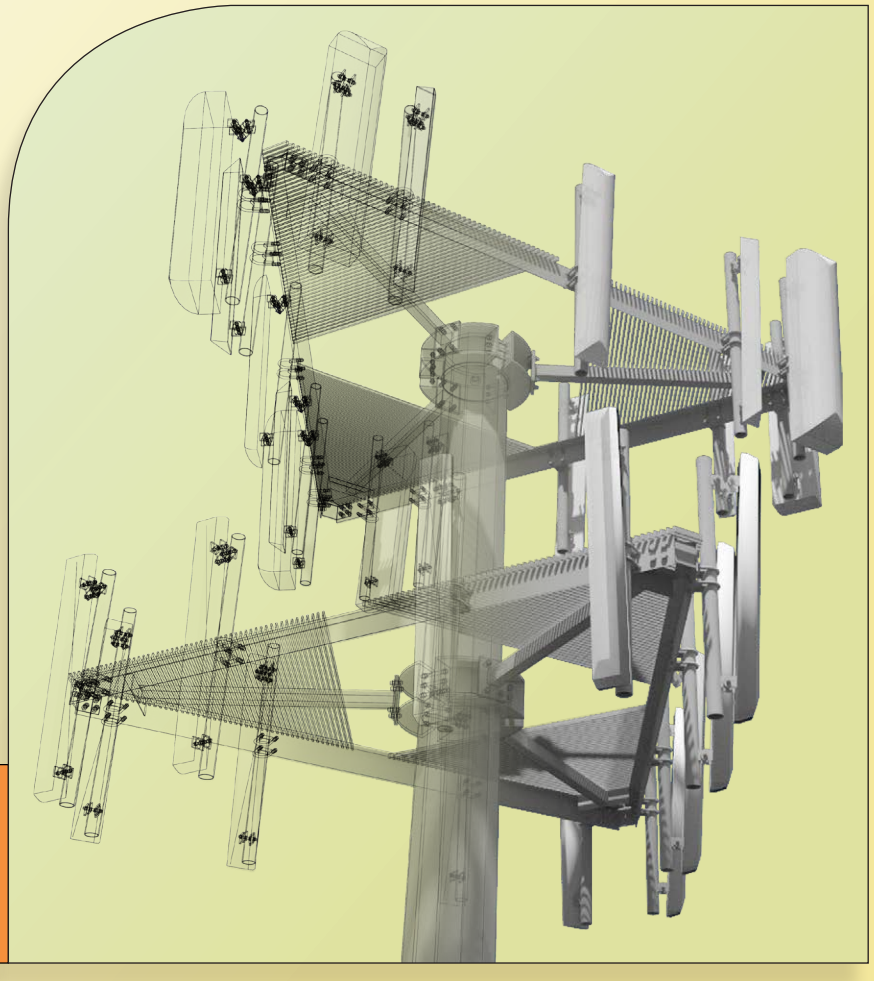
Attachment 5

Visibility Analysis

CT502
NEW LONDON
BATES WOODS PARK
NEW LONDON, CT



Prepared in April 2013 by:
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Project Introduction

Message Center Management, Inc. ("MCM") is pursuing a Certificate of Environmental Compatibility and Public Need ("Certificate") from the Connecticut Siting Council for the construction, maintenance and operation of a wireless communications facility ("Facility") at Bates Woods Park in New London, Connecticut. At the request of MCM, All-Points Technology Corporation, P.C. ("APT") prepared this Visibility Analysis to evaluate potential views associated with the Facility from within a two-mile radius ("Study Area"). In addition to the New London, the adjoining municipality of Waterford is located in the western portion of the Study Area.

Bates Woods Park is occupied by the New London Science and Technology Magnet High School athletic facilities and ball fields, courts, pavilions and other outbuildings, access paths, landscaped areas, and undeveloped wooded land. The proposed Facility Site is located immediately southwest of a baseball diamond right-field fence within a maintained lawn area bordered by trees.

The proposed Facility would consist of a 115-foot tall monopole to replace an existing 90-foot tall light stanchion associated with an adjacent baseball field. The new monopole would accommodate multiple antenna arrays for wireless services providers as well as municipal emergency services (by incorporating a whip antenna at the top of the monopole). The replacement pole would also continue to be used for lighting. The monopole and supporting ground equipment would be housed within an irregularly shaped, fence-enclosed 4,155 square foot compound (measuring approximately 125' x 20' x 127' x 46') The Facility would be located at a ground elevation of approximately 90 feet above mean sea level ("AMSL"). Access and utilities will be provided via separate 20-foot wide easements originating off Chester Road and extending through developed portions of the park.

The park is abutted by the high school and residences to the east, residential properties to north and west, and woods to the south. Land use within the general vicinity of the park is a mix of institutional, residential and commercial. Two large cemeteries are located to the northwest. Downtown New London lies approximately 0.75 mile to the east.

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 might serve to prohibit 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 the Natural Resources Conservation Service (through the USDA) aerial photography (1-meter resolution, flown in 2006, 2008, 2010 and 2012) using IDRISI image processing tools. The IDRISI tools implement 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, the image processing tools were applied to achieve an estimate of locations where the Facility might 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 results in an excessive over-prediction, but provides an opportunity to identify and evaluate those areas with direct sight lines towards the Facility and gain some insight regarding potential seasonal views. Visibility varies seasonally with increased, albeit mostly obstructed, views occurring during "leaf-off" conditions. Each individual Study Area includes mature vegetation with a unique and variable composition and density of woodlands, with mast or pole timber and branching providing the majority of screening in leafless conditions. Because tree spacing, dimensions and branching patterns and the understory vary greatly, creating an accurate Study Area-specific "leaf-off" tree density data layer is not realistic. Considering that any given Study Area has its own discrete forest

[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.

characteristics, modeling for seasonal variations of visibility is problematic and, in our experience, even when incorporating conservative constraints into the model, the results over-predict visibility in "leaf-off" conditions. Eliminating the tree canopy altogether, as performed in the preliminary analysis, exaggerates areas of visibility because it assumes unobstructed sight lines everywhere. However, using this technique allows us to initially identify areas where seasonal visibility may occur and is especially useful during the in-field activities (described below) to further evaluate "leaf-off" scenarios.

Topography in the Study Are ranges from sea level to 270 feet AMSL. Approximately 2,723 acres of tree cover exists within the 8,042-acre Study Area (34%). A conservative average tree canopy height of 50 feet was incorporated into the forest data layer and added to the DEM, thus providing a baseline assessment of intervening vegetation. These preliminary visibility maps were used during the in-field activities to compare the outcome of the initial computer modeling with direct observations of the balloon float.

Additional data layers are incorporated into the preliminary visibility map, including protected and private, state and federal open space, obtained from the State of Connecticut Department of Energy and Environmental Protection ("CTDEEP"), which depict various land and water resources such as parks and forests, recreational facilities, dedicated open space, hiking and multi-use trails, public boat launches and schools, among other categories. Based on a review of publicly-available information, no local or State-designated scenic roadways or Connecticut blue-blazed hiking trails are present 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 17, 2013. The balloon float activities consisted of raising an approximately four-foot diameter, helium-filled balloon tethered to a string height of 115 feet above ground level ("AGL") at the proposed Facility Site. Once the balloon was secured, 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 included sunny skies and generally calm winds (less than 5 mph) with occasional gusts of up to 12 mph.

The tree cover within the Study Area consists primarily of mixed deciduous hardwood species. . 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 60 feet AGL.

Throughout Connecticut, the tree canopy height typically varies from about 55 feet AGL to in excess of 80 feet AGL (where eastern white pine becomes a dominant component of the forest type, average tree heights may be even higher). This general uniformity is most likely the result of historic state-wide clear cutting of forests for charcoal production in the late 1800s and early 1900s. Approximately 69% of Connecticut's forests are characterized as mature[2]. In this Study Area, substantial stands of eastern white pines occur, although not necessarily in close proximity to the proposed Facility location; several specimens were found to extend to heights over 90 feet tall.

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

Photographic Documentation

During the balloon float, a field reconnaissance was completed by driving the public roads within the Study Area and recording 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 view towards the proposed Facility. At each photo location, the geographic coordinates of the camera's position were logged using global positioning system ("GPS") equipment technology.

Photographs were taken with a Nikon D-3000 digital camera body and Nikon 18 to 135 millimeter ("mm") zoom lens, with the lens set to 50mm. A focal length of 50 mm approximates views similar to that achieved by the human eye.

> *"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.[3]"*

The table below summarizes characteristics of the photographs presented in the attachment to this report including a description of each location, view orientation and the distance from where the photo was taken relative to the proposed Facility. A photolog map depicting the locations of the photographs is provided in the attachment to this report.

Photo No.	Location	View Orientation	Distance to Facility
1	Bates Woods Park Parking Lot	Southeast	±0.13-Mile
2	New London High School Parking Lot	Southwest	±0.24-Mile
3	Jefferson Avenue	Southwest	±0.32-Mile
4	St. Mary's Cemetery	Southeast	±0.38-Mile
5	Michael Road	Southeast	±0.32-Mile
6	Bates Street	Southeast	±0.18-Mile
7	Clark Lane – Across from Elementary School	Northeast	±0.41-Mile

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

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

Final Visibility Mapping

Field data and observations were incorporated into the mapping data layers, including the photo locations, areas that experienced land use changes since the most recent aerial photo flights, and those places where the initial model was found to either under or over-predict visibility.

The revised average tree canopy height data layer (using 60 feet AGL) was merged with the DEM and added to the base ground elevations. As a final step, forested areas were extracted from areas of potential visibility, assuming that a person standing within a forest would not be able to view the Facility from beyond a certain distance due to the presence of intervening tree mast and/or understory. APT elected to use a distance of 500 feet for this analysis. 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 as the deciduous vegetation would substantially hinder direct views in many cases at close range. However, even in "leaf off" conditions when views expand, tree mast can still serve to block lines of sight, even at distances less than 500 feet. For purposes of this analysis, it was reasoned that contiguous forested land beyond 500 feet of the Facility would consist of light-impenetrable trees of a uniform height. Once the supplemental data was integrated into the model, APT re-calculated the visibility of the Facility from within the Study Area to produce the final visibility map.

Photographic Simulations

Simulations of the proposed Facility were generated for those photographs where the balloon was visible during the in-field activities and portray scaled renderings of the Facility from these locations. 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[4].

Photo-documentation and simulations are presented in the attachment at the end of this report. The photographs show the balloon at a height of 115 feet to provide visual reference points for the location, height and proportions of the proposed Facility relative to the scene. The photo-simulations depict future proposed conditions with the new monopole outfitted with the existing lights (at 90 feet AGL) and an ice shield immediately above them, two wireless services providers antenna arrays (at 105 and 115 feet AGL) and the emergency services whip antenna (extending 20 feet above the top).

As stated earlier, APT elected to use a 50 mm focal length for the majority of photographs presented in this report. For presentation purposes in this report, the photographs are produced in an approximate 7" by 10.5" format. When viewing in this format size, we believe it is important to provide the largest

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

representational image while maintaining an accurate relation of sizes between objects within the frame of the photograph.

Visibility Analysis Results

Results of this analysis are graphically displayed on the visibility analysis maps provided in the attachment at the end of this report. As depicted on the maps, year-round views of the proposed Facility are expected to be confined primarily to open portions of Bates Woods Park, the high school parking lot and adjacent portion of Jefferson Avenue to the northeast, and extending approximately 0.75 mile to the northwest over parts of St. Mary's Cemetery and Michael Road. Photographs 1 through 5 represent these locations. Limited views of the Facility may be also be seen from parts of Ledge Road, Boulder Drive and Buchannan Road to the northeast and Bates Street to the northwest (see photograph 6 as an example). Although photographs 5 through 7 depict year-round views, they were taken from areas where the majority of views from surrounding locations are either seasonal or obstructed by intervening trees or structures.

A total of 120 acres within the Study Area would have year-round views of the Facility during "leaf-on" conditions; the vast majority of these locations currently have views of the existing light pole and other stanchions occupying the park. Several of the existing light poles are located at higher ground elevations than the structure proposed for replacement and appear taller from numerous vantage points. Even with the 25-foot increase in height, this would remain the case in many locations.

Based on the results of the analysis, we estimate that seasonal visibility (during "leaf-off" conditions) would extend over an additional 128± acres. The views from the majority of these locations would be limited to the top 30± feet of the Facility. Most of these locations currently have tree-top views of the lights. Similar to locations with year-round views, multiple light poles are visible today.

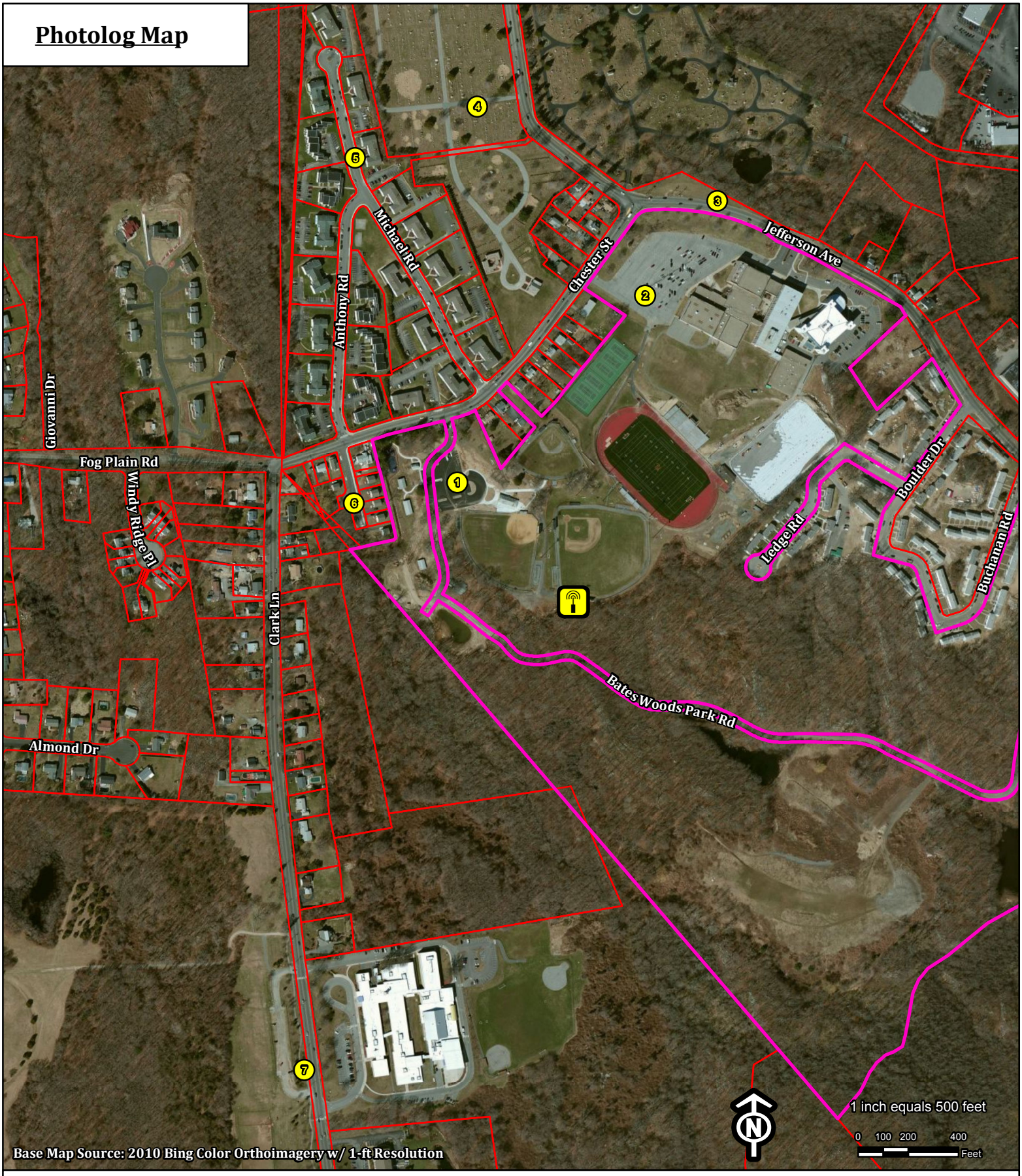
In general, year-round views of the Facility would be limited to a modest geographic footprint by the combination of the relatively short height of the Facility and the intervening vegetation and structures. The increased height of the replacement pole does not substantially expand the viewshed of the existing structure. As a result, it is APT's opinion the proposed AT&T replacement Facility would not cause a substantial adverse environmental effect on the views within the Study Area.

Proximity to Schools and Commercial Child Day Care Centers

No schools or commercial child day care centers are located within 250 feet of the Site. The nearest school (New London Science and Technology Magnet High School) is located at 490 Jefferson Avenue, approximately 0.3 mile to the north. The existing light stanchion is visible from the school parking lot, as would be the proposed Facility (see photo 2). Similarly, the existing light stanchion (as well as others) is visible from certain locations at the Clark Lane Middle School, located approximately 0.4 mile to the southwest (see photo 6). Eleven child day care centers are located within the Study Area; however, the nearest day care center is located approximately 1.25 miles from the proposed Facility Site. No views of the Facility would be achieved from any of the child day care centers.

ATTACHMENTS

Photolog Map



Legend

- Proposed MCM Wireless Telecommunications Facility
- # Photo Point (PP)
- Subject Property
- Connecticut Parcel

Proposed MCM Wireless Telecommunications Facility
Bates Woods Park
New London, Connecticut

Monday, April 29, 2013

MCM
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DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	**BATES WOODS PARK PARKING LOT**	**SOUTHEAST**	**+/- 0.13 MILE**	**YEAR ROUND**

SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	**BATES WOODS PARK PARKING LOT**	**SOUTHEAST**	**+/- 0.13 MILE**	**YEAR ROUND**

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DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
2	**NEW LONDON HIGH SCHOOL PARKING LOT**	**SOUTHWEST**	**+/- 0.24 MILE**	**YEAR ROUND**

SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
2	**NEW LONDON HIGH SCHOOL PARKING LOT**	**SOUTHWEST**	**+/- 0.24 MILE**	**YEAR ROUND**

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DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
3	**JEFFERSON AVENUE**	**SOUTHWEST**	**+/- 0.32 MILE**	**YEAR ROUND**

SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
3	**JEFFERSON AVENUE**	**SOUTHWEST**	**+/- 0.32 MILE**	**YEAR ROUND**

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
4	**ST. MARY'S CEMETERY**	**SOUTHEAST**	**+/- 0.38 MILE**	**YEAR ROUND**

SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
4	**ST. MARY'S CEMETERY**	**SOUTHEAST**	**+/- 0.38 MILE**	**YEAR ROUND**

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DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
5	**MICHAEL ROAD**	**SOUTHEAST**	**+/- 0.32 MILE**	**YEAR ROUND**

SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
5	**MICHAEL ROAD**	**SOUTHEAST**	**+/- 0.32 MILE**	**YEAR ROUND**

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
6	**BATES STREET**	**SOUTHEAST**	**+/- 0.18 MILE**	**YEAR ROUND**

SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
6	**BATES STREET**	**SOUTHEAST**	**+/- 0.18 MILE**	**YEAR ROUND**

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DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
7	**CLARK LANE - ACROSS FROM ELEMENTARY SCHOOL**	**NORTHEAST**	**+/- 0.41 MILE**	**YEAR ROUND**

SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
7	**CLARK LANE - ACROSS FROM ELEMENTARY SCHOOL**	**NORTHEAST**	**+/- 0.41 MILE**	**YEAR ROUND**

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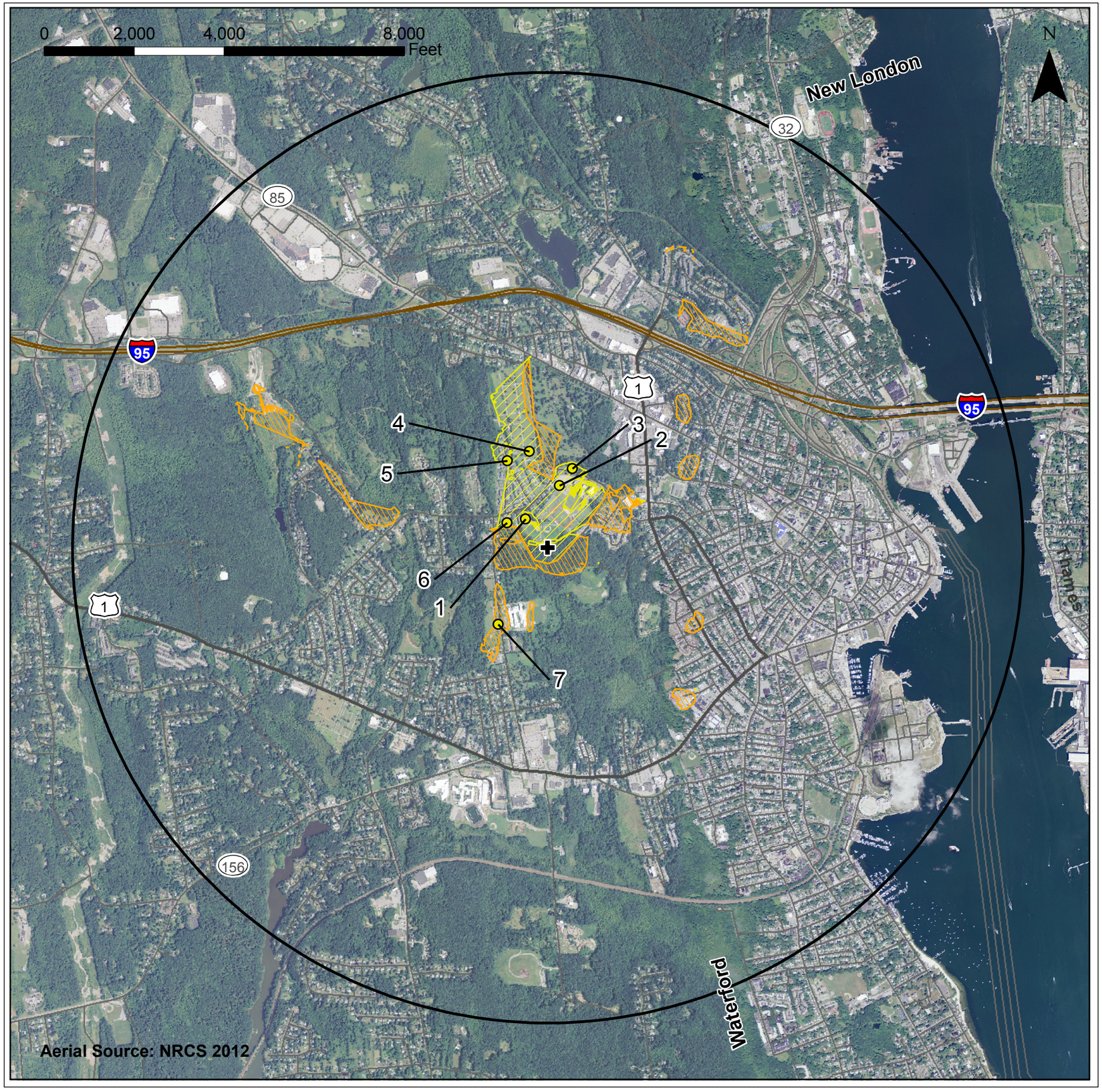

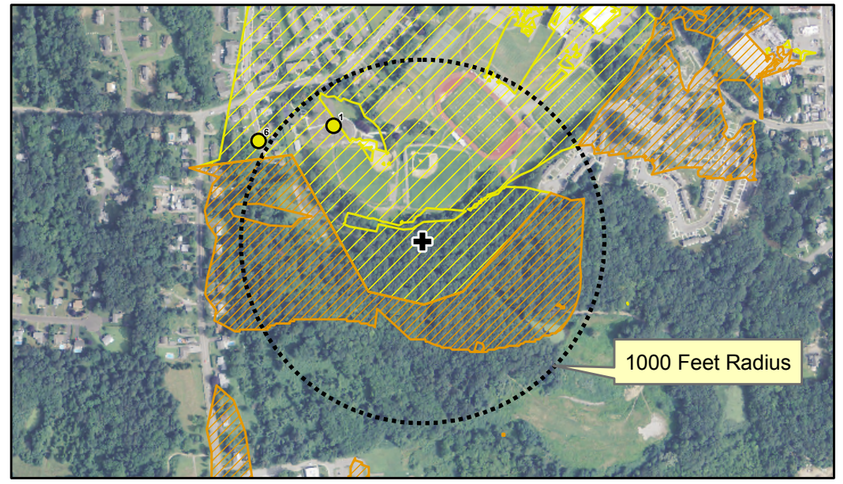

VISIBILITY ANALYSIS - AERIAL BASE

Proposed Wireless Telecommunications Facility
Bates Woods Park
New London, Connecticut

Proposed facility height is 115 feet AGL
Existing tree canopy height estimated as 60 feet
Study area includes 8,042 acres of land

Map compiled 4/19/2013

Areas of Predicted Visibility shown on this map represent areas where the proposed 115-foot tall tower at the project site may potentially be visible, based upon intervening topography, structures, and tree canopy.

Map information field verified by All-Points Technology Corporation on 4/17/13.

Only those resources located within the Study Area are depicted. For a complete list of data sources consulted for this analysis, please refer to the Documentation Page.

Legend

- Proposed Tower
- 2-Mile Study Area
- Year-Round
- Predicted Seasonal Visibility
- Predicted Year-Round Visibility
- Town
- Other DEP Property
- Town

Location

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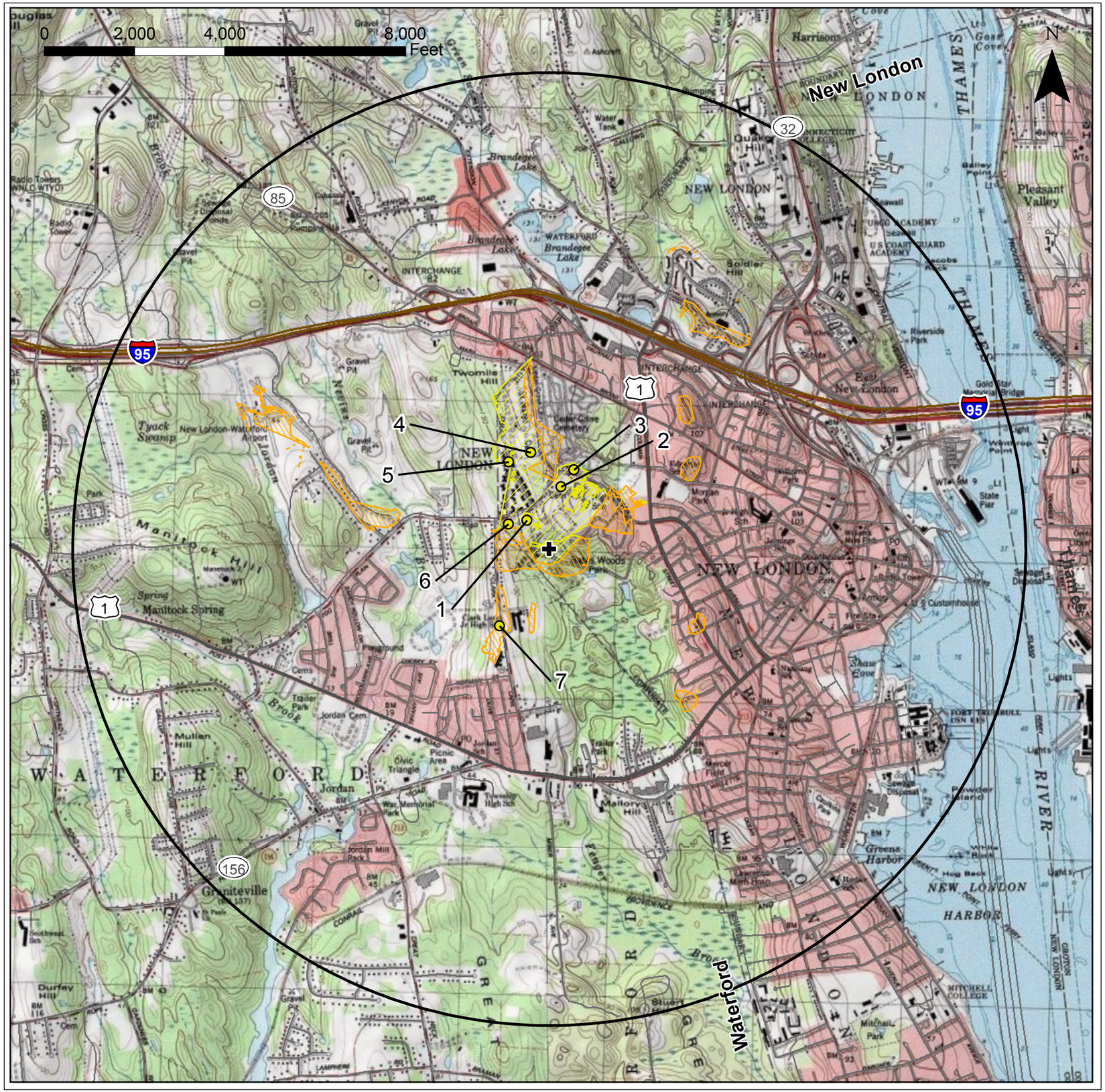
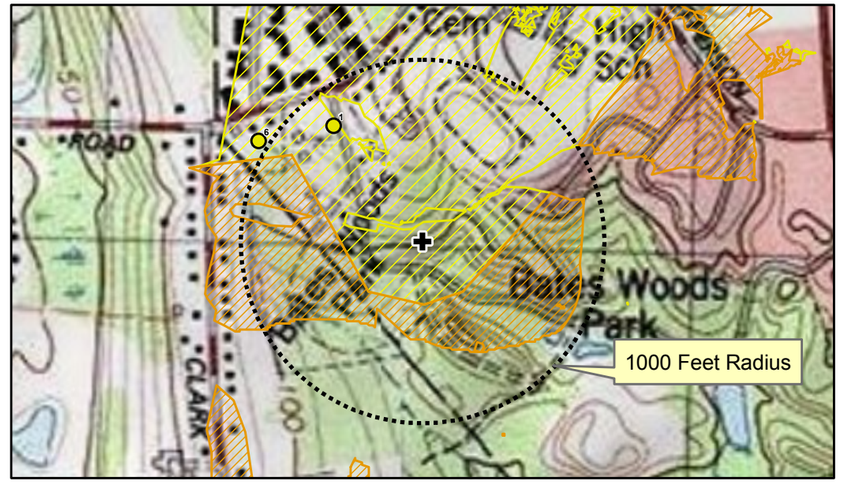
MCM

All of the land within the two-mile radius is Connecticut DEEP Protected Open Space, according to its 2011 Protected Open Space Mapping Project.





VISIBILITY ANALYSIS - TOPO BASE

Proposed Wireless Telecommunications Facility
Bates Woods Park
New London, Connecticut

Proposed facility height is 115 feet AGL
Existing tree canopy height estimated as 60 feet
Study area includes 8,042 acres of land

Map compiled 4/19/2013

Areas of Predicted Visibility shown on this map represent areas where the proposed 115-foot tall tower at the project site may potentially be visible, based upon intervening topography, structures, and tree canopy.

Map information field verified by All-Points Technology Corporation on 4/17/13.

Only those resources located within the Study Area are depicted. For a complete list of data sources consulted for this analysis, please refer to the Documentation Page.

Legend

- Proposed Tower
- 2-Mile Study Area

Photo Locations

- Year-Round
- Predicted Seasonal Visibility
- Predicted Year-Round Visibility
- Town
- Other DEP Property
- Town

Location

All of the land within the two-mile radius is Connecticut DEEP Protected Open Space, according to its 2011 Protected Open Space Mapping Project.

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DOCUMENTATION

SOURCES CONSULTED FOR PRELIMINARY VISBILITY ANALYSES

Message Center Management – Bates Woods Park, New London, CT

Physical Geography / Background Data

Center for Land Use Education and Research, University of Connecticut (http://clear.uconn.edu)
- *Land Use / Land Cover (2006)
- *Coniferous and Deciduous Forest (2006)
- *LiDAR data – topography (2007)
- *Aerial photography (2004)

Natural Resources Conservation Service (USDA) Digital Orthophotos
- *Aerial Photography (2006, 2008, 2010 and 2012)

United States Geological Survey
- *USGS topographic quadrangle maps: Uncasville, New London, Niantic, and Montville (1984)

Heritage Consultants
- ^State Scenic Highways (based on Department of Transportation data, updated monthly)
- ^National Register of Historic Places
- ^State Register of Historic Places

^Municipal Scenic Roads (by website, phone and/or email/fax - current)

Dedicated Open Space & Recreation Areas

Connecticut Department of Energy and Environmental Protection (DEEP)
- *DEEP Property (May 2007)
- *Federal Open Space (1997)
- *Municipal and Private Open Space (1997)
- *DEEP Boat Launches (1994)

Connecticut Forest & Parks Association
- ^Connecticut Walk Book East – The Guide to the Blue-Blazed Hiking Trails of Eastern Connecticut including the Metacomet and Mattabesett Trails, 19th Edition, 2005.

Other

^ConnDOT Scenic Strips (based on Department of Transportation data)

*Available to the public in GIS-compatible format (some require fees).
^ Data not available to general public in GIS format. Reviewed independently and, where applicable, GIS data later prepared specifically for this Study Area.