ATTACHMENT 8

ALL-POINTS TECHNOLOGY CORPORATION

VISIBILITY ANALYSIS

MONROE
30 COBBLERS HILL COURT
MONROE, CONNECTICUT

Prepared for:

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Project Introduction

New Cingular Wireless PCS, LLC, d/b/a AT&T is pursuing a Certificate of Environmental Compatibility and Public Need ("Certificate") from the Connecticut Siting Council ("Council") for the construction, maintenance and operation of a wireless communications facility ("Facility") on property at 30 Cobblers Hill Court in Monroe, Connecticut ("Host Property"). At the request of AT&T, All-Points Technology Corporation, P.C. ("APT") prepared this Visibility Analysis to evaluate potential views associated with the proposed Facility from within a two-mile radius ("Study Area"). In addition to the Town of Monroe, part of the adjoining municipality of Newtown is located within the northern section of the Study Area.

Site Description and Setting

The 36.4± acre Host Property is heavily wooded and abutted to the east by a larger 100± acre lot held in common ownership and occupied by an open quarry and residence (collectively identified herein as the "Host Property"). The proposed Facility would be located in the wooded east central portion of the host Property ("Site"), at a ground elevation of approximately 489 feet above mean sea level ("AMSL"). The Facility would include a 155-foot tall monopole designed to resemble a pine tree. An additional 7-foot extension would be added to assist in camouflaging and creating a tapered tree-top shape. The resultant 162-foot tall "monopine" would be located within a 75-foot by 75-foot chain link fenced enclosure. The 5,625± square foot, gravel-base compound would allow sufficient room for multiple equipment shelters and supporting equipment. Access to the Facility would be gained over a new gravel drive originating at the terminus of the Cobblers Hill Court cul-de-sac and extend generally south to the Site over a series of existing trails and woods roads.

Land use in the Site vicinity is generally residential in nature with large forested tracts. The topography within the Study Area is characterized by rolling hills with ground elevations that range from approximately 100 feet AMSL to nearly 730 feet AMSL. The tree cover within the Study Area (mixed deciduous hardwoods interspersed with stands of mature evergreens) occupies approximately 5,226 acres of the 8,042-acre study area (65%). The average tree canopy is estimated to be approximately 65 feet.

Methodology

APT used the combination of a predictive computer model and in-field analysis to evaluate the visibility associated with the proposed Facility. The predictive model provides an assessment of potential visibility throughout the entire Study Area, including private properties and other areas inaccessible for direct observations. A balloon float was also conducted to field verify results of the model, inventory visible and nonvisible locations, and to provide photographic documentation from publicly accessible areas. A description of the procedures used in the analysis is provided below.

Preliminary Computer Modeling

Two computer modeling tools are used to calculate those areas from which at least the top of the proposed Facility is estimated to be visible: IDRISI image analysis program (developed by Clark Labs, Clark University) and ArcGIS®, developed by Environmental Systems Research Institute, Inc. Project- and Study Area-specific data were incorporated into the computer model, including the Facility's location, height, and ground elevation, as well as the surrounding topography and existing vegetation which are two primary features that can block direct lines of sight. Information used in the model included LiDAR[1]-based digital elevation data and customized land use data layers developed specifically for this analysis. The LiDAR-based Digital Elevation Model ("DEM") represents topographic information for the state of Connecticut that 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. In addition, multiple land use data layers were created from National Agricultural Imagery Program (USDA) aerial photography (1-foot resolution, flown in 2011) using IDRISI image processing tools. The IDRISI tools develop light reflective classes defined by statistical analysis of individual pixels, which are then grouped based on common reflective values such that distinctions can be made automatically between deciduous and coniferous tree species, as well as grassland, impervious surface areas, water and other distinct land use features. This information is manually cross-checked with the recent USGS topographic land characteristics to quality assure the imaging analysis.

Once the data layers were entered, image processing tools were applied and overlaid onto USGS topographic base maps and aerial photographs to achieve an estimate of locations where the Facility might be visible. First, only the topography data layer (DEM) was incorporated to evaluate potential visibility with no intervening vegetative screening. The model is queried to determine where the top of the Facility can be seen from any point(s) within the Study Area, given the intervening existing topography. The initial omission of the forest cover data layer results in an excessive over-prediction, but provides an opportunity to identify and evaluate those areas with potentially direct sight lines toward 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.

Eliminating the tree canopy altogether, as performed in the preliminary analysis exaggerates areas of visibility because it assumes unobstructed sight lines everywhere but in those locations where intervening topography rises above the height of the proposed Facility. However, using this technique not only allows for an initial identification of direct sight lines, but also to gain some insight regarding seasonal views when the leaves are not on the trees. This preliminary mapping is especially useful during the in-field activities (described below) to further evaluate "leaf-off" scenarios.

Visibility varies through the year as the leaves drop from deciduous trees. During "leaf on" conditions, individual trees that are grouped proximate to one another form a near opaque wall of vegetation that, once beyond a certain distance, cannot be seen through. Conversely, visibility increases seasonally with obstructed, views occurring during "leaf-off" conditions. Thus two forest data layers are created to represent both year-round ("leaf-on") and seasonal (leafless or "leaf-off") conditions. These data layers are incorporated into the model, analyzed separately and then merged to produce the visibility maps. Calculations resulting from the leaf-on forest data layer depict areas where at least the top of the Facility may be present above the intervening tree canopy. Similarly, computations from the "leaf-off" data layer also depict areas where the top of the Facility is predicted to be visible but it accounts for the increased transparency due to lack of vegetative screening. The Study Area includes mature vegetation with a unique composition and density of woodlands, with mast or pole timber and branching providing the majority of screening in leafless conditions. Beyond the density of woodlands found within the Study Area, each individual tree has its own unique trunk, pole timber and branching pattern characteristics that provide varying degrees of screening in leafless conditions which cannot be precisely modeled. Because tree spacing, dimensions and branching patterns as well as the understory differ greatly over even small areas, the Study Area has its own discrete forest characteristics. To approximate seasonal visibility, a conservative set of values was incorporated into the model, including the assumptions that each deciduous tree is simply a vertical pole with no distinct branching pattern. Given these conservative assumptions, the resultant modeling still over-predicts visibility in "leaf-off" conditions but does provide a better representation than the initial map using topography only.

A purposely low average tree canopy height of 50 feet was then incorporated into the forest data layers and added to the DEM for a second iteration of the visibility map. The model was queried again to determine where the top of the Facility may be seen from any point(s) within the Study Area, given both the intervening existing topography and forest data layers. The results of the preliminary analysis provide a representation of those areas where portions of the Facility could potentially be visible to the human eye without the aid of magnification, based on a viewer eye-height of 5 feet above the ground and the combination of intervening topography and tree canopy (year-round) and tree trunks (seasonally, when the leaves are off the deciduous trees) using an average tree height of 50 feet. This iteration provides a conservative assessment of intervening vegetation for use during the in-field activities to compare the outcomes of the initial computer modeling with direct observations of the balloon float.

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 due to the presence of intervening tree pole, branching and understory. Each location is dependent on the specific density and composition of the surrounding woodlands, and it is understood that some locations within this distance could provide visibility of at least portions of the Facility at any time of the year. In "leaf-on" conditions, this distance may be overly conservative for most locations as the deciduous vegetation would substantially hinder direct views in many cases at close range. However,

even in “leaf off” conditions when views expand, trees and understory can still serve to block lines of sight, even at distances less than 500 feet. 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.

Additional data was reviewed and incorporated into the visibility analysis, including protected private and public open space, parks, recreational facilities, hiking trails, schools, and historic districts. A portion of the Paugussett Trail extends into the northeast part of the Study Area. The Housatonic Rail Trail extends in a north to south direction through portions of Newtown and Monroe in the western part of the Study Area. No additional Connecticut blue-blazed trails are located within the Study Area. Based on a review of publicly-available information, no state or locally designated scenic roads exist within the Study Area.

In-Field Activities

To supplement and substantiate the results of the computer modeling efforts, APT completed in-field verification activities consisting of a balloon float, vehicular and pedestrian reconnaissance, and photo-documentation.

Balloon Float and Field Reconnaissance

A balloon float was conducted on April 1, 2014.[2] The balloon float consisted of raising an approximately four-foot diameter, helium-filled balloon tethered to height of 160 feet above ground level (“AGL”) at the proposed Site. A Study Area reconnaissance was performed by driving along the local and State roads and locations where the balloon could be seen above/through the tree mast and canopy were inventoried. Visual observations from the reconnaissance were also used to evaluate the results of the preliminary visibility mapping and identify any discrepancies in the initial modeling. Weather conditions on the day of the balloon float included sunny skies with calm winds (less than 2 mph).

During the balloon float, several trees were randomly surveyed using a hand-held infrared laser range finder and Suunto clinometer to ascertain their heights. Numerous locations were selected to obtain tree canopy heights, including along roadways, wooded lots, and high- and low-lying areas to provide for the irregularities associated with different land characteristics and uses found within the Study Area. The average canopy height was developed based on measurements and comparative observations, in this case approximately 65 feet AGL. Throughout Connecticut, the tree canopy height varies from about 55 feet to in excess of 80 feet (where eastern white pine becomes a dominant component of the forest type, average tree heights may be even slightly higher). This general uniformity is most likely the result of historic state-wide clear cutting of forests to produce charcoal and fuelwood, not only for home use, but also for the local brick, brass, and iron industries from the late 1800s to early 1900s[3]. Approximately 69% of Connecticut's forests are characterized as mature[4].

Information obtained during the balloon float events was subsequently incorporated into the computer model to refine the visibility map.

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[2] Prior balloon floats were also conducted on May 3, July 26, and August 28, 2013. During the May 3, 2014 balloon float, the balloon was tethered to a string height of 170 feet AGL. On the subsequent dates, the balloon was tethered to a string height of 160 feet AGL.

[3] Ward, J.S., Worthley, T.E. Forest Regeneration Handbook. A guide for forest owners, harvesting practitioners, and public officials. The Connecticut Agricultural Experiment Station and University of Connecticut, Cooperative Extension. Pg. 5.

[4] USDA Resource Bulletin NE-160, 2004.

Photographic Documentation

During the balloon float and field reconnaissance, APT drove the public roads within the Study Area and recorded observations, including photo-documentation, of those areas where the balloon was and was not visible. Photographs were obtained from several vantage points to document the views of a proposed Facility. The geographic coordinates of the camera's position at each photo location were logged using global positioning system ("GPS") equipment technology.

At each photo location, the geographic coordinates of the camera's position were logged using global positioning system ("GPS") equipment. Photographs were taken with a Canon EOS 6D digital camera body and Canon EF 24 to 105 millimeter ("mm") zoom lens, with the lens set to 50 mm.

> *"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.*[5]*"*

Final Visibility Mapping

Information obtained during the field reconnaissance was incorporated into the mapping data layers, including observations of the balloon float, the photo locations, areas that experienced recent land use changes and those places where the initial model was found to over-predict visibility. The revised average tree canopy height data (65 feet AGL) was merged with the DEM and added to the base ground elevations of the forested areas data layer. Once the additional data was integrated into the model, APT re-calculated the visibility of the proposed Facility from within the Study Area to produce the final visibility map.

Photographic Simulations

Photographic simulations were generated to portray scaled renderings of the proposed Facility from 11 representative locations where the proposed Facility would be visible either on a year-round or seasonal basis. Using field data, site plan information and 3-dimension (3D) modeling software, spatially referenced models of the site area and Facility were generated and merged. The geographic coordinates obtained in the field for the photograph locations were incorporated into the model to produce 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[6].

[5] Warren, Bruce. Photography, West Publishing Company, Eagan, MN, c. 1993, (page 70).

[6] As a final step, the accuracy and scale of select simulations are tested against photographs of similar existing facilities with recorded camera position, focal length, photo location, and tower location.

For presentation purposes in this report, all but one of the photographs were taken with a 50 mm focal length and produced in an approximate 7-inch by 10.5-inch format. When viewing in this format size, we believe it is important to provide the largest representational image while maintaining an accurate relation of sizes between objects within the frame of the photograph.

Photo-documentation of the balloon float and photo-simulations of the proposed Facility are presented in the attachment at the end of this report. The balloon float photos provide visual reference points for the approximate height and location of the proposed Facility relative to the scene. The photo-simulations are intended to provide the reader with a general understanding of the different views that might be achieved of the Facility. It is important to consider that the publicly-accessible locations selected are typically representative of a "worst case" scenario. They were chosen to present unobstructed view lines (wherever possible), are static in nature and do not necessarily fairly characterize the prevailing views from all locations within a given area. For instance, moving a few feet in one direction or another often results in a more obscured view or no view at all. In many cases, a view of the Facility may be limited to the immediate area of the specific photo location.

Photograph Locations

The table below summarizes characteristics of the photographs and simulations presented in the attachment to this report including a description of each location, view orientation, the distance from where the photo was taken relative to the proposed Facility and the general characteristics of that view. The photo locations are depicted on the photolog and viewshed maps provided as attachments to this report.

Photo No.	Location	View Orientation	Distance to Facility	Visibility
1	Host Property	West	±0.31 Mile	Year-round
2	Cahill Road at Turkey Roost Road	Northwest	±0.46 Mile	Seasonal
3	Georges Lane at Cahill Road	Northwest	±0.56 Mile	Year-round
4	Georges Lane	Northwest	±0.56 Mile	Seasonal
5	Georges Lane	Northwest	±0.56 Mile	Seasonal
6	Georges Lane	Northwest	±0.56 Mile	Seasonal
7	Turkey Roost Road	North	±0.74 Mile	Year-round
8	Turkey Roost Road	West	±0.65 Mile	Seasonal
9	Mustang Drive	East	±0.20 Mile	Seasonal
10	Mustang Drive	East	±0.20 Mile	Seasonal
11	Mustang Drive at Pinto Lane	East	±0.23 Mile	Seasonal

Visibility Analysis Results

Results of this analysis are graphically displayed on the viewshed maps provided in the attachment at the end of this report. Those shaded areas of predicted visibility shown on the maps represent locations from which the proposed Facility may be visible year-round (in yellow) or seasonally (in orange), when the leaves are off the deciduous trees. The Facility would be located within a heavily wooded area of the Host Property, approximately 900 feet from the nearest residence. As such, the fence-enclosed equipment compound and lower portions of the monopine would not be visible at any time of year off the Host Property.

A total of 54± acres are predicted to experience year-rounds views of at least a portion of the Facility. Year-round visibility would generally be limited to locations east of the Site and mostly restricted to areas on the host Property (see photograph 1 as an example). Partial views of the Facility could also occur at select locations near the Georges Lane and Cahill Road intersection to the southeast (photo 3) along Turkey Roost Road immediately south of the host Property (photo 7).

An additional 179± acres of seasonal visibility are predicted to extend beyond the Site location through the woods and areas immediately surrounding the host Property, including portions of: Mustang Drive to the west (photo 9-11); Turkey Roost Road to the south and east (photos 2 and 8); the elevated neighborhood to the southeast along Georges Lane (photos 4-6); and, possibly from locations in elevated fields at distances of a mile and beyond. Seasonal views would be heavily obscured by the intervening trees.

No views would be achieved from portions of either the Paugussett Trail or the Housatonic Rail Trail.

Proximity to Schools and Commercial Child Day Care Centers

No schools or commercial child day care facilities are located within 250 feet of the host property. The nearest school and day care facility (Fawn Hollow Elementary School) are located approximately 0.75-mile to the southwest at 345 Fan Hill Road in Monroe. Another day care facility, Monroe Early Learning Center, is located at 375 Fan Hill Road, also approximately 0.75-mile to the southwest. No prominent views of the Facility would be achieved from these locations. It is possible that limited seasonal views of the uppermost portion of the Facility could be achieved from locations on or proximate to these properties, however there are substantial stands of intervening trees and any such views would be difficult to differentiate from the surrounding tree canopy at these distances.

LIMITATIONS

This analysis does not claim to depict the only areas, or all locations, where the Facility may be seen; it is intended to provide a representation of those areas where visibility is possible. The visibility maps depict areas where the proposed Facility may potentially be visible to the human eye without the aid of magnification based on a viewer eye-height of 5 feet above the ground and intervening topography and an assumed, average tree canopy height of 65 feet. This analysis may not necessarily account for all visible locations, and it likely over predicts visibility in several areas, as it relies heavily on computer modeling that combines a topographic DEM, forest data layer extracted from 2011 aerial photographs and a fixed tree canopy height (which will not account for the variability inherent in the real world). Where publicly accessible, field observations of the balloon test have been incorporated to fine tune the model. APT personnel did not access private property beyond the host property to verify results of the computer model in those areas.

The simulations provide a representation of the Facility under similar settings as those encountered during the balloon floats and reconnaissance. Views of the Facility can change throughout the seasons and the time of day, and are dependent on weather and other atmospheric conditions (e.g., haze, fog, clouds); the location, angle and intensity of the sun; and the specific viewer location. Weather conditions on the day of the balloon floats included clear skies and, combined with the leaf-off conditions, the photo-simulations presented in this report provide an accurate portrayal of the Facility during comparable conditions.

ATTACHMENTS

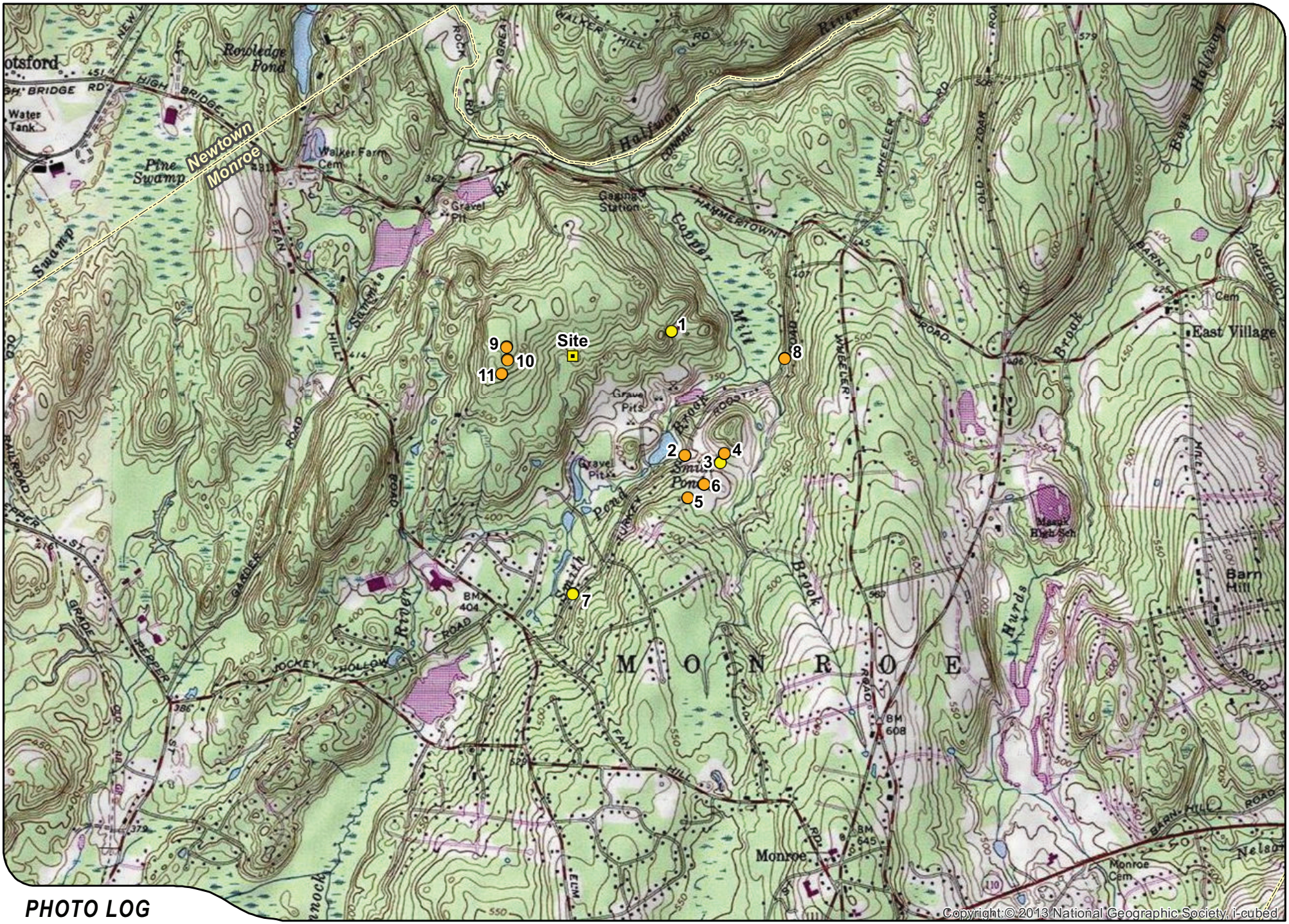

PHOTO LOG

Legend

- Site
- Seasonal Visibility
- Year-Round Visibility
- Municipal Boundary

N W E S

1,000 500 0 1,000 Feet

APT ENGINEERING

at&t

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	**HOST PROPERTY**	**WEST**	**+/- 0.31 MILE**	**YEAR ROUND**

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SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	**HOST PROPERTY**	**WEST**	**+/- 0.31 MILE**	**YEAR ROUND**

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DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
2	**CAHILL ROAD AT TURKEY ROOST ROAD**	**NORTHWEST**	**+/- 0.46 MILE**	**SEASONAL**

SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
2	**CAHILL ROAD AT TURKEY ROOST ROAD**	**NORTHWEST**	**+/- 0.46 MILE**	**SEASONAL**

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DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
3	**GEORGES LANE AT CAHILL ROAD**	**NORTHWEST**	**+/- 0.56 MILE**	**YEAR ROUND**

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SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
3	**GEORGES LANE AT CAHILL ROAD**	**NORTHWEST**	**+/- 0.56 MILE**	**YEAR ROUND**

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