

Proposed Wireless Telecommunications Facility

Two Candidate Site Locations
Holmberg Orchard
12 Orchard Drive
Ledyard, Connecticut

Prepared for **Optasite, Inc.**
 1 Research Drive
 Westborough, MA 01581

Prepared by **VHB/Vanasse Hangen Brustlin, Inc.**
 54 Tuttle Place
 Middletown, CT 06457

September 2006

Visual Resource Evaluation

Optasite, Inc. and T-Mobile seek approval from the Connecticut Siting Council for a Certificate of Environmental Compatibility and Public Need to construct a telecommunications Facility to be located within the Town of Ledyard, Connecticut. As part of the approval process, T-Mobile has selected two potential candidate sites located on property at 12 Orchard Drive in Ledyard, Connecticut ("host property"). These site locations are referred to herein as Candidate A and Candidate B (see Photolog Documentation map contained in Attachment A). This "Visual Resource Evaluation" was conducted to approximate the visibility of a Facility at the proposed locations within a two-mile radius of the Candidates (Study Area) and present the results of the analysis in a comparative format.

Project Introduction

At either of the locations, development of the proposed Facility would include the installation of a 150-foot tall monopole tower with associated ground equipment located within a fenced enclosure. Based on information provided by the project engineer, Clough Harbour & Associates, Candidate A is located at approximately 156 feet Above Mean Sea Level (AMSL) and Candidate B is located at approximately 189 feet AMSL. Access to the proposed Facility at either Candidate Site would follow an existing access way located on the host property.

Site Description and Setting

Identified in the Town of Ledyard Tax Assessor's records as Map 24/Block 1790/Lot 12, the host property consists of approximately 144 acres of land and is occupied by active agricultural fields, several green houses and storage buildings and a single family residence. The host property also includes a number of heavily wooded, undeveloped areas. Both Candidate A and Candidate B are located on the eastern portion of the host property adjacent to an existing peach orchard. Photographs of both site areas are contained in Attachment A of this report. Land use within the general vicinity of the host property is comprised of undeveloped forested land, medium-density residential parcels and roadside commercial uses located along Route 12 to the north and south. In addition to Route 12, the Study Area is traversed by segments of other state numbered routes that include Route 2A, Route 117 and Route 214. In total, the Study Area contains roughly 57 linear miles of roadways.

The topography within the Study Area is characterized by a steep river valley associated with the Thames River. Ground elevations within the Study Area range from less than 10 feet AMSL along the banks of the Thames River and rise to over 300 feet AMSL east and west of the river valley. Overall, the Study Area contains approximately 927 acres of surface water, dominated in large measure by the Thames River and Poquetanuck Cove. The tree cover within the Study Area consists mainly of mixed deciduous hardwood species. The tree canopy occupies approximately 5,539 acres of the 8,042-acre study area (69%). During the in-

field activities associated with this analysis, an infrared laser range finder was used to accurately determine the average tree canopy height throughout the Study Area. Numerous trees were selected for measurement and the average tree canopy established, in this case 65 feet.



METHODOLOGY

To estimate the visibility associated with the proposed Facility, VHB incorporates a two-fold approach utilizing both a predictive computer model and in-field analysis. The predictive model is employed to assess potential visibility throughout the entire Study Area, including private property and/or otherwise inaccessible areas for field verification. A “balloon float” and Study Area drive-through reconnaissance are also conducted to obtain locational and height representations, back check the initial computer model results and provide documentation from publicly accessible areas. Results of both activities are analyzed and incorporated into the final viewshed map. A description of the methodologies used in the analysis is provided below.

Visibility Analysis

Using ESRI’s ArcView® Spatial Analyst, a computer modeling tool, the areas from where the proposed Facility is expected to be visible are calculated. This is based on information entered into the computer model, including Facility height, its ground elevation, the surrounding topography, existing vegetation and any significant structures/objects that may act to obstruct potential views. Data incorporated in the model includes 7.5 minute digital elevation models (DEMs) and a digital forest layer for the project area. The DEMs were produced by the United States Geological Survey (USGS) in 1982 at a 30 meter resolution. The forest layer was derived through on-screen digitizing in ArcView® GIS from 2004 digital orthophotos with a 0.5 foot pixel resolution.

Once the data are entered, a series of constraints are applied to the computer model to achieve an estimate of where the Facility will be visible. Initially, only topography was used as a visual constraint; the tree canopy is omitted to evaluate all areas of potential visibility without any vegetative screening. Although this is an overly conservative prediction, the initial omission of these layers provides a reference for comparison once the tree canopy is established and also assists in the evaluation of potential seasonal visibility of the proposed Facility. A conservative tree canopy height of 50 feet is then used to prepare a preliminary viewshed map for use during the Study Area reconnaissance. The average height of the tree canopy is determined in the field using a hand-held infra-red laser range finder. The average tree canopy height is incorporated into the final viewshed map; in this case, 65 feet was identified as the average tree canopy height. The forested areas within the Study Area were then overlaid on the DEM with a height of 65 feet added and the visibility calculated. The

forested areas are then extracted from the areas of visibility, with the assumption that a person standing among the trees will not be able to view the Facility beyond a distance of approximately 500 feet. Depending on the density of the vegetation in these areas, it is assumed that some locations within this range will provide visibility of at least portions of the Facility based on where one is standing. Lastly, this analysis was conducted in 30-foot increments for Candidate A and Candidate B and the results consolidated into a single thematic layer for each site location in order to determine the approximate amount of the tower structure that would be visible from any given location.

Also included on the map is a data layer, obtained from the Connecticut State Department of Environmental Protection (CTDEP), which depicts various land and water resources such as state parks and forests, recreational facilities, dedicated open space and CTDEP boat launches among other categories. This layer is useful in identifying potential visual impacts to any sensitive receptors that may be located within the Study Area. Lastly, based on a review of available data published by the Connecticut Department of Transportation and discussions with staff in Ledyard, Preston and Montville, it was determined that segments of Rose Hill Road in Ledyard that traverse the northeastern portion of the Study Area is a locally designated scenic roadway.

The preliminary viewshed map (using topography and a conservative tree canopy height of 50 feet) is generated for use during the in-field activity in order to verify the results of the model in comparison to the balloon float. The map also assists in identifying any significant land use changes that may have occurred within the Study Area since the 2004 aerial photographs used in this analysis were produced. Information obtained during the reconnaissance is then incorporated into the final visibility map.

Balloon Float and Study Area Reconnaissance

On September 7, 2006 Vanasse Hangen Brustlin Inc., (VHB) conducted a “balloon float” at the proposed Facilities in order to evaluate their potential viewsheds within the Study Area. The balloon floats consisted of raising and maintaining two helium-filled weather balloons at the proposed site locations at a height of 150 feet Above Ground Level (AGL) for both Candidates. The balloons measure roughly four feet in diameter. Red and black balloons were used at Candidates A and B, respectively, to distinguish between the two proposed sites. Once the balloons were secured at the proposed site locations, VHB personnel drove the public road system in the Study Area to inventory those areas where the balloons were visible and obtain photographs from representative locations. During the balloon float, weather conditions were sunny. The temperature was approximately 80 degrees Fahrenheit with calm winds.

Photographic Documentation

During the balloon float, VHB staff conducted a drive-by reconnaissance along the roads located within the Study Area with an emphasis on nearby residential areas and other potential sensitive receptors in order to evaluate and refine the results of the preliminary viewshed map and to verify where the balloons were, and were not, visible above and/or through the tree canopy. The balloons were photographed from a number of different vantage points to document the actual view towards the proposed Facility. The locations and orientations of the photos are described below:

1. View from Route 12 north of Kendall Drive, looking southeast.
2. View from Pequot Street adjacent to house #6, looking southeast.
3. View from Parker Street adjacent to house #12, looking southeast.
4. View from Cove Road adjacent to house #10, looking southeast.
5. View from Route 12 north of the Preston/Ledyard Town Line, looking southeast.
6. View from Massapeag Side Road adjacent to house #106, looking northeast.
7. View from Massapeag Side Road, looking east.

Photographs of the balloon from the view points listed above were taken with a Nikon Digital Camera COOLPIX 5700, which has a lens focal length equivalent to a 35 mm camera with a 38 to 115 mm zoom. "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."¹ The optical zoom lens for the Nikon COOLPIX was set at a range of 50 mm 70 mm for the purposes of this Visual Resource Evaluation.

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 seven locations identified above where the balloons were visible. The photographic simulations represent a scaled depiction of the proposed monopoles from these locations. The height of the simulated monopoles is determined based on the location of the balloons in the balloon float photographs. The simulations are contained in Attachment B.

¹ Warren, Bruce. *Photography*, West Publishing Company, Eagan, MN, c. 1993, (page 70).



CONCLUSIONS

Attachment B includes three maps: a comparative viewshed map depicting areas of visibility associated with each of the Candidate locations; a viewshed map depicting the approximate percentage of a monopole's visibility at Candidate A; and a viewshed map depicting the approximate percentage of a monopole's visibility at Candidate B.

Based on this visibility analysis there appears to be little difference in visibility between the two proposed Candidate site locations. Areas from where the proposed monopoles would be visible above the tree canopy comprise approximately 561 and 524 acres for Candidate A and Candidate B, respectively. As depicted on the viewshed maps, the majority of visibility associated with both proposed site locations falls predominantly over open water on the Thames River and Poquetanuck Cove. Total visibility over these water bodies includes 479 acres for Candidate A and 460 Acres for Candidate B. These totals account for approximately 85% and 87% of the anticipated visibility that may occur within the Study Area for Candidates A and B, respectively. A significant portion of the land-based visibility for both site locations is expected to occur on the 144-acre host property with approximately 50 acres for Candidate A and roughly 47 acres for Candidate B. Other areas from where both Candidate A and Candidate B are expected to be visible include portions of Pequot Street, Parker Street, Cove Road and Route 12 to the northwest and Massapeag Side Road to the west and southwest. These areas are generally located within 0.50-mile of the proposed Facilities with the exception of Massapeag Side Road which is located approximately one mile away. The topography and abundance of mature woodlands contained within the Study Area serve to limit potential views of the proposed monopoles to the areas discussed above as taller ridgelines and heavily forested areas can be found further from the host property in all cardinal directions. VHB estimates that 12 residences within the Study Area would have year-round views of either proposed Facility. No year-round or seasonal visibility is expected from Rose Hill Road, a locally designated scenic roadway in Ledyard. The viewshed map also depicts several additional areas where seasonal (i.e. during "leaf off" conditions) views through the trees of both Candidate locations are anticipated. Based on observations made in the field during the balloon floats, no significant difference in seasonal visibility is expected between the two proposed Facilities. Areas of anticipated seasonal visibility comprise approximately 57 additional acres and are mostly limited to the Parker Street/Pequot Street and Cove Road areas to the northwest as well as wooded areas located on the host property directly south of the proposed Facilities. In total, VHB estimates that limited seasonal views of either proposed Facility would be achieved from approximately 20 additional residences within the Study Area.

Attachment A

Photolog Documentation Map, Photos of the Proposed Project Area, Balloon Float Photographs and Photographic Simulations

Photographic Documentation

Town of
Ledyard
Connecticut



PROPOSED SITE LOCATION - CANDIDATE A

Photographic Documentation

Town of
Ledyard
Connecticut



PROPOSED SITE LOCATION - CANDIDATE B

Photolog Documentation

Town of
Ledyard
Connecticut



Photographic Documentation and Simulation *View 1 Candidate A*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM ROUTE 12 NORTH OF KENDALL DRIVE, LOOKING SOUTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 0.63 MILE +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 0.66 MILE +/-

Photographic Documentation and Simulation *View 1 Candidate B*

Town of
Ledyard
Connecticut



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4 carrier Monopole
installation



PHOTO TAKEN FROM ROUTE 12 NORTH OF KENDALL DRIVE, LOOKING SOUTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 0.63 MILE +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 0.66 MILE +/-

Photographic Documentation and Simulation *View 2 Candidate A*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM PEQUOT STREET ADJACENT TO HOUSE #6, LOOKING SOUTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 0.50 MILE +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 0.54 MILE +/-

Photographic Documentation and Simulation *View 2 Candidate B*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM PEQUOT STREET ADJACENT TO HOUSE #6, LOOKING SOUTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 0.50 MILE +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 0.54 MILE +/-

Photographic Documentation and Simulation *View 3 Candidate A*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM PARKER STREET ADJACENT TO HOUSE #12, LOOKING SOUTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 0.49 MILE +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 0.53 MILE +/-

Photographic Documentation and Simulation *View 3 Candidate B*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM PARKER STREET ADJACENT TO HOUSE #12, LOOKING SOUTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 0.49 MILE +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 0.53 MILE +/-

Photographic Documentation and Simulation *View 4 Candidate A*

Town of
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Connecticut



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CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM COVE ROAD ADJACENT TO HOUSE #10, LOOKING SOUTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 0.48 MILE +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 0.53 MILE +/-

Photographic Documentation and Simulation *View 4 Candidate B*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation

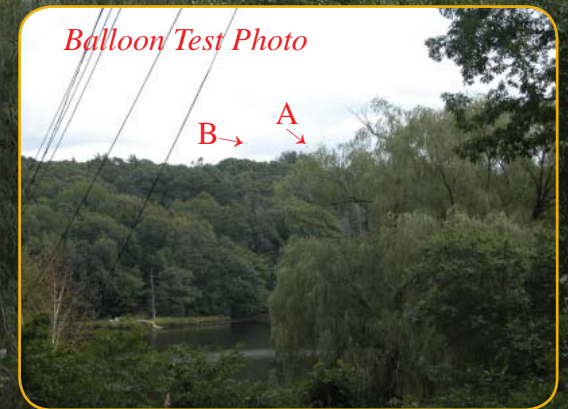


PHOTO TAKEN FROM COVE ROAD ADJACENT TO HOUSE #10, LOOKING SOUTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 0.48 MILE +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 0.53 MILE +/-

Photographic Documentation and Simulation *View 5 Candidate A*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM ROUTE 12 NORTH OF THE LEDYARD/PRESTON TOWN LINE, LOOKING SOUTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 0.47 MILE +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 0.51 MILE +/-

Photographic Documentation and Simulation *View 5 Candidate B*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM ROUTE 12 NORTH OF THE LEDYARD/PRESTON TOWN LINE, LOOKING SOUTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 0.47 MILE +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 0.51 MILE +/-

Photographic Documentation and Simulation *View 6 Candidate A*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM MASSAPEAG SIDE ROAD ADJACENT TO HOUSE #106, LOOKING NORTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 1.02 MILES +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 1.07 MILES +/-

Photographic Documentation and Simulation *View 6 Candidate B*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM MASSAPEAG SIDE ROAD ADJACENT TO HOUSE #106, LOOKING NORTHEAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 1.02 MILES +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 1.07 MILES +/-

Photographic Documentation and Simulation *View 7 Candidate A*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM MASSAPEAG SIDE ROAD, LOOKING EAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 1.05 MILES +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 1.09 MILES +/-

Photographic Documentation and Simulation *View 7 Candidate B*

Town of
Ledyard
Connecticut



Holmberg Orchard
12 Orchard Drive
Ledyard, CT
CT-11-841

4 carrier Monopole
installation



PHOTO TAKEN FROM MASSAPEAG SIDE ROAD, LOOKING EAST - CANDIDATE A AND CANDIDATE B BALLOONS ARE VISIBLE

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE A SITE IS 1.05 MILES +/-

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED CANDIDATE B SITE IS 1.09 MILES +/-

Attachment B

Viewshed Map

Comparative Viewshed Map

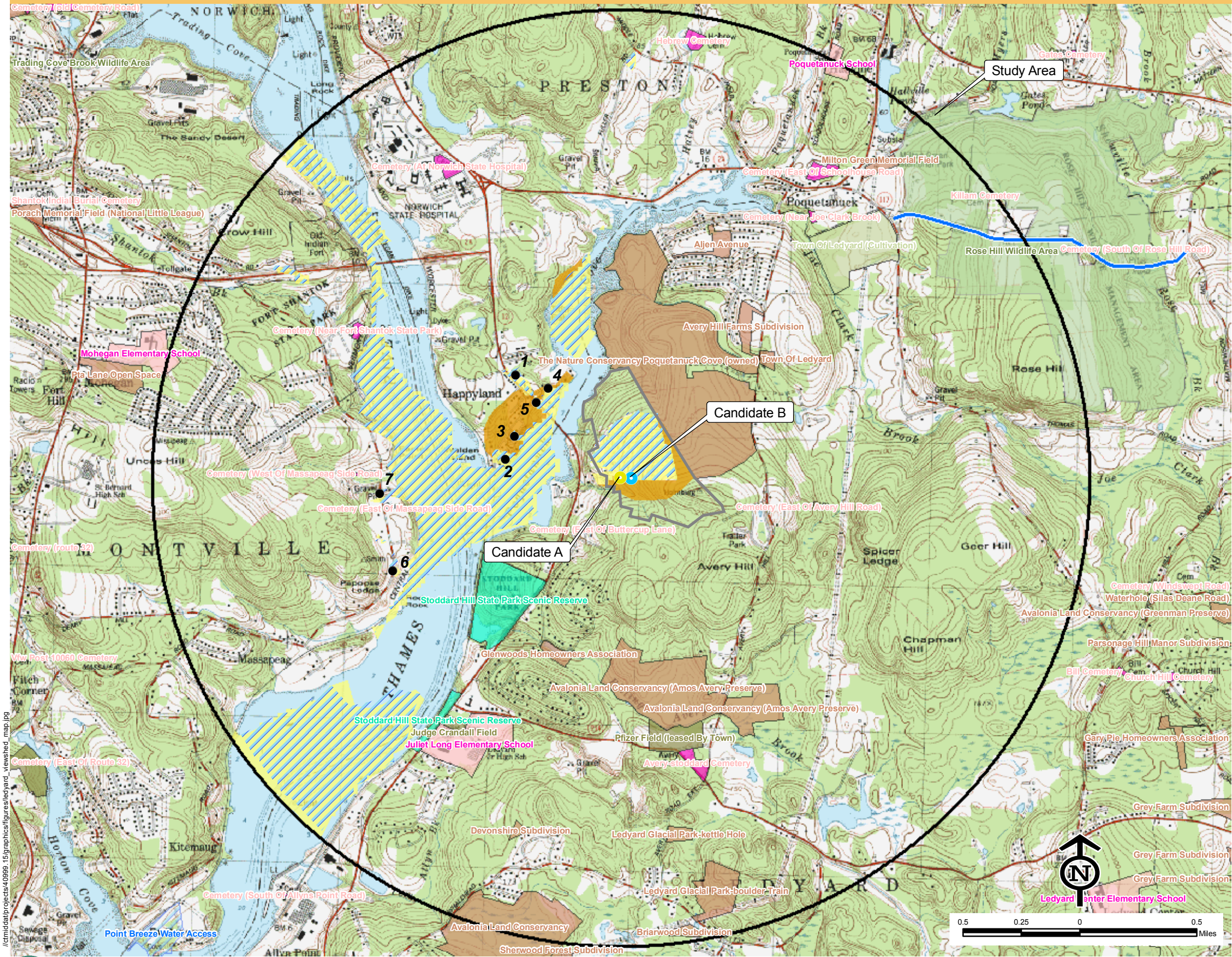
Candidate A and Candidate B

Town of
Ledyard
Connecticut

Proposed Optasite Facility
CT-11-841
Two Candidate Locations
Holmberg Orchard
12 Orchard Drive
Ledyard, Connecticut

- NOTE:
- Viewshed analysis conducted using ESRI's Spatial Analyst.
 - Proposed Facility heights are 150 feet.
 - Existing tree canopy height estimated at 65 feet.
- DATA SOURCES:
- 7.5 minute digital elevation model (DEM) with 30 meter resolution produced by the USGS, 1982
 - Forest areas derived from 2004 digital orthophotos with 0.5-foot pixel resolution; digitized by VHB, 2006
 - Base map comprised of Norwich and Uncasville USGS Quadrangle Maps
 - Protected properties data layer provided CTDEP, 2003
 - Scenic Roads layer derived from available State and Local listings.

Map Compiled September 2006



Viewshed Map

Proposed Candidate Site A

**Town of
Ledyard
Connecticut**

Proposed Optasite Facility CT-11-841 Candidate A Holmberg Orchard 12 Orchard Drive Ledyard, Connecticut

NOTE:

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DATA SOURCES:

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- Forest areas derived from 2004 digital orthophotos with 0.5-foot pixel resolution; digitized by VHB, 2006
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Map Compiled September 2006

Legend

● Candidate A (Includes area of year-round visibility of approximately 500 feet surrounding the Facility)

Photos - September 7, 2006

● Photographic Location

Anticipated Seasonal Visibility (Approximately 57 Acres)

Approx. % of Monopole Visible (Year-Round)

Tree Line View - 65 Acres
Upper 25% - 106 Acres
50% - 344 Acres
75% - 9 Acres
Entire Facility Visible - 37 Acres

Total Year-Round Visibility Approximately 561 Acres

Protected Properties (Municipal)

Cemetery
Preservation
Conservation
Existing Preserved Open Space
Recreation
General Recreation
School
Uncategorized

Protected Properties (CT DEP)

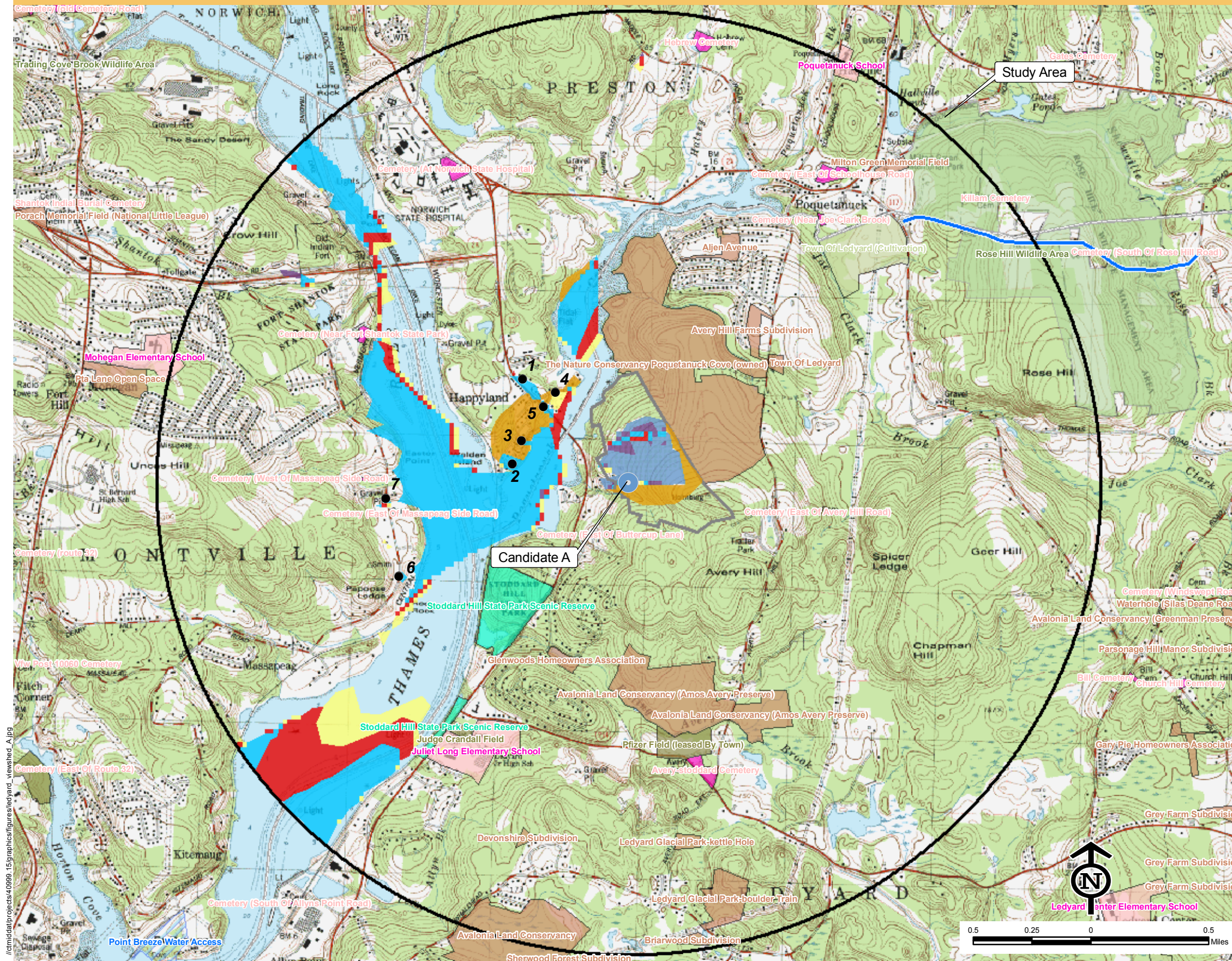
State Forest
State Park
DEP Owned Waterbody
State Park Scenic Reserve
Historic Preserve
Natural Area Preserve
Fish Hatchery
Flood Control
Other
State Park Trail
Water Access
Wildlife Area
Wildlife Sanctuary

★ DEP Boat Launches

Scenic Road (State and Local)

Town Line
Protected Properties (Federal)

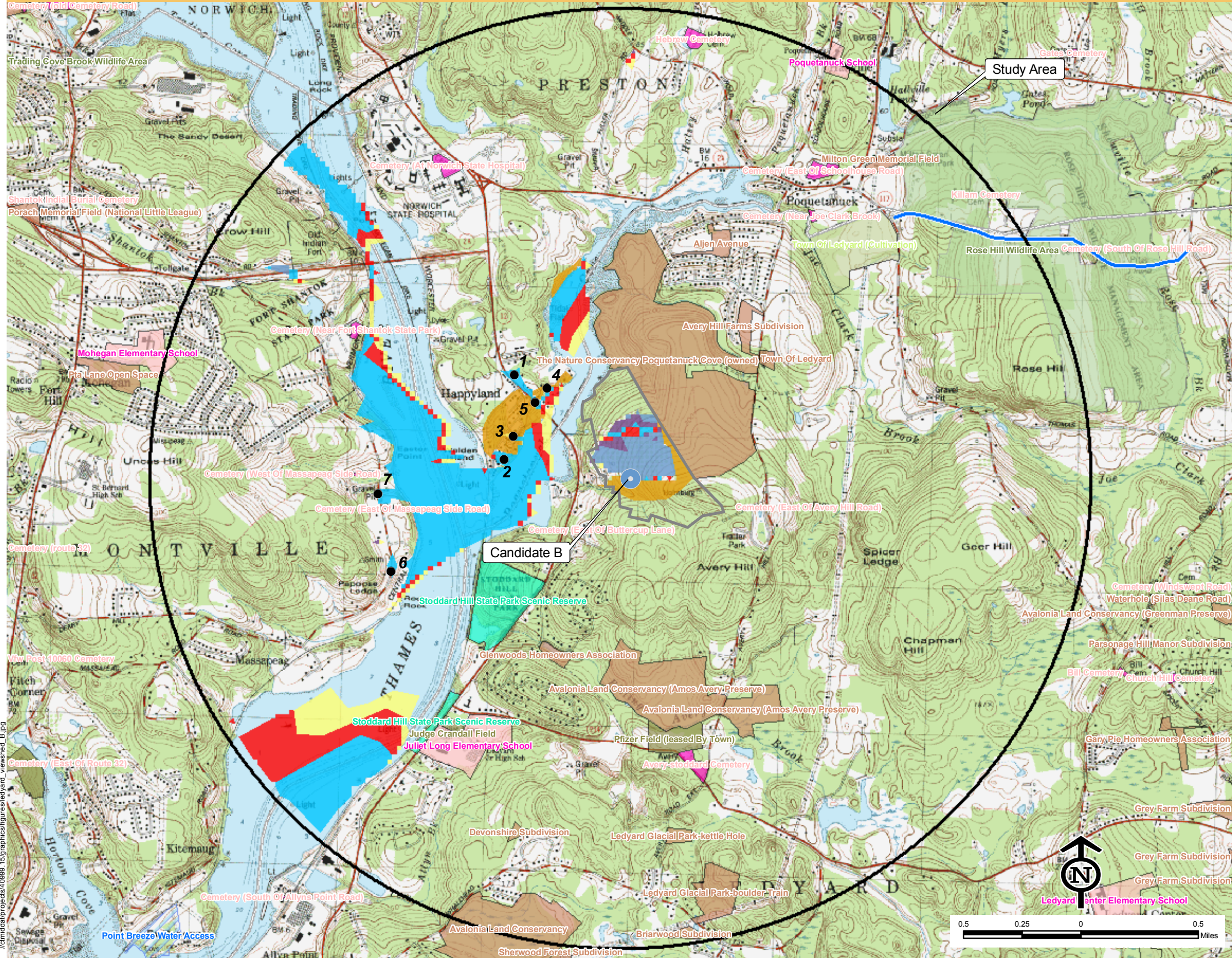
Approx. Property Boundary - Host Property



Viewshed Map

Proposed Candidate Site B

Town of
Ledyard
Connecticut



Proposed Optasite Facility CT-11-841 Candidate B Holmberg Orchard 12 Orchard Drive Ledyard, Connecticut

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DATA SOURCES:
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