



## Iosco County Shoreline Recession Study 2023-2024

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The shoreline of Iosco County was studied to update the erosion rates previously determined in 1983-1986. The high-risk shorelines were designated in 1986. The State of Michigan is required to identify changes in the long term rate of erosion occurring along the shoreline pursuant to R 281.22(22) of the Great Lakes Shorelands Administrative Rules, promulgated pursuant to Part 323, Shorelands Protection and Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). This study identifies shorelines where recession is occurring at an average annual rate of one foot or more per year based on a minimum period of 15 years, in accordance with R 281.22(2). The purpose of identifying these shorelines is to provide setbacks for structures to lessen the risk of structural property damage and loss.

### County Description

Iosco County is in the eastern central Lower Peninsula on Lake Huron. The county is sparsely populated, with 25,237 permanent residents (2020 US Census). The population increases significantly during part of the year when seasonal dwellings are occupied. In three of the six Local Units of Government (LUGs) studied, seasonal dwellings may represent roughly half of all dwellings (Iosco County 2013 Master Plan). With few exceptions, the majority of Iosco County's shoreline is developed with homes or businesses.

Iosco County has 36.2 miles of Lake Huron shoreline. The shoreline includes Tawas Point and Tawas Bay. Other notable shoreline features include Au Sable Point and the mouth of the Au Sable River. The shoreline is generally low with bluffs composed of sand and/or gravel measuring less than 10 feet in height. The shoreline and nearshore include coastal wetlands, sandy beaches, cobble beaches, and artificial shorelines (hardened with revetments and seawalls). A significant portion of the shoreline in the study area was observed to be artificially hardened with seawalls and revetments. Areas of highly artificial shoreline generally did not have beaches and the shoreline function of sediment transport both along and on and offshore were impacted.

## **Methods and Study Area**

The study areas identified for Iosco County included all shorelines designated in 1986, areas identified as highly erodible by the United States Army Corps of Engineers (USACE) in 1971, areas identified when viewing the 2012 USACE Oblique Imagery, areas identified when viewing the 2015 USACE Oblique Imagery, and areas identified from review of recent permits. Staff from EGLE WRD's Bay City District Office were contacted and provided input on the study area. Local government officials were contacted but did not have any sites to add to the study. Study areas are identified in figure 1 below.

### Timing and Water Levels

Fieldwork was conducted in April of 2023. At that time Lake Huron was at 579.36 feet IGLD85 per the USACE. This is 2.83 feet lower than the record high water level of 582.19 feet IGLD85 experienced in July of 2020. The 2020 high water levels impacted Iosco County. Flooding, failure of shoreline hardening structures, and shrinking of beaches were observed in aerial imagery and photos available in EGLE's MiEnviro Portal. Permit requests for shoreline armoring in Iosco County increased 56.9% in 2020 compared to 2019. During the field work in April 2023, the shoreline was generally observed to be recovering from the high-water levels. Beaches were observed to be accreting and vegetation was expanding in many areas. The major exception to this was highly armored areas which were observed to have little to no beach. Field work was conducted in all LUGs with shorelines identified for study. A selection of site photographs from the April 2023 field work is available in Appendix 1.

### Imagery

The historic aerial imagery used in the study was from the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Water Resources Division (WRD), Aerial Imagery Archives. The available leaf-off- imagery was reviewed and selected to represent the historic endpoint for the study. Efforts were made to ensure the study period reflected water level fluctuations and storm events. Past water level data were obtained from the USACE in 2023.

The historic aerial imagery used for all six LUGs studied (Alabaster Township, City of Tawas, City of East Tawas, Baldwin Township, Au Sable Township, and Oscoda Township) was in color and collected in April 1989 with a scale of 1:6,000. The water level was 578.77 feet IGLD85.

All Imagery was orthorectified to modern imagery collected in April 2022 with a 1-foot resolution available through the Michigan Department of Technology, Management and Budget's Statewide Authoritative Imagery and LiDAR Program (MiSAIL) and a United States Geological Survey National Elevation Dataset with 10-meter resolution was used to provide elevation information. The water level was 579.70 feet IGLD85 at the time the imagery was collected. The error due to orthorectification was approximately 0.1 feet (1 inch) plus or minus 0.1 feet (1 inch).

## **Erosion Hazard Line**

The erosion hazard line (EHL) as defined in R 281.21(1)(c) means the line along the shoreland that is the landward edge of the zone of active erosion or the line where the 582.9 feet IGLD85 contour on Lake Huron meets the shoreland, whichever is furthest landward. The zone of active erosion means the area of the shoreland where the disturbance or loss of soil and substrate has

occurred with enough frequency to cause unstable slopes or prevent vegetation of the area [R 281.21(1)(r)]. The recession rate study compared the EHL on historic aerial photographs to the EHL on modern aerial photographs.

The historic EHL was determined by viewing the vegetation lines along the shoreline on the aerial photograph. The modern EHL was determined using the same method with added information provided by the fieldwork. The shoreline was reviewed and the EHL was determined for all identified study areas. The EHLs were hand digitized in ArcMap 10.7.1 and later reviewed in ArcPro 2.9.10.

### Fieldwork

The location of the modern EHL was verified by gathering on-the-ground data using a submeter Global Positioning System (GPS) unit, Trimble Geo7x. All location data were differentially corrected using GPS Pathfinder Office 5.60. Observational and GPS data were gathered where there was public access or permission was provided by the property owner. Figure 1 below shows the location of GPS points taken during field work.

All data were projected to Michigan GeoRef Meters North American Datum 83.

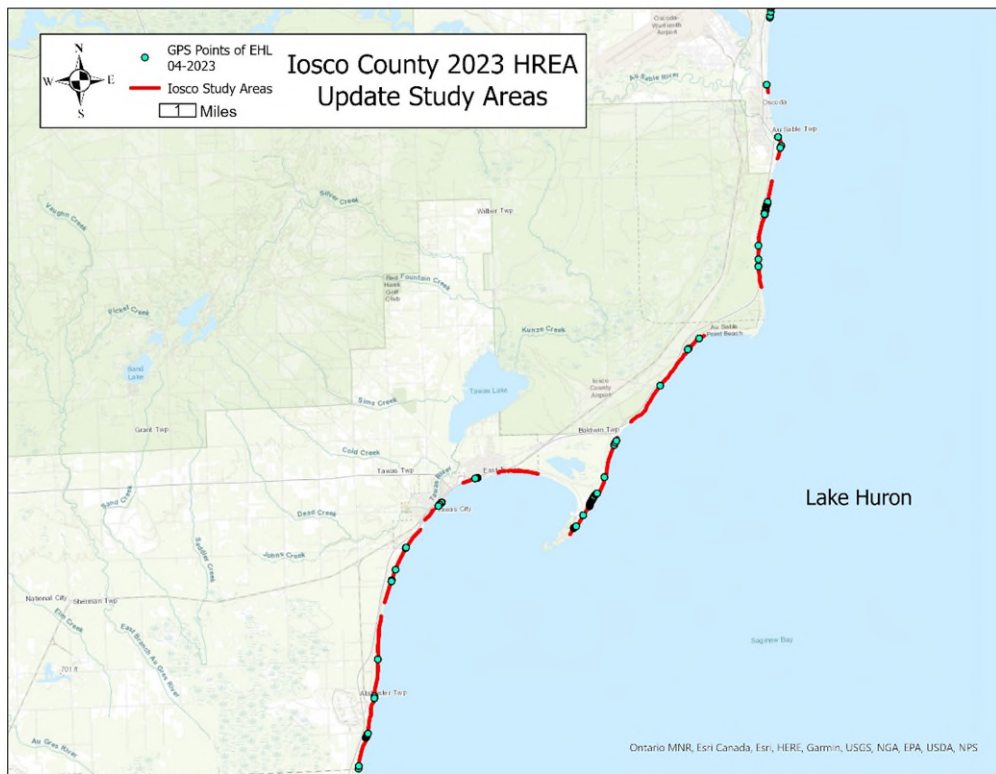


Figure 1: Map of 2023 Iosco County HREA Update Study Areas and GPS Data Points

## High Risk Erosion Area Identification:

Transects were drawn perpendicular to the shoreline at 150-foot intervals and recession rates were calculated along the transect lines. Digital Shoreline Analysis Software was used to determine recession rates. Average recession rates and quality assurance statistics were calculated within each area (Procedure WRD-SWAS-028). Parcel boundary and owner data were received from the Iosco County Equalization Department. The current study area and parcel data were compared to the 1986 designation data to determine designation changes.

High risk erosion areas (HREA) are those shorelines identified as receding at an average annual rate of 1 foot or more per year, over a minimum of 15 years per R 281.22(2)(2). Within these HREAs, the placement of new construction requires a permit and must meet setback distances based on projected recession distances when combined with the type of construction and other site-specific conditions. The projected recession distance is the calculated rate of recession for the area over a 30-year period (for readily moveable structures as defined in R 281.21(1)(k)) or a 60-year period (for permanent structures as defined in R 281.21(1)(i)). An additional 15 feet is added to the calculated rate to account for severe short term erosion losses in accordance with R 281.22(2)(2). The required setback distance is based on the projected recession distance but may be greater in areas of bluffs over 25 feet in height.

Parcels affected by the study are classified under the following categories:

*New (N)*: These parcels were not designated during the previous study as being in an area of high risk erosion; however, the current study found the long-term rate of recession has increased to, or is above, the 1 foot per year threshold requirement for HREA designation.

*Increased (IS)*: These parcels were designated during the previous study as being in an area of high risk erosion. The current study found that the long-term rate of recession continues to be above the 1 foot per year threshold requirement and has increased since the previous study.

*Same (S)*: These parcels were designated during the previous study as being in an area of high risk erosion. The current study found that the long-term rate of recession continues to be above the 1 foot per year threshold requirement and has remained the same since the previous study.

*Lower (L)*: These parcels were designated during the previous study as being in an area of high risk erosion. The current study found that the long-term rate of recession continues to be above the 1 foot per year threshold requirement but has decreased since the previous study.

*Dedesignated (D)*: These are parcels where the average rate of recession was documented to be 1 foot per year or greater during the previous study; however, the current study found the long-term rate of recession has fallen below the 1 foot per year threshold required for HREA designation. The HREA designation is therefore removed, also eliminating the permit requirements under Part 323.

## Public Notification

Letters explaining the proposed changes to the HREAs along the Lake Huron shoreline of Iosco County will be sent to property owners and local governmental agencies as required per R 281.22(1). A virtual public meeting will be held prior to designation. The meeting information will be posted on the EGLE calendar.

## **Results**

During the current study, 19.6 miles of shoreline were identified as needing study because they were either previously designated or there may have been recession. While effort was made to take GPS points along as much of modern EHL as possible, fieldwork and access constraints warranted solely a digital comparison of EHL's in portions of the study area.

Of the entire study area, 2.39 miles of shoreline were identified as having receded at an average annual rate of 1 foot or greater per year over the 33-year period of the study. Of the 2.39 miles of shoreline identified, 0.76 miles are located in Alabaster Township and 1.63 miles are located in Baldwin Township. In 1986, approximately 15.11 miles of shoreline were designated as HREA county wide. Of the original 15.11 miles, 12.72 miles no longer meet the criteria for designation as the average annual rate of recession has fallen below the 1 foot or greater per year threshold. No new shoreline not originally designated in 1986 was found to meet designation criteria; however, 4 new second tier parcels (non-lakefront parcels) are proposed for designation in Alabaster Township. Summary of Results for the county and local units of government are provided in Appendix 2. An index of field study locations is available in Appendix 3.

All imagery and data are in Lansing, Michigan with EGLE WRD, Field Operations Support Section's Great Lakes Shorelands Unit and Wetlands, Lakes, and Streams Unit. The maps of proposed changes to Iosco County HREAs are in Appendix 4.

## **Oscoda Township**

The Township had 52 parcels designated in 1986 across three HREAs: Area A (South of 3 Mile Park), Area B (South of 3 Mile Park; contiguous with Area A), and Area C (Bachman Rd). All three areas were reviewed in the field. In general, the shoreline was densely developed with homes and cottages. The shoreline was generally flat with no bluff along the majority of the study area. In all three areas, beaches were observed to be inflating, vegetation was expanding lakeward, and coastal wetlands were forming. No active erosion was observed in Oscoda Township during the April 2023 field work. A comparison of the historic and modern EHLs showed an average annual recession rate of less than 1 foot per year throughout the entire study area. The designations should be removed. It is worth noting that unlike much of the county, shoreline armoring was not prevalent in Oscoda Township and the shoreline appeared to be highly functioning with growing foredunes, wide beaches, and sand bars.

## **Au Sable Township**

The Township had 91 parcels designated in 1986 across four HREA's: Area A, Area B, Area C, and Area D. In addition to the previously designated areas, the previously undesignated areas between HREA's B & C and C & D were also studied after evidence of erosion was observed on

aerial photography and obliques prior to the field work. In general, the shoreline across the entirety of the township is flat with little to no bluff. Areas in northern part of the township nearer the mouth of the Au Sable River had more beach compared to areas to the south, much of which had little to no beach. Many of the township's private properties are armored with seawalls and revetments. Active erosion was observed in a few properties near and south of HREA B. No other active erosion was observed in the township. The EHL was observed at the top of shoreline armoring structures across much of the study area. A comparison of the historic and modern EHLs showed an average annual recession rate of less than 1 foot per year throughout the entire study area. The designations should be removed. No new designations are proposed in Au Sable Township as a result of this study.

## **Baldwin Township**

The Township had 400 parcels designated in 1986 across two HREA's: Area A and Area B. The 1986 study noted that the township had "recession rates as high as any found on the US side of Lake Huron." During the current study, the shoreline of Baldwin Township was observed to be heavily armored with only a few areas containing natural beach and coastal wetlands. In areas of significant shoreline armoring, there is little natural shoreline function, and the reflection of wave energy was observed. A comparison of the historic and modern EHLs showed an average annual recession rate of less than 1 foot per year in the majority of the study area. 393 of the originally designated parcels no longer meet the HREA designation requirements and the designations should be removed from these properties.

A comparison of the historic and modern EHL in three previously designated areas between East Birch Drive and Tawas Point State Park showed an average annual recession rate of 1 foot or more per year. Parcels in these three areas continue to meet the definition of a HREA and the designation should remain with updates to the rates and projected recession distances (PRD) as discussed below.

HREA C (East Birch Drive) contains four parcels. During field review, a flat shoreline with little beach was observed. In 1986, the parcels were found to have an average annual rate of recession of 4.5 feet per year with a 30-year PRD of 150 feet and a 60-year PRD of 230 feet. A portion of one of the parcels was located in a different sub-HREA in 1986 had an average annual rate of erosion of 1.1 feet per year. The recent comparison of the modern and historic EHL found an average annual rate of erosion of 1.5 feet per year. The proposed new 30-year PRD for readily moveable structures is 60 feet. The proposed new 60-year PRD for permanent structures is 105 feet. This result is a *lower setback* (L) with the exception of the portion of the one parcel mentioned in which it is an *increase setback* (IS).

HREA D (Baldwin Resort) contains one parcel that was designated in 1986. The parcel is large and was split between two sub-HREA's in 1986: the northern portion of the parcel had a previous recession rate of 3.8 feet per year; the southern portion of the parcel had a previous recession rate of 1.6 feet per year. During field review, active erosion was observed along much of the parcel. The EHL was observed to be along the top of a low (approximately 5 feet high) bluff with a wave cut face. Many fallen trees and other evidence of erosion typical of a HREA were observed along this shoreline. The recent comparison of the modern and historic EHL found an average annual rate of recession of 2.5 feet per year. The parcel continues to meet the definition of a HREA and should remain designated. The proposed 30-year PRD for readily

moveable structures is 90 feet. The proposed 60-year PRD is 165 feet. This is a *lower setback* (L) for the northern portion of the parcel and an *increase setback* (IS) for the southern portion of the parcel. It should be noted that this parcel contains shoreline on both Tawas Bay and the open coast of Lake Huron. The HREA designation applies only to the open coast of Lake Huron shoreline of the parcel.

HREA E (Tawas Point) contains two parcels that were designated in 1986. Both parcels are owned by the Michigan Department of Natural Resources as part of Tawas Point State Park. In 1986, the shoreline of these parcels was found to have a recession rate of 1.6 feet per year. Field review of this area indicated recent active erosion and recession of the shoreline as did review of aerial imagery/oblique photographs. The recent comparison of the modern and historic EHL found an average annual recession rate of 2.5 feet per year. The parcels continue to meet the definition of a HREA and should remain designated. The proposed 30-year PRD for readily moveable structures is 90 feet. The proposed 60-year PRD for permanent structures is 165 feet. This is an *increase setback* (IS) for the parcels. It should be noted that one of the parcels contains shoreline on both Tawas Bay and the open coast of Lake Huron. The HREA designation applies only to the open coast of Lake Huron shoreline of the parcel.

### **City of East Tawas**

The city had 57 parcels designated in 1986 across three HREA's: Area A, Area B, and Area C. Due to access, only Area C was reviewed in the field. Observations from aerial photography and obliques combined with the field observations at Area C indicate that the shoreline of the city is heavily armored with seawalls and revetments. Little natural shoreline remains. No active erosion was observed during the field review; however, armoring is indicative of past erosion. A comparison of the historic and modern EHLs showed an average annual recession rate of less than 1 foot per year throughout the entire study area. The designations should be removed.

### **City of Tawas**

The city had 54 parcels designated in 1986 across four HREA's: Area A, Area B, Area C, and Area D. Due to access, only Areas B and D were reviewed in the field. At Area B, a beach was present within the City Park and it appeared to be inflating. A large, filled pier structure exists at the City Park and it is likely that the structure interferes with longshore drift processes. Observations from the pier end confirm observations from aerial imagery and obliques that the majority of the City's shoreline is armored with little to no natural shoreline or beach. At Area D, a heavily armored shoreline of seawalls and revetments was observed. There was no beach along the visible shoreline and no active erosion was present given the armoring structures; however, armoring is indicative of past erosion. A comparison of the historic and modern EHLs showed an average annual recession rate of less than 1 foot per year throughout the entire study area. The designations should be removed.

### **Alabaster Township**

The Township had 136 parcels designated in 1986 across five HREA's: Area A, Area B, Area C, Area D, and Area E. In general, the Township was heavily armored with seawalls and revetments. Little to no beaches were observed along the armored shorelines and the natural shoreline function appears to be diminished in these areas. The major exceptions to this were

beaches and growing coastal wetlands observed at unarmored shorelines found generally where US Gypsum Company owned large parcels as well as a large township owned parcel along the County line. The shorelines at Areas A, B, and E were reviewed in the field. The shoreline at Areas C and D were not reviewed in the field due to access. In areas A and B, a heavily armored shoreline with no active erosion was observed. Aerial imagery and obliques indicate that the shorelines in Areas C and D are also heavily armored with little beach. The comparison of the EHL was much more variable in Area E. At the north of Area E, an inflating beach and dune was observed with no active erosion. Further south, along Keystone Road, significant active erosion was observed with a wave cut face along a low (~5 feet in height) bluff and many fallen trees. Further south on a large Township owned parcel a natural sand and cobble beach backed by forest with evidence of active erosion such as fallen trees was observed.

In addition to the four previously designated HREA's, several of the previously undesignated areas were studied. The area between HREA A and B was included in the study area as it is a relatively short stretch of shoreline that in 1986 almost met the designation criteria. The area between HREA B and C was included in the study. This area was reviewed in the field and was observed to have less armoring than other areas of the Township and an inflating beach and growing coastal wetland was observed. The area between HREA D and E was included in the study. This area was reviewed in the field and found to be heavily armored. The shoreline south of Area E was also included in the study and reviewed in the field. The shoreline was found to be a natural sand and cobble beach backed by forest with evidence of active erosion such as fallen trees.

In HREA A, the area between HREA A and B, HREA B, the area between HREA B and C, HREA C, HREA D, and the area between HREA D and E, a comparison of the modern and historic EHLs showed an average annual recession rate of less than 1 foot per year. The designations should be removed. No new designations are proposed in these areas as a result of this study.

In HREA E and the area south to the County line, a comparison between the modern and historic EHLs showed an average annual recession rate of less than 1 foot per year in all but two areas: near Keystone Road and the large Township owned parcel in the South of the study area. The designations should be removed in all areas except for those two identified here.

HREA F (Keystone Road) contains 6 parcels, two of which were designated in 1986 with an average annual recession rate of 1.8 feet per year. Four parcels are proposed to be a *new designation* (N). These parcels are along the previously designated shoreline but were not designated in 1986 as they are second tier parcels from the shoreline. Since the 1986 designation, the shoreline in this location has receded sufficiently such that the proposed PRD's extend onto these four parcels. The recent comparison of the modern and historic EHL at this location showed an average annual rate of recession of 1.3 feet per year. The first analysis using 150 feet spaced transects showed some uncertainty in this area. Given the observations of active erosion typical of a HREA, this area was further analyzed with 50 feet spaced transects, which confirmed that the recession rate on these parcels meets the definition of a HREA and should remain designated. The proposed 30-year PRD for readily moveable structures is 55 feet. The proposed 60-year PRD for permanent structures is 95 feet. This is a *lower setback* (L) for the previously designated parcels.



HREA G (South County Line) contains the Township owned parcel described above. Portions of this parcel were designated in 1986 with an average annual rate of recession of 1.8 feet per year. The recent comparison of the modern and historic EHL at this location showed an average annual rate of recession of 1.3 feet per year. The parcel meets the definition of a HREA and should remain designated. The proposed 30-year PRD for readily moveable structures is 55 feet. The proposed 60-year PRD for permanent structures is 95 feet. This is a *lower setback* (L) for the northern portion of the parcel. It is a *new designation* (N) for the southern portion of the parcel.

## Summary

The recession rate study meets the technical requirements of R 281.22(2)(2). The study reviewed data spanning 33 years. The study found that three areas of existing high risk erosion area continue to meet the designation criteria in Baldwin Township and two areas of existing high risk erosion area continue to meet the designation criteria in Alabaster Township. These shorelines will remain designated with updated recession rates and projected recession distances from this study. The high risk erosion area designation should be removed from all other shorelines designated in 1986 as they no longer meet the requirements of a high risk erosion area. Future studies may indicate erosion is occurring and meets the statutory limits for identification as a high risk erosion area as described in Part 323 and the Great Lakes Shorelands Administrative Rules. While much of Iosco County is no longer considered to be high risk, erosion is a natural and expected process along the Great Lakes shoreline. Erosion can and will occur in shorelines that meet and do not meet the definition of a high risk erosion area.

## References

Iosco County Master Plan. 2013. <https://iosco.net/wp-content/uploads/Master-Plan.pdf>

United States Army Corps of Engineers. 2021. Coordinated Monthly Mean Lakewide Average Water Levels, 1918-2021. <https://www.usace.army.mil/>

United States Census Bureau. 2020. [factfinder.census.gov](https://factfinder.census.gov).

WRD-SWAS-028. 2016. Department of Environmental Quality, Water Resources Division, Surface Water Assessment Section Procedure, Part 323 – Determining Recession Rates of Great Lakes Shorelines

## Appendix 1. Photos from April 19-20, 2023, Fieldwork

This appendix includes a selection of photos from the April 2023 field work and is not a complete log of all photos, notes, and data collected.



Photo 1: Looking north along vegetation line in Oscoda Township, HREA B – South of 3 Mile Park. Note the inflating beach and expanding vegetation.



Photo 2: Looking south along vegetation line in Oscoda Township, HREA C – Bachman Rd. Note the inflating beach and growing coastal wetland.



Photo 3: Looking south along the vegetation line in Au Sable Township, HREA A – South of River. Note the growing beach.



Photo 4: Eroding parcel between armored parcels in Au Sable Township between HREA B and C – Along US-23.



Photo 5: Armored shoreline in Au Sable Township, HREA D – Along US-23.



Photo 6: Looking south from the north end of HREA A – Iris Drive in Baldwin Township. Note the significant armoring to the south.



Photo 7: Looking south from the north end of HREA B – Arbutus Drive, Baldwin Township. Note the significant armoring to south.



Photo 8: Armored, unarmored, and failed armor in background at HREA C – East Birch Road, Baldwin Township.



Photo 9: Looking north along EHL in HREA D – Balwin Resort, Baldwin Township. Note the wave cut face and fallen trees.



Photo 10: Looking north along EHL in HREA E – Tawas Point State Park, Baldwin Township. Note the recently installed revetment and evidence of erosion damage to road.



Photo 11: Looking west along the beach toward armored shoreline in HREA C – East Tawas City Park, City of East Tawas.



Photo 12: Looking north along heavily armored shoreline in HREA D – Townline Road, Tawas City



Photo 13: Looking south along armored shoreline in HREA B – Townline Road to Douglas Road, Alabaster Township



Photo 14: Looking north along beach in previously undesignated shoreline between HREA B and C, Alabaster Township. Note the expanding vegetation and inflating beach.





Photo 15: Looking south along EHL in HREA F – Keystone Road, Alabaster Township. Note the actively eroding shoreline and fallen trees.



Photo 16: Looking north in HREA G – South County Line, Alabaster Township. Note the ridge of rocks that appear to be shoved by ice or waves and the fallen trees.

## Appendix 2. Summary of Results

All mileage is approximate in all of the following tables.

Table 1. County Wide

<b>Year of Designation</b>	<b>1986</b>	<b>2024</b>
Miles of Shoreline in the County = 36.2		
Miles of Shoreline Studied	Unknown	19.6
Miles of Shoreline Designated	15.11	2.39
Miles of Shoreline Newly Designated	15.11	0
Miles of Shoreline with Designation Removed	NA	12.72
# of HREA's*	20	5
# of Parcels Designated	790	14
# of Parcels Newly Designated	790	4
# of Parcels Remain Designated	NA	10
# of Parcels with Designation Removed	NA	780
Highest Rate of Recession (ft/yr) and PRDs** (ft)	9.2; 290/565	2.5; 90/165
Lowest Rate of Recession (ft/yr) and PRDs (ft)	1.1; 35/65	1.3; 55/95

\*HREA is High Risk Erosion Area per Part 323, Shorelands Protection and Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

\*\*PRD is the Projected Recession Distance (feet) at 30 years and 60 years, respectively, as referred to in Rule 281.22 of the Great Lakes Shorelands Administrative Rules.

Table 2a. Oscoda Township Summary of Results

<b>Year of Designation</b>	<b>1986</b>	<b>2024</b>
Miles of shoreline in township = 6.6		
Miles of shoreline studied	Unknown	1.04
Historic photo year	1938; 1952	1989
Modern photo year	1979	2022
Number of years between historic and modern imagery	41; 27	33
Miles of shoreline designated	1.3	0
Miles of shoreline newly designated	1.3	0
Miles of shoreline that will remain designated	NA	0
Miles of shoreline with designation removed	NA	1.3
# of HREAs	3	0
# of parcels designated	52	0
# of parcels newly designated	52	0
# of parcels remain designated	NA	0
# of parcels with designation removed	NA	52
Highest rate of recession (ft/yr) and PRDs (ft)	1.6; 45/95	NA
Lowest rate of recession (ft/yr) and PRDs (ft)	1.1; 35/65	NA

Table 2b. Oscoda Township average annual recession rates and projected recession distances\*

Study Site Name (HREA)	1986 Rate (ft/yr)	1986 PRD30 (ft)	1986 PRD60 (ft)	2024 Rate (ft/yr)	2024 PRD30 (ft)	2024 PRD60 (ft)	2024 HREA	2024 Update Code
South of 3 Mile Park (A)	1.1	35	65	<1.0	NA	NA	NA	Dedesignated
South of 3 Mile Park (B)	1.6	45	95	<1.0	NA	NA	NA	Dedesignated
Bachman Road (C)	1.3	40	80	<1.0	NA	NA	NA	Dedesignated

\*Study Site's with a descriptive name were reviewed in the field

Table 3a. Au Sable Township Summary of Results

Year of Designation	1986	2024
Miles of shoreline in township = 5.8		
Miles of shoreline studied	Unknown	3.72
Historic photo year	1938; 1948; 1952	1989
Modern photo year	1974; 1979	2022
Number of years between historic and modern imagery	22-41 years	33
Miles of shoreline designated	1.9	0
Miles of shoreline newly designated	1.9	0
Miles of shoreline that will remain designated	NA	0
Miles of shoreline with designation removed	NA	1.9
# of HREAs	4	0
# of parcels designated	91	0
# of parcels newly designated	91	0
# of parcels remain designated	NA	0
# of parcels with designation removed	NA	91
Highest rate of recession (ft/yr) and PRDs (ft)	9.2; 290/565	NA
Lowest rate of recession (ft/yr) and PRDs (ft)	1.3; 40/80	NA

Table 3b. Au Sable Township average annual recession rates and projected recession distances\*

Study Site Name (HREA)	1986 Rate (ft/yr)	1986 PRD30 (ft)	1986 PRD60 (ft)	2024 Rate (ft/yr)	2024 PRD30 (ft)	2024 PRD60 (ft)	2024 HREA	2024 Update Code
North of Au Sable River (A1)	2.9	100	190	<1.0	NA	NA	NA	Dedesignated
South of Au Sable River (A2)	9.2	290	565	<1.0	NA	NA	NA	Dedesignated
HREA A3	4.1	140	260	<1.0	NA	NA	NA	Dedesignated
Along US 23 (B1)	2.2	80	145	<1.0	NA	NA	NA	Dedesignated
Along US 23 (B2)	1.3	40	80	<1.0	NA	NA	NA	Dedesignated
Along US 23 (C)	1.5	45	90	<1.0	NA	NA	NA	Dedesignated
Along US 23 (D)	1.4	55	100	<1.0	NA	NA	NA	Dedesignated

\*Study Site's with a descriptive name were reviewed in the field

Table 4a. Baldwin Township Summary of Results

Year of Designation	1986	2024
Miles of shoreline in township = 13.0		
Miles of shoreline studied	Unknown	6.12
Historic photo year	1938; 1952	1989
Modern photo year	1973	2022
Number of years between historic and modern imagery	35; 21	33
Miles of shoreline designated	6.12	1.63
Miles of shoreline newly designated	6.12	0
Miles of shoreline that will remain designated	NA	1.63
Miles of shoreline with designation removed	NA	4.49
# of HREAs*	2	3
# of parcels designated	400	7
# of parcels newly designated	400	0
# of parcels remain designated	NA	7
# of parcels with designation removed	NA	393
Highest rate of recession (ft/yr) and PRDs (ft)	4.5; 150/285	2.5; 90/165
Lowest rate of recession (ft/yr) and PRDs** (ft)	1.1; 50/80	1.5; 60/105

Table 4b. Baldwin Township average annual recession rates and projected recession distances\*

Study Site Name (HREA)	1986 Rate (ft/yr)	1986 PRD30 (ft)	1986 PRD60 (ft)	2024 Rate (ft/yr)	2024 PRD30 (ft)	2024 PRD60 (ft)	2024 HREA	2024 Update Code
Iris Dr (A1)	1.5	45	90	<1.0	NA	NA	NA	Dedesignated
Kirkland Dr (A2)	3.7	110	220	<1.0	NA	NA	NA	Dedesignated
HREA A3	1.6	65	110	<1.0	NA	NA	NA	Dedesignated
HREA A4	3.0	105	195	<1.0	NA	NA	NA	Dedesignated
HREA A5	1.3	40	80	<1.0	NA	NA	NA	Dedesignated
Forest St (A6)	3.2	110	205	<1.0	NA	NA	NA	Dedesignated
Wolverine Dr (A7)	2.3	85	155	<1.0	NA	NA	NA	Dedesignated
Huron Hills (B1)	1.5	60	105	<1.0	NA	NA	NA	Dedesignated
HREA B2	2.2	80	145	<1.0	NA	NA	NA	Dedesignated
E Birch St (C)	4.5	150	285	1.5	60	105	C	Setback Lowered (L)
E Birch St (C)	1.1	50	80	1.5	60	105	C	Setback Increased (IS)
Baldwin Resort (D)	3.8	115	230	2.5	90	165	D	Setback Lowered (L)
Baldwin Resort (D)	1.6	65	110	2.5	90	165	D	Setback Increased (IS)
Tawas Point State Park (E)	1.6	65	110	2.5	90	165	E	Setback Increased (IS)

\*Study Site's with a descriptive name were reviewed in the field.

Table 5a. City of East Tawas Summary of Results

<b>Year of Designation</b>	<b>1986</b>	<b>2024</b>
Miles of shoreline in city = 2.0		
Miles of shoreline studied	Unknown	1.44
Historic photo year	1938	1989
Modern photo year	1973	2022
Number of years between historic and modern imagery	35	33
Miles of shoreline designated	1.44	0
Miles of shoreline newly designated	1.44	0
Miles of shoreline that will remain designated	NA	0
Miles of shoreline with designation removed	NA	1.44
# of HREAs*	3	0
# of parcels designated	57	0
# of parcels newly designated	57	0
# of parcels remain designated	NA	0
# of parcels with designation removed	NA	57
Highest rate of recession (ft/yr) and PRDs (ft)	2.1; 75/140	NA
Lowest rate of recession (ft/yr) and PRDs** (ft)	1.6; 60/110	NA

Table 5b. City of East Tawas average annual recession rates and projected recession distances\*

<b>Study Site Name (HREA)</b>	<b>1986 Rate (ft/yr)</b>	<b>1986 PRD30 (ft)</b>	<b>1986 PRD60 (ft)</b>	<b>2024 Rate (ft/yr)</b>	<b>2024 PRD30 (ft)</b>	<b>2024 PRD60 (ft)</b>	<b>2024 HREA</b>	<b>2024 Update Code</b>
HREA A	1.6	60	110	<1.0	NA	NA	NA	Dedesignated
HREA B	2.1	75	140	<1.0	NA	NA	NA	Dedesignated
East Tawas City Park (C^)	1.6	60	110	<1.0	NA	NA	NA	Dedesignated

\*Study Site's with a descriptive name were reviewed in the field.

^The third HREA area, what would have been HREA C of East Tawas, was originally designated as part of HREA A of the City of Tawas City.

Table 6a. City of Tawas Summary of Results

<b>Year of Designation</b>	<b>1986</b>	<b>2024</b>
Miles of shoreline in city = 2.5		
Miles of shoreline studied	Unknown	1.35
Historic photo year	1938	1989
Modern photo year	1973	2022
Number of years between historic and modern imagery	35	33
Miles of shoreline designated	1.35	0
Miles of shoreline newly designated	1.35	0
Miles of shoreline that will remain designated	NA	0
Miles of shoreline with designation removed	NA	1.35
# of HREAs*	4	0
# of parcels designated	54	0
# of parcels newly designated	54	0
# of parcels remain designated	NA	0
# of parcels with designation removed	NA	54
Highest rate of recession (ft/yr) and PRDs (ft)	2.9; 85/175	NA
Lowest rate of recession (ft/yr) and PRDs** (ft)	1.1; 35/65	NA

Table 6b. City of Tawas average annual recession rates and projected recession distances\*

<b>Study Site Name (HREA)</b>	<b>1986 Rate (ft/yr)</b>	<b>1986 PRD30 (ft)</b>	<b>1986 PRD60 (ft)</b>	<b>2024 Rate (ft/yr)</b>	<b>2024 PRD30 (ft)</b>	<b>2024 PRD60 (ft)</b>	<b>2024 HREA</b>	<b>2024 Update Code</b>
HREA A	1.6	60	110	<1.0	NA	NA	NA	Dedesignated
Tawas City Shoreline Park (B)	2.9	85	175	<1.0	NA	NA	NA	Dedesignated
HREA C	1.1	35	65	<1.0	NA	NA	NA	Dedesignated
Townline Road (D)	1.4	60	100	<1.0	NA	NA	NA	Dedesignated

\*Study Site's with a descriptive name were reviewed in the field.

Table 7a. Alabaster Township Summary of Results

<b>Year of Designation</b>	<b>1986</b>	<b>2024</b>
Miles of shoreline in township = 6.3		
Miles of shoreline studied	Unknown	5.9
Historic photo year	1938	1989
Modern photo year	1979	2022
Number of years between historic and modern imagery	41	33
Miles of shoreline designated	3	0.76
Miles of shoreline newly designated	3	0.06
Miles of shoreline that will remain designated	NA	0.7
Miles of shoreline with designation removed	NA	2.24
# of HREAs*	5	2
# of parcels designated	136	7
# of parcels newly designated	136	4
# of parcels remain designated	NA	3
# of parcels with designation removed	NA	133
Highest rate of recession (ft/yr) and PRDs (ft)	1.8; 70/125	1.3; 55/95
Lowest rate of recession (ft/yr) and PRDs** (ft)	1.1; 35/65	1.3; 55/95

Table 7b. Alabaster Township average annual recession rates and projected recession distances\*

<b>Study Site Name (HREA)</b>	<b>1986 Rate (ft/yr)</b>	<b>1986 PRD30 (ft)</b>	<b>1986 PRD60 (ft)</b>	<b>2024 Rate (ft/yr)</b>	<b>2024 PRD30 (ft)</b>	<b>2024 PRD60 (ft)</b>	<b>2024 HREA</b>	<b>2024 Update Code</b>
Townline Road, along Bay Drive to Douglas Road (A) (B)	1.4; 1.1	60; 35	100; 65	<1.0	NA	NA	NA	Dedesignated
HREA C	1.4	40	85	<1.0	NA	NA	NA	Dedesignated
HREA D	1.2	35	70	<1.0	NA	NA	NA	Dedesignated
Keystone Road (E)	1.8	70	125	1.3	55	95	F	Setback Lowered (L)
South County Line (E)	1.8	70	125	1.3	55	95	G	Setback Lowered (L)

\*Study Site's with a descriptive name were reviewed in the field.

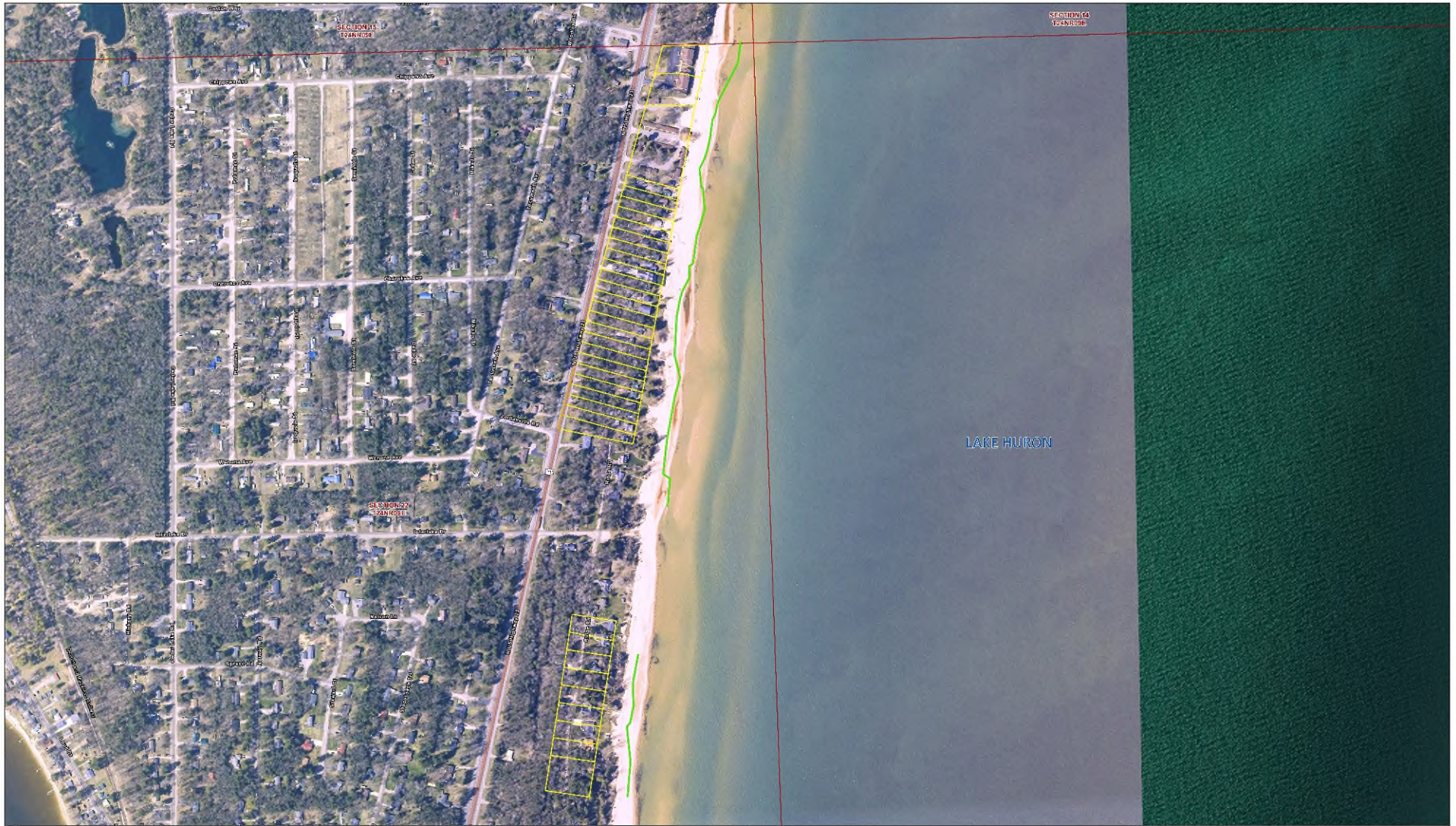


### Appendix 3. Index of Field Study Locations

<b>Local Unit of Government</b>	<b>Study Site Name (HREA)</b>	<b>Township Range Section</b>
Oscoda Township	South of 3 Mile Park (A)	T24N R09E Section 22
Oscoda Township	South of 3 Mile Park (B)	T24N R09E Section 22
Oscoda Township	Bachman Road (C)	T24N R09E Section 34
Au Sable Township	North of Au Sable River (A)	T23N R09E Sections 10, 11
Au Sable Township	South of Au Sable River (A)	T23N R09E Sections 10, 11
Au Sable Township	Along US 23 (B)	T23N R09E Section 15
Au Sable Township	Along US 23	T23N R09E Sections 15, 22
Au Sable Township	Along US 23 (C)	T23N R09E Section 27
Au Sable Township	Along US 23 (D)	T23N R09E Section 27
Baldwin Township	Iris Drive (A)	T22N R09E Section 5
Baldwin Township	Kirkland Drive (A)	T22N R09E Section 5
Baldwin Township	Forest Street (A)	T22N R09E Section 7
Baldwin Township	Wolverine Drive (A)	T22N R08E Section 13
Baldwin Township	Huron Hills (B)	T22N R08E Section 24
Baldwin Township	East Birch Street (C)	T22N R08E Section 26
Baldwin Township	Baldwin Resort (D)	T22N R08E Section 26
Baldwin Township	Tawas Point State Park (E)	T22N R08E Section 34, 35
East Tawas	East Tawas City Park (C)	T22N R08E Section 29
Tawas City	Tawas City Shoreline Park (B)	T22N R08E Section 30
Tawas City	Townline Road (D)	T22N R07E Section 36
Alabaster Township	Townline Road (A)	T21N R07E Section 1
Alabaster Township	Along Bay Drive (B)	T21N R07E Section 1
Alabaster Township	Along Bay Drive	T21N R07E Section 2
Alabaster Township	Alabaster Road End	T21N R07E Section 14, 23
Alabaster Township	Keystone Road (F)	T21N R07E Section 5
Alabaster Township	South County Line (G)	T21N R07E Section 34

### Appendix 4. Preliminary Maps

# Map 1a. Oscoda Township HREA A and B Dededesignation Parcels

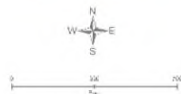


## High-Risk Erosion Area Update - 2023

Oscoda Township, Iosco County  
T24N, R09E Sections 22

### High Risk Erosion Areas De-Designated Parcels

- 100' HREA's (SECTION 14-24)
  - Erosion Designated Parcels
  - Sections
- Background Year: 2022



#### MAP INFORMATION:

This map identifies potential high-risk erosion areas under Part 323, Standards Protection and Maintenance, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. The shaded areas indicate an average rate of recession of at least one foot per year.

Background images as well as soils and survey data were provided by the State of Michigan, Center for Data Solutions and Technology Partnerships.

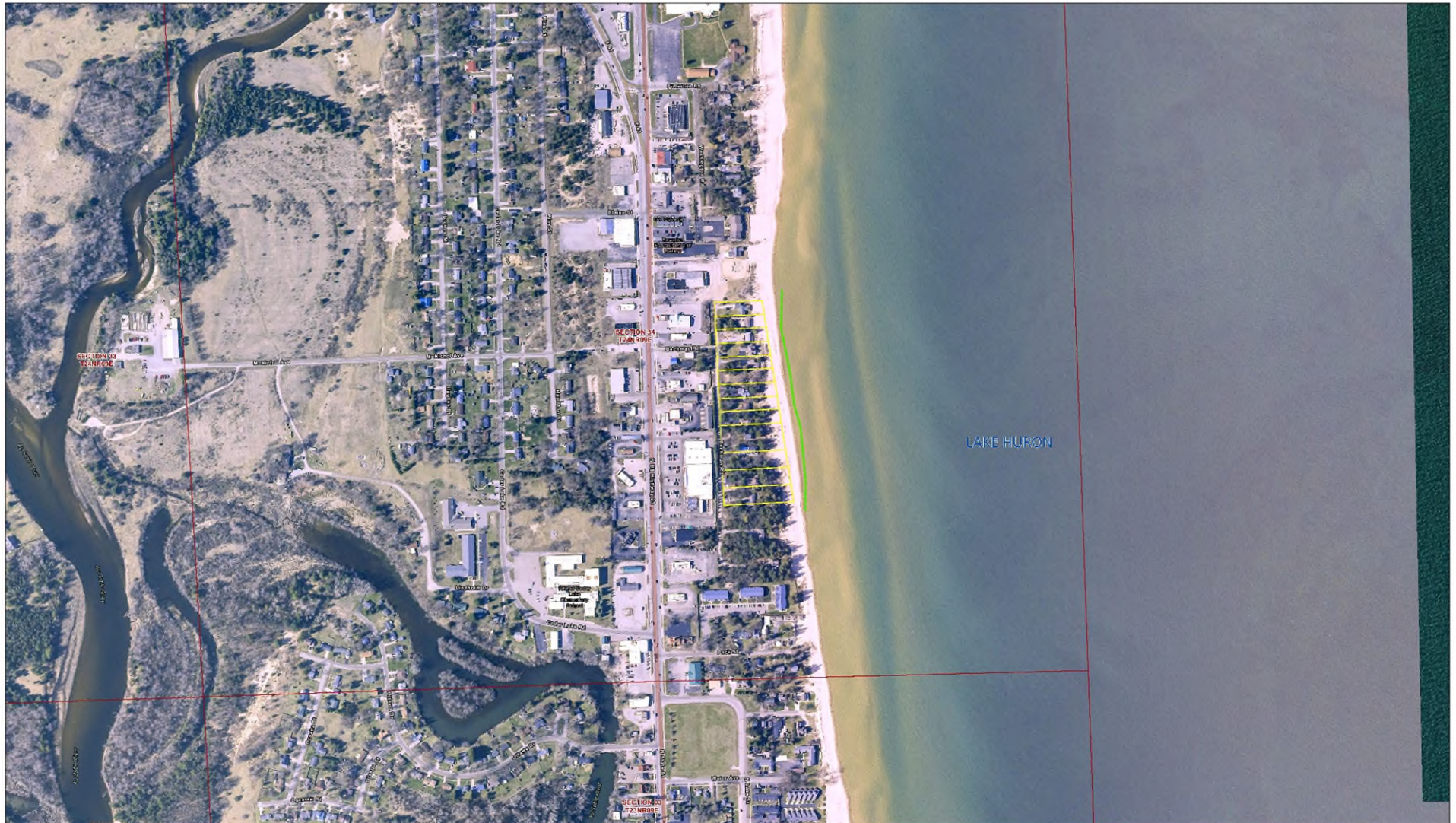
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# Map 1b. Oscoda Township HREA C Dedesignation Parcels

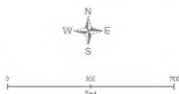


## High-Risk Erosion Area Update - 2023

Oscoda Township, Iosco County  
T24N, R09E Sections 34

### High Risk Erosion Areas De-Designated Parcels

- 2023 HREAs to be de-designated
  - Existing High Risk Erosion Areas
  - Sections
- Background: 1/18/2023



#### MAP INFORMATION:

This map identifies potential high risk erosion areas under Part 322, Standards of Protection and Management, of the National Pollutant Discharge Elimination Act (NPDES), as amended. The shaded areas indicate an average rate of erosion of at least one foot per year.

Background images, as well as roads and survey data were provided by the State of Michigan, Center for Smart Solutions and Technology Advancement.

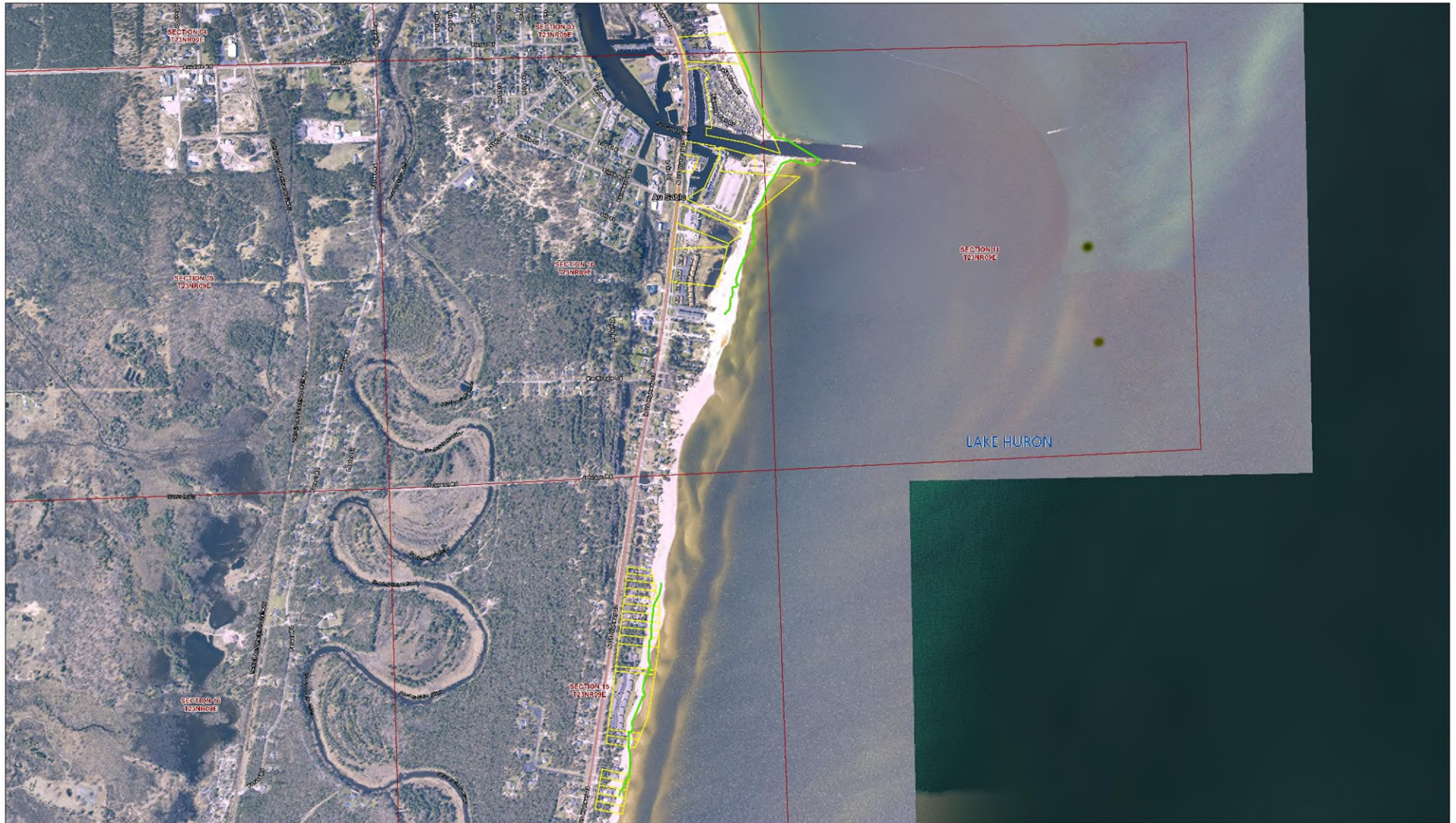
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# Map 2a. Au Sable Township HREA A and B Dedesignation Parcels

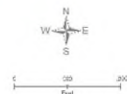


## High-Risk Erosion Area Update - 2023

Au Sable Township, Iosco County  
T23N, R09E Sections 10, 11, and 15

## High Risk Erosion Areas De-Designated Parcels

- 2023 HREAs (background)
  - De-Designated Parcels
  - Sections
- Background: 1/18/23, 2022



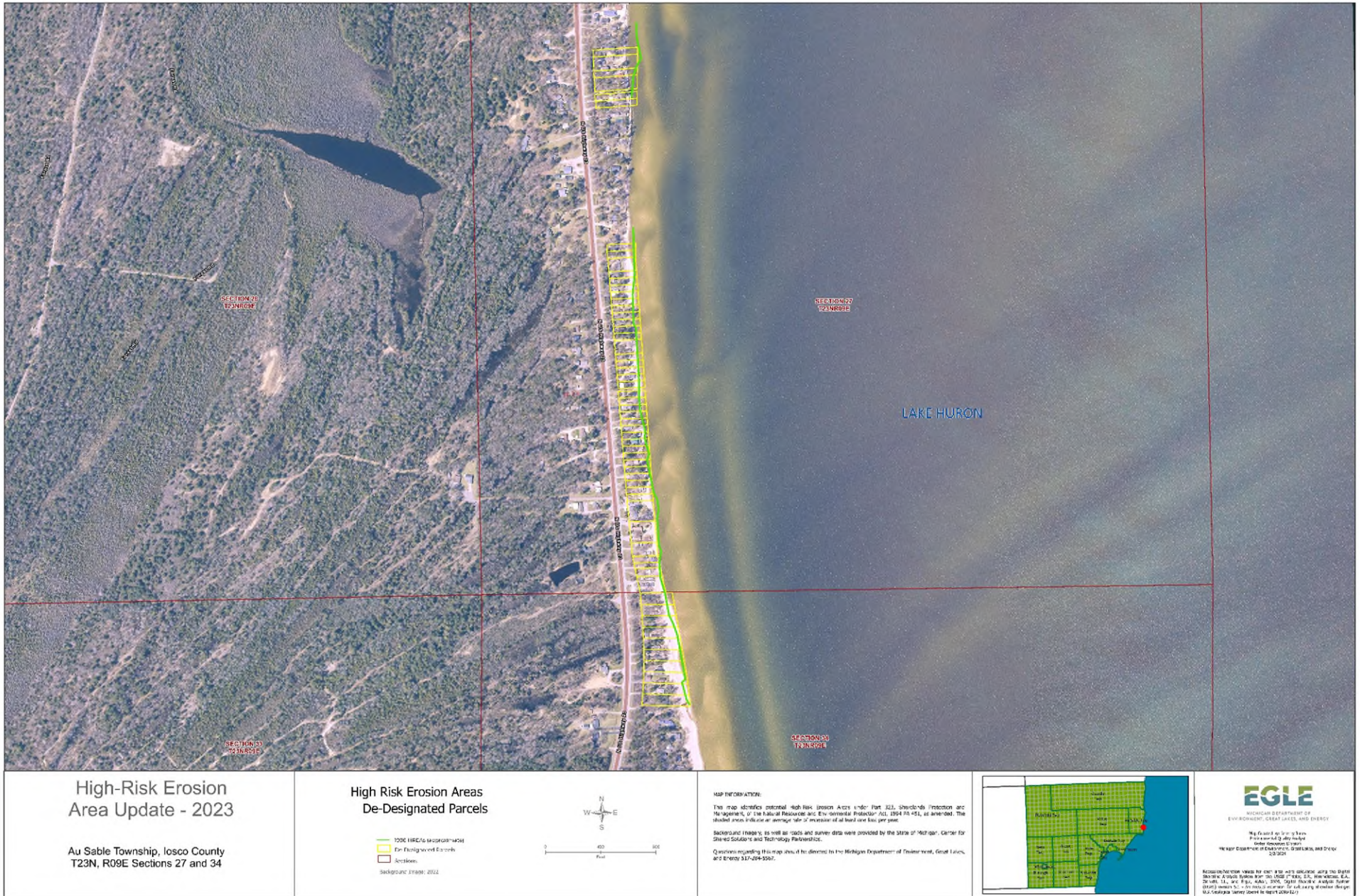
**MAP INFORMATION:**  
This map identifies potential high risk erosion areas under Part 322, Standards for Erosion and Sediment Control, of the Natural Resources and Environment Protection Act, 1994 PA 451, as amended. The shaded areas indicate an average rate of erosion of at least one foot per year.  
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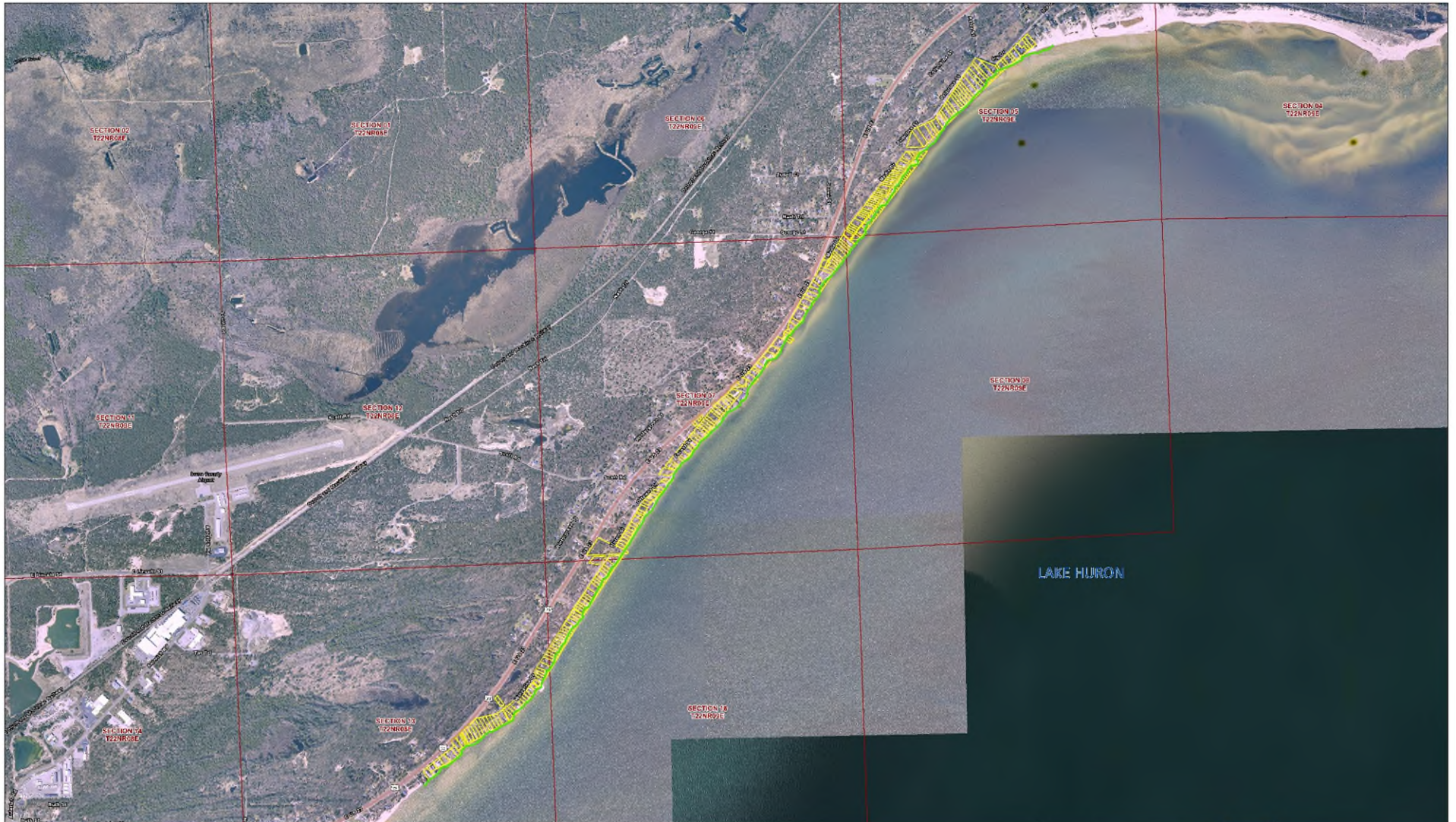
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Map 2b. Au Sable Township HREA C and D Dedesignation Parcels



Map 3a. Baldwin Township HREA A Dedesignation Parcels

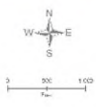


High-Risk Erosion Area Update - 2023

Baldwin Township, Iosco County  
T22N, R09E Sections 5, 7, 8, 13 and 18

High Risk Erosion Areas  
De-Designated Parcels

- 2006 HREAs (as designated)
  - Eri De-designated Parcels
  - Sections
- Background: 1/18/2022



**MAP INFORMATION:**  
This map identifies potential high risk erosion areas under Part 322, Standards for Erosion and Management, of the Natural Resources and Environment Protection Act, 1994 PA 451, as amended. The shaded areas indicate an average rate of erosion of at least one foot per year.  
Baldwin Township, as well as roads and survey data were provided by the State of Michigan, Center for Smart Solutions and Technology Solutions.  
Questions regarding this map should be directed to the Michigan Department of Transportation, Great Lakes, and Energy 317-694-5567.



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Map prepared by: **John P. Kavanagh**  
Professional Engineer  
Michigan Department of Environment, Great Lakes, and Energy  
2023/05/01

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Map 3b. Baldwin Township HREA B Dedesignation Parcels and Proposed HREA C and D Designation Parcels

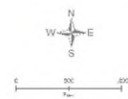


High-Risk Erosion Area Update - 2023

Baldwin Township, Iosco County  
T22N, R08E Sections 24, 23 and 26

High Risk Erosion Areas  
30 YR/60 YR Projected Recession Distance (Feet)  
Average Annual Rate of Recession (FT/YR)

- Area C 60' / 100' AVG. A.R. 6 FT/YR
  - Area D 60' / 100' AVG. A.R. 6 FT/YR
  - 1961 HREA parcels
  - 1978-2012 HREA parcels
  - Section
- Background Elevation: 2222



**MAP INFORMATION:**  
This map identifies potential high risk erosion areas under Part 322, Standards for Section and Management, of the Public Resources and Environmental Protection Act, 1994 PA 451, as amended. The shaded areas indicate an average rate of recession of at least one foot per year.  
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Map created by: J. J. Kinn  
Project Lead: J. J. Kinn  
Under Supervision: J. J. Kinn  
Michigan Department of Environment, Great Lakes, and Energy  
2023-02-01

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Map 3c. Baldwin Township HREA B Dedesignation Parcels and Proposed HREA E Designation Parcels

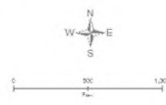


**High-Risk Erosion Area Update - 2023**

Baldwin Township, Iosco County  
T22N, R08E Sections 35, 34 and 3

**High Risk Erosion Areas**  
30 YR/60 YR Projected Recession Distance (Feet)  
Average Annual Rate of Recession (FT/YR)

- Area E: 90' / 1.67' / 1.67'
- 1961 HREA E Designation Parcels
- 1961 HREA B Dedesignation Parcels
- Background Image: 2022



**MAP INFORMATION:**

This map identifies potential high risk erosion areas under Part 322, Standards of Protection and Management, of the National Pollutant Discharge Elimination Act (NPDES), as amended. The shaded areas indicate an average rate of recession of at least one foot per year.

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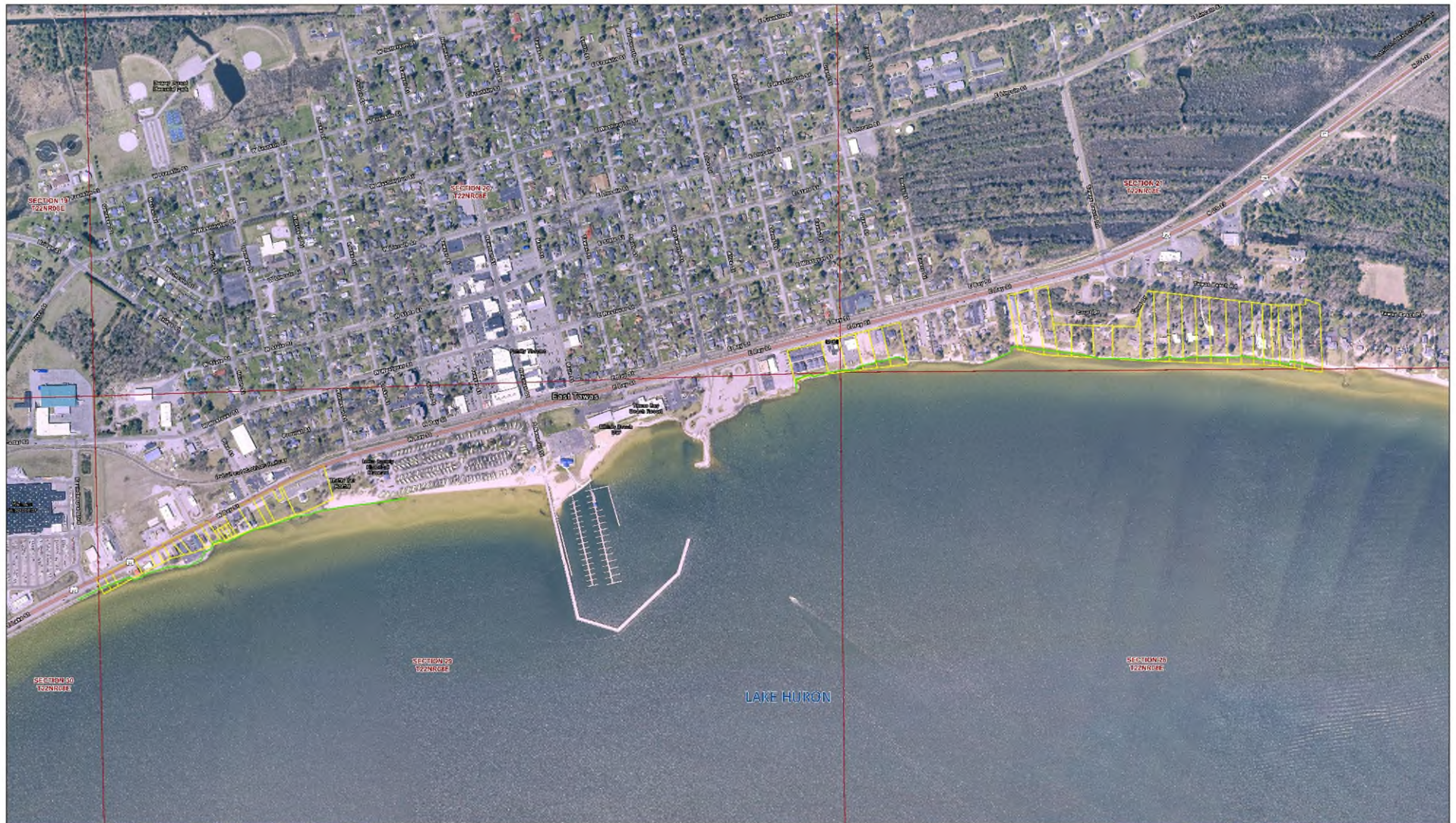


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Map 4a. City of East Tawas HREA A, B, and C Dededesignation Parcels and City of Tawas HREA A Dededesignation Parcels

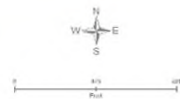


### High-Risk Erosion Area Update - 2023

East Tawas, Iosco County  
T22N, R08E Sections 20, 21 and 29

### High Risk Erosion Areas De-Designated Parcels

- High Risk Erosion Area
  - De-Designated Parcel
  - Sections
- Designation: Image: 7023



#### MAP INFORMATION:

This map identifies potential high risk erosion areas under Part 322, Standards for Erosion and Sediment Control, of the Natural Resources and Environment Protection Act, 1994 PA 451, as amended. The shaded areas indicate an average rate of erosion of at least one foot per year.

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# Map 5a. City of Tawas HREA B, C, and D Dedesignation Parcels



## High-Risk Erosion Area Update - 2023

City of Tawas, Iosco County  
T22N, R07E Sections 36, 31 and 30

### High Risk Erosion Areas De-Designated Parcels

- High Risk Erosion Area
  - De-Designated Parcel
  - Section
- Designation: Image: 7023



**MAP INFORMATION:**  
 This map identifies potential high-risk erosion areas under Part 322, Standards for erosion and management, of the Natural Resources and Environment Protection Act, 1994 PA 451, as amended. The shaded areas indicate an average rate of erosion of at least one foot per year.  
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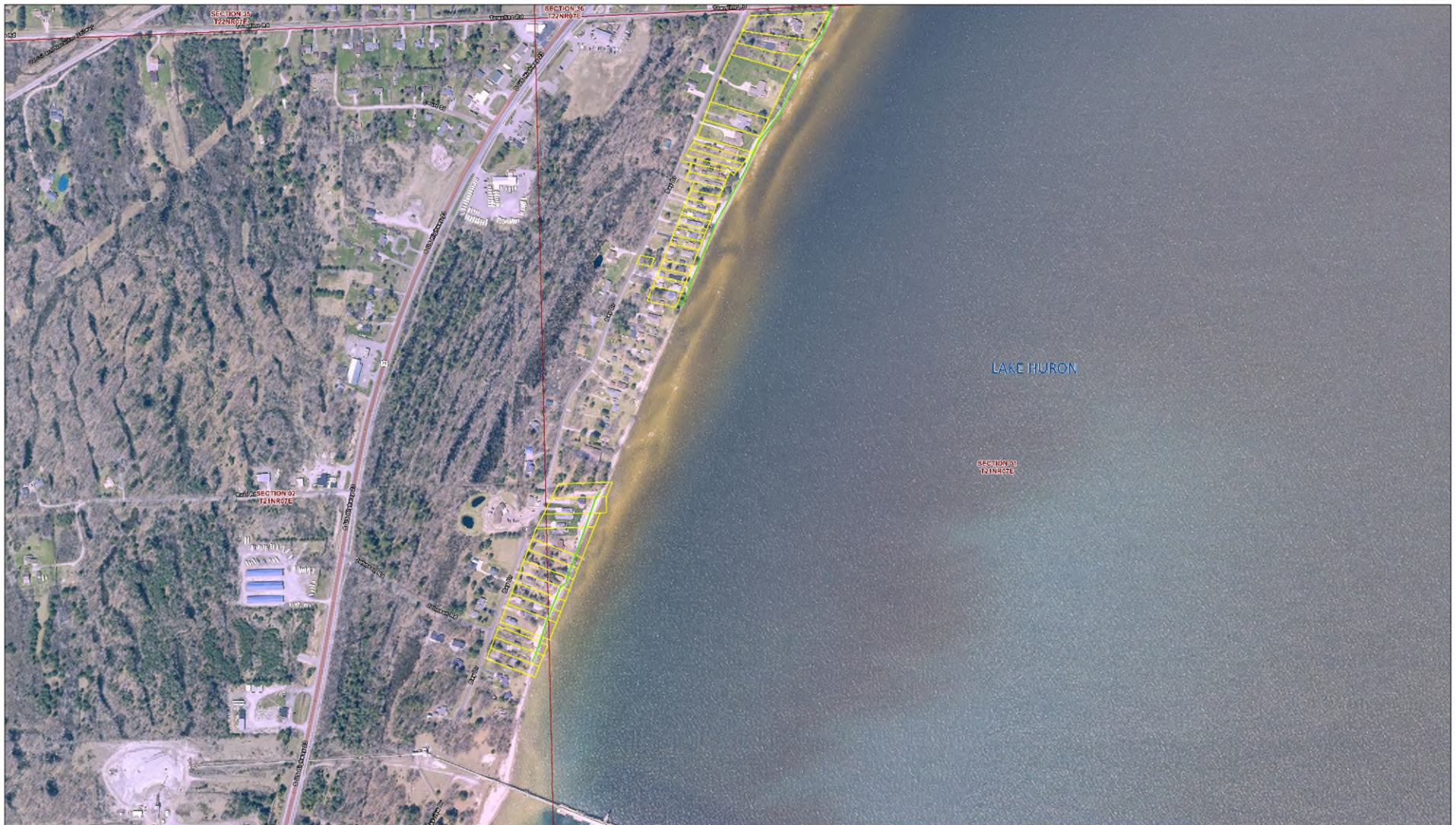


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# Map 6a. Alabaster Township HREA A and B Dedesignation Parcels

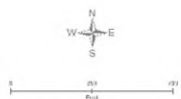


## High-Risk Erosion Area Update - 2023

Alabaster Township, Iosco County  
T21N, R07E Sections 1 and 2

## High Risk Erosion Areas De-Designated Parcels

- High Risk Erosion Area
  - De-Designated Parcel
  - Sections
- Designation: Image: 7027



**MAP INFORMATION:**  
This map identifies potential high risk erosion areas under Part 322, Standards for Erosion and Sediment Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. The shaded areas indicate an average rate of erosion of at least one foot per year.  
Sectors and shapefiles as well as roads and survey data were provided by the State of Michigan, Center for Smart Solutions and Technology Realization.  
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Map created by: J. J. Kinn  
Project Lead and Data Analyst  
Update Date: 05/2023  
Michigan Department of Environment, Great Lakes, and Energy  
2023/05/23

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Map 6b. Alabaster Township HREA C and D Dedesignation Parcels



High-Risk Erosion Area Update - 2023

Alabaster Township, Iosco County  
T21N, R07E Sections 11 and 14

High Risk Erosion Areas  
De-Designated Parcels

- High Risk Erosion Area
  - De-Designated Parcels
  - Sections
- Designation: Image: 7023



**MAP INFORMATION:**  
This map identifies potential high risk erosion areas under Part 302.3, Standards for erosion and management of the Natural Resources and Environment Protection Act, 1994 PA 451, as amended. The shaded areas indicate an average rate of erosion of at least one foot per year.  
Data and imagery as well as roads and survey data were provided by the State of Michigan, Center for Smart Solutions and Technology Solutions.  
Questions regarding this map should be directed to the Michigan Department of Environment, Great Lakes, and Energy 517-694-5567.

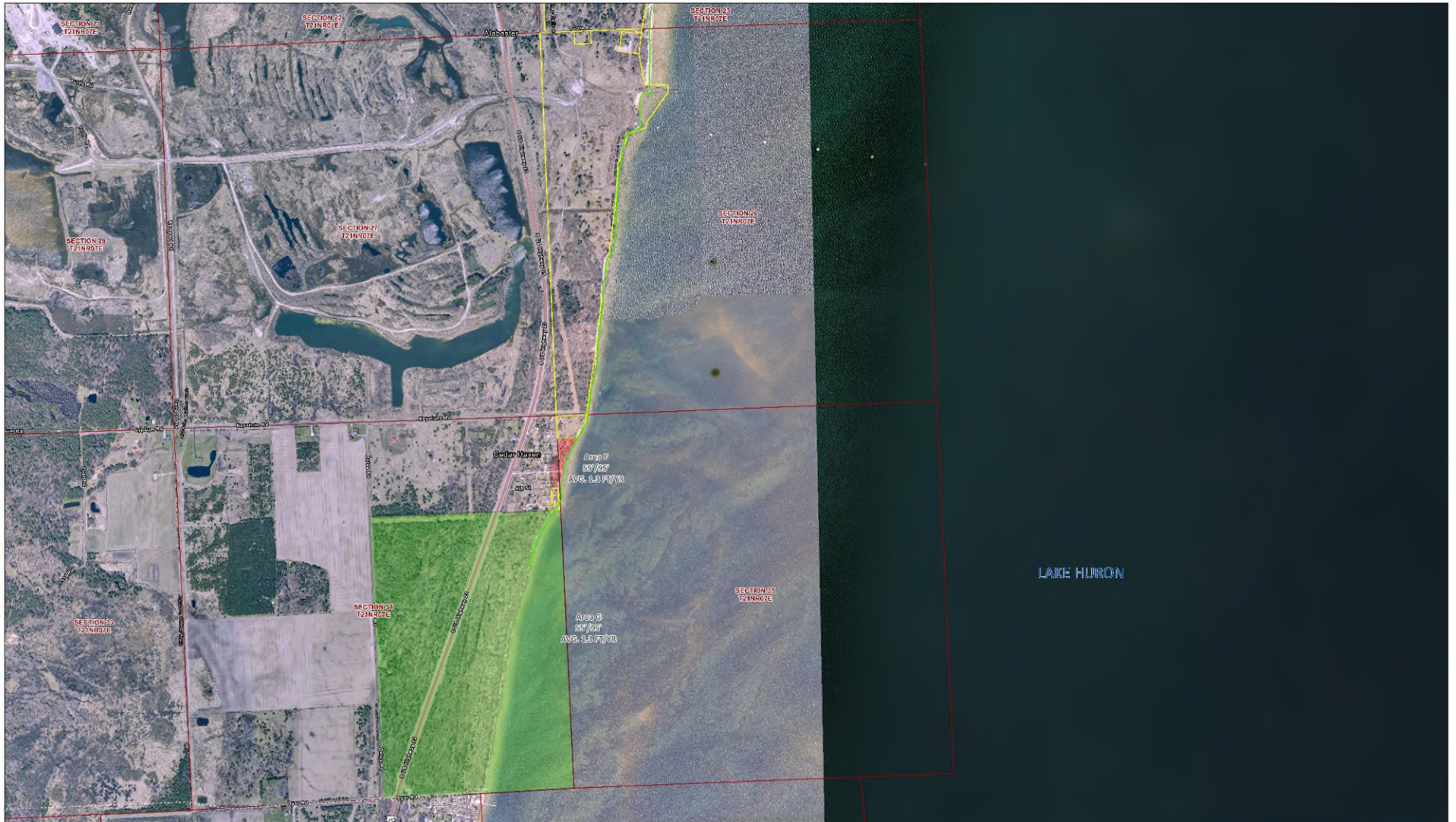


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Map created by: 10/19/23  
Project lead: D. J. J. J. J.  
Author: Department of Environment, Great Lakes, and Energy  
2023/10/19

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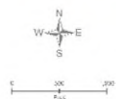
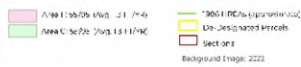
# Map 6c. Alabaster Township HREA E Dedications and Proposed HREA F and G Designation Parcels



## High-Risk Erosion Area Update - 2023

Alabaster Township, Iosco County  
T21N, R07E Sections 34, 35 and 26

### High Risk Erosion Areas 30 YR/60 YR Projected Recession Distance (Feet) Average Annual Rate of Recession (FT/YR)



MAP INFORMATION:  
This map identifies potential high risk erosion areas under Part 311, Standards for erosion and Management of the Natural Resources and Environment Protection Act, 1994 PA 451, as amended. The shaded areas indicate an average rate of recession of at least one foot per year.  
Background Image: 2022



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Map created by: [Name]  
Project lead: [Name]  
Map Date: [Date]

Michigan Department of Environment, Great Lakes, and Energy  
2023-05-17

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