 Atlantic Beach Simulation, Late Afternoon,** Vestas V164-7.0 MW, 10 nm

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Vestas V164-7.0 MW

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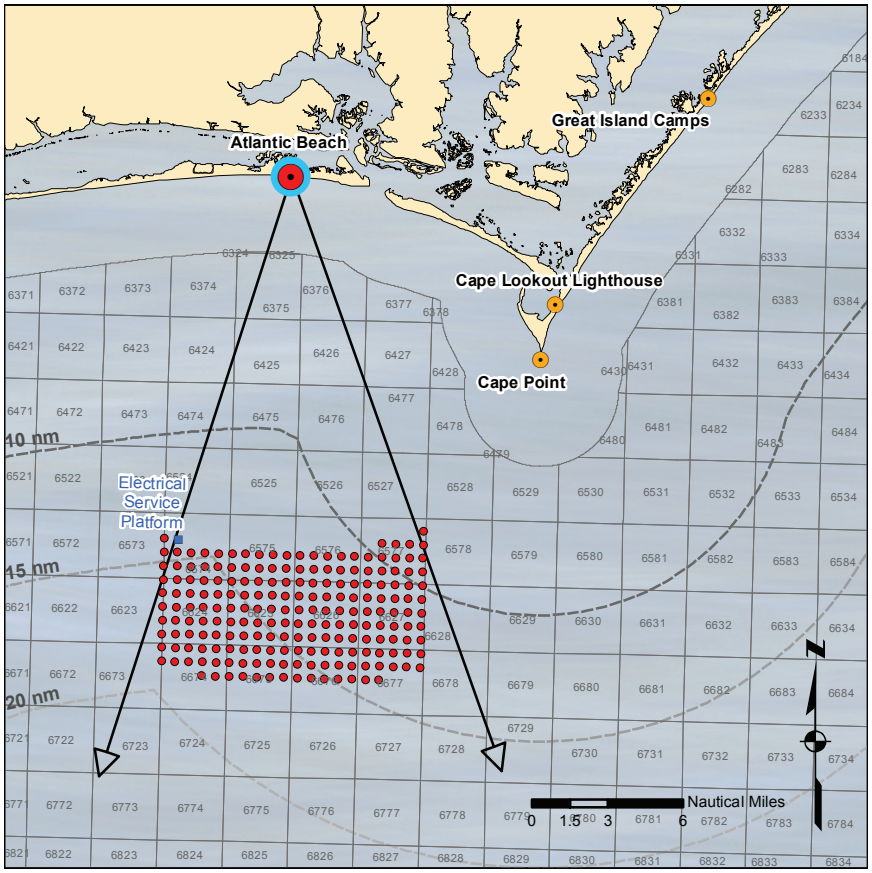


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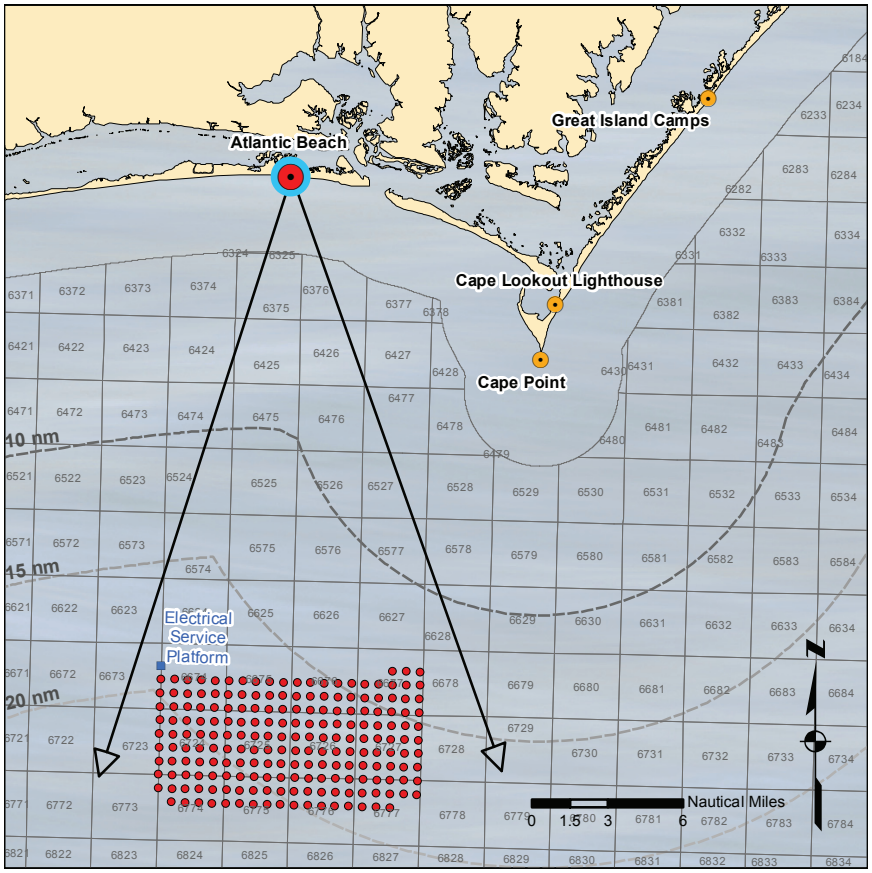


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# Footnotes



## INFORMATION PAGE FOOTNOTES

**[1]GPS Coordinates**
Location coordinates as used in WindPRO to register the wireframe diagram to the photograph. Due to slight errors and lens distortion, these values may differ at the fourth significant digit as obtained from a handheld GPS device at the time the photographs were taken and as shown on the Project Location Map.

**[2]Visibility**
Visibility is obtained from the closest airport weather station (see chart at right). The chart shows which weather station was used for each site. Visibility is measured up to ten statute miles.

**[3]Camera Azimuth**
Camera azimuth was obtained using a magnetic compass at the time of photography. However magnetic anomalies in the study area make some of these measurements unreliable. The camera azimuth reported here is for true north and reflects the bearing used to register the wind turbines to the photograph in WindPRO.

**[4]Refraction Coefficient**
The correction for refraction comes from Technical Appendix F Earth Curvature and Refraction of Light, in the report *Visual Representation of Windfarms Good Practice Guidance*, prepared for Scottish Natural Heritage (h+m 2006). The coefficient of refraction k is commonly defined as the ratio between the radius of the earth and the radius of the light in the line of sight between an object and the observer (Hirt 2010). The value reported here is half this value, but it is multiplied by two in the Technical Appendix's equation.

**Closest Airport Weather Station to Sites**

| Site | Weather Station Location NC |
|---|---|
| 001 Corolla Lighthouse | Kill Devil Hills |
| 002 Beach at Duck | Kill Devil Hills |
| 003 Kitty Hawk | Kill Devil Hills |
| 004 Coquina Beach | Kill Devil Hills |
| 005 Bodie Island Lighthouse | Hatteras |
| 006 Cape Hatteras Lighthouse | Hatteras |
| 007 Lighthouse Beach | Hatteras |
| 008 Ocracoke Beach | Hatteras |
| 009 Portsmouth Life Saving Station Tower | Hatteras |
| 010 Long Point Camps | Hatteras |
| 011 Great Island Camps | Beaufort |
| 012 Cape Lookout Lighthouse | Beaufort |
| 013 Cape Point | Beaufort |
| 014 Atlantic Beach | Beaufort |
| 015 Bald Head Island | Southport |
| 016 Oak Island | Southport |
| 017 Holden Beach | Southport |
| 018 Sunset Beach | Southport |

**ABBREVIATIONS**

| | |
|---|---|
| nm | nautical miles |
| mi | statute miles |
| mm | millimeters |
| m | meters |
| sec. | seconds |
| ‘ | feet |
| “ | inches |
| ° | degrees |
| lat | latitude |
| long | longitude |

**REFERENCES**

h+m and envision. 2006. Visual Representation of Windfarms Good Practice Guidance. Scottish Natural Heritage.

Hirt C., Guillaume S., Wisbar A., Bürki B. and Sternberg, H. 2010. Monitoring of the refraction coefficient of the lower atmosphere using a controlled set-up of simultaneous reciprocal vertical angle measurements. Journal of Geophysical Research, 115, D21102, doi:10.1029/2010JD014067