

*Proposed Wireless
Telecommunications Facility*

Voluntown
81 James Road
Voluntown, Connecticut

Prepared for



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Visual Resource Evaluation

Cellco Partnership dba Verizon Wireless seeks approval from the Connecticut Siting Council for a Certificate of Environmental Compatibility and Public Need to construct a wireless telecommunications facility ("Facility") on property at 81 James Road (identified herein as the "host property"), in the Town of Voluntown, Connecticut. This Visual Resource Evaluation was conducted to evaluate the visibility of the Facility within a two-mile radius of the proposed Site location ("Study Area"). The eastern portion of Study Area is located in Rhode Island. Attachment A contains a map that depicts the proposed location of the Facility and the limits of the Study Area.

Project Introduction

The proposed Facility includes the installation of a 160-foot tall monopole tower with associated ground equipment to be located at its base. Both the monopole and ground equipment would be situated within a fence-enclosed compound. The proposed Facility would be located at a ground elevation of approximately 442 feet Above Mean Sea Level (AMSL). Access to the Facility would use an existing curb cut on James Road and follow a portion of the host property driveway approximately 155 feet before veering onto a dirt path that extends 680± feet eastward thorough an open field. The existing dirt path would be improved with gravel to provide for a 12-foot wide access drive. A photograph of the proposed project area is included in Attachment A.

Site Description and Setting

Identified in the Town of Voluntown land records as Map 30/Lot 63, the host property consists of approximately 9.5 acres of that includes both wooded and open areas. The host property is also currently occupied by a single-family residence located roughly 730 feet southeast of the proposed Facility Site. Land use within the general vicinity is comprised of low-density residential development and undeveloped woodlands. Segments of Route 138 and Route 165 are contained within the Study Area. In total, the Study Area features approximately 30 linear miles of roadways.

The topography within the Study Area is generally characterized by gently rolling hills with ground elevations that range from approximately 275 feet AMSL to just over 500 feet AMSL. The Study Area contains approximately 427 acres of surface water, which includes Beach Pond located approximately 0.90-mile to the northeast of the proposed Facility. The tree cover within the Study Area consists mainly of mixed deciduous hardwood species that occupy approximately 7,044 acres of the 8,042-acre study area (87%). The average tree canopy height throughout the Study Area was estimated to be approximately 65 feet.



METHODOLOGY

To evaluate the visibility associated with the proposed Facility, VHB used the combination of a predictive computer model and in-field analysis. The predictive model provided a preliminary assessment of potential visibility throughout the entire study area, including private property and other areas inaccessible for direct observations. A "balloon float" and Study Area reconnaissance were subsequently conducted for field verification to back-check the initial computer modeling results, obtain location and height representations, and provide photographic documentation from publicly accessible areas. A description of the procedures used in the analysis is provided below.

Visibility Analysis

VHB uses ArcGIS® Spatial Analyst, a computer modeling tool developed by Environmental Systems Research Institute, Inc., to calculate the areas from which at least the top of the proposed Facility is expected to be visible. Project- and Study Area-specific data were incorporated into the computer model, including Facility height, its ground elevation, underlying and surrounding topography and existing vegetation. Information used in the model included Connecticut LiDAR¹-based digital elevation data, converted into a model, and a digital forest (or tree canopy) layer developed for the Study Area. The LiDAR-based Digital Elevation Model (DEM) represents ten-foot spatial resolution elevation information for the state of Connecticut and was derived through the spatial interpolation of airborne LiDAR-based data collected in the year 2000 and has a horizontal resolution of ten (10) feet. The data was edited in 2007 made available by the University of Connecticut through its Center for Land Use Education and Research (CLEAR). To create the forest layer, mature trees and woodland areas depicted on aerial photographs (ranging in dates from 2004 to 2008) were manually digitized (hand traced) in ArcGIS®, creating a geographic data layer for inclusion in the computer model. The black and white, digital aerial photographs, obtained from the Connecticut Department of Transportation, were flown in the spring of 2004 and used for this analysis to depict pre-leaf emergence (i.e., "leaf-off") conditions. These photographs are half-foot pixel resolution. The more recent aerial photographs (2006 and 2008) were overlaid and evaluated to identify any new development resulting in the removal of trees.

Once the specific data layers were entered, the ArcGIS® Spatial Analyst Viewshed tool is applied to achieve an estimate of locations where the proposed Facility could be visible. First, only topography was used as a possible visual constraint; the tree canopy was omitted to evaluate potential visibility with no intervening vegetative screening. The initial omission of this data layer is an excessively conservative prediction, but it provides an opportunity to identify areas within potential direct lines of sight of the Facility.

¹ LiDAR is an acronym for Light Detection and Ranging. It is a technology that utilized lasers to determine the distance to an object or surface. LiDAR is similar to radar, but incorporates laser pulses rather than sound waves. It measures the time delay between transmission and reflection of the laser pulse.

The forest data layer was then overlaid and built into the DEM, using a conservative average tree canopy height of 50 feet, to establish a baseline assessment of intervening vegetation. The resultant preliminary viewshed map was used during the in-field activities (describe further below) to compare the outcome of the initial computer modeling with observations of the balloon float to identify deviations. Information obtained from the field reconnaissance is ultimately incorporated into the model to refine the viewshed map.

The average tree canopy height was also refined based on information collected in the field using a combination of a hand-held laser range finder, clinometer and comparative observations. The revised average tree canopy height, in this case 65 feet, was then incorporated into the model with the results displayed on the viewshed map. The forested areas were overlaid on the DEM with a height of 65 feet added to the base elevation and the visibility from within the Study Area calculated.

As a final step, the forested areas were extracted from the areas of visibility, using a conservative assumption that a person standing within the forest will not be able to view the proposed Facility beyond a distance of approximately 500 feet. Depending on the density of the intervening tree canopy and understory of the surrounding woodlands, it is assumed that some locations within this distance could provide visibility of at least portions of the proposed Facility at any time of the year. In "leaf-on" conditions, this distance may be overly conservative for most locations. However, for purposes of this analysis, it was reasoned that forested land beyond 500 feet of the proposed Facility would consist of light-impenetrable trees of a uniform height.

Also included in the model and viewshed map are data layers, obtained from the Connecticut State Department of Environmental Protection (CTDEP), which depicts various land and water resources such as state parks and forests, trails, recreational facilities, protected municipal and private open space, schools, CTDEP boat launches, and other land use categories. Based on review of the Connecticut Walk Book (East Edition), it was also determined that three trails within the Study Area are part of the Connecticut Blue Blaze Trail system, including the Pachaug Trail, the Nehantic Trail, and the Narragansett Trail. In addition, the Laurel Loop Trail and Nehantic Pachaug Crossover Trail also traverse portions of the Study Area. Lastly, based on both a review of published information and discussions with municipal personnel in Voluntown, it was determined that there are no local or state designated scenic roads located within the Study Area.

Balloon Float and Study Area Reconnaissance

Vanasse Hangen Brustlin Inc., (VHB) conducted balloon floats at the proposed Facility on three separate occasions, including September 23, 2009, April 6, 2010, and August 17, 2010 to further evaluate the potential viewshed within the Study Area. The balloon floats consisted of raising and maintaining an approximate four-foot diameter, helium-filled balloon at the proposed site location at a height of 160 feet. The September 2009 balloon float was conducted to provide Verizon with a "quick look" of the potential year-round visibility from

locations proximate to the property. During the April 6, 2010 balloon float, VHB staff conducted a drive-by reconnaissance along the public roads located within the Study Area to evaluate the results of the preliminary viewshed map, inventory where the balloon was, and was not, visible above and/or through the tree canopy during "leaf-off" conditions, and obtain photographic documentation. Weather conditions during the April 6th balloon float included temperatures of approximately 65 degrees Fahrenheit, partly sunny skies and calm winds. The August 17, 2010 balloon float was conducted to further assess potential visibility from Beach Pond and its publicly-accessible shoreline. During the August 17th balloon float, the temperature was approximately 85 degrees Fahrenheit with calm wind conditions and partly sunny skies.

Photographic Documentation

During the in-field activities, the balloon was photographed from a number of different vantage points to document the actual view towards the proposed Facility. Several locations where the balloon was not visible are also included to provide documentation from representative areas within the Study Area, including Beach Pond. The locations of the photos are described below:

View	Location	Orientation	Dist. To Site	Visibility
1	James Road across from host property	Northeast	± 0.17-Mile	Seasonal
2	James Road south of #87	Northeast	± 0.17-Mile	Seasonal
3	James Road adjacent to #5	Southeast	± 0.42-Mile	Seasonal
4	Pachaug State Forest along north shore of Beach Pond	Southwest	± 1.07-Mile	Non-Visible
5	Route 138/Route 165 Split	Southeast	± 1.17-Mile	Non-Visible
6	Route 165 north of Beach Pond Parking Area	Southwest	± 1.41-Mile	Non-Visible
7	Route 165 across from Living Word Fellowship Church	Southeast	± 0.71-Mile	Non-Visible
8	Adjacent to #742 Route 165	Southwest	± 0.58-Mile	Non-Visible
9	Adjacent to #173 James Road	Northeast	± 0.43-Mile	Non-Visible
10	Beach Pond	South	± 0.95-Mile	Non-Visible
11	Beach Pond	Southwest	± 1.20-Mile	Non-Visible
12	Beach Pond	Southwest	± 1.50-Mile	Non-Visible
13	Beach Pond	Southwest	± 1.53-Mile	Non-Visible

Photographs of the balloon from the view points listed above were taken with a Nikon D-80 digital camera body and Nikon 18 to 135 mm zoom lens. For the purposes of this report, the lens was set to 50mm. "The lens that most closely approximates the view of the unaided human eye is known as the normal focal-length lens. For the 35 mm camera format, which gives a 24x36 mm image, the normal focal length is about 50 mm."²

² Warren, Bruce. *Photography*, West Publishing Company, Eagan, MN, c. 1993, (page 70).

The locations of the photographic points are recorded in the field using a hand-held GPS receiver and are subsequently plotted on the maps contained in the attachments to this document.

Photographic Simulation

Photographic simulations were generated for the three representative locations where the balloon was visible during the in-field activities. The photographic simulations portray a scaled rendering of the proposed Facility from these locations, with three wireless service providers represented. Using field data, site plan information, and 3-dimension (3D) modeling software, a spatially referenced model of the site area was generated. Geographic coordinates (latitude and longitude) were collected in the field for all of the photograph locations via GPS and later used to generate virtual camera positions within the spatial 3D model. Photo simulations were then created using a combination of renderings generated in the 3D model and photo rendering software programs. The balloon was included in the photographs to provide a visual marker and to cross-reference the height and proportions of the proposed Facility. A photolog map and the simulations are contained in Attachment A.

CONCLUSIONS

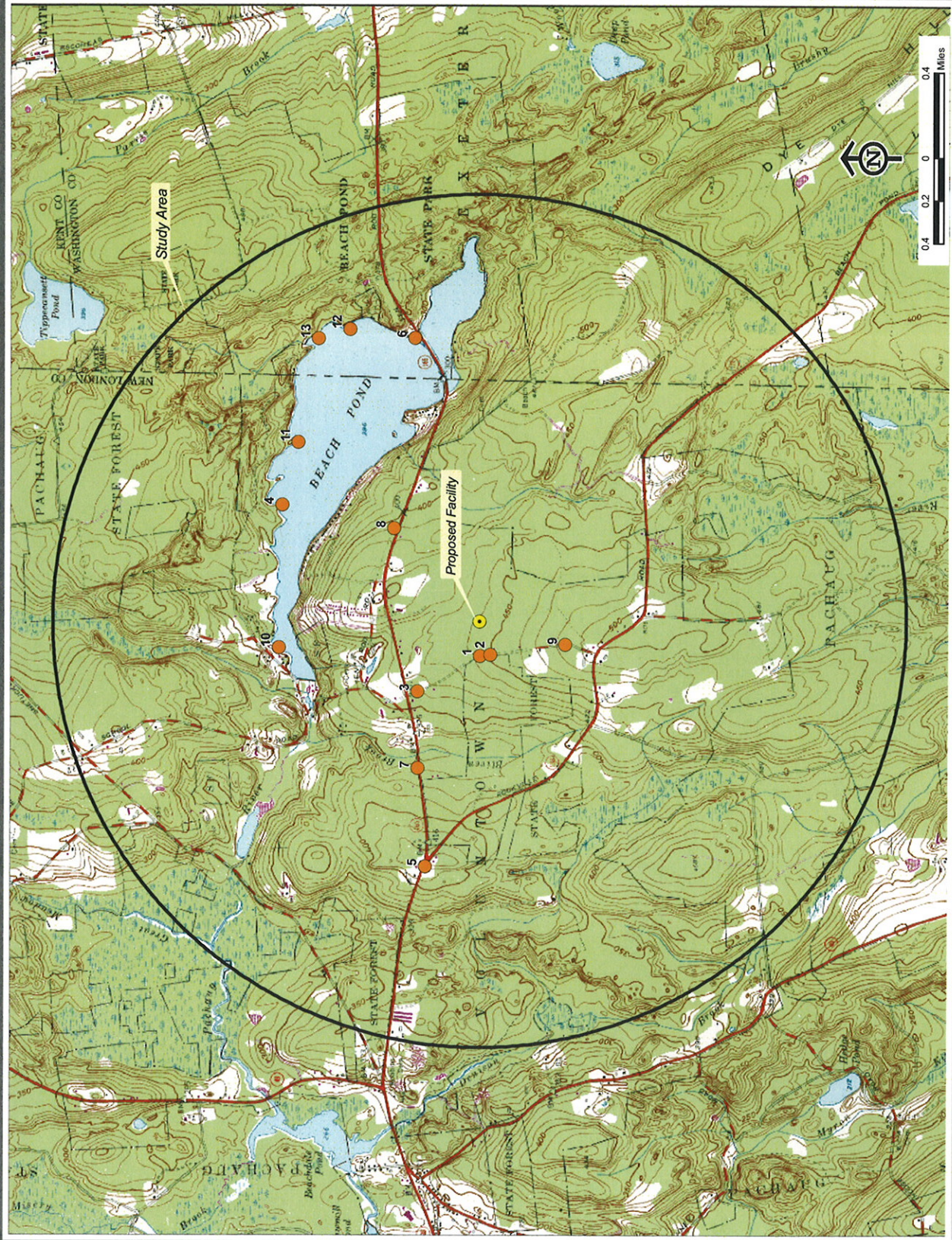
Based on this analysis, areas from where the proposed 160-foot tall Facility would be visible above the tree canopy comprise approximately three and a half (3.5) acres, or less than one tenth of one percent of the 8,042-acre Study Area. Field observations during balloon floats support the findings of the computer modeling. VHB had multiple opportunities to conduct reconnaissance of the Study Area during balloon floats in different seasons. As depicted on the viewshed map (provided in Attachment B), year-round visibility associated with the proposed monopole is confined to open areas on the western portion of the host property. VHB anticipates that year-round views may be achieved from the residence occupying the host property and one additional residential property located off James Road adjacent to the host property. Overall however, potential year-round visibility would be limited to the Facility's immediate area by the rolling topography and extensive vegetative cover within the Study Area. Construction activities will disturb a footprint of approximately 100 feet by 100 feet within the transitional forest at the edges of the upper field.

The viewshed map also depicts several additional areas where seasonal (i.e. during "leaf off" conditions) views are anticipated. These areas comprise approximately 26 acres and are located within the immediate vicinity of the proposed Facility, including select portions of James Road adjacent to the host property. VHB estimates that limited seasonal views of the proposed Facility may be achieved from portions of approximately five additional residential properties within the Study Area, all of which are located along James Road.

Attachment A

Study Area Map, Project Area Photograph, Balloon Float Photographs, and Photographic Simulations

Photolog Map



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| Photographic Documentation



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VIEW	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
	PROPOSED PROJECT AREA	N/A	0.00 MILE +/-	N/A

| Photographic Documentation



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VIEW	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	JAMES ROAD ACROSS FROM HOST PROPERTY	NORTHEAST	0.17 MILE +/-	SEASONAL

Photographic Simulation



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VIEW	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	JAMES ROAD ACROSS FROM HOST PROPERTY	NORTHEAST	0.17 MILE +/-	SEASONAL

| Photographic Documentation



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VIEW	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
2	JAMES ROAD SOUTH OF #87	NORTHEAST	0.17 MILE +/-	SEASONAL

Photographic Simulation



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VIEW	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
2	JAMES ROAD SOUTH OF #87	NORTHEAST	0.17 MILE +/-	SEASONAL

Photographic Documentation



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VIEW	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
3	JAMES ROAD ADJACENT TO #5	SOUTHEAST	0.42 MILE +/-	SEASONAL

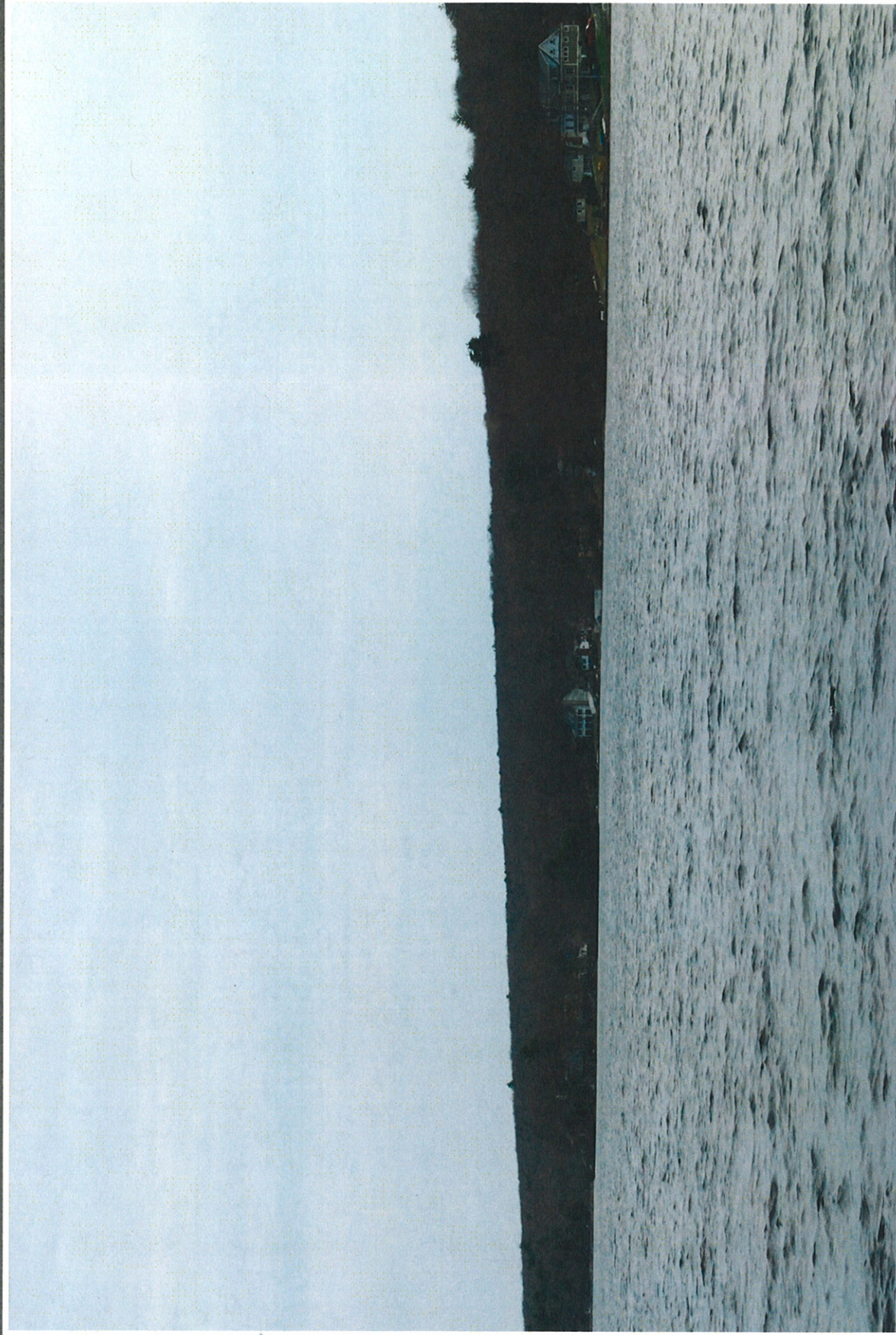
Photographic Simulation



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VIEW	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
3	JAMES ROAD ADJACENT TO #5	SOUTHEAST	0.42 MILE +/-	SEASONAL

| Photographic Documentation



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VIEW	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
4	PACHAUG STATE FOREST ALONG NORTH SHORE OF BEACH POND	SOUTHWEST	1.07 MILES +/-	NON-VISIBLE

| Photographic Documentation



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VIEW	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
5	ROUTE 138 / ROUTE 165 SPLIT	SOUTHEAST	1.17 MILES +/-	NON-VISIBLE

| Photographic Documentation



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VIEW	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
6	ROUTE 165 NORTH OF BEACH POND PARKING AREA	SOUTHWEST	1.41 MILES +/-	NON-VISIBLE