

THE HOMESTEAD WASTEWATER DISPOSAL ENVIRONMENTAL ASSESSMENT

3.0 AFFECTED ENVIRONMENT

3.1 Topography

The topography of the general project vicinity is one of moderate to steep slopes bordering the eastern shoreline of Lake Michigan in western Leelanau County, Michigan. Elevational changes in the immediate area vary from 730 to 740 feet above mean sea level (msl) in the vicinity of Thoreson Road to approximately 580 feet above msl along the Lake Michigan shore adjacent to Sunset Trail. Elevations in the vicinity of existing easement Parcel B range from approximately 740 to 780 feet above msl, Parcel C ranges from approximately 750 to 760 feet above msl (Figure 6). The West Study area elevations range roughly between 650 and 664 feet above msl while the higher East Study area elevations average between 730 to 740 feet above msl (Figure 7a). The wooded Parcel B site varies the most in topographic relief and has the steepest slopes of any of the existing or proposed sites. A discussion regarding soils and slopes is given in Section 3.3.

3.2 Hydrology

According to the Wellhead Protection Delineation Report for the Crystal River Water Company (Gosling Czubak, 2001), Devonian age limestone bedrock (Traverse Group) occurs at a depth of 400 to 600 feet below the surface in the vicinity of The Homestead's water supply wells and the project area. The two water supply wells (6- and 8-inch casings) are 42 feet apart, occur at an elevation of about 600 feet above msl, and are located 0.5 mile southwest of the resort's primary wastewater treatment facility. The wells penetrate unconsolidated glacial deposits of sand and gravel and intersect the water table at about 583 feet above msl. The 6-inch well has a typical yield of 200 gallons per minute (gpm) while the 8-inch well has a typical yield of 350 gpm. A hydraulic conductivity of 300 feet/day is estimated for the wellhead protection area.

The overlying materials north of the water wells (hydraulically upgradient) are end moraine deposits, which also occur in the vicinity of the project area. Groundwater flow in the unconfined aquifer surrounding the wells is from east to west and discharges to Lake Michigan (Gosling Czubak, 2001). Information from monitoring wells in the vicinity of the existing easement Parcels B and C indicates that groundwater flows west-northwest toward the lake (Sheaffer & Roland, 2003). General depth and flow of groundwater in the project vicinity is shown in Figures 6 and 7a, which are cross-sections, and are identified on the maps (Figures 10a, 10b, 11a, and 11b).

Groundwater quality data is available from MDEQ Compliance Monitoring Reports for nine monitoring wells in the vicinity of Parcels B and C and the primary treatment lagoon. The location of these wells is depicted in the Monitor Well Site Plan (Figure 7b). Parcel B has not performed as expected but Parcel C has (when it is not overtaxed). Because of this, the quarterly total inorganic nitrogen (TIN) level in two of the downgradient monitor wells (Wells Nos. 3 and 6) has, on occasion, exceeded the permit limit of 5 mg/l. As additional background information, it should be noted that the irrigation season is from May 1 to October 31, which provides 26 weeks or 183 days. However, not all of these days are available due to downtime for repairs, crop harvesting, or rainy days. Nevertheless, there are a sufficient number of days in the irrigation season for "down time."

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Other than surface water sheet flow, there are no surface water drainages or streams in the vicinity of the project area. The lack of channeled drainages is a result of both the topographic relief in the area as well as the high permeability of the soils (see Section 4.3). Consequently, surface water quality analysis has not been conducted in the project vicinity.

3.3 Soils and Substrate

According to the Soil Survey of Leelanau County (1973), there are nine soil types representing three soil series in the project area. Parcels B and C are dominated by Kalkaska sand on slopes of 6 to 45 percent for Parcel B and on slopes of 6 to 12 percent for Parcel C. Kalkaska soils are well drained to moderately well drained and have rapid permeability. The seasonal high water table (hwt) is typically greater than 4 feet below the surface.

The East Study Area is mapped as Emmet-Leelanau complex (sandy loam and loamy sand) on slopes of 2 to 18 percent. Emmet-Leelanau soils are well drained and have moderate permeability. The seasonal hwt is generally greater than 4 feet below the surface. Emmet-Leelanau soils on slopes of two to six percent dominate this study area.

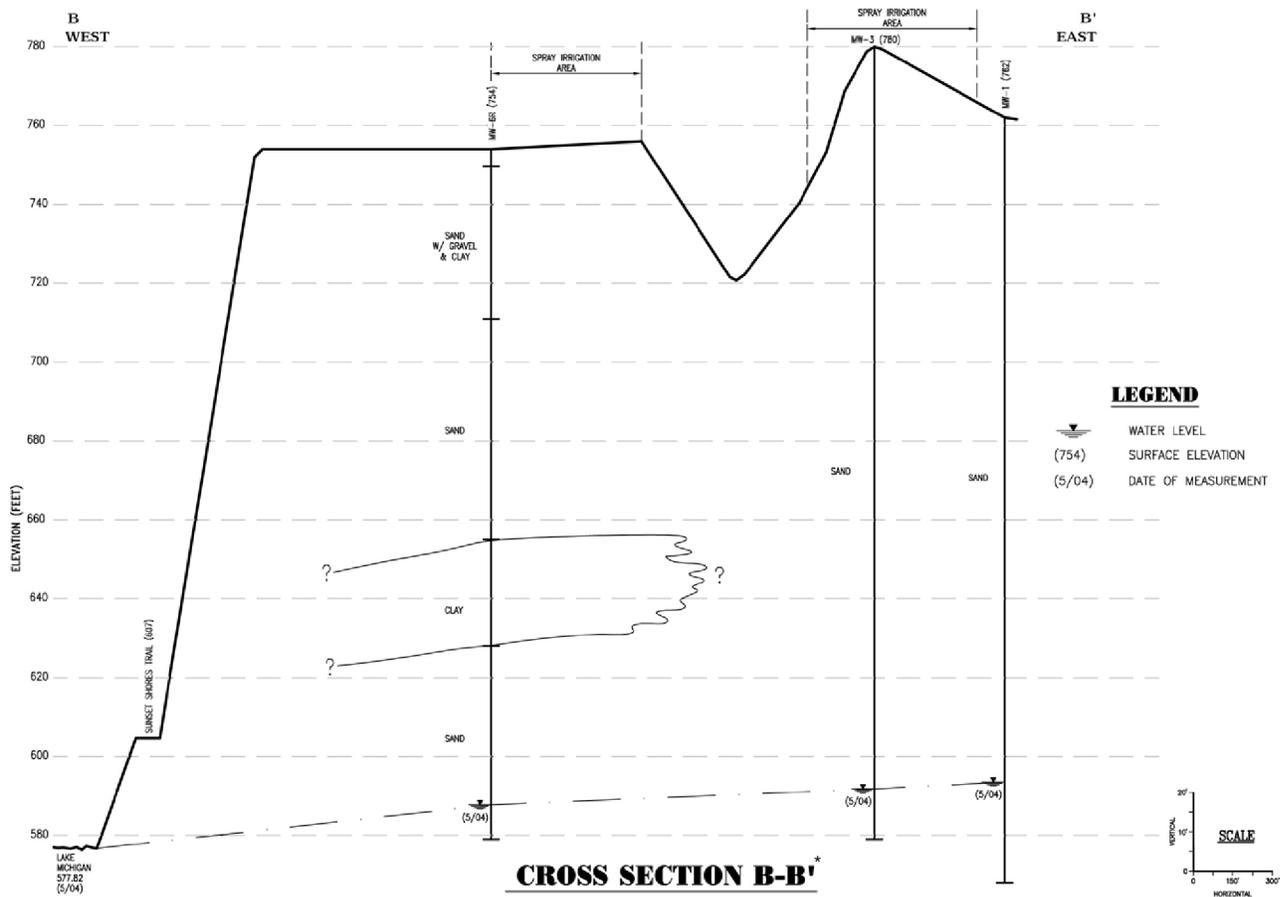
The West Study Area is mapped as both Emmet-Leelanau soils and Leelanau-East Lake loamy sands. Emmet-Leelanau soils on slopes of two to six percent are mapped across the northern half of the site, while Leelanau-East Lake soils on slopes of 0 to 12 percent are mapped across the southern half of the site. As previously stated, Emmet-Leelanau soils are well drained and have moderate permeability. The seasonal hwt is generally greater than 4 feet below the surface. Leelanau-East Lake soils are well drained to moderately well drained and have rapid permeability. The seasonal hwt is generally 2 to 4 feet or more below the surface.

A soils investigation was conducted by Gosling Czubak Engineering for the West Study Area, the East Study Area, and the South Study Area (all located in the open fields north and east of the existing Parcels B and C) (Gosling Czubak, 2003). The investigation required soil borings from 16 locations among the three sites (see Figure 3). Six of eight borings across the West Study Area found a limiting layer of sandy clay loam, which reduces water percolation. Three of six borings across the East Study Area found a limiting layer of sandy clay loam, while rocks or cobbles were encountered in five of the six borings. Soils across the South Study Area were the best of the three study areas in terms of water percolation.

3.4 Ecological Resources

The project area occurs within the Great Lakes section of the Hemlock-White Pine-North Hardwoods Region as described by Braun (1950). The original hardwood and hemlock-hardwood forests were dominated by sugar maple (*Acer saccharum*), beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), basswood (*Tilia americana*), and eastern hemlock (*Tsuga canadensis*). Once these forests were cut for lumber and farming, secondary forests often included a predominance of both quaking aspen (*Populus tremuloides*) and big-tooth aspen (*Populus grandidentata*). The original pine forests in the region were dominated by white pine (*Pinus strobus*), red pine (*Pinus resinosa*), and jack pine (*Pinus banksiana*).

Currently, Parcel B is wooded, approximately three acres of which is non-native conifer plantation (photo 8 in Appendix B). Parcel C has been planted in alfalfa (*Medicago sativa*) (photo 9 in Appendix B). The open fields to the north surrounding the Thoreson farmstead were investigated by Dr. Noel Pavlovic and Dr. Walt Loope, USGS Lake Michigan Ecological



LEGEND

640 — — — Elevation Contours in Feet

*Cross-section location shown in Figures 10a - 11b.

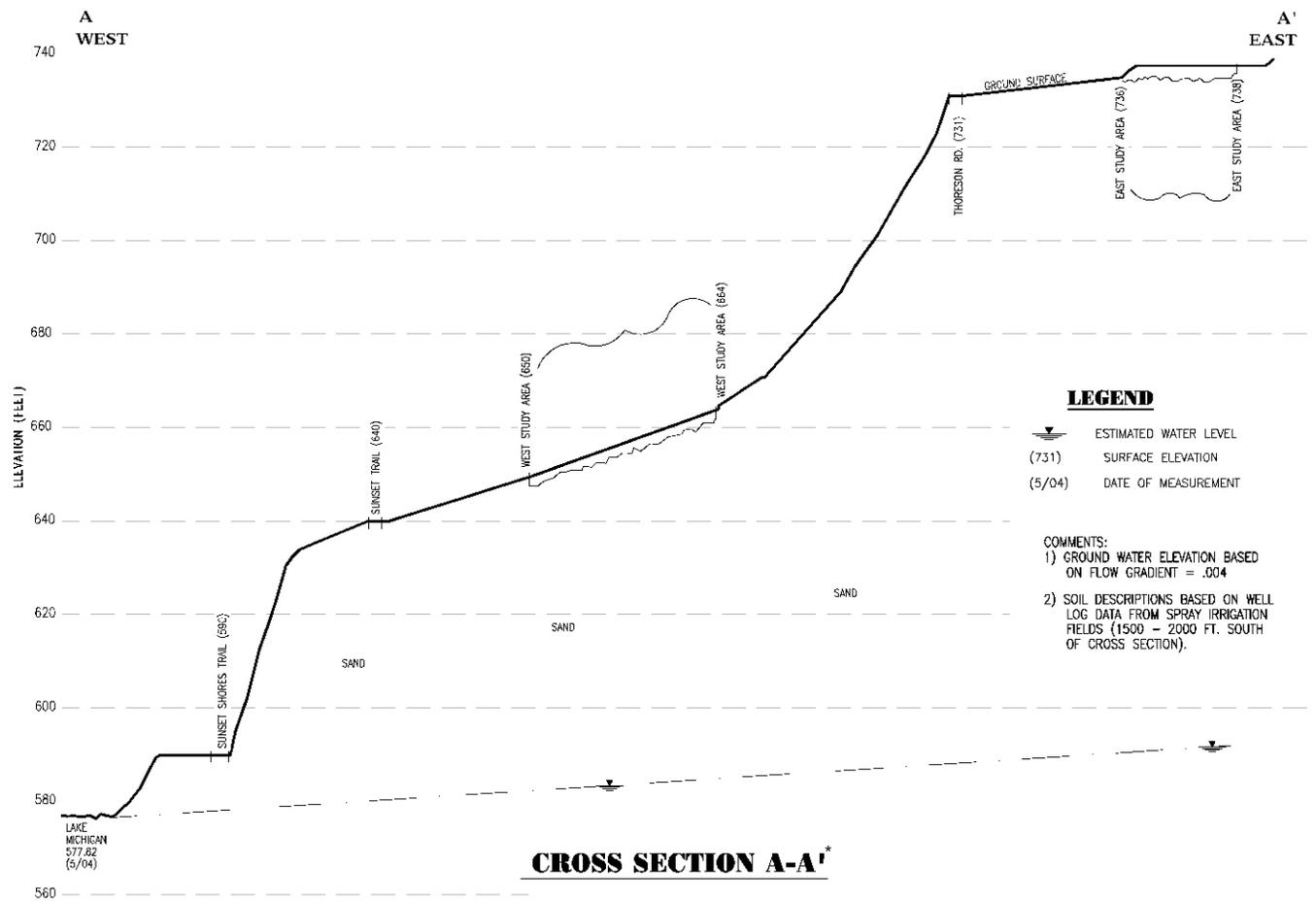
Source: Gosling Czubak, 2004

**SLEEPING BEAR DUNES NATIONAL LAKESHORE
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**FIGURE 6
CROSS-SECTION OF EAST AND WEST STUDY AREA**

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LEGEND

640 — — — Elevation Contours in Feet

*Cross-section location shown in Figures 10a - 11b.

Source: Gosling Czubak, 2004

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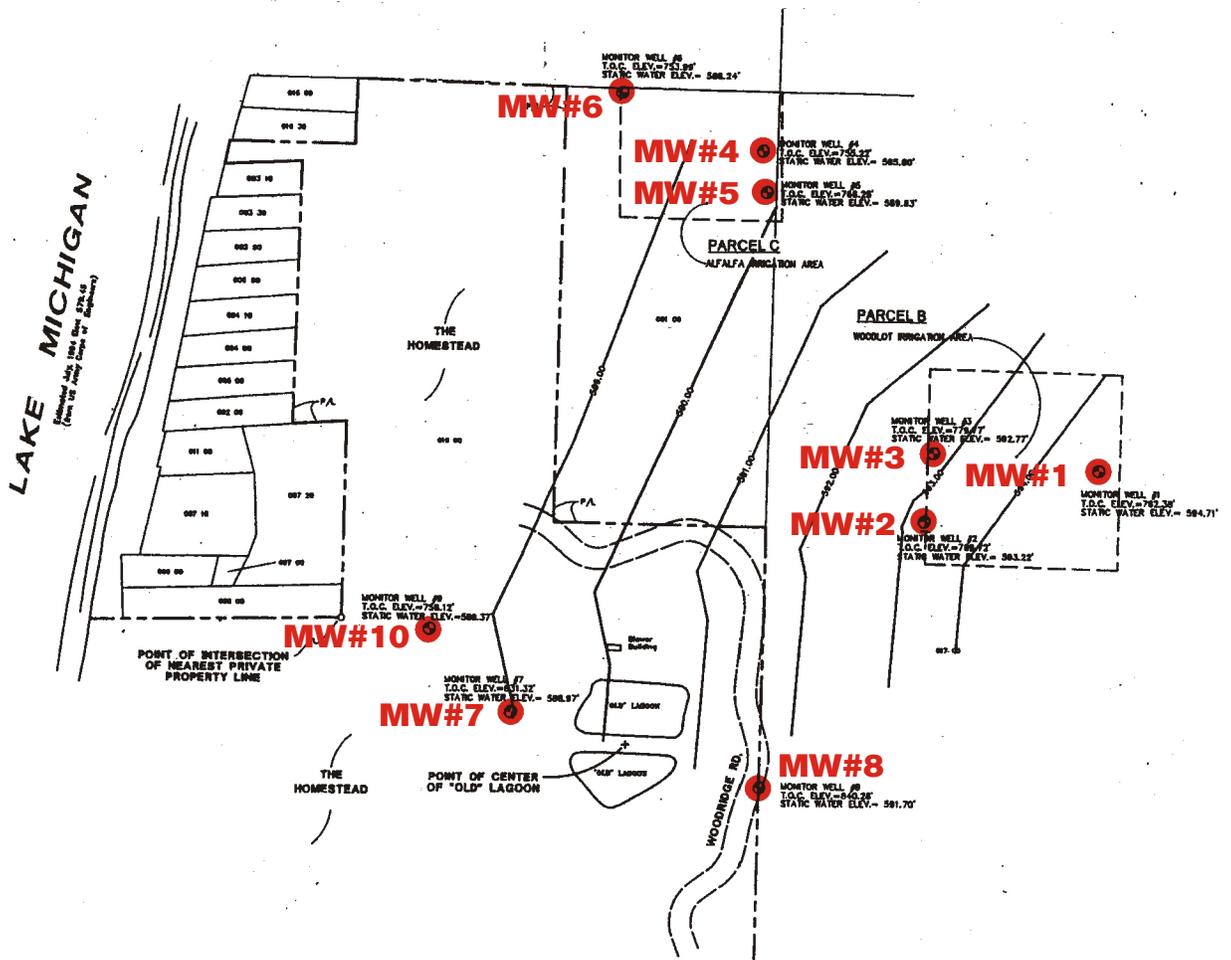


**FIGURE 7a
CROSS-SECTION OF EAST AND WEST STUDY AREA**

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The Homestead Irrigation Management Plan Appendix H

Monitor Well Locations and Groundwater Elevations, Parcels B and C



NOTE: The data for MW#4 was not included in the determination of the ground water conditions.

Source: Gosling Czubak Engineering Sciences, Inc., 2003



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SCALE: 1"=400'

**FIGURE 7b
MONITORING WELL SITE PLAN**

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Research Station, during the summers of 1998 to 2001 as part of a non-indigenous plant study. Transect 31 was taken in the fields east of Thoreson Road and recorded a predominance of non-native species including orchard grass (*Dactylis glomerata*), quack-grass (*Agropyron repens*), Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), common St. John's wort (*Hypericum perforatum*), and the invasive spotted knapweed (*Centaurea maculosa*). Transect 32 was taken in the fields west of Thoreson Road and recorded a predominance of timothy (*Phleum pratense*), smooth brome, quack-grass, spotted knapweed, Canada goldenrod (*Solidago canadensis*), and orange hawkweed (*Hieracium aurantiacum*). No species of threatened or endangered flora were observed during these studies.

Lists of vertebrate wildlife have been compiled for the Lakeshore by the park staff. Approximately 21 species of amphibians, 19 species of reptiles, and 45 species of mammals have been reported for the park, with several taxa (*i.e.*, subspecies) added to these groups. Among the more common amphibians are American toad (*Bufo americana*), gray treefrog (*Hyla versicolor*), green frog (*Rana clamitans*), wood frog (*Rana sylvatica*), and red-backed salamander (*Plethodon cinereus*). Among the more common reptiles are northern water snake (*Nerodia sipedon*), common garter snake (*Thamnophis sirtalis*), eastern box turtle (*Terrapene carolina*), and midland painted turtle (*Chrysemys picta marginata*). Among the more frequent mammals are American beaver (*Castor canadensis*), Virginia opossum (*Didelphis virginiana*), meadow vole (*Microtus pennsylvanicus*), woodland vole (*Microtus pinetorum*), red squirrel (*Tamiasciurus hudsonicus*), striped skunk (*Mephitis mephitis*), and white-tailed deer (*Odocoileus virginianus*).

According to the Atlas of Breeding Birds of Michigan (Brewer, *et al.*, 1991), 159 species of birds were recorded as breeding in Leelanau County during the 1983 to 1988 survey. Approximately 250 species of birds have been observed within the Lakeshore, while as many as half of this total may be breeding within the Lakeshore. Some of the more common breeding birds include Cooper's hawk (*Accipiter cooperii*), mourning dove (*Zenaida macroura*), downy woodpecker (*Picoides pubescens*), black-capped chickadee (*Poecile atricapillus*), red-breasted nuthatch (*Sitta canadensis*), red-eyed vireo (*Vireo olivaceus*), hermit thrush (*Catharus guttatus*), magnolia warbler (*Dendroica magnolia*), pine warbler (*Dendroica pinus*), red-winged blackbird (*Agelaius phoeniceus*), song sparrow (*Melospiza melodia*), and white-throated sparrow (*Zonotrichia albicollis*).

In the summer of 2002 an assessment of historic openlands (fields) was conducted at the Lakeshore by Greg Corace and Thomas Wyse. Their observations in the Thoreson field area included the following five bird species of "conservation priority" by the U.S. Fish and Wildlife Service (USFWS): northern harrier (*Circus cyaneus*), field sparrow (*Spizella pusilla*), grasshopper sparrow (*Ammodramus savannarum*), bobolink (*Dolichonyx oryzivorus*), and eastern meadowlark (*Sturnella magna*). These species are protected by the Migratory Bird Treaty Act of 1918, but are not state or federally listed. No federally threatened or endangered species, proposed species, or designated or proposed critical habitat are present in the project area (U.S. Fish and Wildlife Service letter, June 18, 2004).

Lastly, the shoreline and coastal waters of Lake Michigan occur approximately 1,000 feet west of Parcel C and the West Study Area. This area of shallow littoral waters extends offshore for 0.50 to 0.75 mile, and its large boulders provide habitat for bass, perch, and other fish as well as crayfish and mussels. Like much of the Lake Michigan shoreline, non-native zebra mussels and cladophora algae are a problem here.

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3.5 Land Use

Land uses in and around the project area are a mix of public (the Lakeshore) and private (private residences and The Homestead, which includes commercial, recreational, and residential facilities). A portion of the NPS holdings, which were acquired in 1979 from Arthur and Helen Huey, were subject to an easement, in perpetuity, that was granted to The Homestead in 1972. This easement allows The Homestead the use of these lands for access and isolation (Parcel A) and disposal of treated wastewater (Parcels B and C). Any changes in land use resulting from an easement relocation would have to reflect NPS criteria that new parcels must be of equal or lesser value than those under the existing easement. If new areas are acquired, then the easement language must reflect not only the land being used, but also the manner in which it may be used and any rights-of-way where piping may need to be installed and/or maintained.

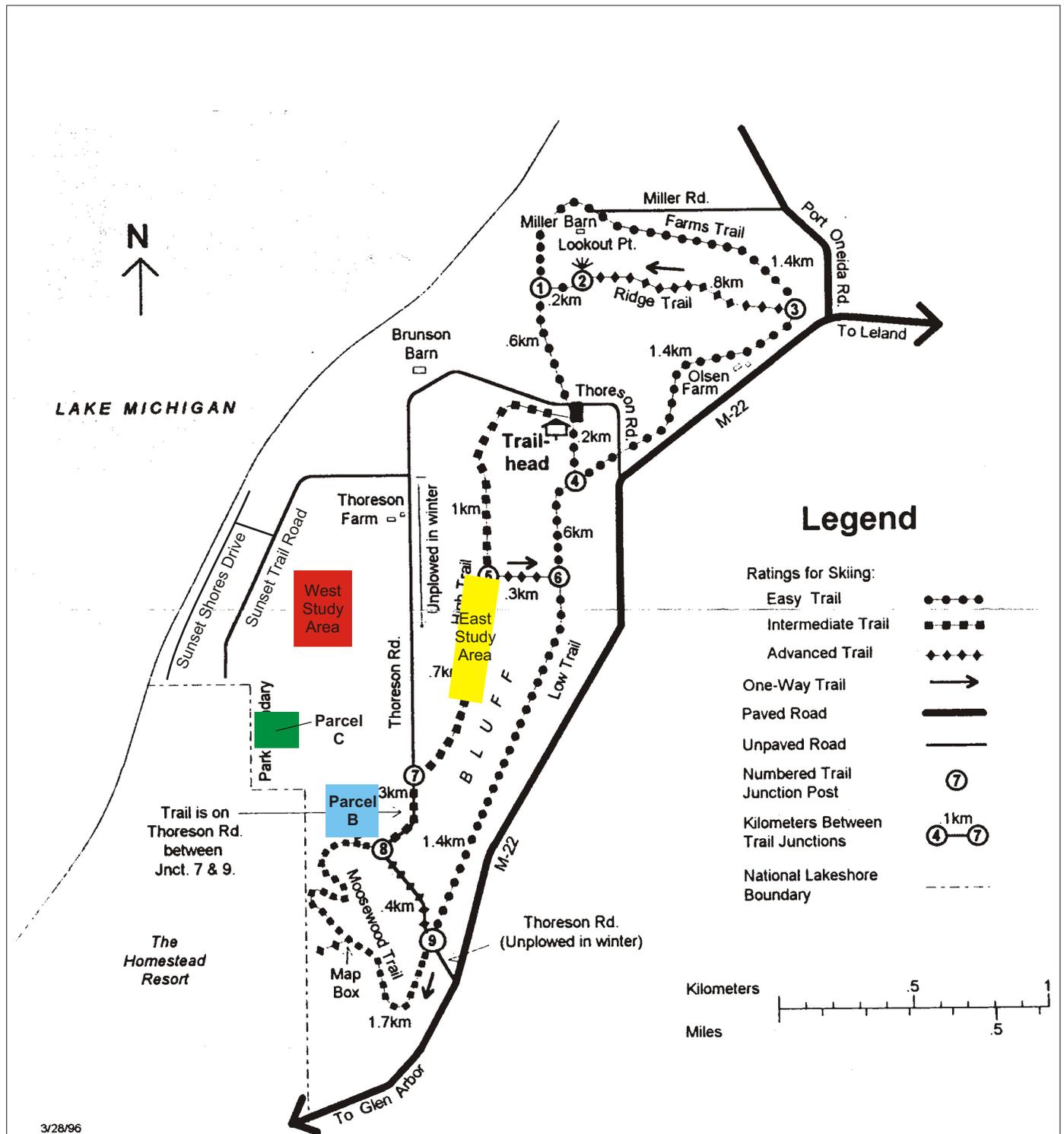
The Thoreson Farmstead, located directly off of Thoreson Road and to the north of all parcels, has the only existing, useable, structures within the project area (including the house and associated structures). The largest current land use within the project area is open space characterized by open fields—primarily dominated by grasses. These fields were cultivated in the past, some as recently as within the last three decades, but currently all of the fields are lying fallow. There are also mixed-age and mature forests, including a conifer plantation within and adjacent to Parcel B, present within the project area.

There are three roads and one hiking trail within the project area; Thoreson Road, Sunset Trail, and Sunset Shores are roads leading to the farmstead and to private residences. The private residences along Sunset Shores are located between properties owned by The Homestead and the NPS, and the shoreline of Lake Michigan. The private residences along Sunset Trail are located just north of the road. The East Study Area and West Study Area are located to the east and west of Thoreson Road. All four parcels discussed in this EA are to the south and east of Sunset Trail. The only hiking trail within the area is the Bay View Trail. This seven mile trail traverses the entire project area, but draws the closest to the East Study Area to the south and proceeds east around Parcel B (see Figure 8).

3.6 Cultural Resources

Cultural resources at the Lakeshore include remnants of prehistoric American Indian use, logging, farming, and maritime commerce (NPS, 1998). Archeological resources within the park include remnants of artifacts used by prehistoric peoples over 3,000 years ago; however, there is little evidence of archeological remains within the project vicinity. There is also evidence that the Ottawa and Chippewa (Ojibwe) Indian tribes used the area to hunt and to collect maple sap. It was an Indian legend that gave the area the name of “Sleeping Bear.” More numerous are the many historic areas of significance within the park.

The East and West Study Areas of the project are located in the Port Oneida Port Oneida Rural Historic District. The District is on the National Register of Historic Places with a “state” level of significance (Figure 9). Port Oneida took its name from the first ship to stop at the dock, the S.S. ONEIDA. The town was open for settlement in 1852 and, in 1860, had a population of 87 people. The entire historic district contains 20 free-standing structures (*e.g.* flagpoles) and 121 buildings (large and small). There are 18 farmsteads, 13 of which are owned by the NPS. One of those NPS-owned farmsteads, the Thoreson Farmstead, is located within the project area (Figure 9 and photos 1 to 5 in Appendix B). Recently, the Glen Arbor Art Association (GAAA) has been working with Lakeshore staff to restore the Thoreson Farmstead. Their goal is to enter



3/28/96

Source: NPS, 1999



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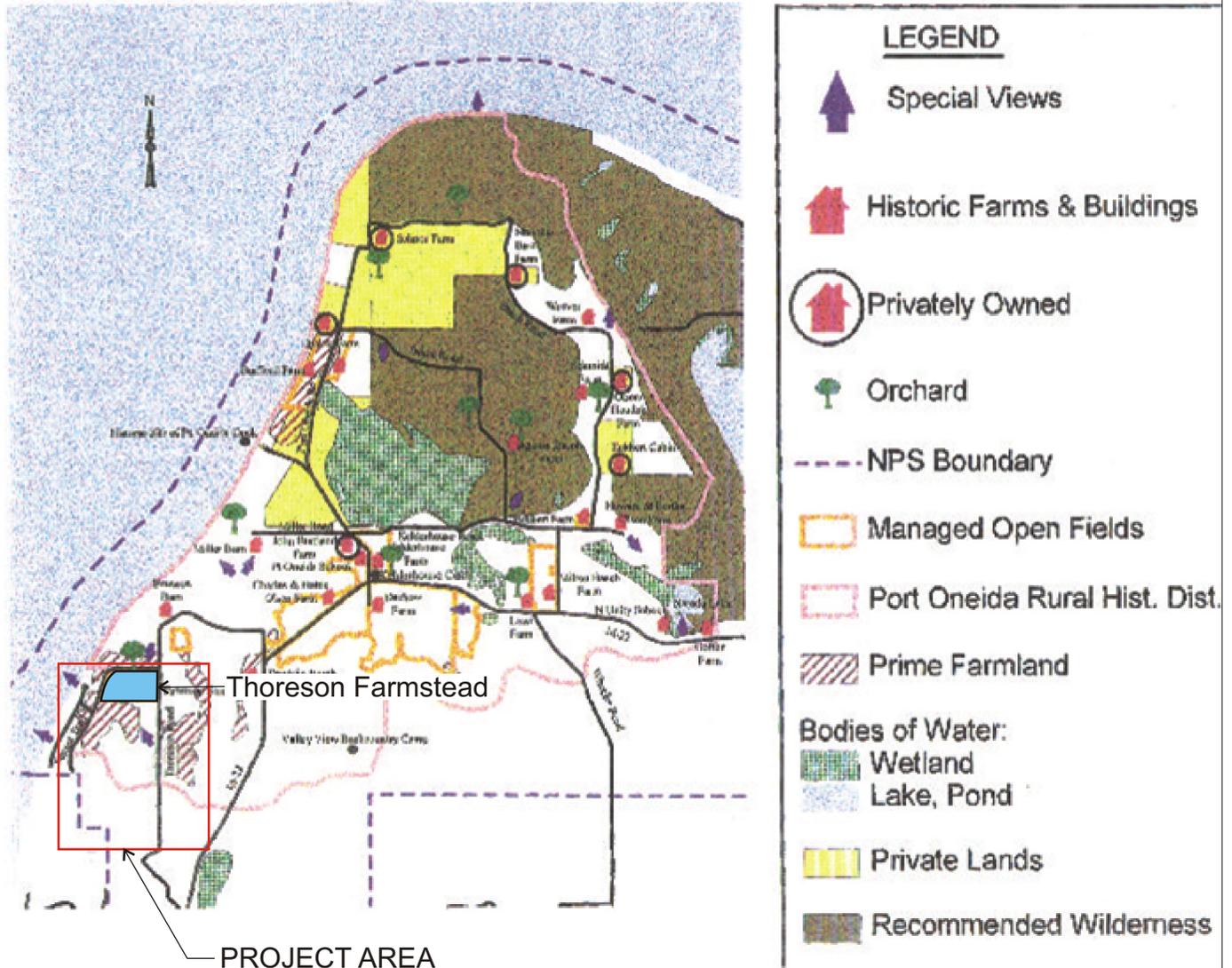


**FIGURE 8
BAY VIEW TRAIL**

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PORT ONEIDA RURAL HISTORIC DISTRICT

Sleeping Bear Dunes National Lakeshore



Source: NPS, 1998



NOT TO SCALE

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**FIGURE 9
PORT OF ONEIDA RURAL HISTORIC DISTRICT**

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a long-term adaptive use agreement for the site. This partnership has already restored portions of the farmstead such as the implement shed, the granary, farmhouse, chicken shed, and privy.

3.7 Visitor Experience and Viewshed

Visitors to the Lakeshore are encouraged to take advantage of both the island and mainland scenic landscapes. The Lakeshore strives to foster a high degree of solitude, a feeling of self-reliance, and a sense of exploration as essential aspects of a visitor's experience. In 2003 the total number of recreation visits to the Lakeshore was 1,143,857 persons. Visitors can enter the park via state routes M-22, M-72, and M-109, and numerous county roads. M-22 is located near the project area. A visitor's experience on the mainland, which includes the project area, provides a wide range of experiences and a variety of year-round interpretive and recreational facilities and programs, with the local towns and farmsteads serving as focal points for visitor services. Table 1 displays a wide variety of recreational activities available to visitors during the summer and winter.

Visitors to the Lakeshore are encouraged to visit the Port Oneida Rural Historic District. This National Register site offers visitors an opportunity to view a farming community at the turn of the century with few modern intrusions. Other than Cades Cove in the Great Smoky

Table 1 Recreational Activities Available to Visitors	
Summer Activities	Winter Activities
Hiking	Hiking
Canoeing/Boating	Cross-country Skiing
Dune Climbing	Dune Climbing/Sledding
Driving the Stocking Scenic Drive	Snow-Shoeing
Hang Gliding	Camping
Camping	Bird Watching
Bird Watching	Ice Fishing
Bicycling	
Picnicking	
Fishing	

Mountains National Park, there are few, if any, farming villages that have been preserved in place with the integrity of the Port Oneida Rural Historic District. The Port Oneida Rural Historic District is open year-round to visitors with weekly tours given during July and August. The Thoreson Farmstead, which is part of Port Oneida, is within the project area. Recently, the GAAA has worked with NPS to restore and use the Thoreson Farmstead buildings. Wastewater treatment areas, Parcels B and C, are near the Thoreson Farmstead and the Bay View Trail. Signs have been placed around the perimeter of each parcel to warn visitors of the spray field operations (see photos in Appendix B).

The viewsheds and cultural landscapes within the park are considered to be important aspects for the visitor experience; as much so as the condition of the buildings, interpretive programs, and other activities at the Lakeshore. The scenic beauty and natural character of the Lakeshore are protected for the benefit, inspiration, education, recreation, and enjoyment of the public. Thoreson Farmstead and the views along Thoreson Road are particularly known for their spectacular views of the countryside, the Manitou Islands, and the Manitou Passage.

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