

2013 Piping Plover Habitat Assessment Report

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Enbridge

2013 Piping Plover Habitat Assessment Report (Rev 0)

PRESENTED BY MERJENT, INC.
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TABLE OF CONTENTS

EXECUTIVE SUMMARY1

1.0 INTRODUCTION2

2.0 PURPOSE OF HABITAT ASSESSMENT2

3.0 PIPING PLOVER STATUS, NATURAL HISTORY, AND RANGE2

4.0 METHODS4

 4.1 DESKTOP REVIEW.....4

 4.2 FIELD-BASED HABITAT ASSESSMENT4

 4.2.1 Field Methods.....4

 4.2.2 Interpretation of Field Data5

5.0 RESULTS6

 5.1 RESULTS OF DESKTOP REVIEW.....6

 5.2 FIELD LIMITATIONS9

 5.3 FIELD-BASED HABITAT ASSESSMENT10

6.0 REFERENCES.....14

LIST OF TABLES

Table 5.1-1 Wetlands Identified as Potentially Suitable Habitat Based on Desktop Review

Table 5.1-2 Potentially Suitable Piping Plover Wetlands within Environmental Survey Corridor

Table 5.3-1 Characteristics of Potentially Suitable Piping Plover Wetlands within Environmental Survey Corridor

LIST OF FIGURES

Figure 3.0-1 North Dakota Counties Where Piping Plover May Occur Along the Route

APPENDICES

Appendix A 2013 Piping Plover Habitat Assessment Protocol

Appendix B U.S. Fish and Wildlife Service Correspondence

Appendix C Maps of Potentially Suitable Piping Plover Habitat (included in filing)

Appendix D Field Data Sheets

Appendix E Photographs of Wetlands Visited during Field Surveys

Other Appendices available upon request

EXECUTIVE SUMMARY

Western Ecosystems Technologies, Inc. ("WEST"), on behalf of Merjent, Inc. ("Merjent") and Enbridge, conducted piping plover (*Charadrius melodus*) habitat assessment surveys between August to October, 2013 within an environmental survey corridor. The habitat assessment is necessary to determine the specific locations for surveys of piping plover individuals prior to pipeline construction activities and to evaluate potential impacts on the federally threatened Great Plains piping plover.

The environmental survey corridor crosses through five counties in North Dakota where the piping plover is known to occur: Williams, Mountrail, Ward, McHenry, and Pierce counties. Piping plover nest on exposed, sparsely vegetated beaches surrounding large wetlands. The suitability of a wetland for piping plover depends on water levels and may vary annually.

The piping plover habitat assessment is described in the 2013 Piping Plover Habitat Assessment Protocol ("Protocol"). The habitat assessment was conducted in two steps: (1) preliminary desktop review of wetlands using several years of aerial imagery that represented dry and wet years to assess potentially suitable habitat within a one-mile study area, and (2) field-based habitat assessment of wetlands identified in the desktop review and located within the environmental survey corridor to further evaluate their suitability as piping plover habitat based on a suite of characteristics. The desktop review and field-based habitat assessment took place from August to October 2013 in counties where piping plover have the potential to occur.

The desktop review identified 242 wetlands within a one-mile study area that were considered to provide potentially suitable habitat because they were 2 hectares or larger and had evidence of exposed substrate during dry or wet years. Of the 242 wetlands identified as potentially suitable habitat during the desktop review, 54 wetlands are located within the environmental survey corridor. Fifty three wetlands were surveyed. One wetland in Mountrail County (PPHMO047a) was not surveyed due to access restrictions.

Wetlands were eliminated as potentially suitable piping plover habitat if one or more of the following characteristics were present:

- 1) greater than 25 percent vegetative cover along the shoreline;
- 2) silty or mucky substrate with no sand, gravel, or salt-encrusted substrate present; or
- 3) presence of trees within the environmental survey corridor.

Forty-six of the 53 surveyed wetlands were eliminated as potential habitat due to the presence of vegetative cover greater than 25 percent along the shoreline.

Of the remaining seven wetlands that were surveyed, four did not have gravel or sand in the substrate and one had trees in the environmental survey corridor. Based on these characteristics, two wetlands had the characteristics necessary to be suitable habitat: PPHWA001b and PPHPI070a.

The results of the habitat assessment will inform future survey efforts for piping plover individuals during the nesting season, facilitate discussions with U.S. Fish and Wildlife Service ("USFWS"), and provide data to evaluate potential impacts on the species under the federal Endangered Species Act.

1.0 INTRODUCTION

Western Ecosystems Technologies, Inc. (“WEST”), on behalf of Merjent, Inc. (“Merjent”) and Enbridge, conducted piping plover (*Charadrius melodus*) habitat assessment surveys within an environmental survey corridor. The assessment included a preliminary desktop review followed by field-based habitat assessment. The desktop review and field-based habitat assessment were conducted by WEST from August to October, 2013.

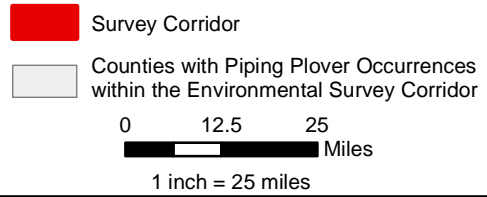
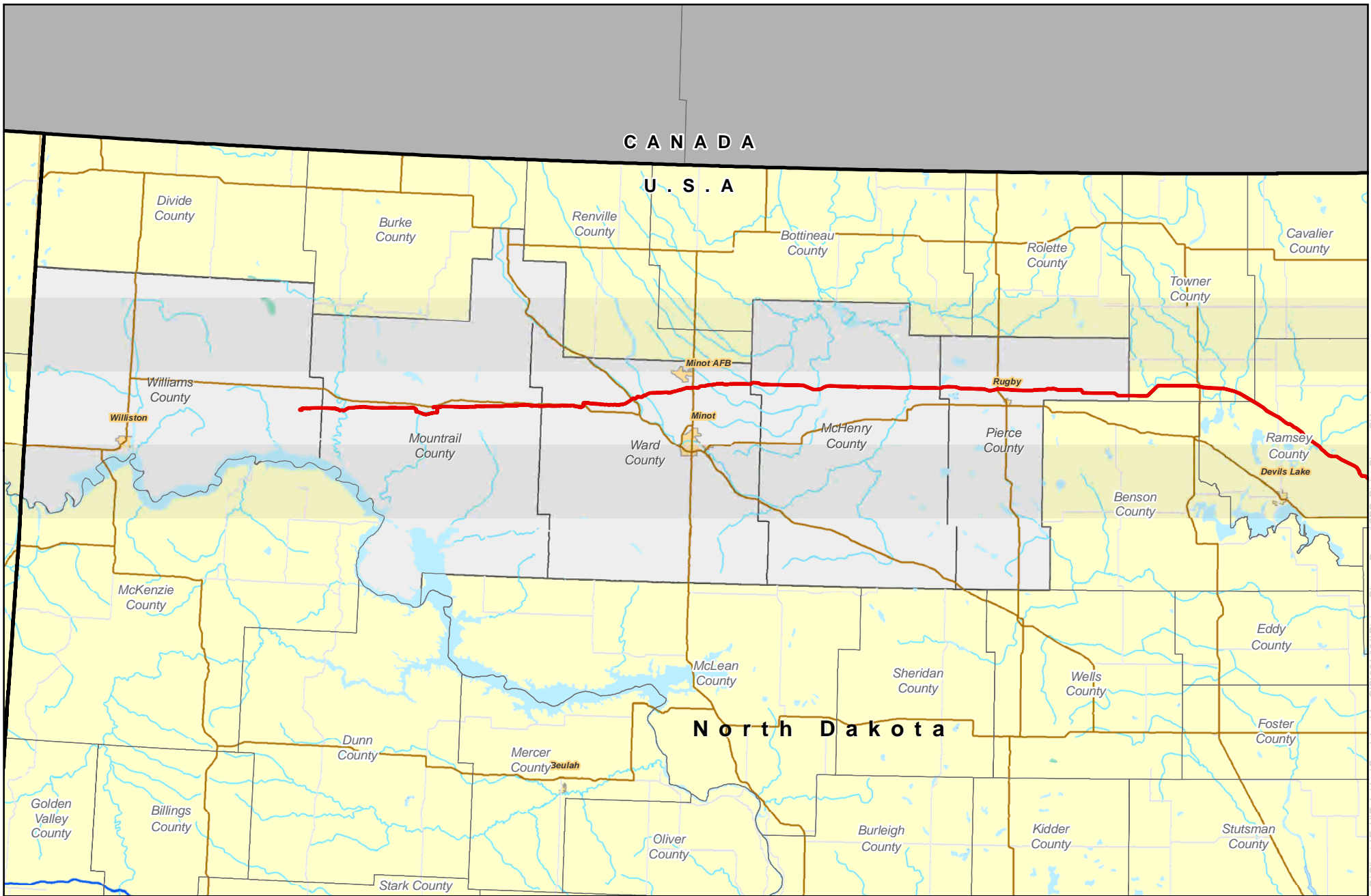
2.0 PURPOSE OF HABITAT ASSESSMENT

The purpose of the 2013 Piping Plover Habitat Assessment is to identify potentially suitable piping plover habitat within the environmental survey corridor, which ranges from approximately 250-foot to 450-foot wide area. Under Section 7 of the federal Endangered Species Act (“ESA”), the potential effects of actions that are implemented, funded, or permitted by a federal agency must be evaluated to determine if federally listed species may be impacted. In order to determine potential impacts, the presence of suitable habitat within the environmental survey corridor was assessed. The results of the habitat assessment will inform potential surveys for piping plover individuals, future consultations with the USFWS, impact analysis under the ESA, and conservation measures development for the species.

3.0 PIPING PLOVER STATUS, NATURAL HISTORY, AND RANGE

Piping plover are small shorebirds that breed in three geographic regions in North America. The range of the Great Plains population of piping plover overlaps with the environmental survey corridor. The Great Plains population of piping plover is listed under the ESA as threatened. In the Great Plains, piping plover nest on open, sparsely vegetated sand or gravel beaches adjacent to wetlands, and on beaches, sand bars, and dredged material islands of major river systems. Piping plover arrive on breeding grounds in early April through mid-May and remain for 3 to 4 months. They lay 3 to 4 eggs in shallow scraped depressions lined with light colored pebbles and shell fragments. The eggs are well camouflaged and blend in well with their surroundings. Both sexes incubate the eggs, which hatch within 30 days, and both sexes feed the young until they can fly, about 30 days after hatching (USFWS, undated).

Prairie freshwater and alkali wetlands and surrounding shoreline may provide courtship, nesting, foraging, sheltering, brood-rearing, and dispersal habitat for Great Plains piping plovers. Piping plovers nest in wetlands ranging from 3 to 2,576 hectares (Licht, 2001). Piping plover generally nest on beaches that are sparsely vegetated; wetlands with cattails or trees are not suitable habitat (C. Aron, USFWS, pers. comm. June 26, 2013). Some research indicates that piping plover nest primarily in alkali wetlands (Root and Ryan, 2004). However, surveys have found piping plover nesting in freshwater wetlands, as well (Haig et al. 2005; C. Aron, USFWS, pers. comm., June 26, 2013). The suitability of wetlands for piping plover nesting depends in part on water levels that may vary annually. Thus, wetlands should be initially evaluated using several years of aerial imagery that include years with both high and low water levels (C. Aron, USFWS, pers. comm., June 26, 2013).



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Figure 3.0-1
Piping Plover Habitat Survey



4.0 METHODS

The 2013 Piping Plover Habitat Assessment Protocol (Protocol), prepared by Merjent, describes the methods used to identify potentially suitable piping plover habitat within the environmental survey corridor (Appendix A). The assessment included a preliminary desktop review followed by field-based habitat assessment. The desktop review and field-based habitat assessment were conducted by WEST on behalf of Merjent and Enbridge from August to October, 2013.

The Protocol was developed based on general information about the species provided by the USFWS North Dakota Field Office (“NDFO”) (Appendix B). Merjent and Enbridge forwarded the Protocol to the USFWS NDFO on June 3, 2013 and requested agency review, recommendations, and concurrence regarding the Protocol. The USFWS NDFO initially indicated that they would be able to discuss the Protocol and provided some preliminary comments. However, before detailed discussions could occur, the USFWS NDFO determined that further consultations with Enbridge could not occur until a federal lead agency had been identified. Enbridge was not able to receive recommendations or concurrence on the Protocol prior to implementation of the desktop review and field-based habitat assessment described in this report. Enbridge received additional guidance from the USFWS NDFO in December 2013 and January 2014 after a lead federal agency had been identified (Appendix B). This guidance was used to further define suitable habitat based on the data that was collected during the field-based habitat assessment.

4.1 DESKTOP REVIEW

The desktop review of potential piping plover habitat was conducted by WEST Geographic Information System (“GIS”) specialists and biologists within the five North Dakota counties where the USFWS indicates piping plover may occur, specifically within the environmental survey corridor. Using GIS data, National Wetland Inventory (“NWI”) wetlands were identified within a one-mile study area. Multi-basin wetlands were divided into single basins and basins less than 2 hectares (“ha”) were omitted. A 2-hectare minimum size instead of 3 hectares was used to be additionally inclusive during the identification of potential piping plover suitable habitat.

Wetlands greater than 2 hectares were assessed during a wet year (2012) and two dry years (2003 & 2006) using National Agricultural Imagery Program (“NAIP”) county mosaic imagery. Wetlands greater than two hectares that showed no open water or no exposed substrate (i.e., exposed, sparsely vegetated areas) during both the wet (2012) and dry time periods (2003 and 2006) were omitted. The remaining NWI wetlands within the environmental survey corridor and within one-mile study area were documented and included in a shapefile for use in the field-based habitat assessment effort.

4.2 FIELD-BASED HABITAT ASSESSMENT

A field-based habitat assessment of the 54 wetlands located within the environmental survey corridor and identified as potential piping plover suitable habitat during the desktop review was conducted in Williams, Mountrail, Ward, McHenry, and Pierce counties.

4.2.1 Field Methods

Data was collected on a sub-meter Trimble GeoXH unit using the North Dakota State Plane North, NAD 83 survey feet coordinate system.

Survey crews recorded the following characteristics for use in evaluating a wetland as piping plover suitable habitat:

- Presence of sand, gravel, and/or salt-encrusted substrate;
- Estimated percentage of overall vegetative cover using an overall visual qualitative observation and the Daubenmire cover class method (Daubenmire, 1959);
- Presence of halophytic vegetation such as *Salicornia rubra*, *Suaeda calceoliformis*, *Atriplex patula*, *Hordeum jubatum*, *Distichils spicata*, and *Puccinellia nuttalliana*;
- Presence of cattails (*Typha* spp.);
- Presence of trees; and
- Visual and auditory observations of piping plover.

Percent vegetative cover was estimated using two methods—an overall visual qualitative assessment and the Daubenmire cover class method. The visual qualitative assessment consisted of surveyors visually estimating the approximate percent of vegetative cover along the shoreline using six categories of vegetative cover: 0-5 percent, 5-25 percent, 25-50 percent, 50-75 percent, 75-95 percent, and 95-100 percent. A second method, the Daubenmire cover class method, was used to confirm the results of the visual qualitative assessment. For the Daubenmire cover class method, surveyors employed a 50 centimeters (“cm”) by 20 cm Daubenmire frame, which was placed at the sample point, typically located 5 to 10 feet from the water’s edge (Daubenmire, 1959). In some cases the sample point was closer to the water’s edge because 5 to 10 feet would have been within upland. Total vegetative cover within the Daubenmire frame was estimated and assigned one of six cover classes (0-5 percent, 5-25 percent, 25-50 percent, 50-75 percent, 75-95 percent, and 95-100 percent). Each sample point and actual water’s edge were recorded. In cases in which the results from the two methods differed, the results of the visual qualitative assessment were used because this method assessed the entire wetland as opposed to a small sample plot.

4.2.2 Interpretation of Field Data

Following the completion of field surveys, wetlands identified as providing potentially suitable habitat during the desktop review were further evaluated based on the data collected during field surveys. Wetlands were omitted as suitable habitat if surveys showed either of the following:

- Habitat had been disturbed or destroyed since aerial imagery was recorded; or
- Presence of one or more of the following characteristics:
 - greater than 25 percent vegetative cover along the shoreline;
 - silty or mucky substrate with no sand, gravel, or salt-encrusted substrate present; and
 - presence of trees in the environmental survey corridor.

Presence of cattails was not used to eliminate wetlands as potential suitable habitat for piping plovers; piping plover may nest along the shorelines of wetlands if cattails are sparse or present in discrete patches. Limiting suitable habitat to wetlands with less than 25 percent vegetative cover ensured that wetlands that were included as potential habitat did not have cattails covering most of their shoreline. Absence of exposed wetland substrate during field surveys was also not used to eliminate the area as potentially suitable habitat because in wet years, such as 2013, typically exposed beach habitat may be inundated. Presence or absence of halophytic vegetation provided information on the alkaline nature of the wetland, but was not

used to eliminate a wetland as potential habitat because piping plover may nest near freshwater wetlands during some years.

5.0 RESULTS

5.1 RESULTS OF DESKTOP REVIEW

The desktop review of aerial imagery resulted in the identification of 242 wetlands with the potential to serve as providing potentially suitable habitat located within the one-mile study area; 54 of the 242 wetlands are located within the environmental survey corridor (see Table 5.1-1). Wetlands were included as potentially suitable habitat if they were greater than 2 hectares in size and if there was evidence of open water and barren beach habitat in aerial imagery from past dry (2003, 2006) or wet time periods (2012). Maps of the wetlands documented during the desktop habitat assessment are provided in Appendix C.

County	Wetland Basins Within Environmental Survey Corridor	Wetland Basins Within 1-mile Study Area
Williams	0	1
Mountrail	18	83
Ward	10	54
McHenry	6	39
Pierce	20	65
TOTAL	54	242

Each of the wetlands within the environmental survey corridor is listed in Table 5.1-2, along with the tract number(s) where they occur, their size, and NWI classification. These wetlands range in size from 2 hectares (i.e., the minimum size to be considered potential piping plover habitat) to 228 hectares. The majority (39) are classified as “freshwater emergent wetland”. Nine are classified as “lake”, and six are classified as “freshwater pond”. None of these wetlands occur entirely within the environmental survey corridor, and many have little overlap with the corridor.

Table 5.1-1 Wetlands Identified as Potentially Suitable Habitat Based on Desktop Review				
Wetland Number	Tract Number(s)	Size of Wetland (hectares)	Wetland Type	Wetland Code¹
PPHMO031a	ND-MO-031	2.13	Freshwater Emergent Wetland	PEMC
PPHMO032a	ND-MO-032	2.63	Freshwater Emergent Wetland	PEMC
PPHMO032b	ND-MO-032, ND-MO-033	4.27	Freshwater Emergent Wetland	PEMC
PPHMO034a	ND-MO-034	55.78	Lake	L2ABG
PPHMO038a	ND-MO-038	2.87	Freshwater Emergent Wetland	PEMC
PPHMO039a	ND-MO-038, ND-MO-039	35.55	Freshwater Emergent Wetland	PEMC
PPHMO047a	ND-MO-047.900RV	21.16	Freshwater Emergent Wetland	PEMA
PPHMO056.210a	ND-MO-056.210	13.36	Freshwater Emergent Wetland	PEM/ABFh
PPHMO076.1a	ND-MO-075, ND-MO-75.900RD, ND-MO-076.1	6.07	Freshwater Pond	PABF
PPHMO076a	ND-MO-076	5.94	Freshwater Emergent Wetland	PEM/ABF
PPHMO096a	ND-MO-096	3.32	Freshwater Emergent Wetland	PEMC
PPHMO096b	ND-MO-096, ND-MO-097	2.00	Freshwater Emergent Wetland	PEMC
PPHMO097a	ND-MO-097, ND-MO-097.900RD	3.29	Freshwater Emergent Wetland	PEMC
PPHMO098a	ND-MO-098, ND-MO-099	8.32	Freshwater Emergent Wetland	PEM/ABF
PPHMO100a	ND-MO-100, ND-MO-101	16.13	Lake	L2ABG
PPHMO102a	ND-MO-102	14.84	Lake	L2ABG
PPHMO103a	ND-MO-103, ND-103.100	20.17	Lake	L2ABG
PPHMO105a	ND-MO-105	4.69	Freshwater Emergent Wetland	PEMC
PPHWA001a	ND-WA_001	3.24	Freshwater Emergent Wetland	PEMC
PPHWA001b	ND-WA-001, ND-WA-001.1	7.73	Freshwater Emergent Wetland	PEMF
PPHWA001.1a	ND-WA-001	2.01	Freshwater Emergent Wetland	PEMF
PPHWA003a	ND-WA-003	2.12	Freshwater Pond	PABF

Table 5.1-1 Wetlands Identified as Potentially Suitable Habitat Based on Desktop Review				
Wetland Number	Tract Number(s)	Size of Wetland (hectares)	Wetland Type	Wetland Code¹
PPHWA003b	ND-WA-003	2.10	Freshwater Emergent Wetland	PEM/ABF
PPHWA004a	ND-WA-004a	15.84	Lake	L2ABG
PPHWA006a	ND-WA-006	5.80	Freshwater Pond	PABF
PPHWA007a	ND-WA-007	30.36	Lake	L2ABG
PPHWA010a	ND-WA-010, ND-WA-010.900RR	2.06	Freshwater Emergent Wetland	PEMF
PPHWA070a	ND-WA-070	29.41	Freshwater Emergent Wetland	PEM/ABF
PPHMC029.520a	ND-MC-029.520	8.18	Freshwater Emergent Wetland	PEMC
PPHMC029.540a	ND-MC-029.540	203.66	Freshwater Emergent Wetland	PEM/ABF
PPHMC034a	ND-MC-034	2.10	Freshwater Emergent Wetland	PEMC
PPHMC034b	ND-MC-034	9.93	Freshwater Emergent Wetland	PEMC
PPHMC046a	ND-MC-046	42.33	Freshwater Emergent Wetland	PEMC
PPHMC071a	ND-MC-071	28.29	Freshwater Emergent Wetland	PEMC
PPHPI004a	ND-PI-004	20.17	Freshwater Emergent Wetland	PEMC
PPHPI005a	ND-PI-005	8.36	Freshwater Emergent Wetland	PEMC
PPHPI006a	ND-PI-006, ND-PI-007	4.38	Freshwater Emergent Wetland	PEMCd
PPHPI008a	ND-PI-008	9.84	Freshwater Emergent Wetland	PEMC
PPHPI011a	ND-PI-011, ND-PI-012, ND-PI-013	66.73	Lake	L2ABF
PPHPI020a	ND-PI-020	10.53	Freshwater Emergent Wetland	PEMC
PPHPI022a	ND-PI-022	3.15	Freshwater Emergent Wetland	PEMC
PPHPI044a	ND-PI-044	3.72	Freshwater Emergent Wetland	PEM/ABF
PPHPI044b	ND-PI-044	3.11	Freshwater Emergent Wetland	PEM/ABF
PPHPI045a	ND-PI-045, ND-PI-046	2.73	Freshwater Emergent Wetland	PEM/ABF
PPHPI049.504a	ND-PI-049,504, ND-PI-049.506	96.65	Lake	L2ABG
PPHPI049.506a	ND-PI-049.506	23.33	Freshwater Pond	PABF

Table 5.1-1 Wetlands Identified as Potentially Suitable Habitat Based on Desktop Review				
Wetland Number	Tract Number(s)	Size of Wetland (hectares)	Wetland Type	Wetland Code¹
PPHPI058a	ND-PI-058, ND-PI-058.200	2.35	Freshwater Emergent Wetland	PEMC
PPHPI058.2a	ND-PI-058.200, ND-PI-058	7.93	Freshwater Pond	PABF
PPHPI060a	ND-PI-060, ND-PI-061	4.83	Freshwater Emergent Wetland	PEM/ABF
PPHPI061a	ND-PI-061	4.59	Freshwater Pond	PABF
PPHPI062a	ND-PI-062, ND-PI-063	4.50	Freshwater Emergent Wetland	PEMC
PPHPI067a	ND-PI-067	11.96	Freshwater Emergent Wetland	PEMF
PPHPI070a	ND-PI-070.200, ND-PI-070	228.05	Lake	L2ABG
PPHPI086a	ND-PI-086	2.95	Freshwater Emergent Wetland	PEMAd

Notes:

¹ PEMC – Palustrine, emergent, seasonally flooded
L2ABG – Lacustrine, littoral, aquatic bed, intermittently exposed
PEMA - Palustrine, emergent, temporarily flooded
PEM/ABFh – Palustrine emergent/aquatic bed, semi-permanently flooded, diked/impounded
PABF - Palustrine, aquatic bed, semi-permanently flooded
PEM/ABF – Palustrine emergent/aquatic bed, semi-permanently flooded
PEMF - Palustrine, emergent, semi-permanently flooded
PABF - Palustrine, aquatic bed, semi-permanently flooded
PEMCd - Palustrine, emergent, seasonally flooded, partially drained/ditched
L2ABF – Lacustrine, littoral, aquatic bed, semi-permanently flooded
PEMAd - Palustrine, emergent, temporarily flooded, partially drained/ditche

5.2 FIELD LIMITATIONS

Data were collected on all but one (PPHMO047a) of the 54 wetlands identified during the desktop review. This wetland was not surveyed due to access restrictions, but will be surveyed in 2014 if access is granted. All 54 wetlands are included in the mapset.

Most wetlands that were investigated occurred in depressions in the landscape; their size may vary considerably from year to year depending on precipitation and groundwater. Overall, 2013 was above average for precipitation in the portion of North Dakota where the environmental survey corridor is located, and in particular, in the five counties where wetlands were investigated for piping plover habitat. Therefore, many of the wetlands were at or near their full capacity. However, two wetlands, PPHMO032b and PPHMO038a, appeared to be declining wetlands (i.e., becoming upland), probably as a result of sedimentation from wind and water erosion from adjacent cultivated fields.

5.3 FIELD-BASED HABITAT ASSESSMENT

Maps of the wetlands that were investigated in the field are provided in Appendix C. Data sheets collected at each wetland are provided in Appendix D. Photographs of each wetland are available in Appendix E, including overviews of the wetlands, photos of substrate, and the Daubenmire plot. A summary of the habitat features recorded at each wetland is provided in Table 5.3-1.

The habitat assessment included documenting visual and auditory observations of piping plover individuals. The presence of piping plover at a site would indicate that the wetland was suitable habitat, regardless of the presence or absence of other features. However, the efficacy of the habitat assessment did not depend on being timed to occur when individuals were present. Each field crew included at least one biologist familiar with piping plover. No evidence either visual or auditory indicated presence of piping plover. Therefore, no wetlands were included as suitable habitat based on this criterion. Given the timing of the habitat assessment, the lack of observations of piping plover individuals may have been because the piping plovers had left their breeding habitat for the year.

According to the Protocol, any wetlands investigated in the field that were found to be disturbed or destroyed could be eliminated as potentially suitable piping plover habitat. None of the wetlands were found to be destroyed; however, as described above in Section 5.2, 2 of the wetlands (PPHMO032b and PPHMO038a) investigated appeared to be “filling in” and had no surface water, most likely due to sedimentation from surrounding cultivated fields. While this might be considered a type of disturbance, data were collected at these wetlands, and they were not eliminated based on disturbance.

Wetlands were considered suitable piping plover habitat, if they had one or more of the following characteristics:

- greater than 25 percent vegetative cover along the shoreline;
- silty or mucky substrate with no sand, gravel, or salt-encrusted substrate present; and
- presence of trees in the environmental survey corridor.

Approximately 46 of the 53 surveyed wetlands were eliminated due to the presence of vegetative cover greater than 25 percent (Table 5.3-1)¹. Forty-six (46) of the 53 wetlands were eliminated as potential habitat due to the presence of vegetative cover greater than 25 percent along the shoreline. Of the remaining seven wetlands that were surveyed, four did not have gravel or sand in the substrate, and one had trees in the environmental survey corridor. Based on these characteristics, two wetlands had the characteristics necessary to be suitable habitat: PPHWA001b and PPHPI070a.

¹ This includes the 2 wetlands where vegetation was not sampled using a Daubenmire plot because there was no open water (PPHMO032b and PPHMO038a); the vegetative cover at these 2 wetlands was estimated visually at greater than 95 percent cover.

**Table 5.3-1
Characteristics of Potentially Suitable Piping Plover Wetlands within the Environmental Survey Corridor**

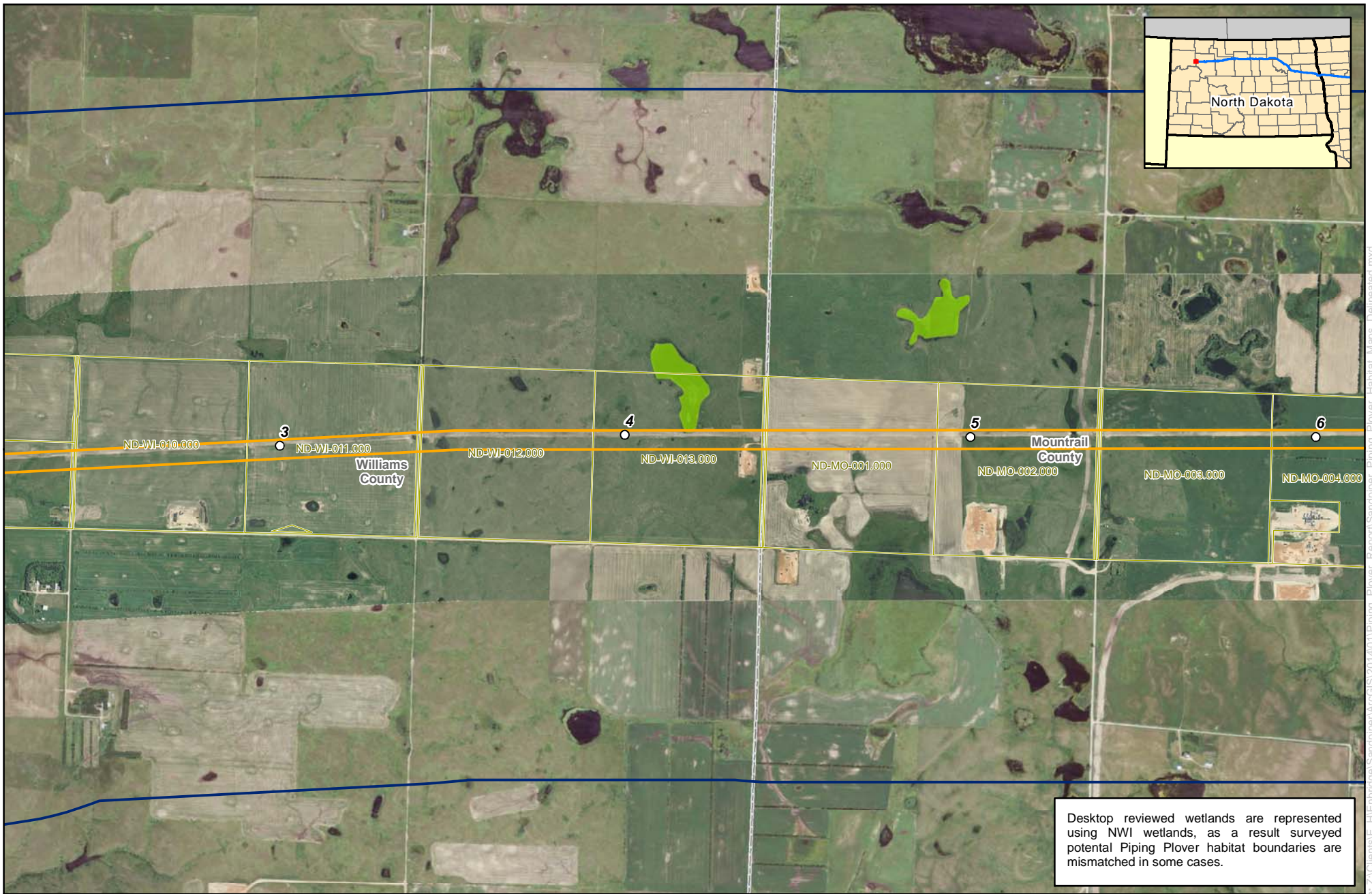
Wetland Number	Size (ha)	Vegetative Cover	Halophytic Vegetation Present?	Sand, Gravel, or Salt Encrusted Substrate Present?		Substrate Observed At Sample Point	Cattail Present?		Trees Present?		Potentially Suitable Piping Plover Habitat
				Within Corridor	Outside Corridor		Within Corridor	Outside Corridor	Within Corridor	Outside Corridor	
PPHMO031a	2.13	95-100 percent	No	No	No	Muck	No	No	No	Yes	No
PPHMO032a	2.63	75-95 percent	No	No	No	Muck	Yes	Yes	No	Yes	No
PPHMO032b	4.27	>95 percent (est.)	No	No	No	None exposed	No	No	No	Yes	No
PPHMO034a	55.78	95-100 percent	No	No	No	None exposed	No	No	No	Yes	No
PPHMO038a	2.87	>95 percent (est.)	Yes ¹	No	No	None exposed	No	No	No	No	No
PPHMO039a	35.55	5-25 percent	Yes ¹	No	No	Silty muck	Yes	Yes	No	No	No
PPHMO047a ⁷	21.16										Unknown
PPHMO056.210a	13.36	95-100 percent	Yes ^{1,2,3,4,5}	No	No	Silty clay	Yes	Yes	No	No	No
PPHMO076.1a	6.07	95-100 percent	Yes ¹	No	No	Rock, debris	No	No	No	No	No
PPHMO076a	5.94	75-95 percent	Yes ^{1,4}	No	No	Muck	Yes	No	No	Yes	No
PPHMO096a	3.32	95-100 percent	Yes ¹	No	No	None exposed	Yes	Yes	No	No	No
PPHMO096b	2.00	25-50 percent	Yes ¹	No	No	Muck	Yes	Yes	No	No	No
PPHMO097a	3.29	95-100 percent	Yes ¹	No	No	Muck	Yes	Yes	No	No	No
PPHMO098a	8.32	50-75 percent	Yes ¹	No	No	Clayey muck	Yes	Yes	No	Yes	No
PPHMO100a	16.13	5-25 percent	Yes ¹	Yes	Yes	Gravel, soil	Yes	Yes	Yes	Yes	No
PPHMO102a	14.84	50-75 percent	Yes ¹	Yes	Yes	Dark soil; sand & gravel in water	Yes	Yes	Yes	Yes	No
PPHMO103a	20.17	50-75 percent	Yes ¹	No	No	Dark muck	No	No	No	Yes	No
PPHMO105a	4.69	75-95 percent	Yes ¹	No	No	Dark muck	Yes	Yes	Yes	No	No
PPHWA001a	3.24	0-5 percent	Yes ¹	No	No	Dark clay	Yes	Yes	No	No	No
PPHWA001b	7.73	5-25 percent	Yes ¹	Yes	Yes	Dark clay; some gravel	Yes	Yes	No	No	Yes
PPHWA001.1a	2.01	0-5 percent	Yes ¹	No	No	No sand or gravel	No	No	No	No	No

**Table 5.3-1
Characteristics of Potentially Suitable Piping Plover Wetlands within the Environmental Survey Corridor**

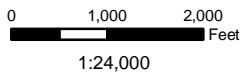
Wetland Number	Size (ha)	Vegetative Cover	Halophytic Vegetation Present?	Sand, Gravel, or Salt Encrusted Substrate Present?		Substrate Observed At Sample Point	Cattail Present?		Trees Present?		Potentially Suitable Piping Plover Habitat
				Within Corridor	Outside Corridor		Within Corridor	Outside Corridor	Within Corridor	Outside Corridor	
PPHWA003a	2.12	5-25 percent	Yes ¹	No	No	Dark muck	Yes	Yes	No	No	No
PPHWA003b	2.10	25-50 percent	Yes ¹	Yes	Yes	Sand & gravel in water	Yes	Yes	No	No	No
PPHWA004a	15.84	25-50 percent	Yes ^{1,6}	Yes	Yes	Sand & dark soil	Yes	Yes	No	Yes	No
PPHWA006a	5.80	95-100 percent	Yes ¹	No	No	Muck	No	No	No	No	No
PPHWA007a	30.36	25-50 percent	Yes ¹	Yes	Yes	Sand & muck	Yes	Yes	Yes	Yes	No
PPHWA010a	2.06	50-75 percent	Yes ¹	No	No	Dark clay	Yes	Yes	Yes	Yes	No
PPHWA070a	29.41	25-50 percent	No	No	No	Black soil	Yes	Yes	Yes	Yes	No
PPHMC029.520a	8.18	50-75 percent	No	No	No	Black soil	Yes	Yes	No	Yes	No
PPHMC029.540a	203.66	95-100 percent	No	No	No	Dark, no sand	Yes	Yes	No	No	No
PPHMC034a	2.10	95-100 percent	Yes ⁶	No	No	Not recorded	Yes	Yes	No	No	No
PPHMC034b	9.93	75-95 percent	Yes ^{1,6}	No	No	Slight sand	Yes	Yes	No	No	No
PPHMC046a	42.33	50-75 percent	Yes ¹	No	No	Not sandy	Yes	Yes	No	No	No
PPHMC071a	28.29	75-95 percent	No	No	No	None exposed	Yes	Yes	No	Yes	No
PPHPI004a	20.17	95-100 percent	Yes ^{1,6}	No	No	Muck	Yes	Yes	No	No	No
PPHPI005a	8.36	75-95 percent	Yes ^{1,4,6}	No	No	Muck	Yes	Yes	No	No	No
PPHPI006a	4.38	50-75 percent	Yes ⁶	No	No	Muck	Yes	Yes	No	No	No
PPHPI008a	9.84	75-95 percent	Yes ^{1,6}	No	No	None exposed	Yes	Yes	No	No	No
PPHPI011a	66.73	95-100 percent	Yes ^{1,3,4,5,6}	Yes	No	Fine sand, salt crust	Yes	Yes	Yes	No	No
PPHPI020a	10.53	95-100 percent	Yes ^{1,2,3,4,5,6}	Yes	Yes	Sandy, silty soil	Yes	Yes	No	No	No
PPHPI022a	3.15	95-100 percent	Yes ^{1,2,3}	No	No	Sandy silt	Yes	Yes	No	No	No
PPHPI044a	3.72	95-100 percent	Yes ^{1,6}	No	No	Muck	No	Yes	No	No	No
PPHPI044b	3.11	95-100 percent	No	No	No	None exposed	Yes	Yes	No	No	No
PPHPI045a	2.73	95-100 percent	No	No	No	None exposed	Yes	Yes	No	Yes	No

Appendix C

Maps of Potentially Suitable Piping Plover Habitat



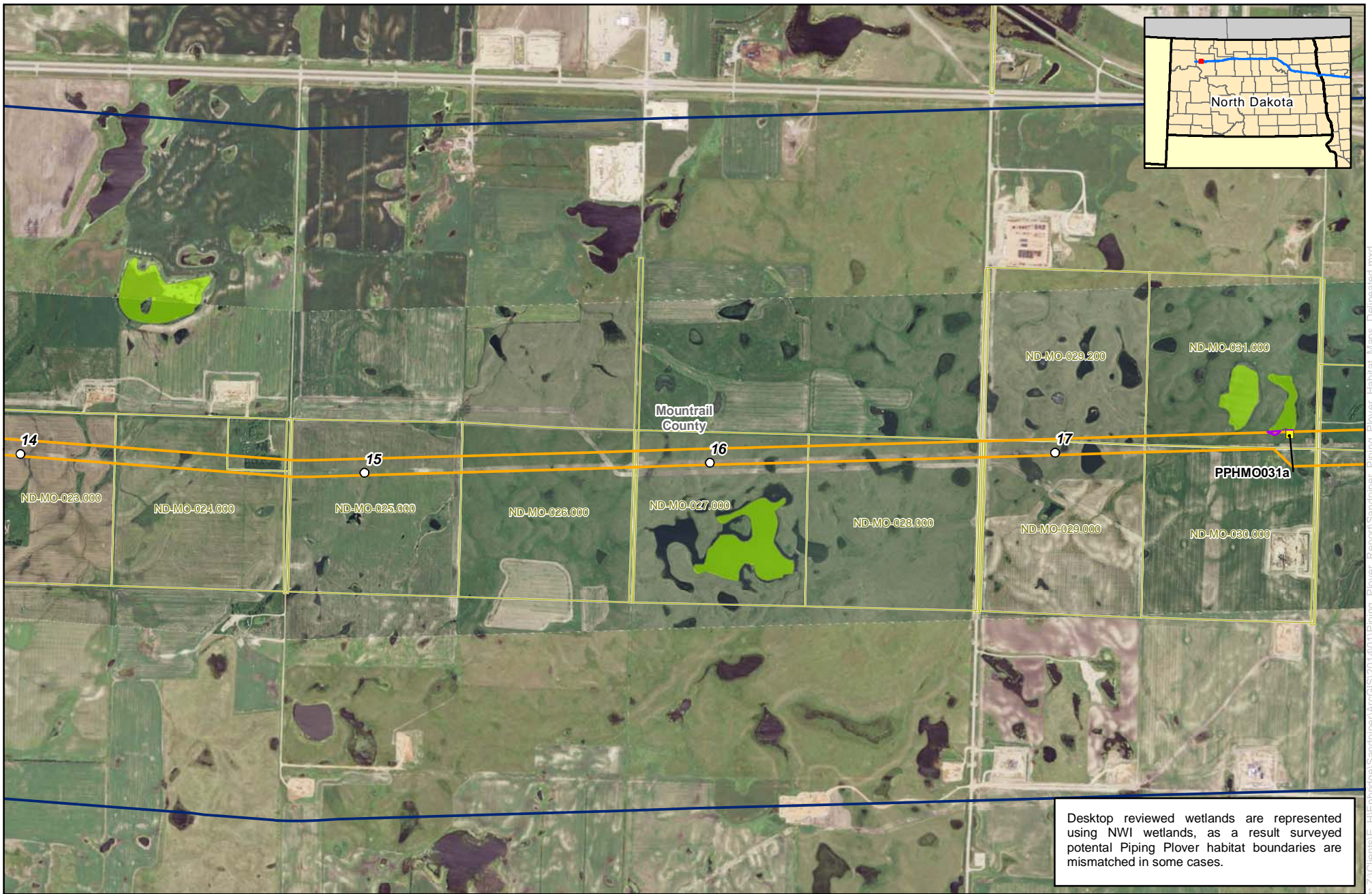
Desktop reviewed wetlands are represented using NWI wetlands, as a result surveyed potential Piping Plover habitat boundaries are mismatched in some cases.



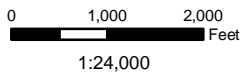
Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |

Source: z:\Clients\E_H\Enbridge\Sandpiper\ArcGIS\2014\01\Piping_Plover_Report\Sandpiper_Piping_Plover_Habitat_Maps_Deliverables.mxd Date: 1/20/2014

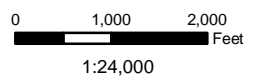
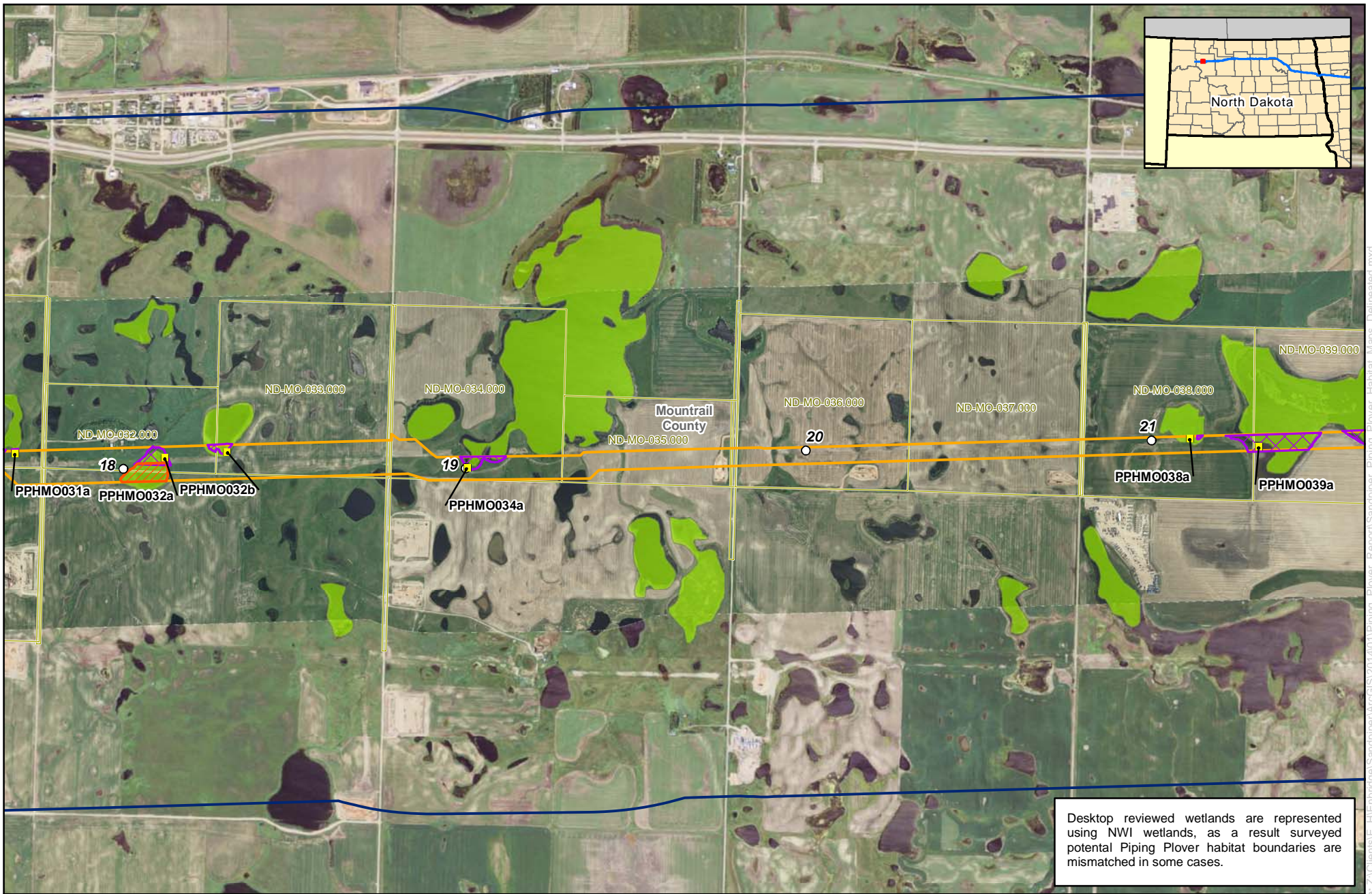


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Enbridge Potential Piping Plover Suitable Habitat

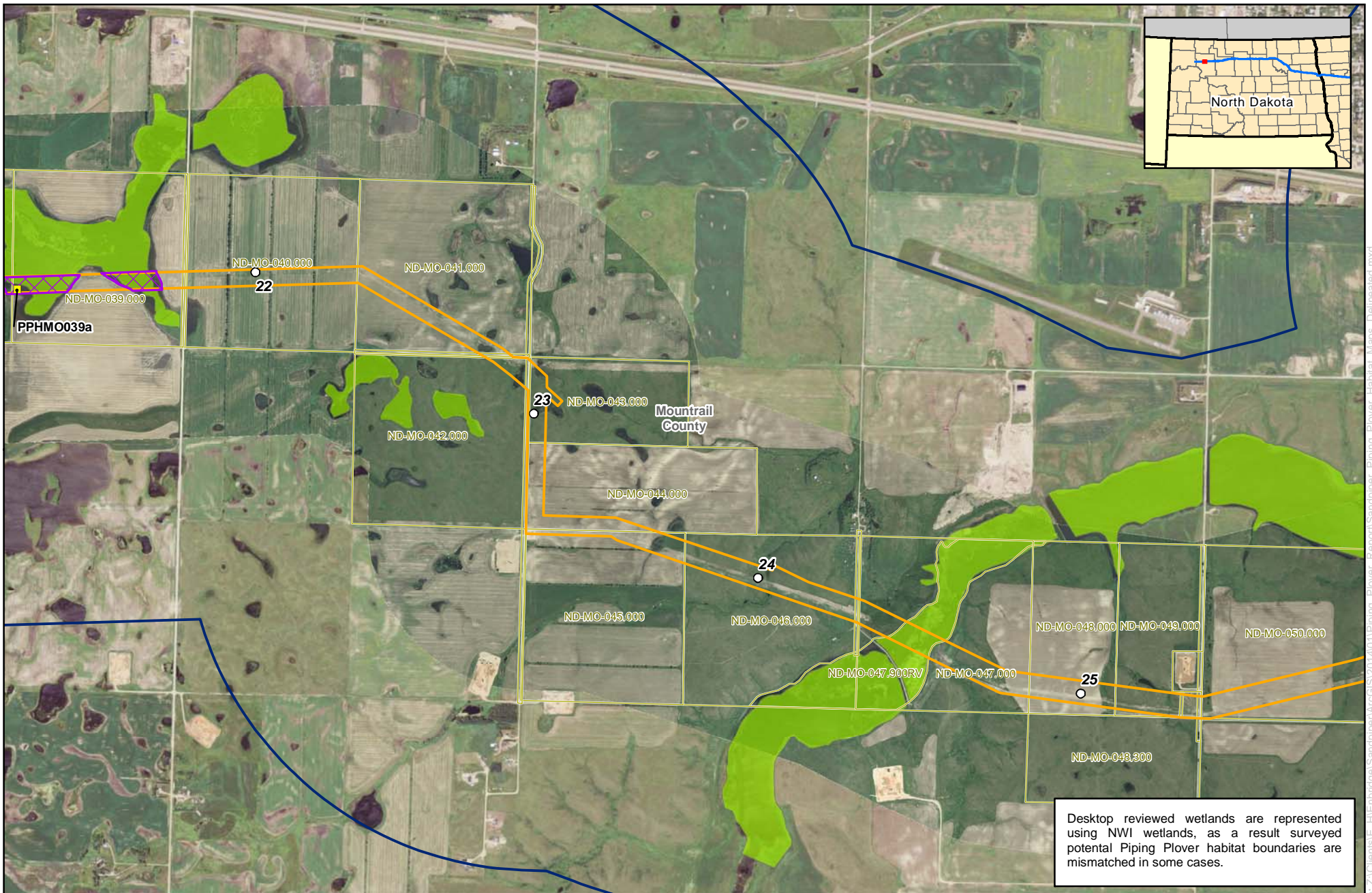
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| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
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Enbridge Potential Piping Plover Suitable Habitat

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| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |

Source: z:\Clients\IE_HIE\enbridge\Sandpiper\ArcGIS\2014\01\Piping_Plover_Report\Sandpiper_Piping_Plover_Habitat_Maps_Deliverables.mxd Date: 1/20/2014

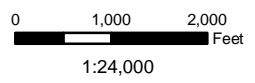
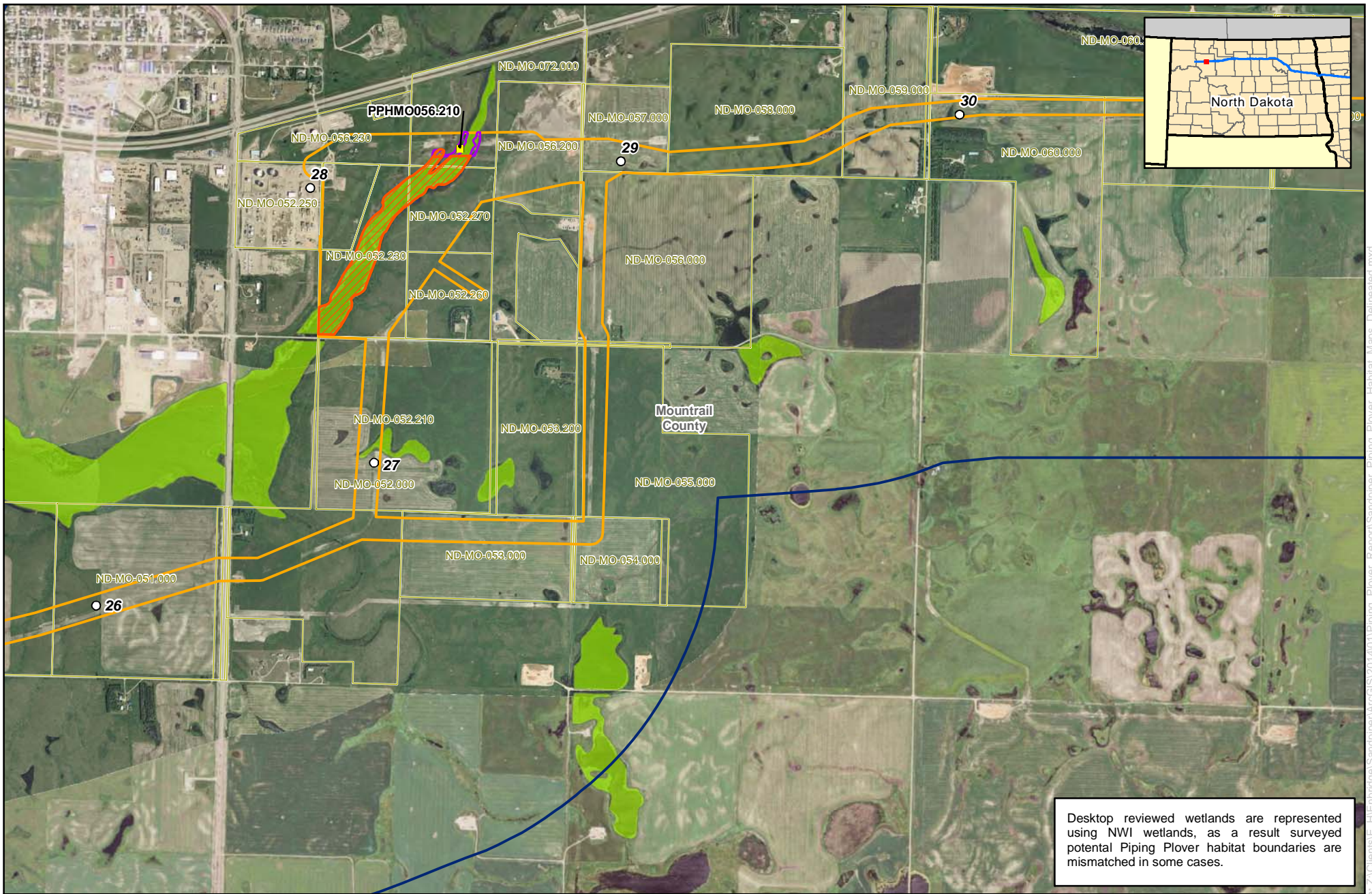


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Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |

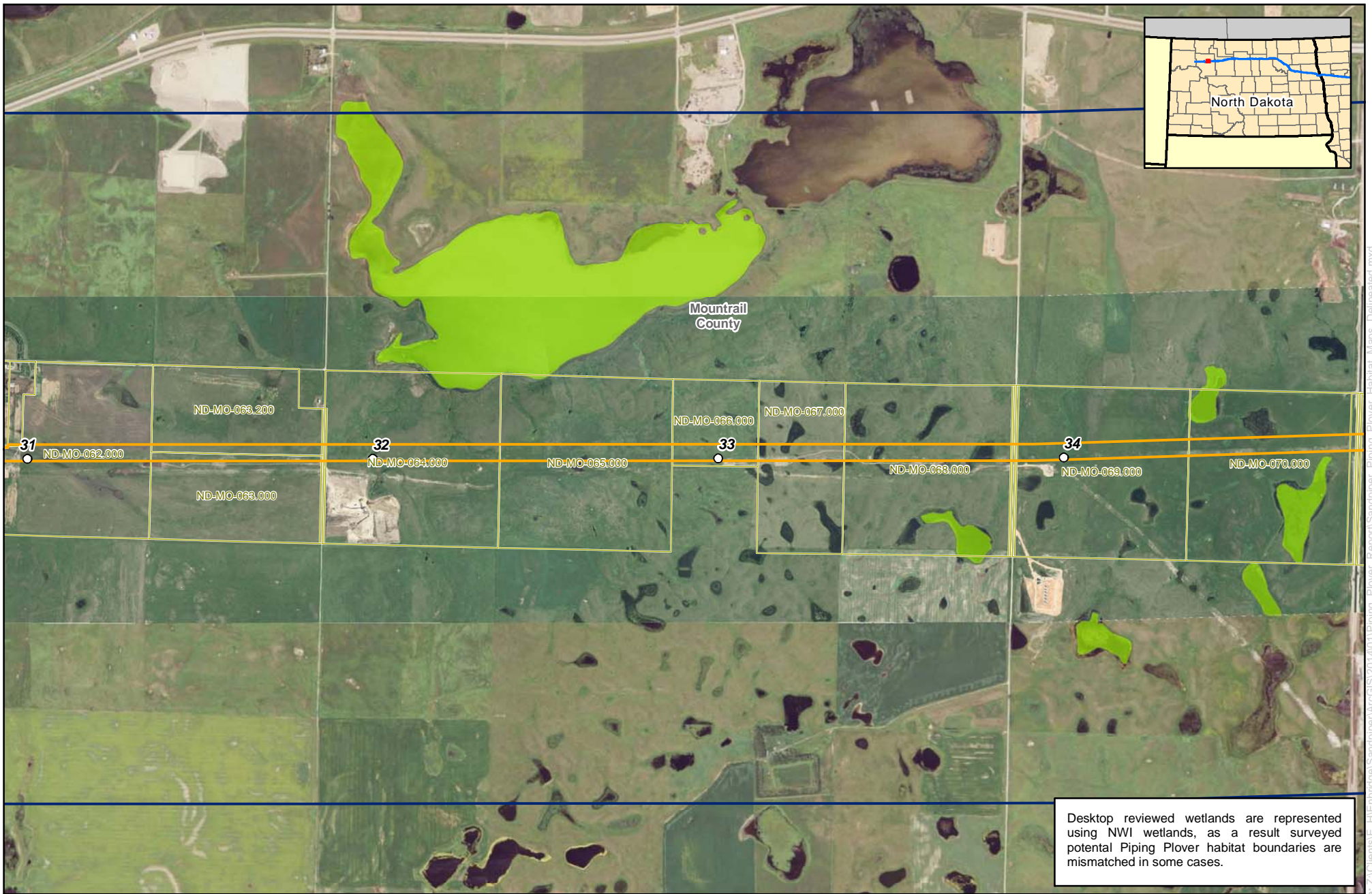


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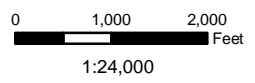
Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |

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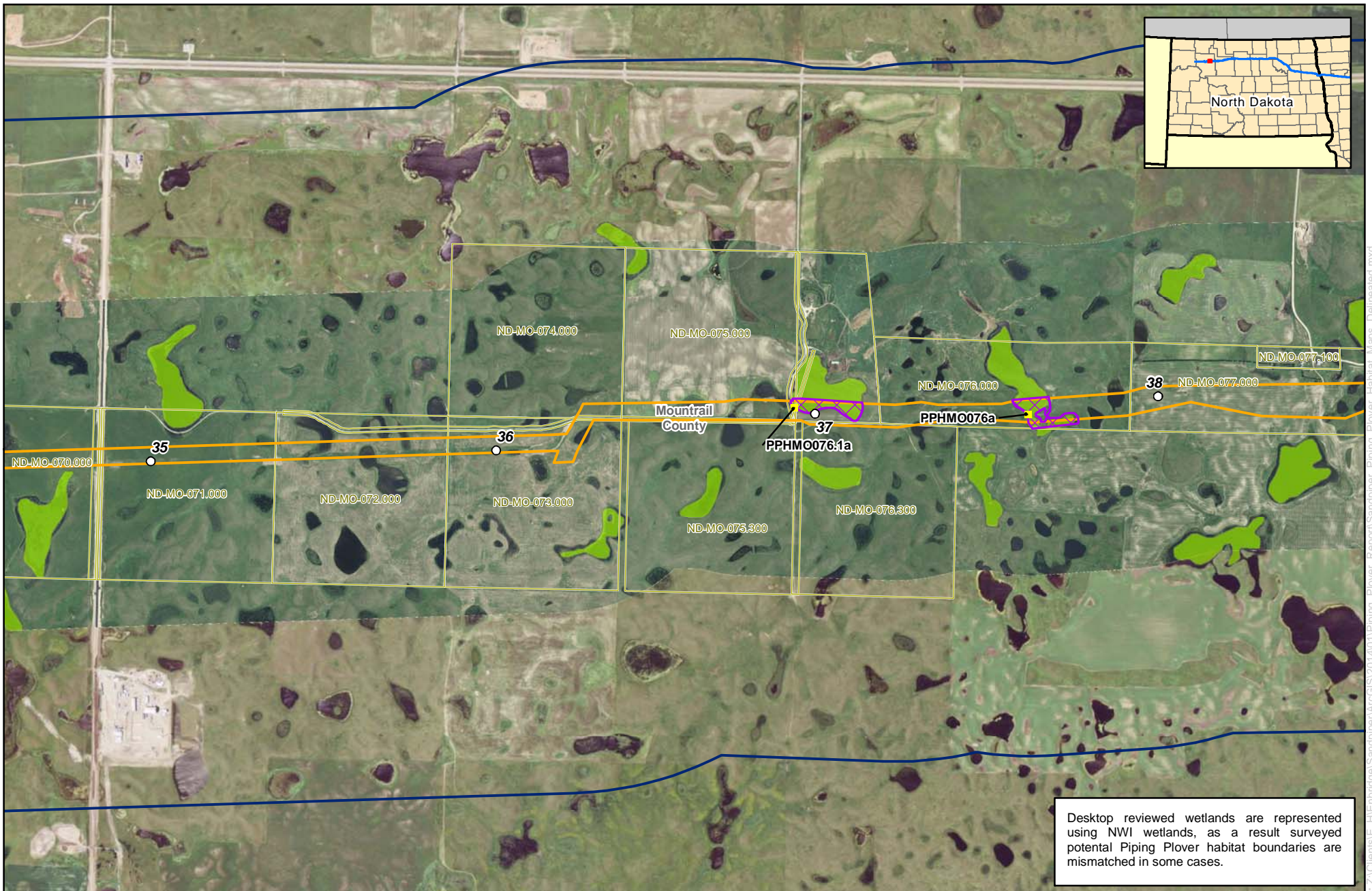
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Enbridge Potential Piping Plover Suitable Habitat

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| Milepost | Sample Point |
| Study Area | Desktop Reviewed Wetlands |
| Environmental Survey Corridor | Potential Piping Plover Habitat |
| Survey Needed | Yes |
| Parcels | No |

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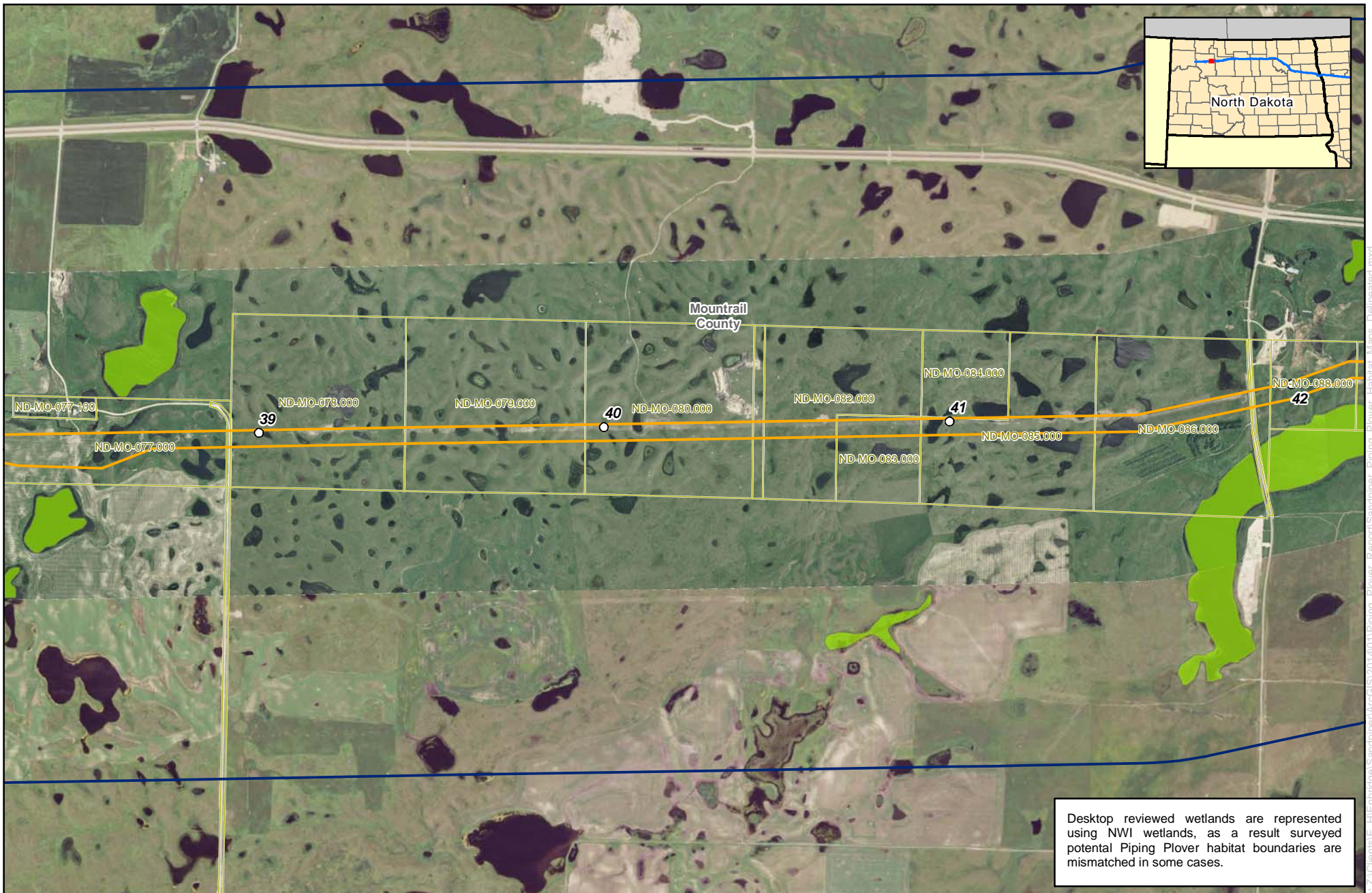


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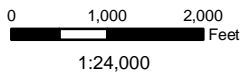


Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |



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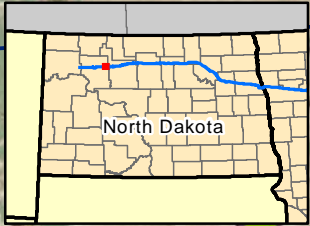
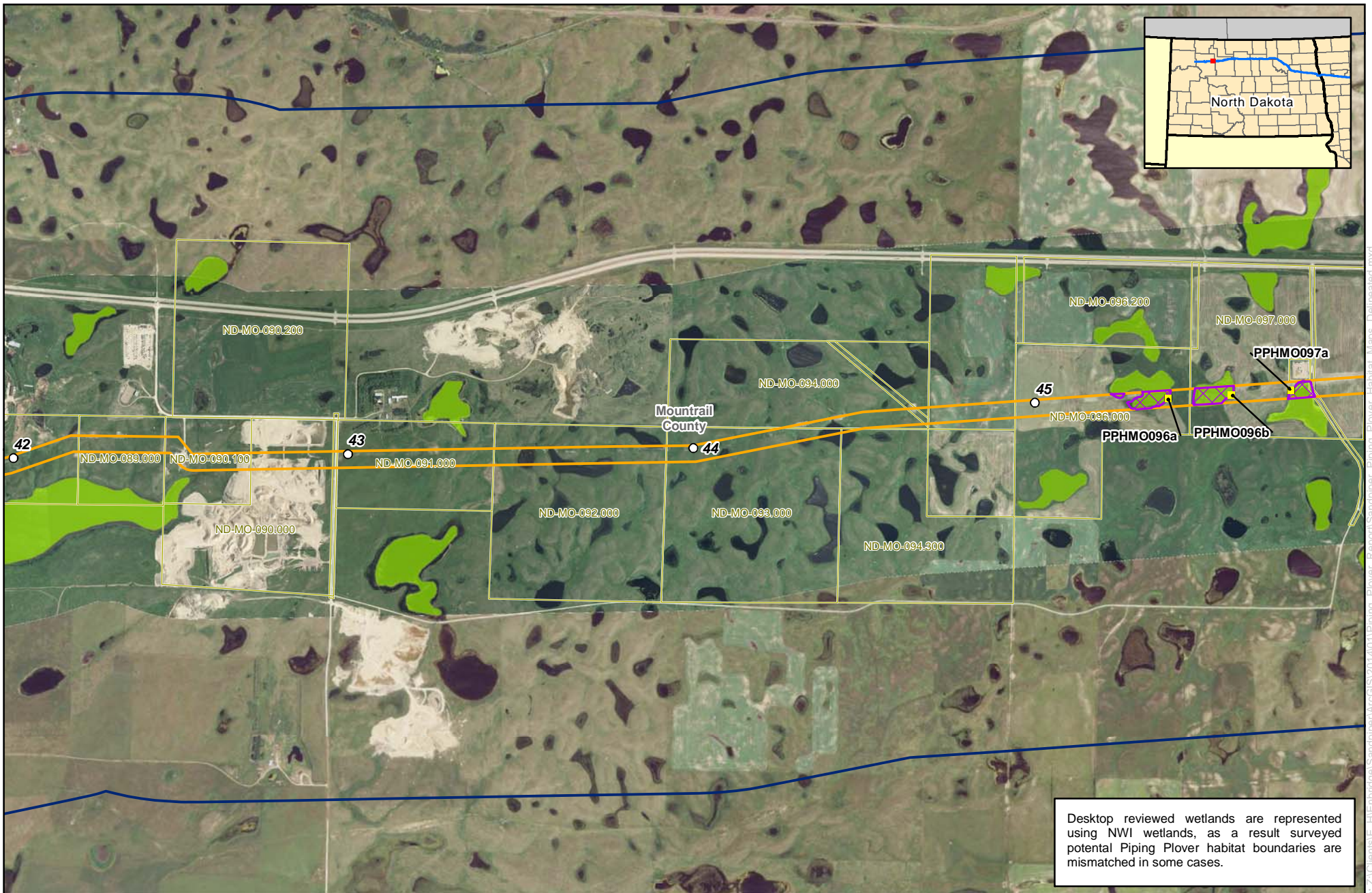


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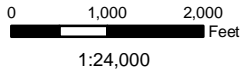
Potential Piping Plover Suitable Habitat

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| Milepost | Sample Point |
| Study Area | Desktop Reviewed Wetlands |
| Environmental Survey Corridor | Potential Piping Plover Habitat |
| Survey Needed | Yes |
| Parcels | No |

Source: z:\Clients\IE_HIE\enbridge\Sandpiper\ArcGIS\2014\01\Piping_Plover_Report\Sandpiper_Piping_Plover_Habitat_Maps_Deliverables.mxd Date: (1/20/2014)

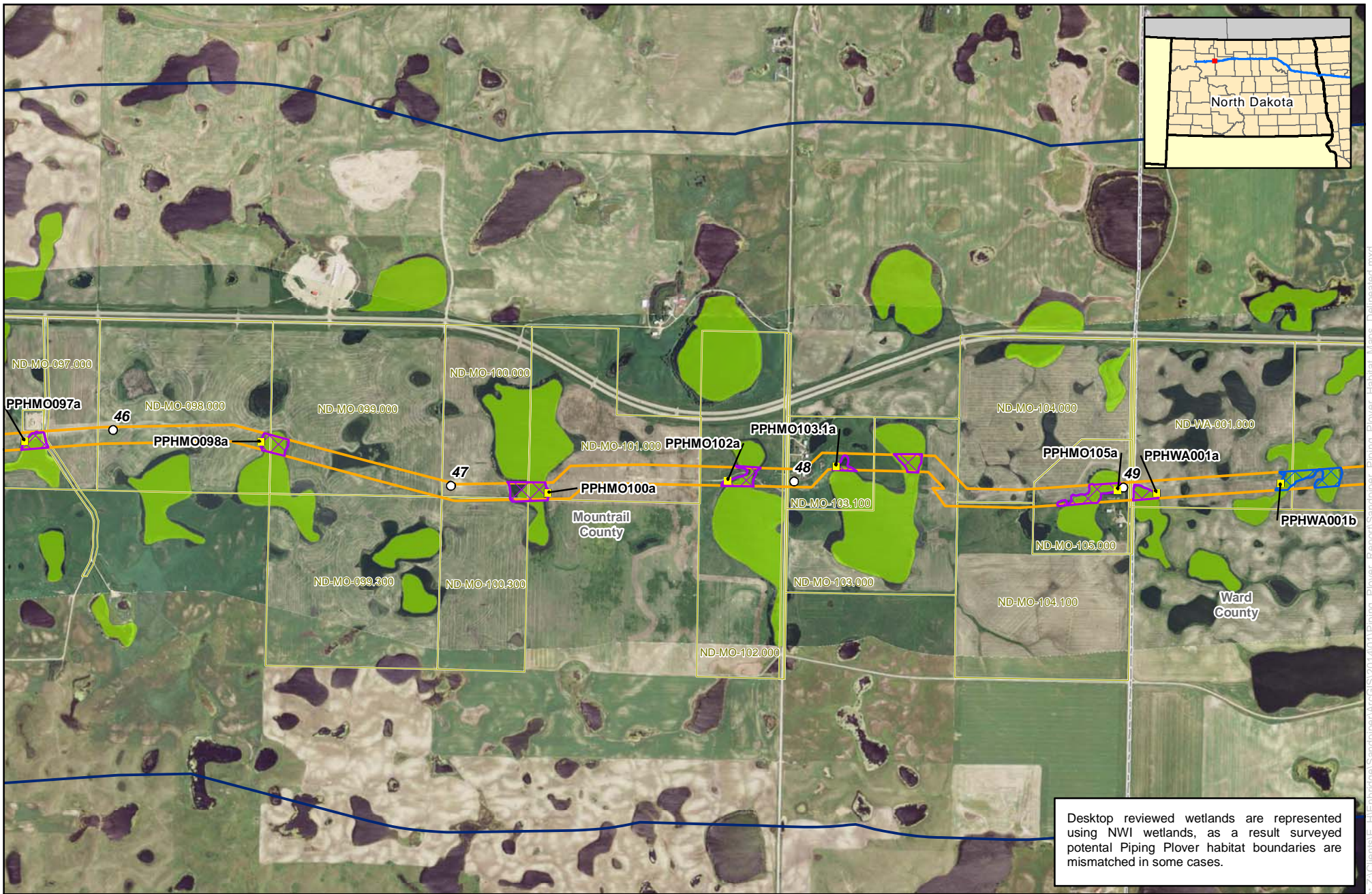


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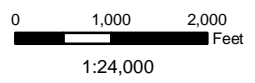


Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |



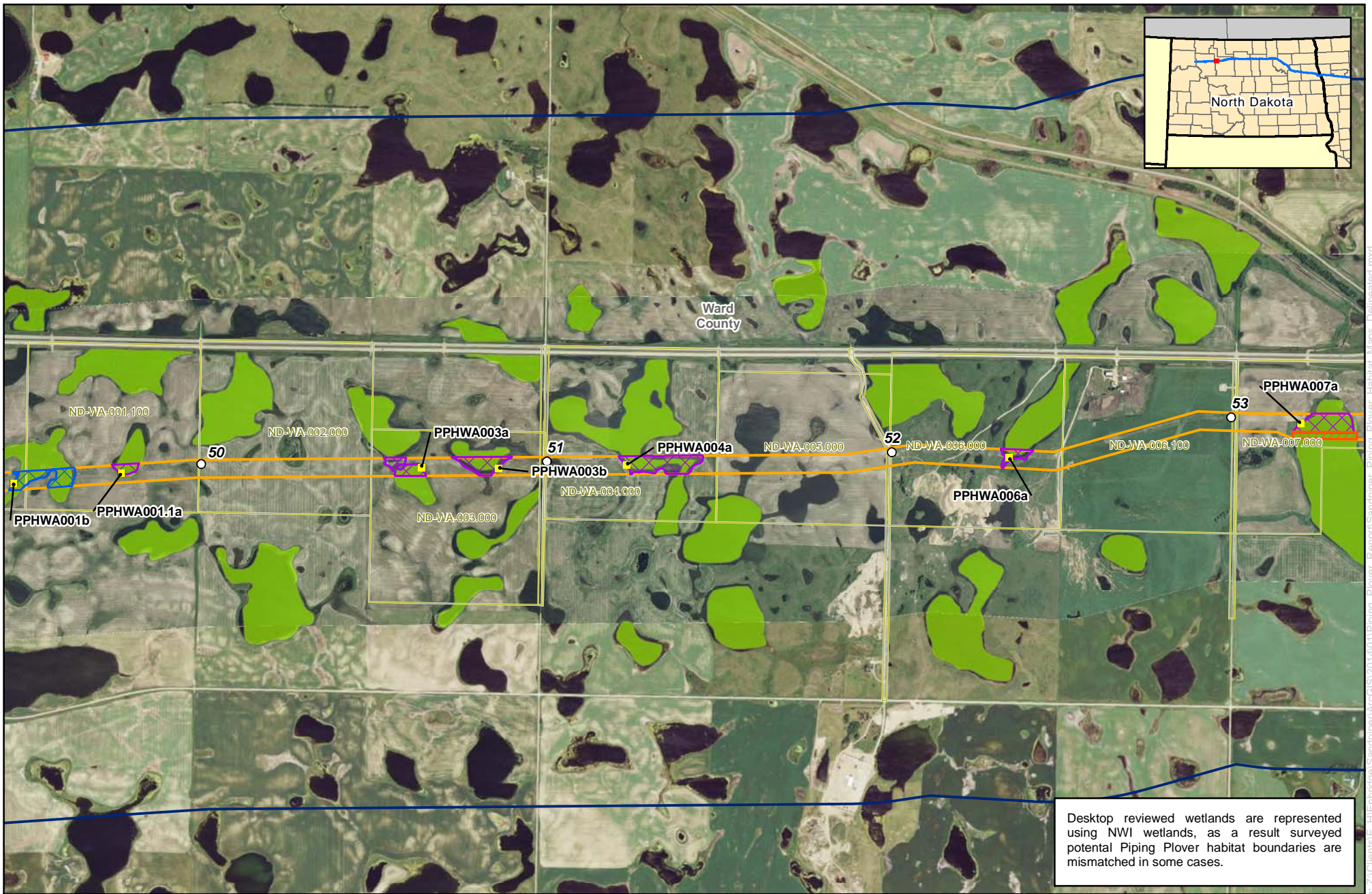
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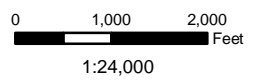
Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |

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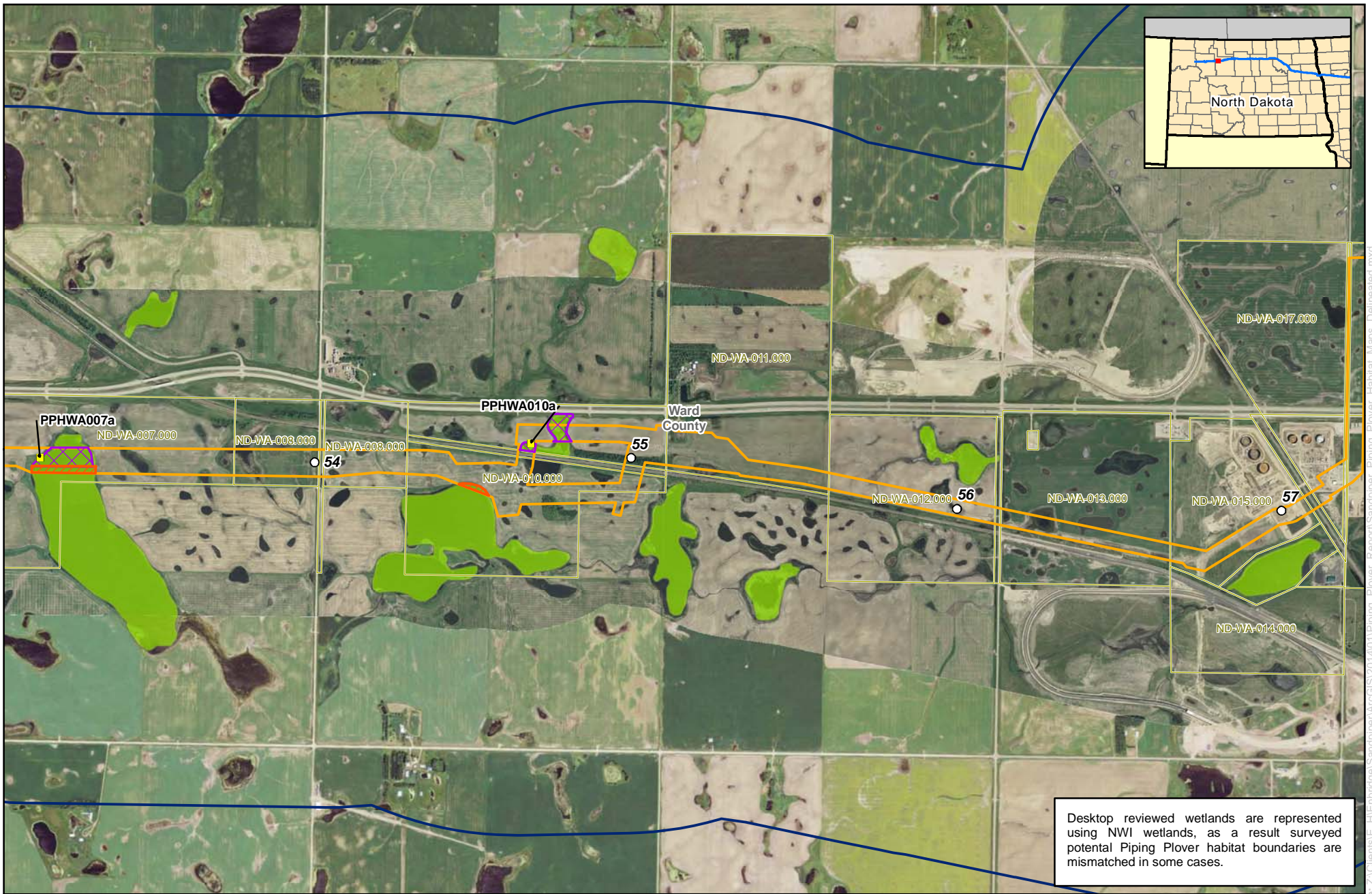
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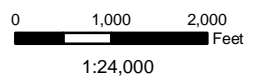
Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
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| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |

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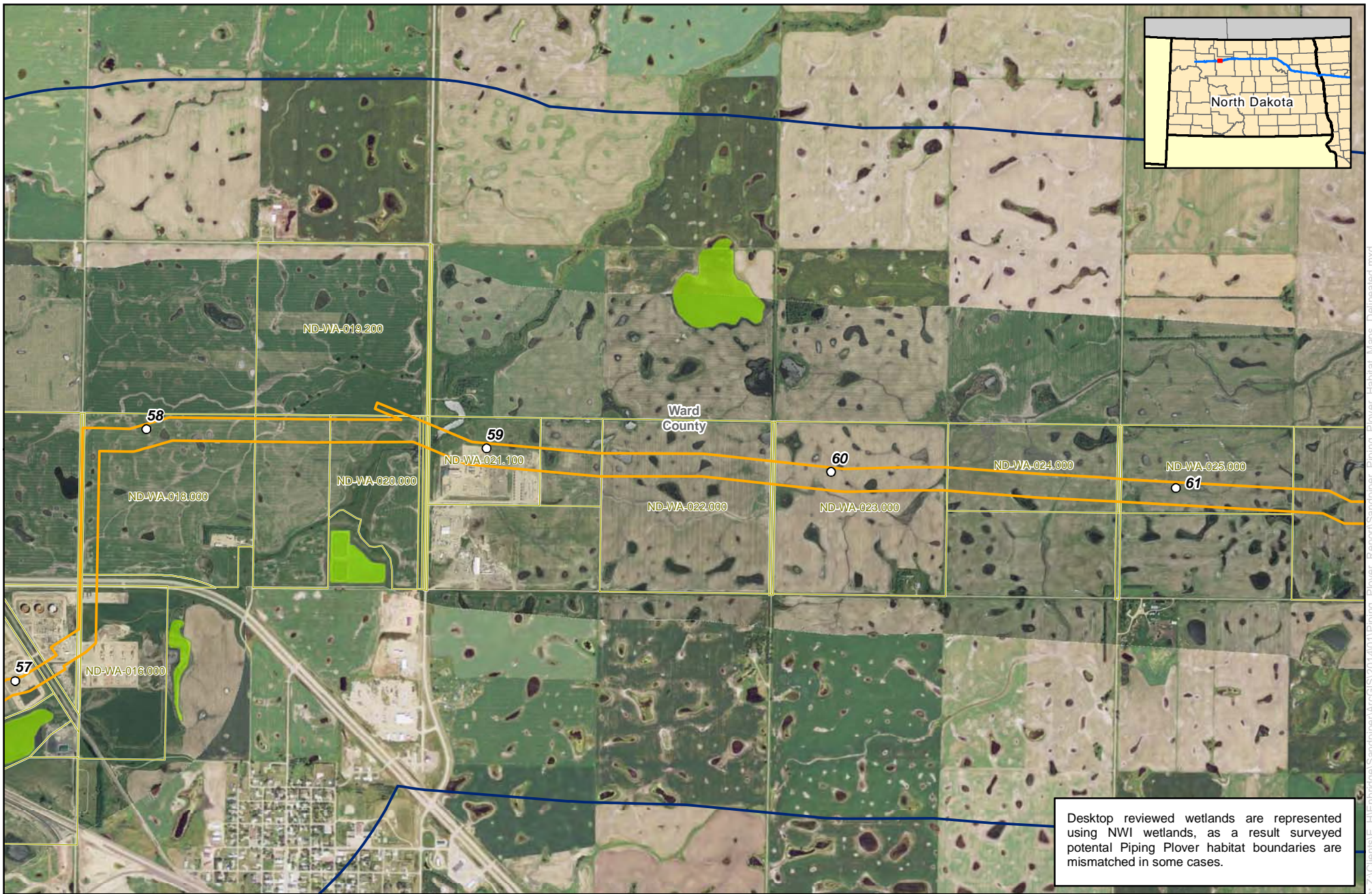
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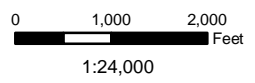
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Potential Piping Plover Suitable Habitat

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| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |



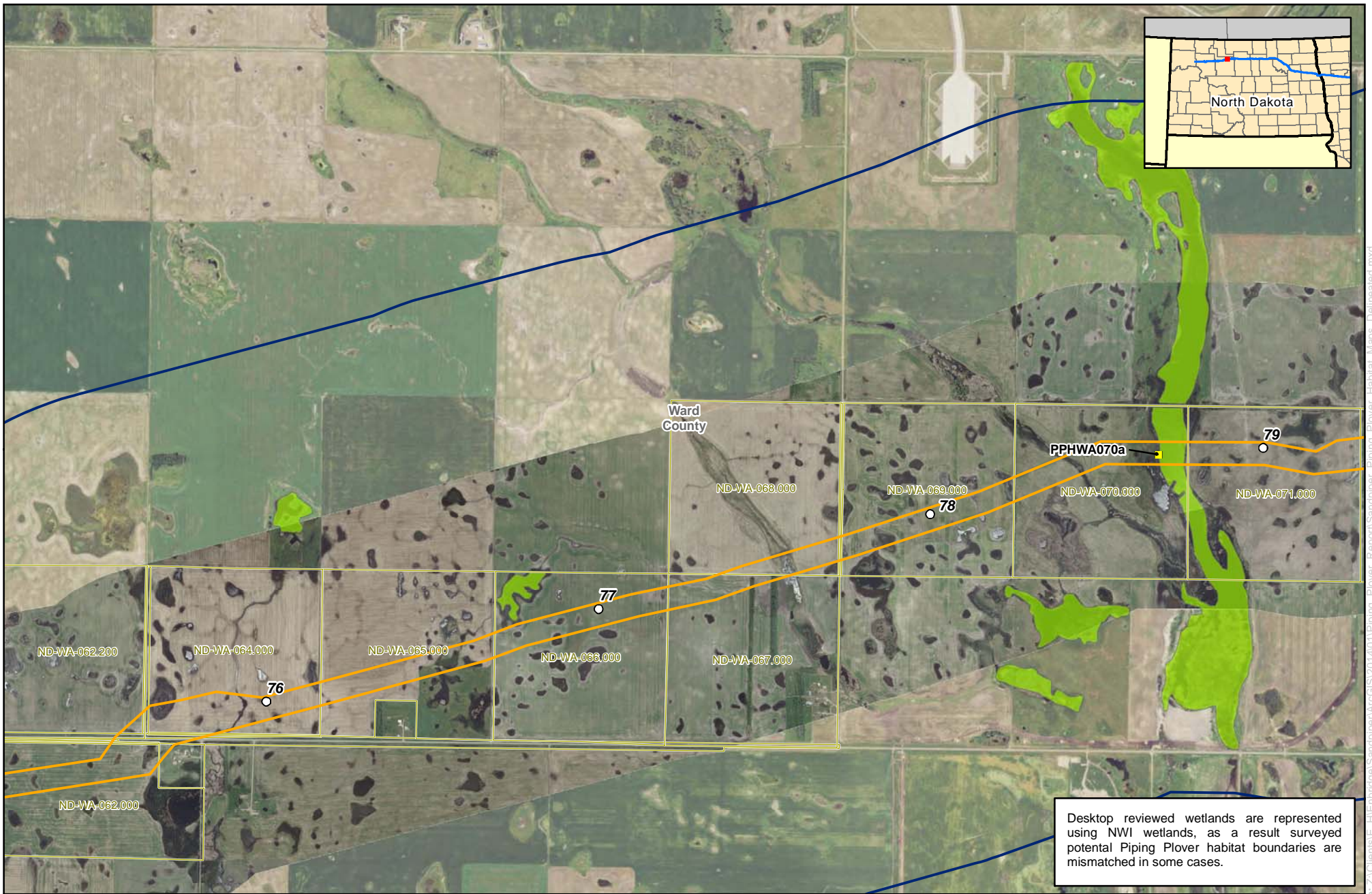
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Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |

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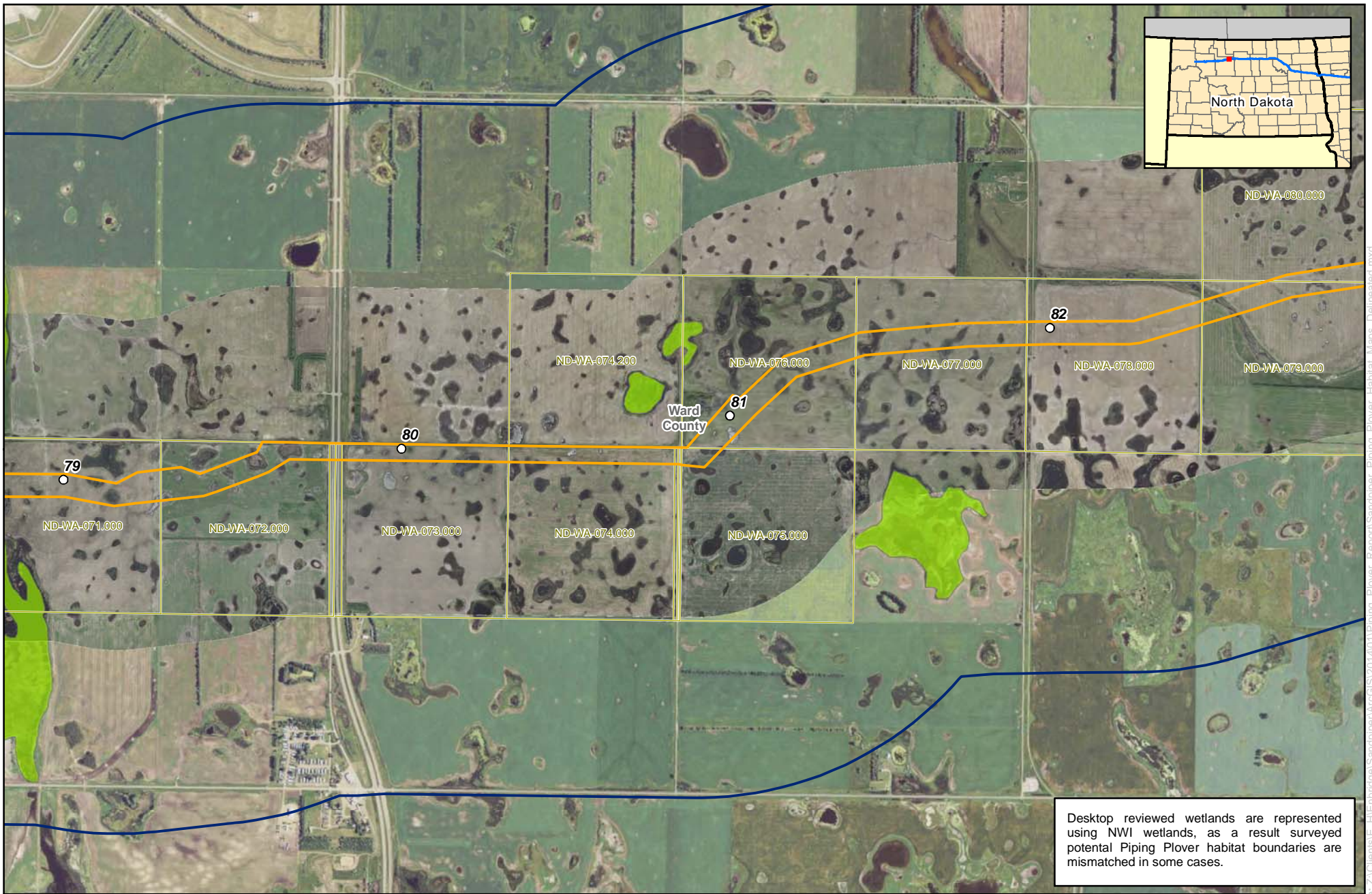
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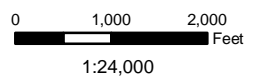
Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
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| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |

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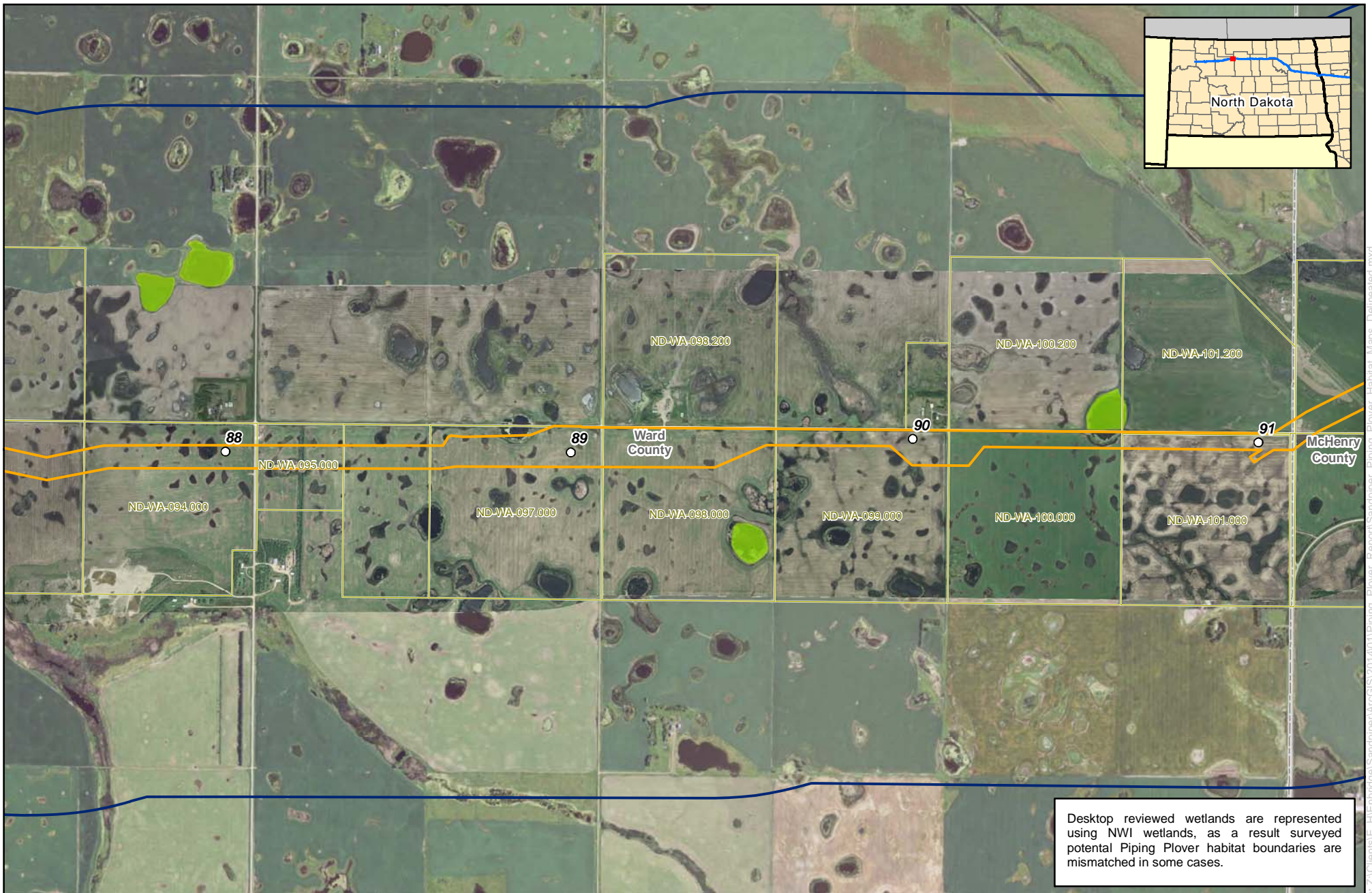
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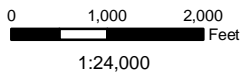
Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
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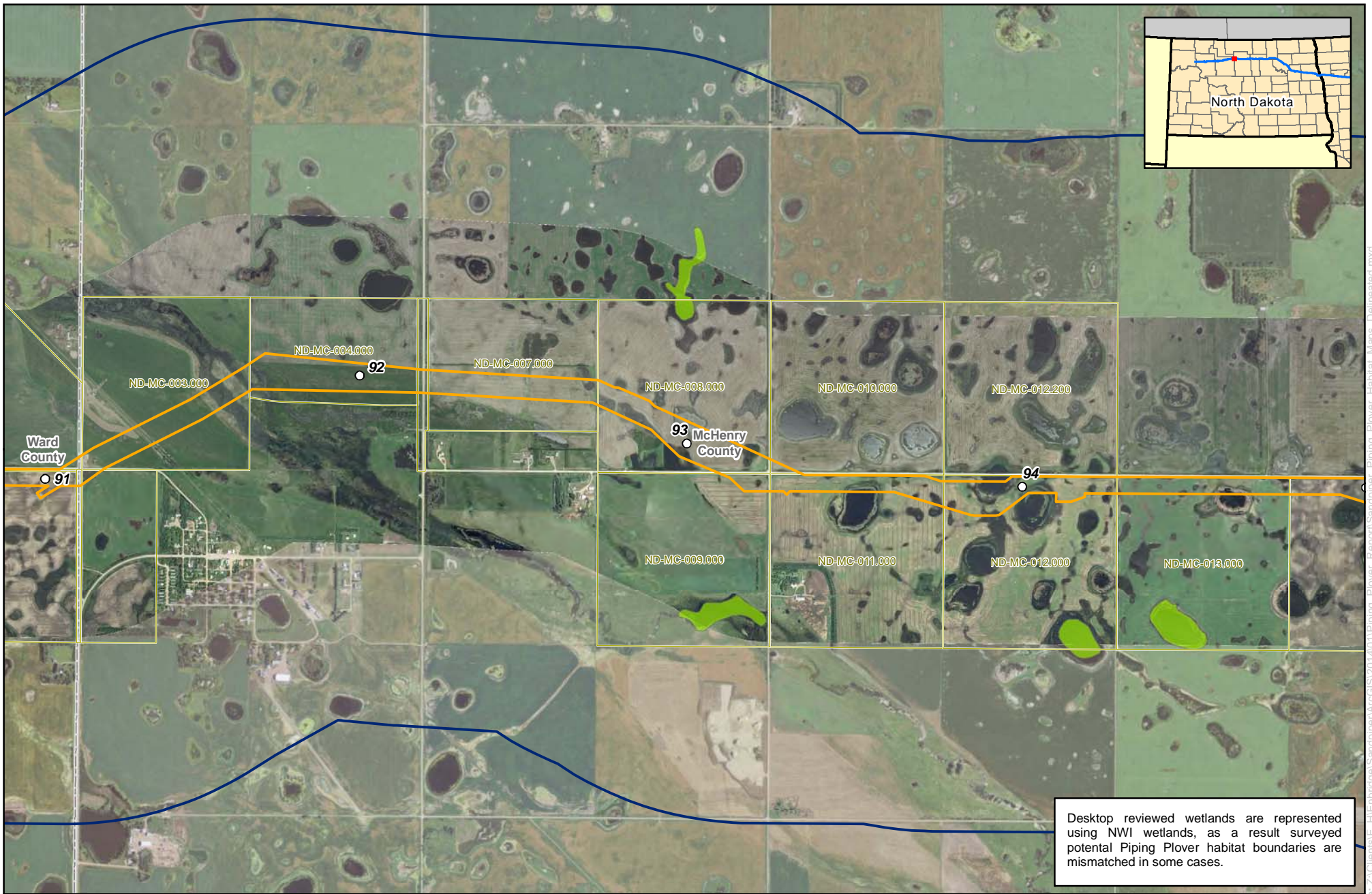


Enbridge Potential Piping Plover Suitable Habitat

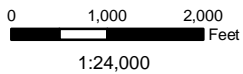
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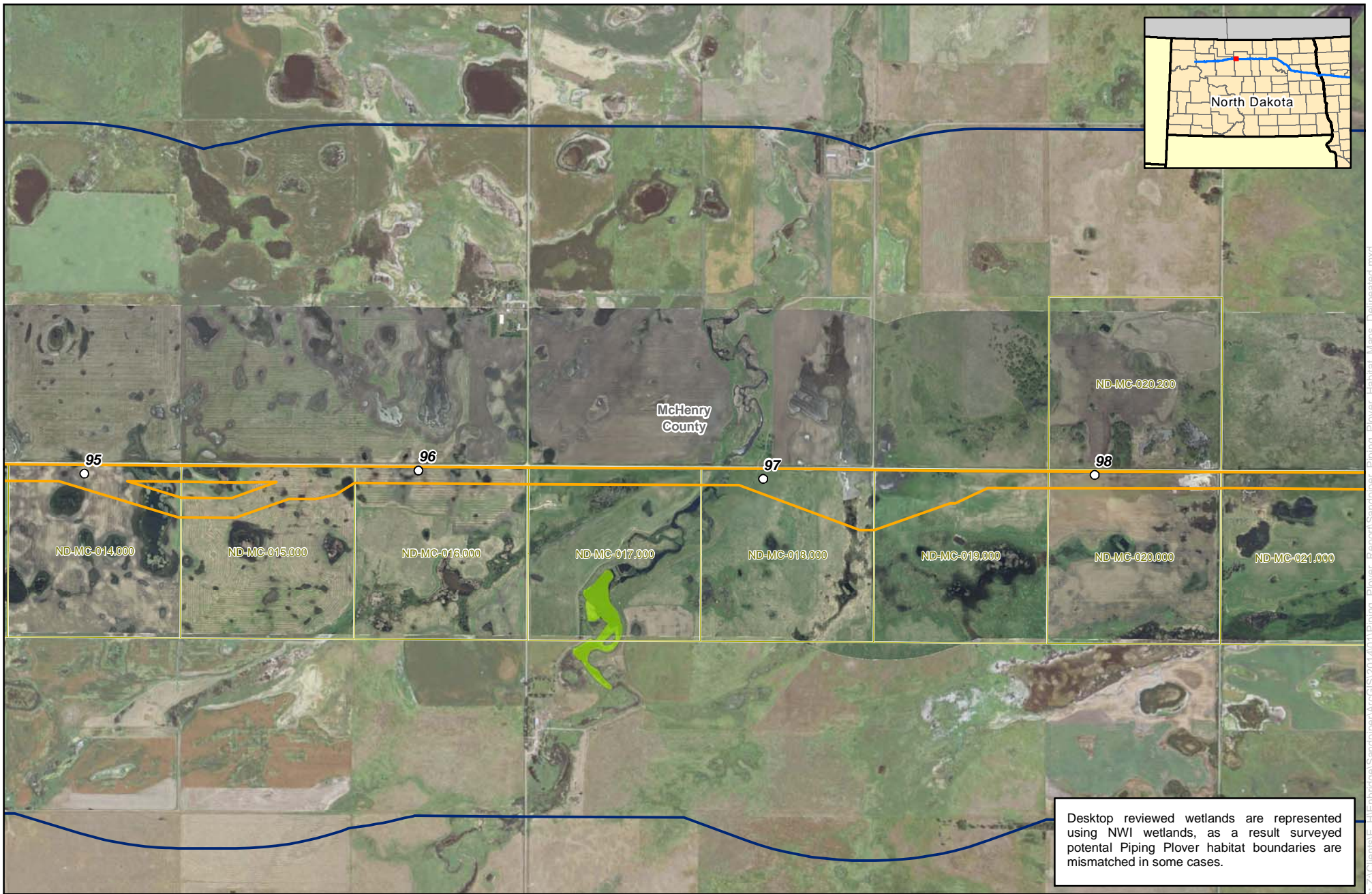


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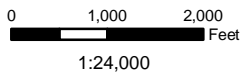


Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
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| ▨ Survey Needed | ▭ Yes |
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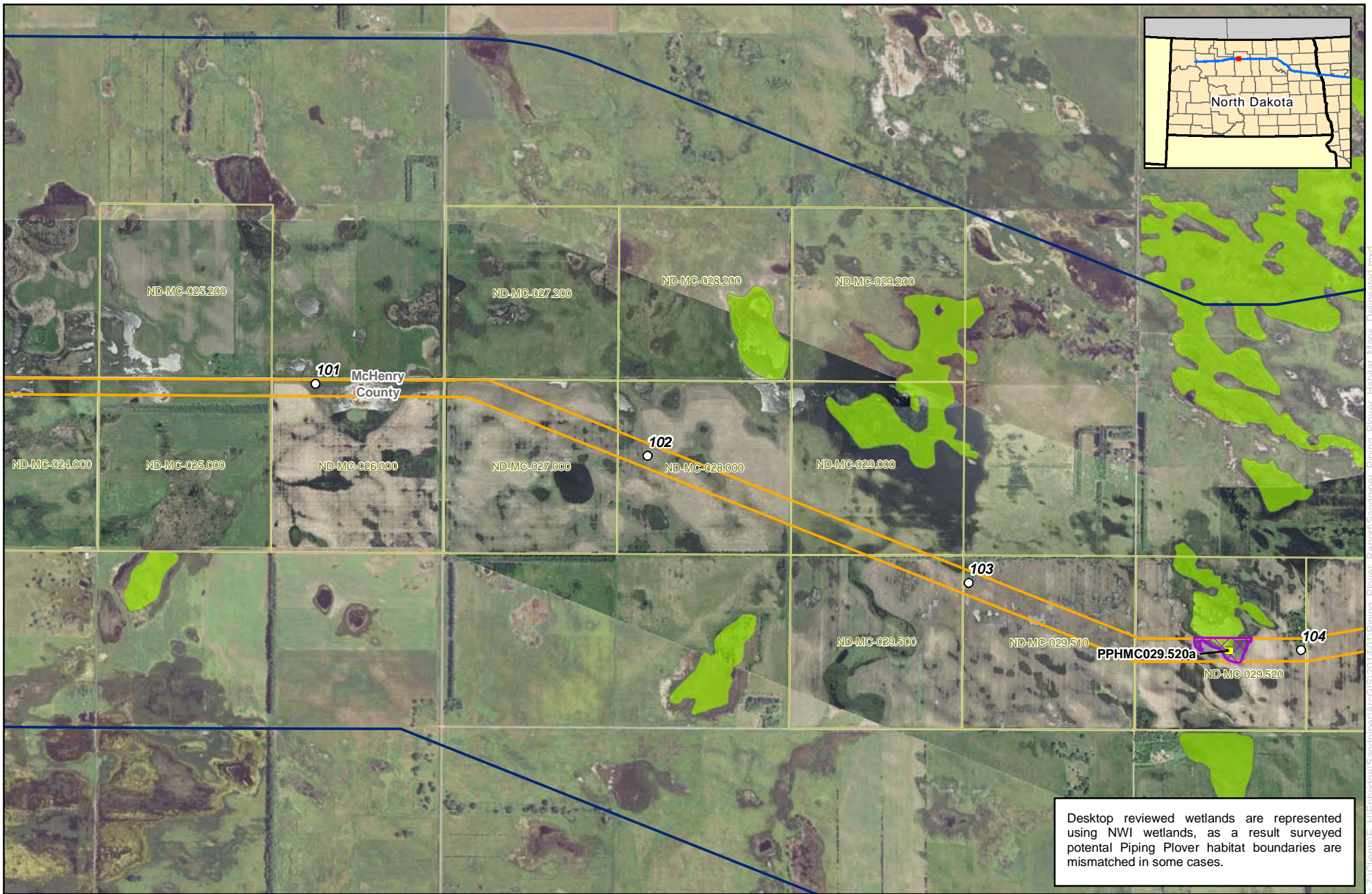


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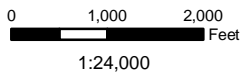


Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |



Desktop reviewed wetlands are represented using NWI wetlands, as a result surveyed potential Piping Plover habitat boundaries are mismatched in some cases.

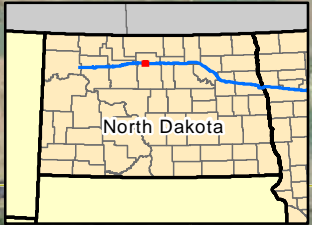
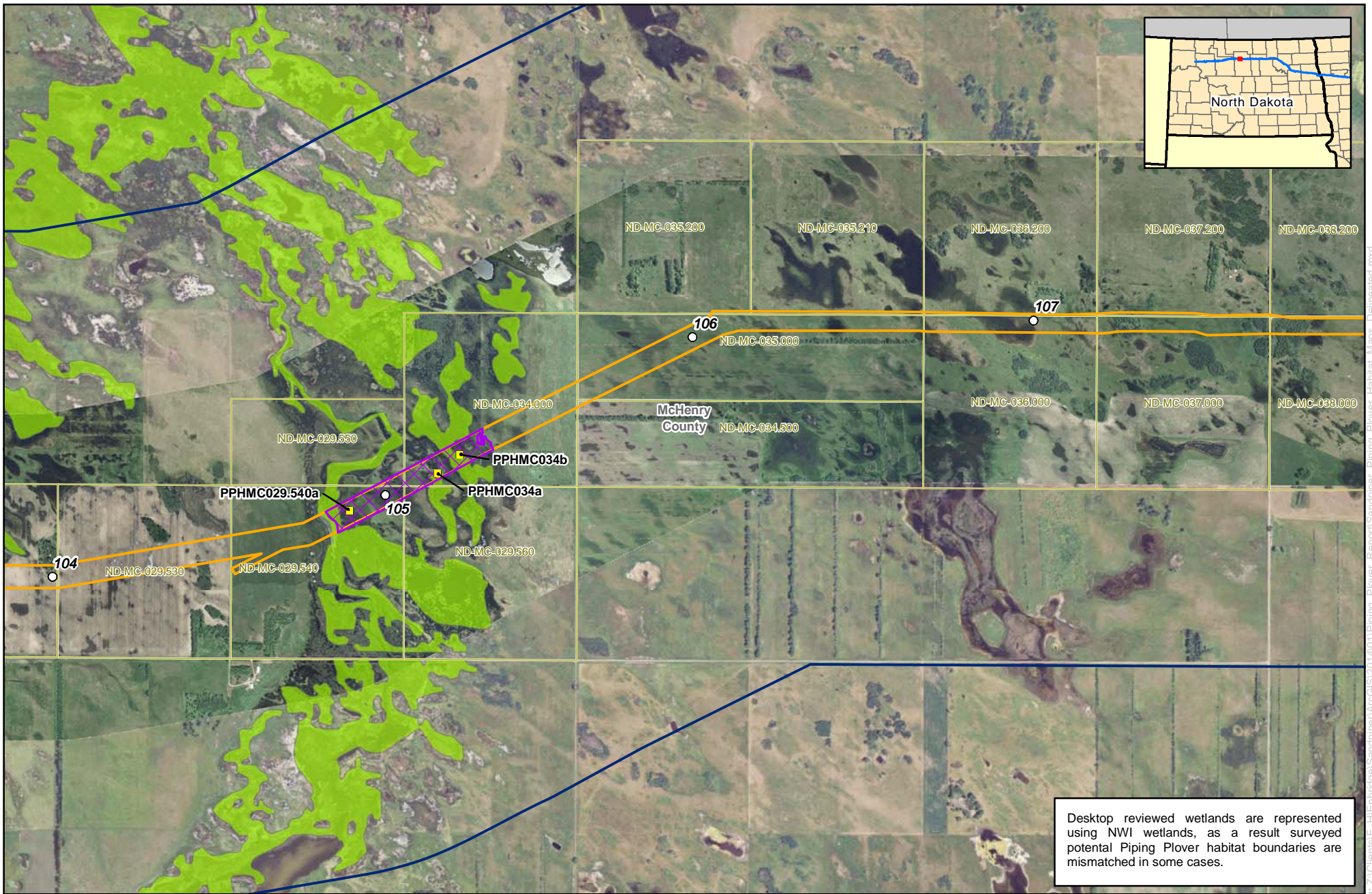


Enbridge Potential Piping Plover Suitable Habitat

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|---------------------------------|-----------------------------------|
| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |

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Date: 1/20/2014



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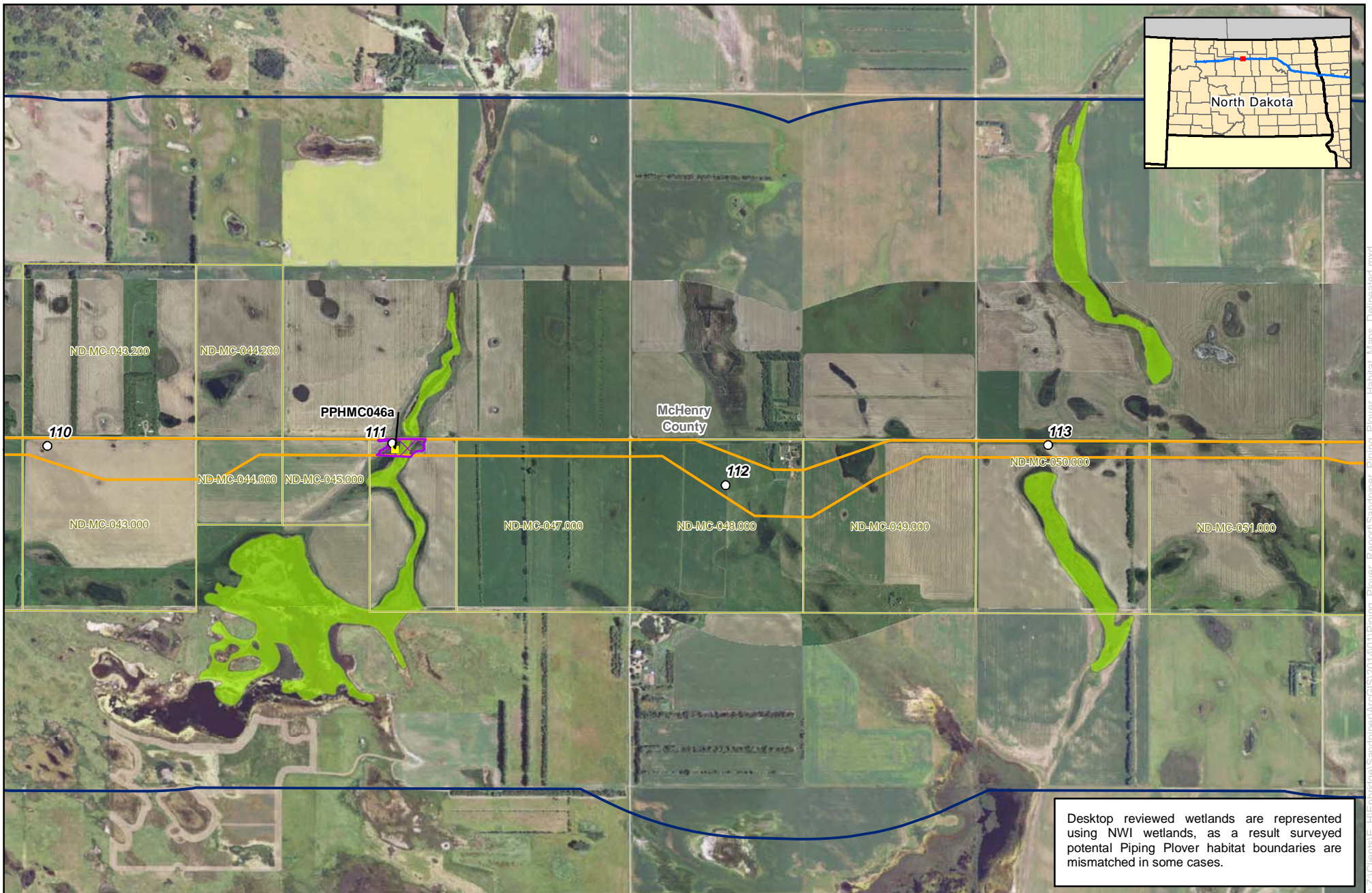


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Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▨ Potential Piping Plover Habitat |
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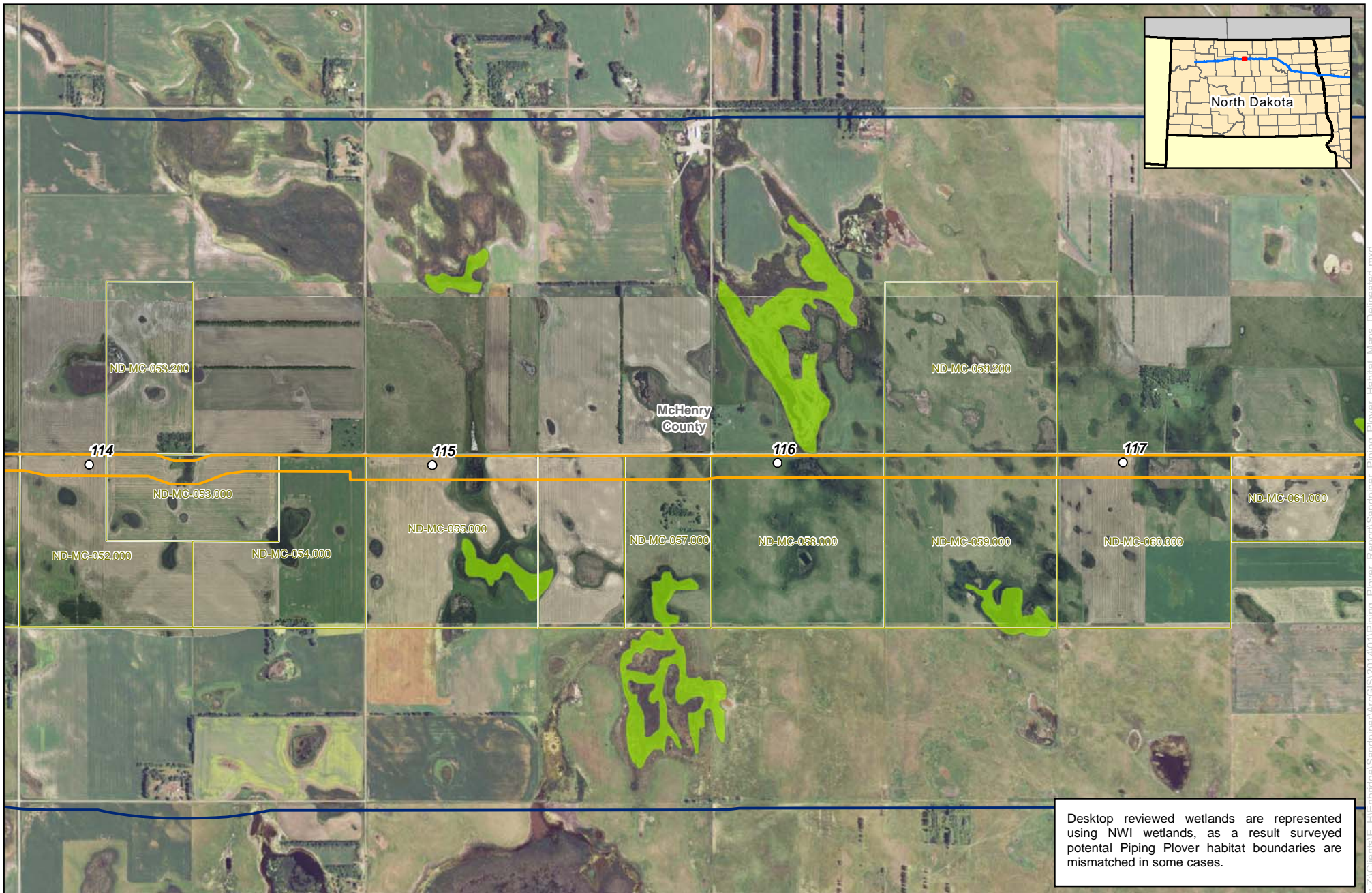


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Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
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| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |

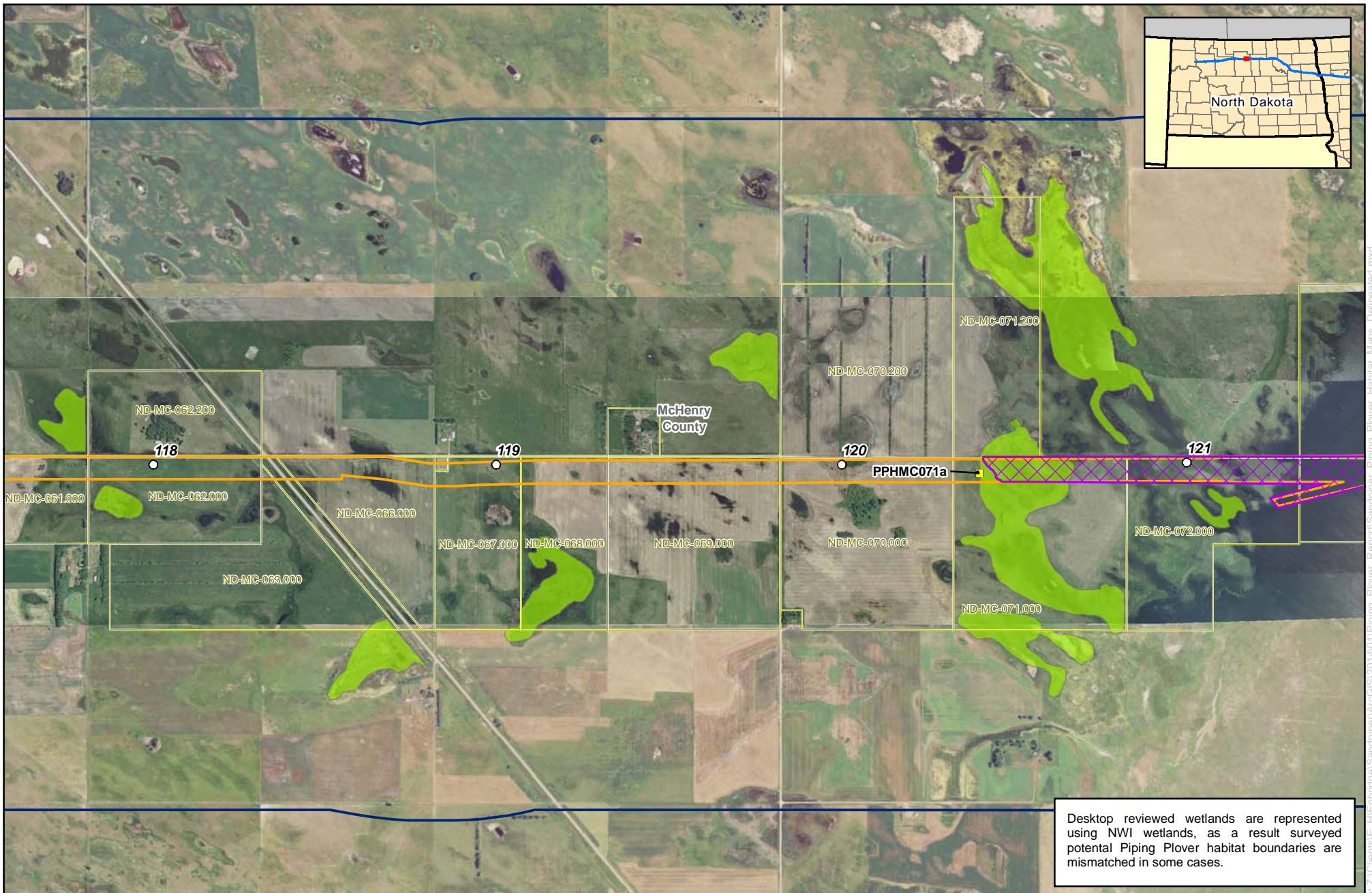


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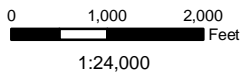


Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |



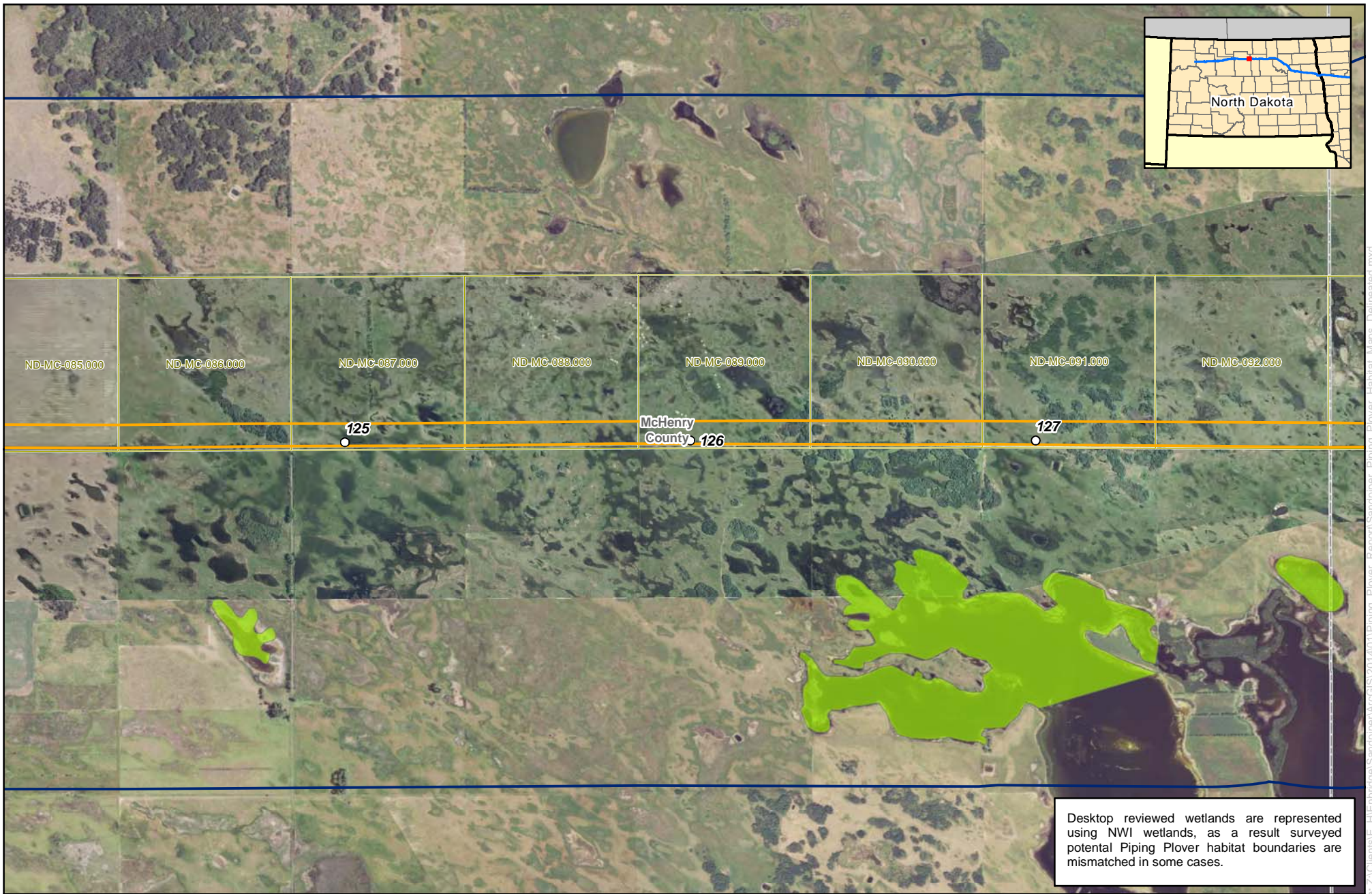
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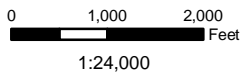
Enbridge Potential Piping Plover Suitable Habitat

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|---------------------------------|-----------------------------------|
| ○ Milepost | ■ Sample Point |
| ▭ Study Area | ■ Desktop Reviewed Wetlands |
| ▭ Environmental Survey Corridor | ▭ Potential Piping Plover Habitat |
| ▨ Survey Needed | ▭ Yes |
| ▭ Parcels | ▭ No |

Source: z:\Clients\IE_HIE\enbridge\Sandpiper\ArcGIS\2014\01\Piping_Plover_Report\Sandpiper_Piping_Plover_Habitat_Maps_DeltaState.mxd Date: 1/20/2014



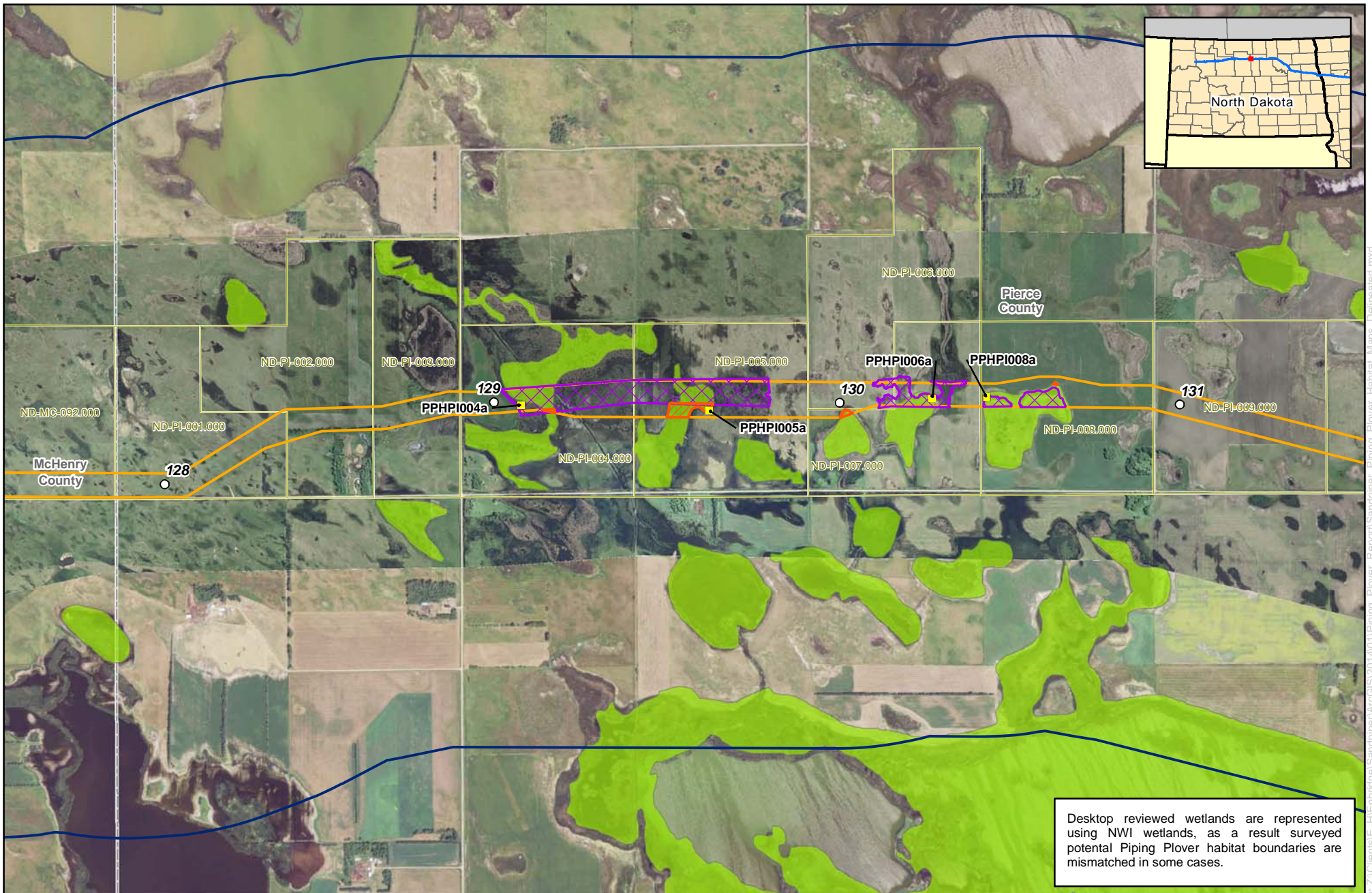
Desktop reviewed wetlands are represented using NWI wetlands, as a result surveyed potential Piping Plover habitat boundaries are mismatched in some cases.



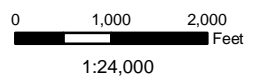
Enbridge Potential Piping Plover Suitable Habitat

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| ○ Milepost | ■ Sample Point |
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Date: 1/20/2014 Source: z:\Clients\IE_HIE\enbridge\Standpipe\ArcGIS\2014\01\Piping_Plover_Report\Standpipe_Piping_Plover_Habitat_Maps_Deliverable.mxd



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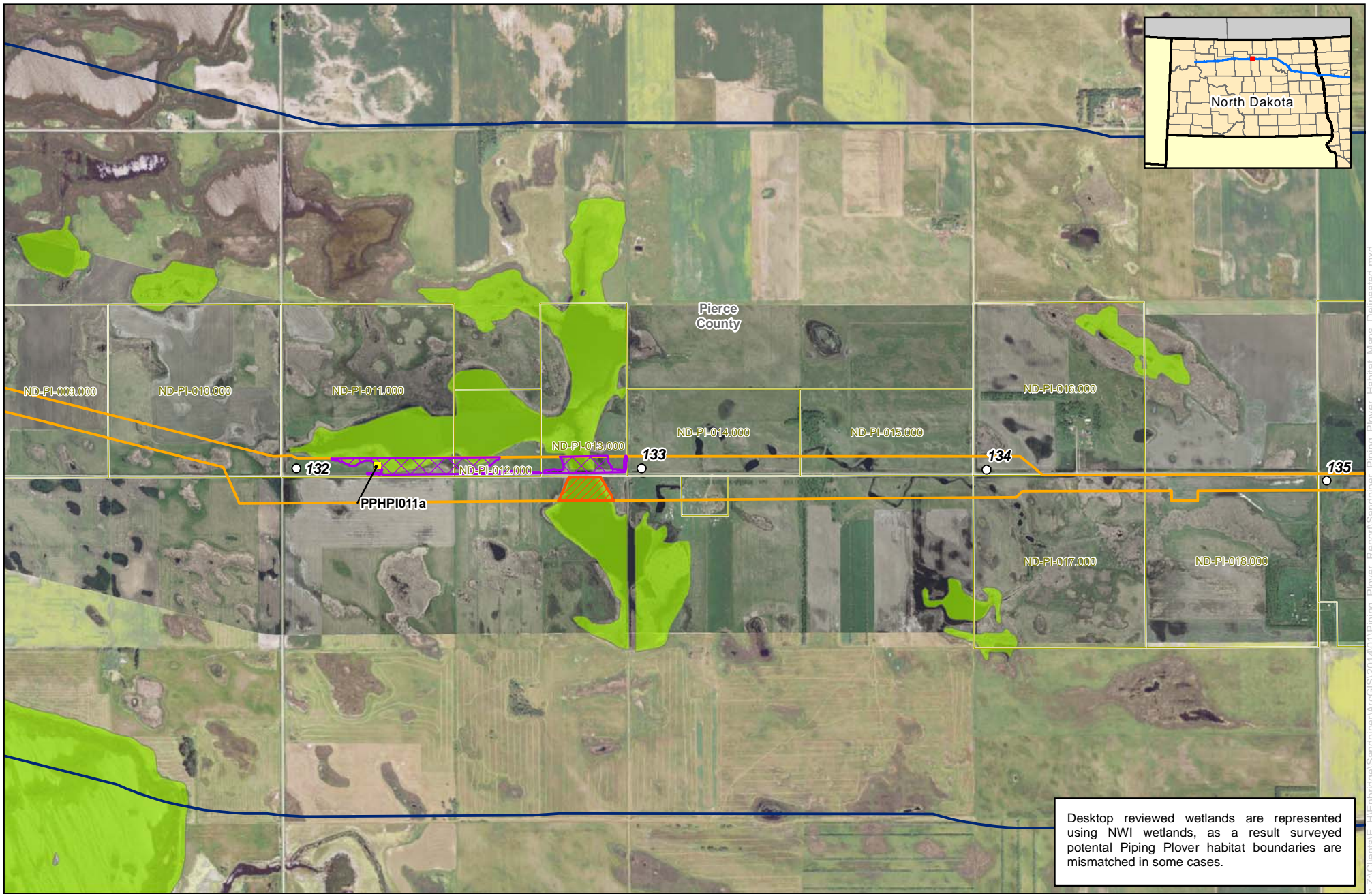


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Potential Piping Plover Suitable Habitat

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| ▭ Parcels | ▨ No |

Source: z:\Clients\IE_H\Enbridge\Sandpiper\ArcGIS\2014011\piping_Plover_Report\Sandpiper_Piping_Plover_Habitat_Maps_Deliverable.mxd Date: 1/20/2014



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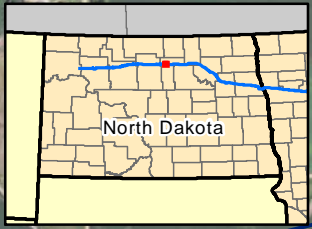
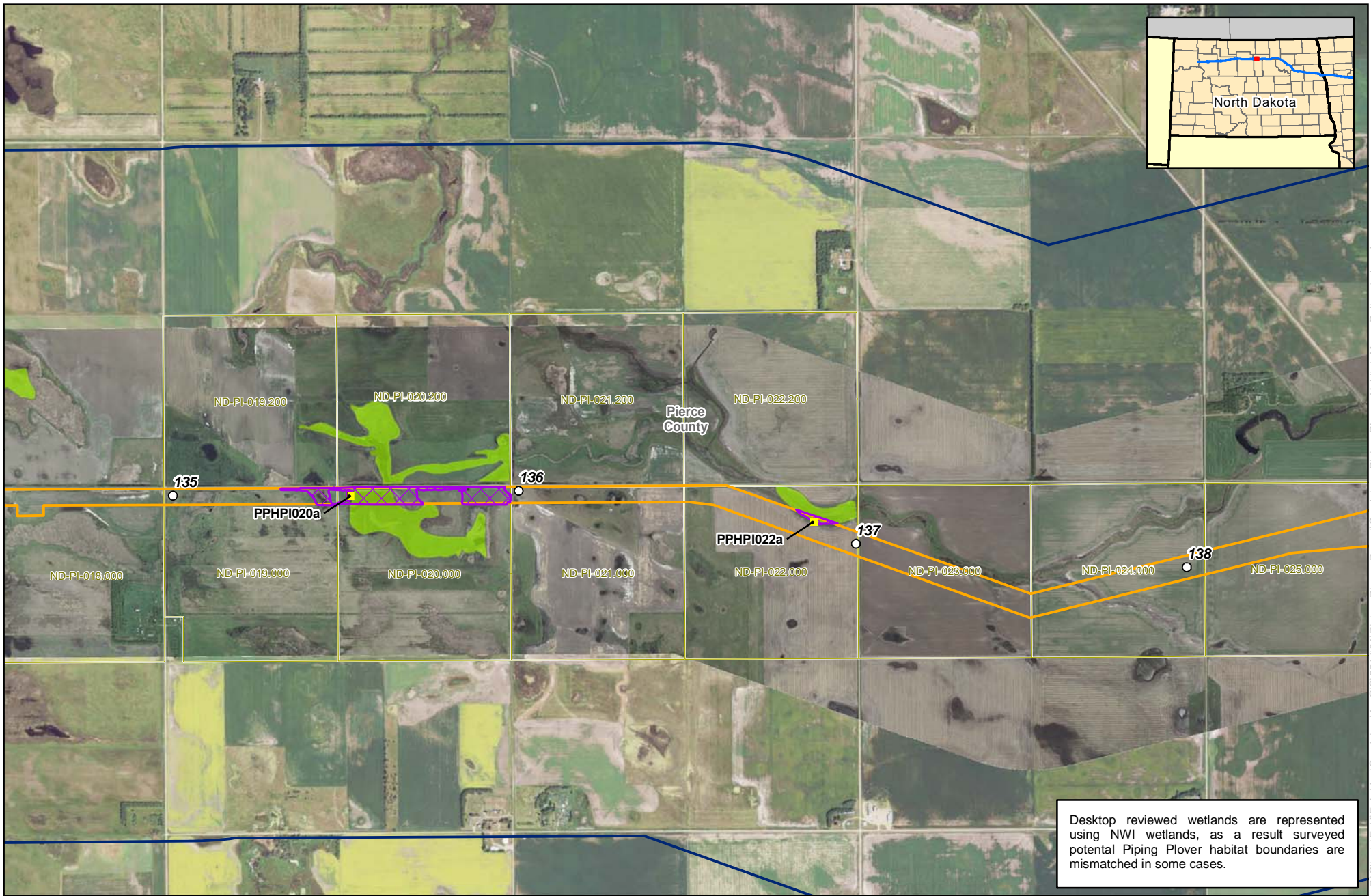
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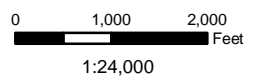
Enbridge Potential Piping Plover Suitable Habitat

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Source: z:\Clients\E_H\Enbridge\Sandpiper\ArcGIS\2014\01\Piping_Plover_Report\Sandpiper_Piping_Plover_Habitat_Maps_Deliverable.mxd Date: 1/20/2014



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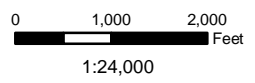
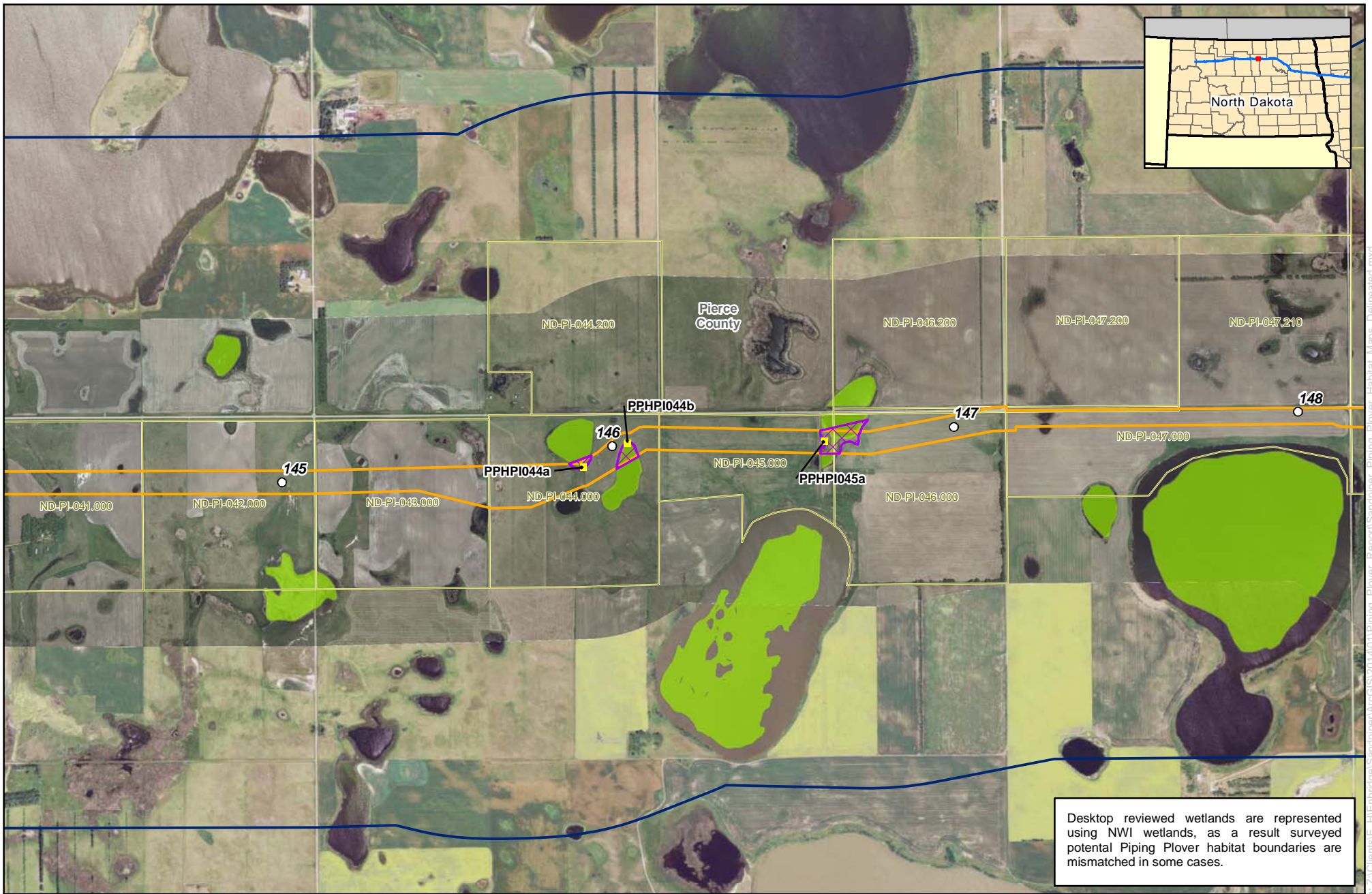


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Potential Piping Plover Suitable Habitat

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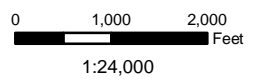
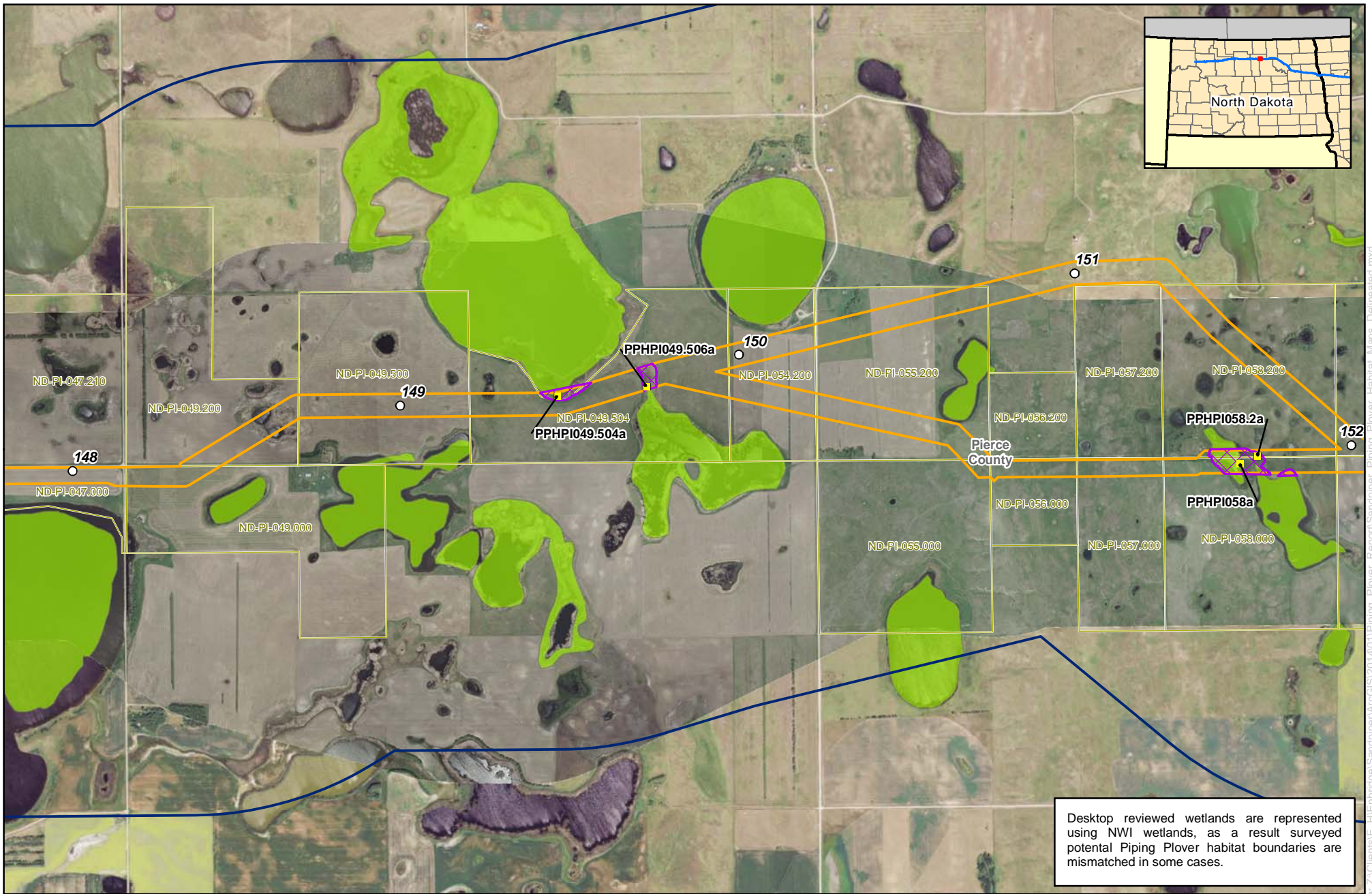


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Potential Piping Plover Suitable Habitat

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Date: 1/20/2014 Source: z:\Clients\E_H\Enbridge\Sandpiper\ArcGIS2014\01\Piping_Plover_Report\Sandpiper_Piping_Plover_Habitat_Maps_Delimited.mxd

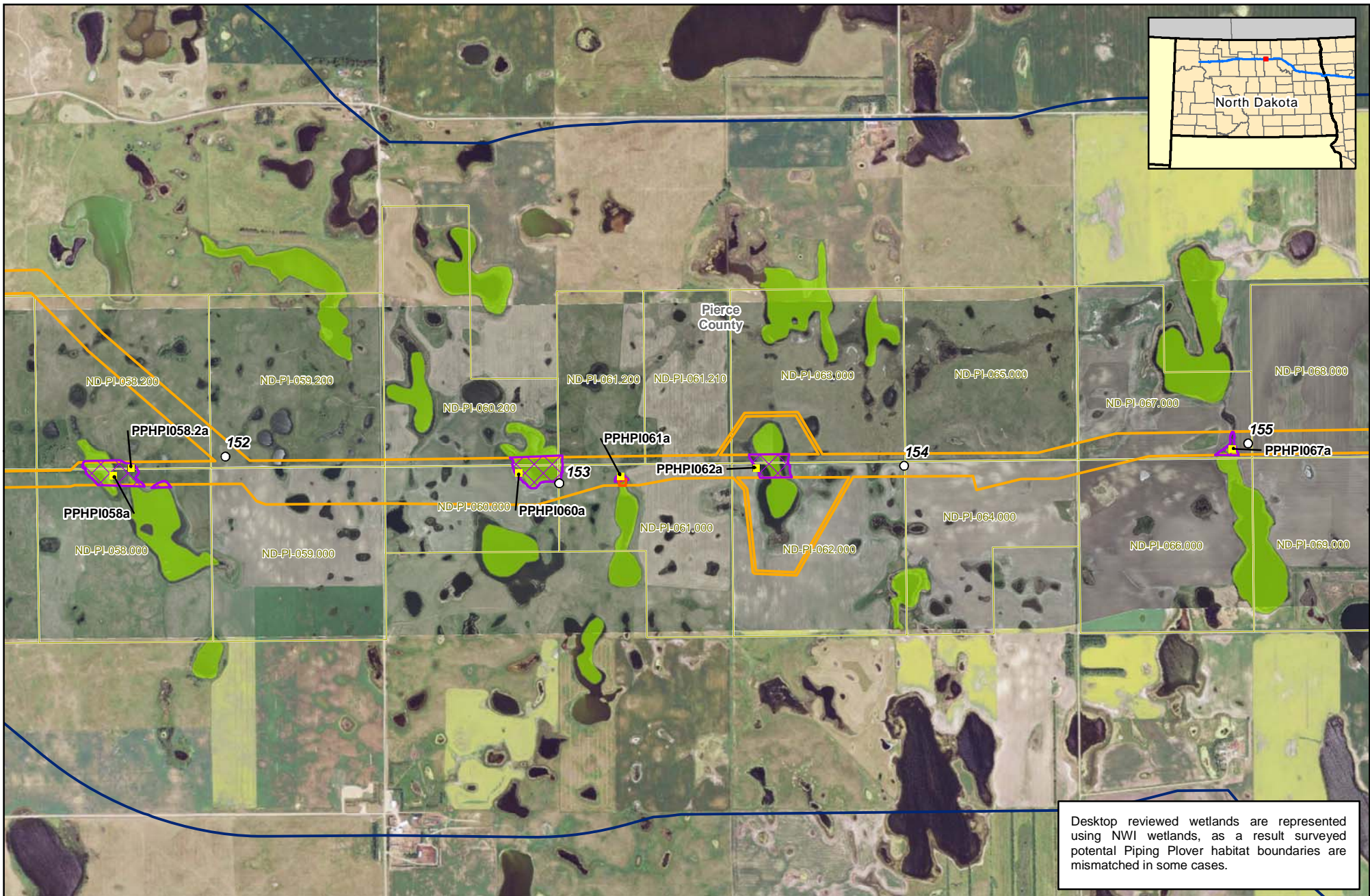
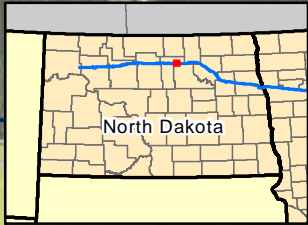


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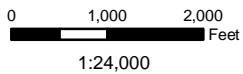
Potential Piping Plover Suitable Habitat

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Source: z:\Clients\ENBRIDGE\Sandpiper\ArcGIS\2014\01\Piping_Plover_Report\Sandpiper_Piping_Plover_Habitat_Maps_Deliverables.mxd Date: 1/20/2014

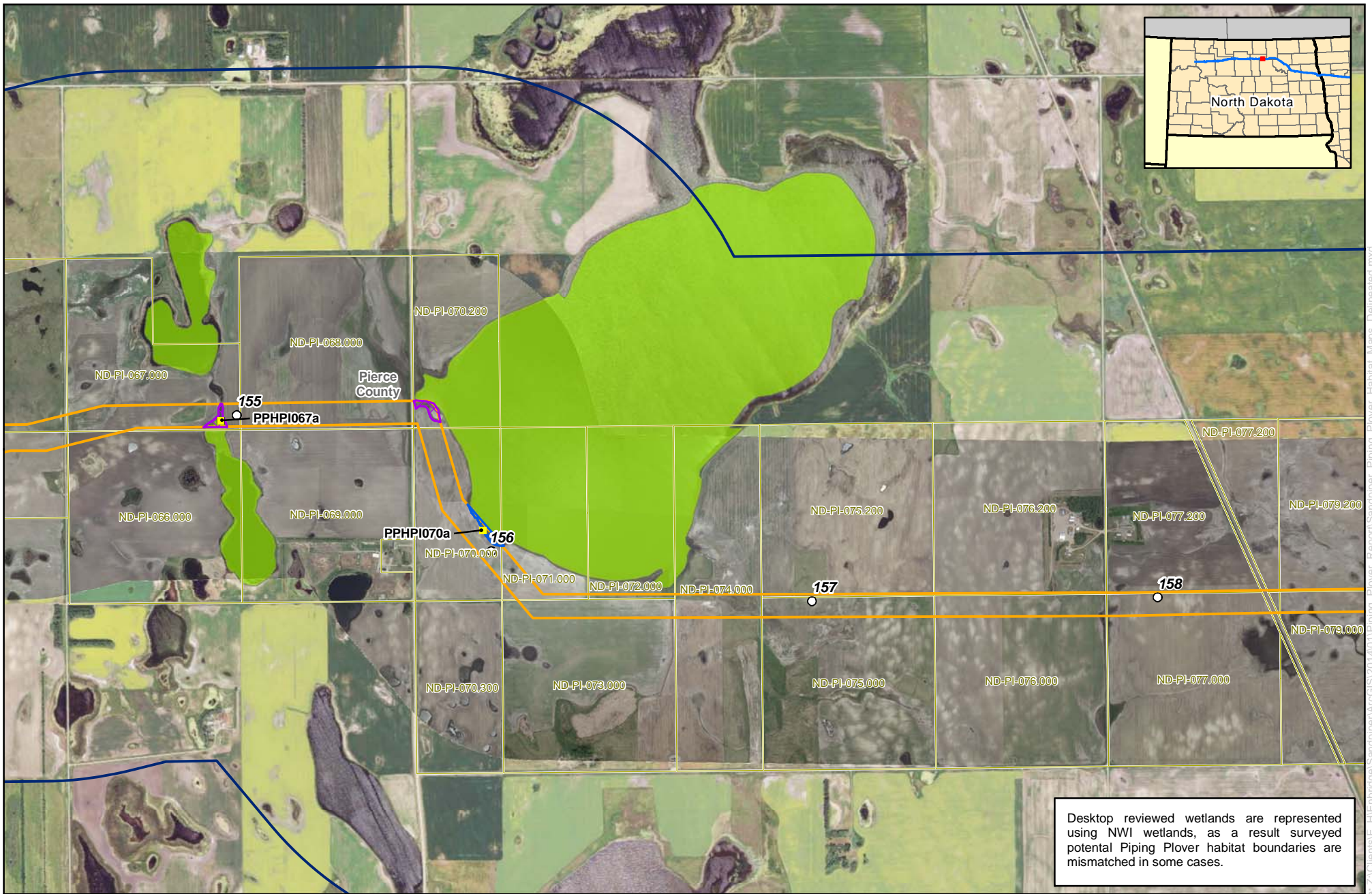


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Enbridge Potential Piping Plover Suitable Habitat

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| Milepost | Sample Point |
| Study Area | Desktop Reviewed Wetlands |
| Environmental Survey Corridor | Potential Piping Plover Habitat |
| Survey Needed | Yes |
| Parcels | No |



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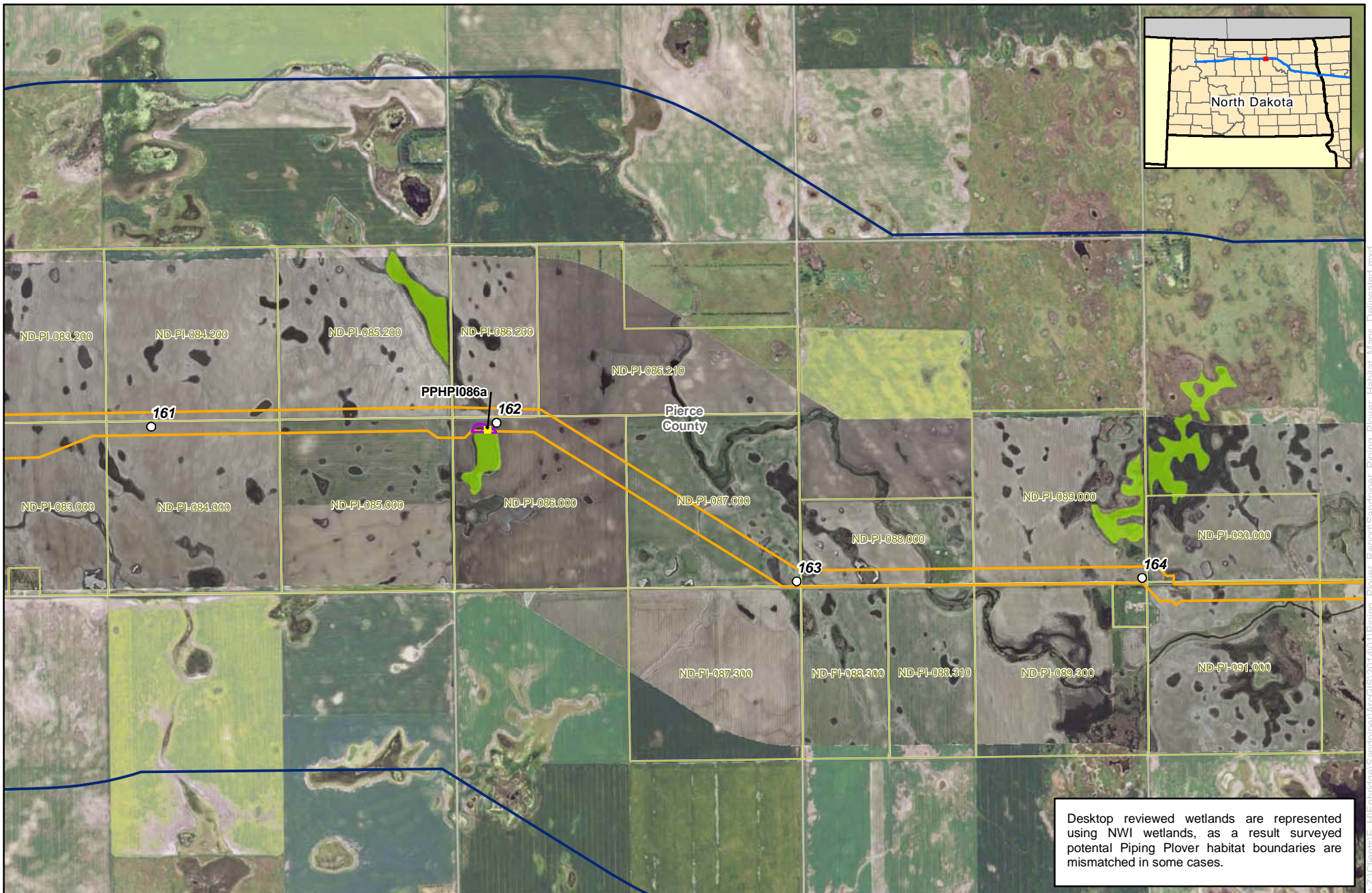
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Enbridge Potential Piping Plover Suitable Habitat

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Source: z:\Clients\E_H\Enbridge\Sandpiper\ArcGIS\2014\01\11\piping_Plover_Report\Sandpiper_Piping_Plover_Habitat_Maps_Delimited.mxd Date: 1/20/2014



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Enbridge Potential Piping Plover Suitable Habitat

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