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Other Supporting Information

Wetland Delineation Report

Upper Niobrara White NRD

Box Butte and Sheridan Counties, Nebraska

January 2023

CONTENTS

Appendices

Tables

1.0 BACKGROUND AND INTRODUCTION

Upper Niobrara White Natural Resources District (UNWNRD) is in the preliminary stages of developing its Watershed Plan in Box Butte and Sheridan County, Nebraska, for future improvements to address resource concerns related to flood prevention and groundwater declines (the Project). The proposed lands associated with the Project are situated in a rural area north of Alliance, Nebraska (see **Appendix A**, Figure 1—Project Location). The Project Study Area (Study Area) consists of rolling hills, plains, riparian drainages, and floodplains. The Study Area consists of 11 areas and 15 road right-of-way (ROW) segments adding up to 289.55 acres. These sites are located in the following townships, ranges, and sections:

- Township 28 North
    - Range 48 West
        - Sections 24, 25, 26, and 36
    - Range 47 West
        - Sections 26, 27, 30, 34, and 35
    - Range 46 West
        - Section 11
- Township 27 North
    - Range 48 West
        - Sections 11, 15, 16, 17, 21, 22, 23, 25, 26, 27, and 36
    - Range 47 West
        - Sections 16, 17, 21, 22, 23, 24, 25, 26, 30, 31, 32, 33, and 34
    - Range 46 West
        - Section 6
    - Range 48 West
        - Section 3
- Township 26 North
    - Range 47 West
        - Section 3

The purpose of this Wetland Delineation Report is to document the type, size, and location of water resources in the Study Area, including wetlands and other Waters of the U.S., as seen in Figure 2 of **Appendix A**. Based on a desktop analysis and survey conducted in June 2022, there are 44 wetland features totaling 54.19 acres. Of the 44 wetlands, 37 wetlands are emergent (53.4 acres), two (2) are forested (0.68 acre), and five (5) are scrub-shrub (0.11 acre). In addition to the wetlands, there are two (2) ephemeral channels totaling 0.02 acre (31 linear feet) and 10 open waters totaling 3.28 acres.

2.0 WETLAND DELINEATION METHODOLOGY

2.1 Standard Wetlands

HDR, Inc. (HDR) conducted an on-site wetland delineation in the Study Area June 6 – 9, 2022. Representative wetland and upland data forms were taken in accordance with the *1987 Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987) and the *Great Plains Regional Supplement to the Corps of Engineers Wetland Delineation Manual* (USACE, 2010).

According to the U.S. Army Corps of Engineers (USACE) Antecedent Precipitation Tool, normal conditions were present at the time of the delineation. The Drought Index (PDSI) was severe drought, and the WebWIMP H20 Balance documented a dry season for the delineation. Results of the Antecedent Precipitation Tool can be found in **Appendix B**.

Prior to field delineations, a desktop analysis was conducted using National Wetlands Inventory (NWI) data (USFWS, 2022), the National Hydrography Dataset (NHD) (USGS, 2022), Natural Resource Conservation Service (NRCS) Soil Survey (NRCS, 2021), and U.S. Department of Agriculture (USDA) NRCS natural color and color infrared aerial photographs (USDA, 2022) to identify possible wetlands and other water resources (see **Appendix A**, Figure 3).

Identifiable iron or manganese features (e.g., redoximorphic or redox features) do not readily form in saturated soils with a high pH. While many factors can cause a high pH (7.9 or higher), salt content is a common cause in the Great Plains of the United States. A high pH can be indicated in terms of Moderately Alkaline, Strongly Alkaline, and Very Strongly Alkaline in the USDA NRCS Soil Survey (USACE 2010). While alkalinity is not reported in the NRCS Custom Soil Resource Report for the Study Area, salt content is reported (i.e., maximum salinity). As a result, the following soil map units occurring within the Study Area were noted as being moderate to very strong saline, so indications of hydrophytic vegetation and wetland hydrology were relied upon in determining the presence/absence of a wetland within these soil map units:

- 1189 – Las Animas-Lisco very fine sandy loams, occasionally flooded
    - Contains 39% of Lisco, occasionally flooded, which is moderately saline to strongly saline;
- 5643 – Janise loam, occasionally flooded;
- 5646 – Janise loamy fine sand, overblown, 0 to 3 percent slopes;
- 1320 – Beckton silt loam, 0 to 2 percent slopes; and
- 3228 – Lute loam, 0 to 2 percent slopes.

USACE Wetland Determination Data Form locations and wetland boundaries were mapped in the field using sub-meter GPS technology, and wetlands were classified according to *Classification of Wetlands and Deepwater Habitats of the United States* (Federal Geographic Data Committee [FGDC], 2013) and Nebraska Wetland Subclass definitions. Vegetation was classified according to the *National Wetland Plant List* (USACE, 2020). Wetland Determination Data Forms are provided in **Appendix C**. Representative photos of the Study Area, including water resources and Waters of the U.S., are provided in **Appendix D**.

3.0 RESULTS

The results are presented in two sub-sections: standard wetlands and other water resources (stream channels and open waters). The results are also provided in **Appendix A**, Figure 2 Wetlands and Water Resources. The representative Wetland Determination Data Forms are provided in **Appendix C,** and Site Photographs are in **Appendix D**.

3.1 Wetlands

Results of the June 2022 wetland delineation are presented in Error! Reference source not found.. As mentioned in Section 1.0, 37 palustrine emergent (PEMA) wetlands totaling 53.4 acres, two (2) palustrine forested (PFOA) wetlands totaling 0.68 acre, and five (5) palustrine scrub-shrub (PSSA) wetlands totaling 0.11 acre were documented within the Study Area, totaling 54.19 acres.

Table 1. Standard Wetland Delineation Results

Wetland ID	Figure 2, Page Number(s)	Study Area	Wetland Classification[a] (Cowardin | Nebraska Subclass)	Area (acres)
W-1	1	Road ROW 17	PEMA | N/A	0.06
W-2	1	Road ROW 17	PEMA | N/A	0.02
W-3	1	Road ROW 17	PEMA | N/A	0.02
W-4	1	Road ROW 17	PEMA | N/A	0.11
W-5	1	Road ROW 17	PEMA | N/A	0.05
W-6	4	Area 10b	PEMA | Riverine Channel	1.14
W-7	5	Area 10a	PEMA | Riverine Channel	0.05
W-8	5	Area 10a	PEMA | Riverine Channel	0.41
W-9	5	Area 10a	PEMA | Riverine Channel	0.02
W-10	5	Area 10a	PEMA | Riverine Channel	0.01
W-11	5	Area 10a	PEMA | Riverine Channel	1.57
W-12	5	Area 10a	PEMA | Riverine Channel	0.01
W-13	9/10	Area 9a	PEMA | Riverine Channel	11.49
W-14	11	Area 9b	PEMA | Riverine Channel	0.22
W-15	11/12	Area 9b	PEMA | Riverine Channel	6.30

Wetland ID	Figure 2, Page Number(s)	Study Area	Wetland Classification[a] (Cowardin | Nebraska Subclass)	Area (acres)
W-16	12	Area 9b	PFOA | Riverine Channel	0.16
W-17	11	Area 9b	PFOA | Riverine Channel	0.52
W-18	12	Area 9b	PEMA | Riverine Channel	0.17
W-19	12	Area 9b	PEMA | Riverine Channel	10.59
W-20	13/14	Area 8b	PEMA | Riverine Channel	10.56
W-21	13/14	Area 8b	PSSA | Riverine Channel	0.03
W-22	13/14	Road ROW 8a & Area 8b	PEMA | Riverine Floodplain	0.05
W-23	13/14	Road ROW 8a	PEMA | Riverine Channel	0.0005
W-24	15	Road ROW 22	PEMA | Riverine Channel	0.06
W-25	15	Road ROW 22	PEMA | Riverine Channel	0.05
W-26	16	Road ROW 23	PEMA | Riverine Channel	0.01
W-27	16	Road ROW 23	PEMA | Riverine Channel	0.01
W-28	17/18	Area 6	PEMA | Riverine Channel	4.52
W-29	20	Road ROW 26	PEMA | Riverine Floodplain	0.09
W-30	21	Road ROW 25	PEMA | Riverine Channel	0.05
W-31	21	Road ROW 25	PEMA | Riverine Channel	0.01
W-32	22	Road ROW 14	PEMA | Riverine Floodplain	0.06
W-33	23	Road ROW 21	PEMA | Riverine Floodplain	0.03
W-34	23	Road ROW 21	PSSA | Riverine Floodplain	0.03
W-35	23	Road ROW 21	PSSA | Riverine Floodplain	0.02
W-36	23	Road ROW 21	PSSA | Riverine Floodplain	0.01
W-37	24	Road ROW 19	PEMA | Riverine Channel	0.003
W-38	24	Road ROW 19	PSSA | Riverine Channel	0.02
W-39	24	Road ROW 19	PEMA | Riverine Channel	0.01

Wetland ID	Figure 2, Page Number(s)	Study Area	Wetland Classification[a] (Cowardin | Nebraska Subclass)	Area (acres)
W-40	24	Road ROW 19	PEMA | Riverine Channel	0.02
W-41	25	Road ROW 2a & Area 2b	PEMA | Riverine Channel	3.44
W-42	25	Area 2a	PEMA | Riverine Floodplain	0.36
W-43	25	Area 2a	PEMA | Riverine Floodplain	1.78
W-44	25	Area 2b	PEMA | Riverine Channel	0.05
			TOTAL	**54.19**

Notes:

a. PEMA = Palustrine Emergent Temporarily Flooded; PSSA = Palustrine Scrub-Shrub Temporarily Flooded; PFOA = Palustrine Forested Temporarily Flooded.

The 37 PEMA wetlands varied from small roadside areas to large areas intertwined with some upland, open water, scrub-shrub wetlands, and/or forested wetlands. Of the 37 PEMA wetlands, 21 were within the Road ROW study areas. These 20 sites had reed canarygrass (*Phalaris arundinacea*) and cattails (*Typha spp.*) dominating their plant communities. Most of these wetlands occur in a low landscape position where they can collect water for extended periods from overland runoff, including neighboring crop field runoff and road runoff.

Wetlands W-1 through W-5, W-22, W-23, W-29, W-32, and W-33 are dominated by emergent wetland vegetation, particularly reed canarygrass and cattail, and occur along roads within the study area. These wetlands are largely a result of road construction and maintain wetland characteristics with a low landscape position, concave topography, and runoff from roads and upslope road drainage ditches.

Emergent wetlands W-24 through W-27, W-28, W-30, W-31, W-37, W-39, and W-40 are associated with linear drainage features that do not contain characteristics of a stream, such as a change in the character of soil, sediment sorting, scour, deposition, and defined bed and bank (USACE 2007). Rather, linear drainage features exhibit characteristics of an emergent, of which includes hydrophytic vegetation, hydric soils, and wetland hydrology indicators. Prevalent emergent wetland vegetation included that of previously mentioned roadside wetlands, but with more diversity, including, common rush (*Juncus effusus*), common spikerush (*Eleocharis palustris*), and silverscale saltbush (*Atriplex argentea*).

Wetlands W-6 through W-13, W-28, and W-41 through W-44 are all PEMA wetlands, and also associated with linear drainage features. Among these wetlands, common dominant species included reed canarygrass, common timothy (*Phleum pratense*), and unknown sedges (*Carex spp*.). Soils were found to be problematic at most of these wetlands due to moderate to strong

saline levels in the soils and/or anthropogenic influence. The primary source of hydrology is a high-water table during wet periods, overland runoff, and precipitation throughout the year.

Wetlands W-14, W-15, W-18, and W-19 are all PEMA wetlands located at site 9b. These wetlands were intertwined with upland areas, forested wetlands, and open water within a linear drainage feature, identified as Box Butte Creek. A low landscape position, upstream drainage, and active beaver activity/dams in the local vicinity all contribute to wetland hydrology indicators. The PEMA wetland area's plant community was dominated by sedges, redtop (*Agrostis gigantea*), and reed canarygrass. In the southern end of site 9b, where W-19 begins, a shift in vegetation occurs, and the emergent wetland becomes dominated by cattails mixed with some willows (*Salix spp*.) These wetlands have a direct hydrological connection with Box Butte Creek. During large flow events, water levels within Box Butte Creek rise substantially according to local residents.

Wetlands W-16 and W-17 located within site 9b are PFOA wetlands. As previously mentioned, these wetlands were intertwined with PEMA wetlands, upland islands, and areas with open water withina low landscape drainageway with local beaver activity/dams. W-16 and W-17 are dominated by black willow (*Salix nigra*) and silverscale saltbush. These forested wetlands' primary source of hydrology is from the high water table associated with Box Butte Creek.

Wetlands W-34 through 36 and W-38 are roadside PSSA wetlands within two ROW sites. Wetland W-21 is also a PSSA wetland abutting a large PEMA wetland and upland area. These wetlands were predominantly dominated by sandbar willow (*Salix exigua*) with some black willow. The primary source of hydrology for these wetlands is a high water table associated with a low landscape position and overland/upslope runoff.

Wetland W-20 is a PEMA wetland located within site 8b. This wetland's plant community is dominated by reed canarygrass, cattails, and some sandbar willow. The primary source of hydrology within this wetland is a high water table associated with a low landscape position and periodic flow within a drainageway.

3.2 Other Water Resources

The delineation identified two (2) ephemeral channels (**Table 2**) and 10 open water resources (

Table 3). The ephemeral channels are unnamed waterways.

Table 2. Streams

Sample ID	Figure 2, Page Number	Site	Type	Channel Linear (feet) / Area (acre)
S-1	22	Road ROW 14	Ephemeral Channel	14 / 0.009
S-2	22	Road ROW 14	Ephemeral Channel	17 / 0.007
			TOTAL	**31 / 0.02**

The ephemeral channels (S-1 and S-2) are small channels associated with runoff from the adjacent agricultural fields. At the time of the delineation, little water was in the channel. The average ordinary high-water mark (OHWM) width for the identified ephemeral channel is 2 feet.

Table 3. Open Waters

Sample ID	Figure 2, Page Number(s)	Site	Type	Open Water Area (acre)
OW-1	4	Area 10b	PUB	0.06
OW-2	5	Area 10a	PUB	0.07
OW-3	5	Area 10a	PUB	0.07
OW-4	5	Area 10a	PUB	0.10
OW-5	5	Area 10a	PUB	0.27
OW-6	5	Area 10a	PUB	0.05
OW-7	5	Area 10a	PUB	0.23
OW-8	11	Area 9b	PUB	0.25
OW-9	11/12	Area 9b	PUB	0.84
OW-10	13/14	Area 8b	PUB	0.15
			TOTAL	**3.58**

Open waters OW-1 through OW-10 are ponded areas associated with their low-lying positions in the landscape. These open waters were void of vegetation and supported wetland fringes. These open waters appear to receive their hydrology from precipitation and a high-water table. In addition to precipitation and a high-water table, an influential aspect of OW-6 and OW-7 are beaver dams located upstream of the ponds.

4.0 DISCUSSION

The wetland delineation resulted in 44 wetlands (54.19 acres), two ephemeral channels (0.02 acre/ 31 ft), and 10 open water features (3.58 acres), all considered to be waters of the U.S.

Activities within waters of the U.S. are regulated by the USACE and Environmental Protection Agency (EPA). Due to the recent court order vacating the Navigable Water Protection Rule revisions to the definition of waters to be regulated by the Clean Water Act (i.e., waters of the U.S.), HDR evaluated, based on professional interpretation of the pre-2015 regulatory regime, the potential for federal jurisdiction under Section 404 of the Clean Water Act in the Study Area. The two most recently approved guidance for jurisdictional determinations from the USACE and EPA prior to 2015 were published on January 15, 2003 (68 Federal Register 1996) and December 2, 2008 (USACE 2008), referred to as the SWANCC Joint Memorandum and the Rapanos Guidance, respectively. Future rulemaking and guidance could change the definition of waters of the U.S. As a result, further evaluation of potential jurisdiction may be necessary when additional guidance or further rulemaking is available from the USACE.

This delineation and proposed jurisdictional determination of waters of the U.S. within the Study Area is based on the best professional judgment of HDR's team of wetland delineators, with extensive experience with delineation and Clean Water Act Section 404 permitting in the Great Plains region of the United States. However, it does not constitute an Approved Jurisdictional Determination, which can only be officially rendered by the USACE Regulatory Branch through the formal review process.

5.0 REFERENCES

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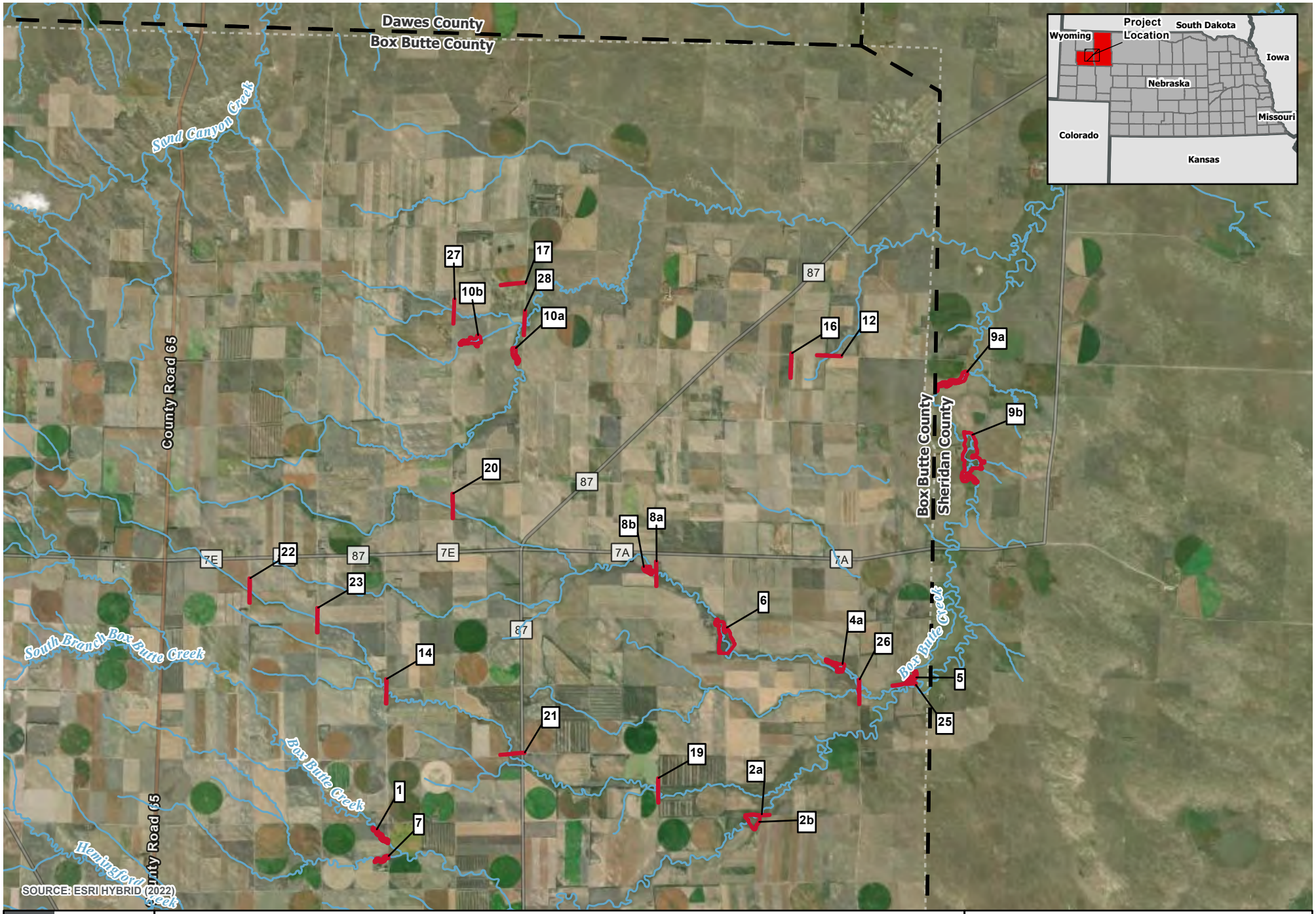
Appendix A.
FIGURES



PROJECT LOCATIONS

BOX BUTTE WETLAND DELINEATION

FIGURE 1

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- Photo Point
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- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Road ROW 17

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 1 OF 28

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- Open Water
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- Study Area - Road ROW
- County

Road ROW 27

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 2 OF 28

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- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Road ROW 28

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 3 OF 28

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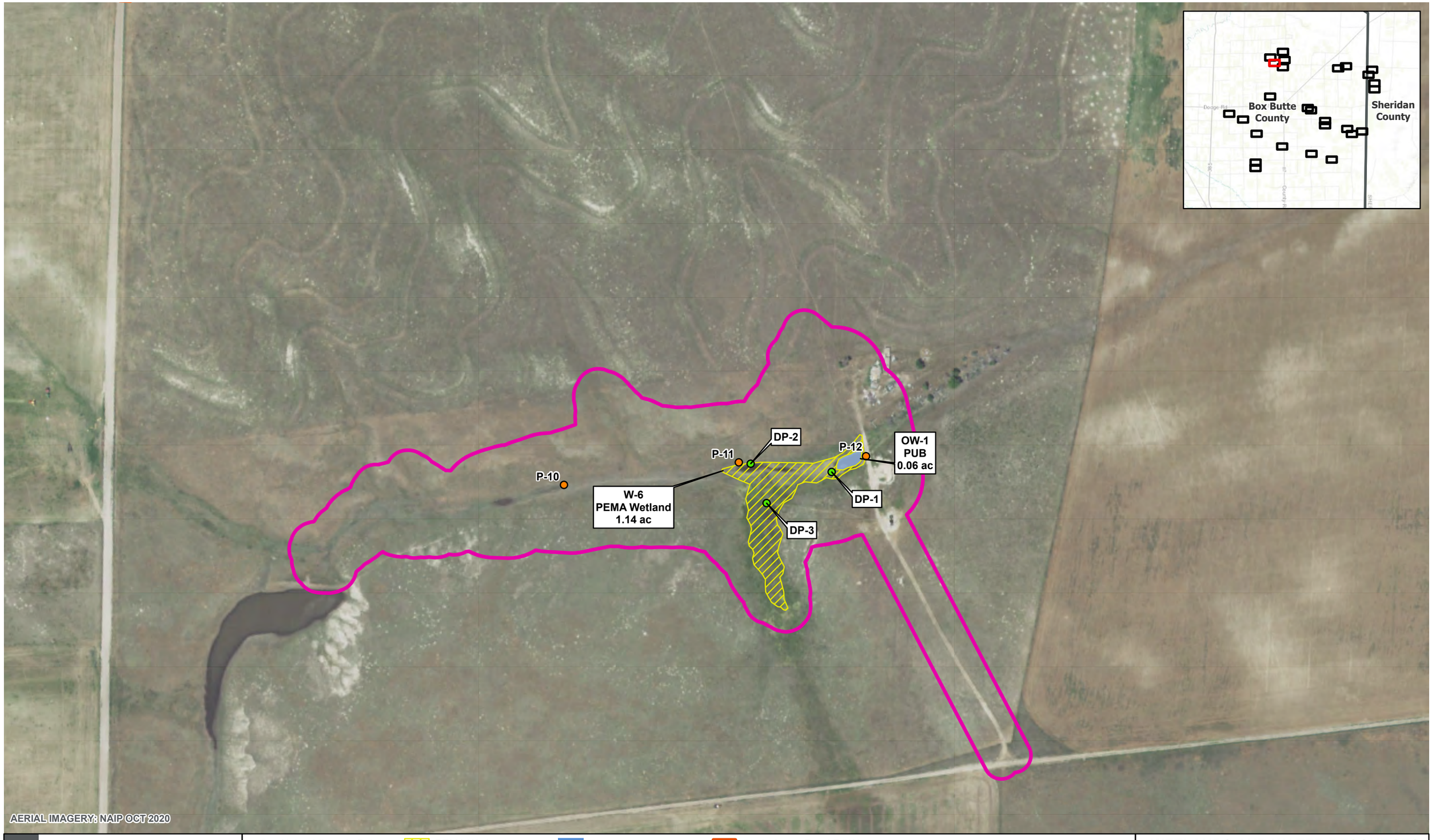

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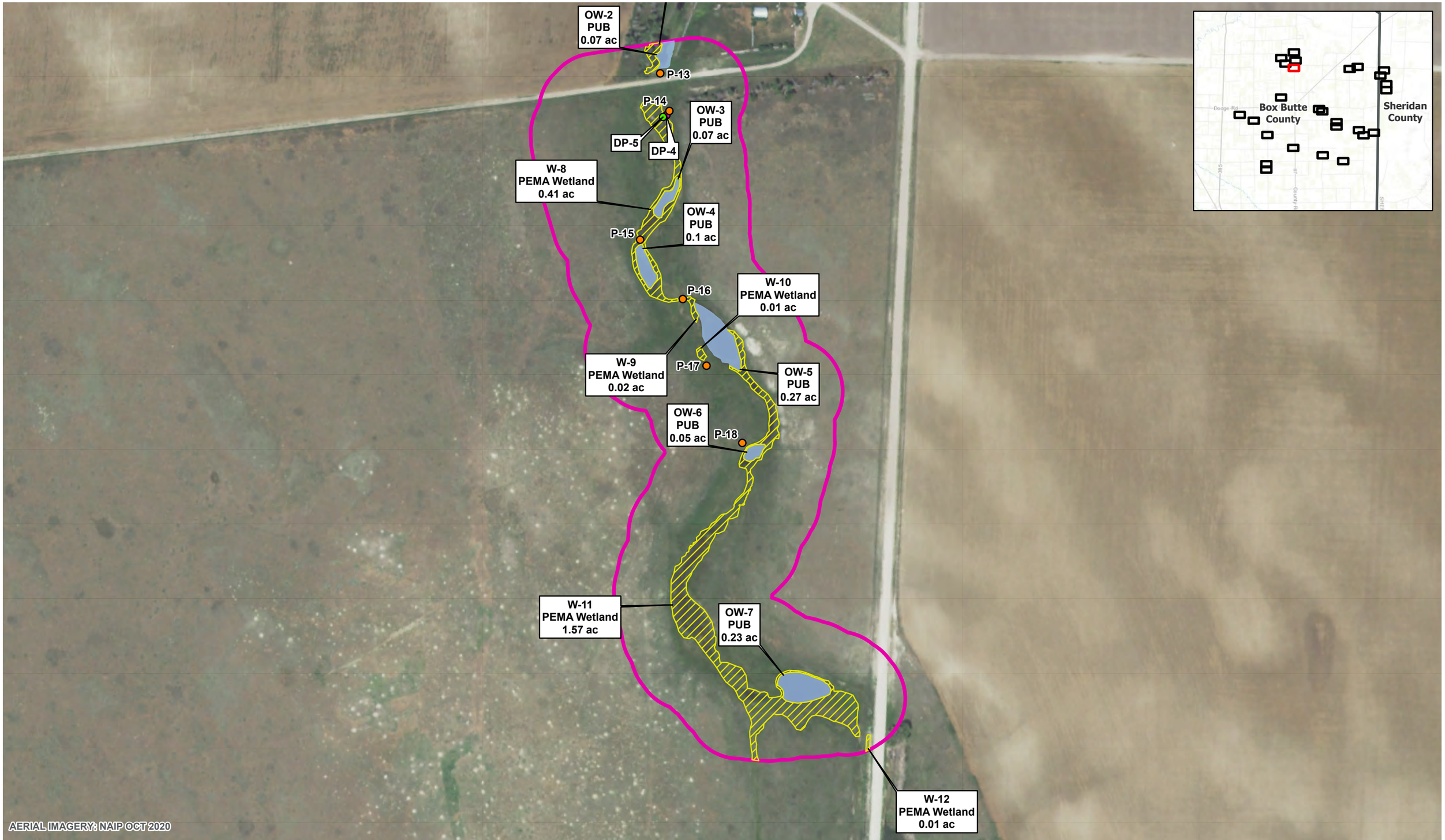
- County

Area 10b

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 4 OF 28



WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 5 OF 28

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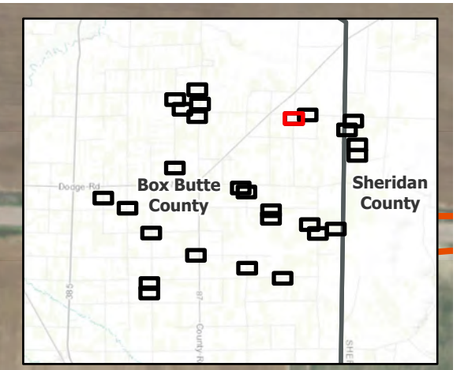
Road ROW 20

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 6 OF 28



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- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Road ROW 16

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 7 OF 28

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- Photo Point
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- Stream
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- County

Road ROW 12

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 8 OF 28

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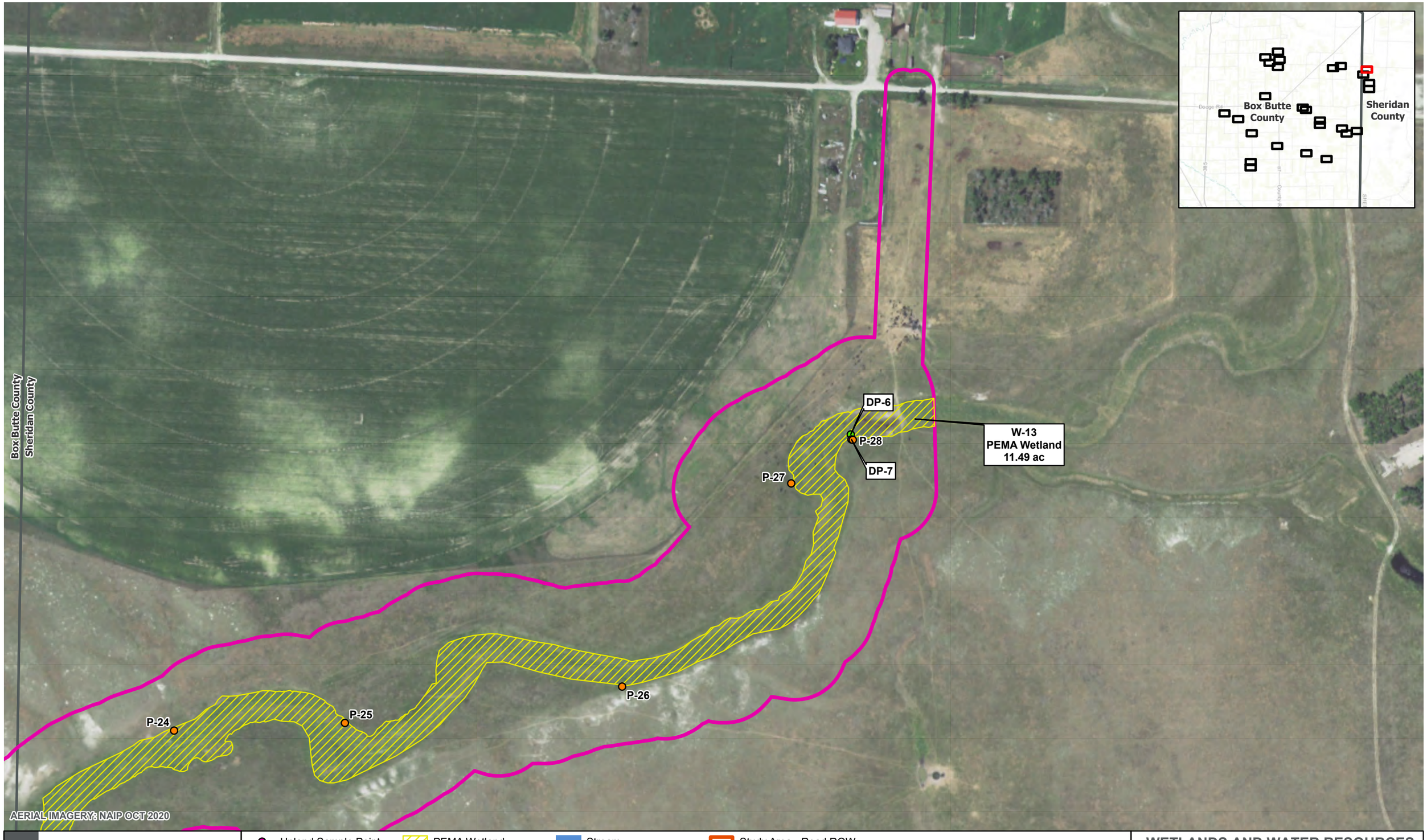

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- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Area 9a

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 9 OF 28

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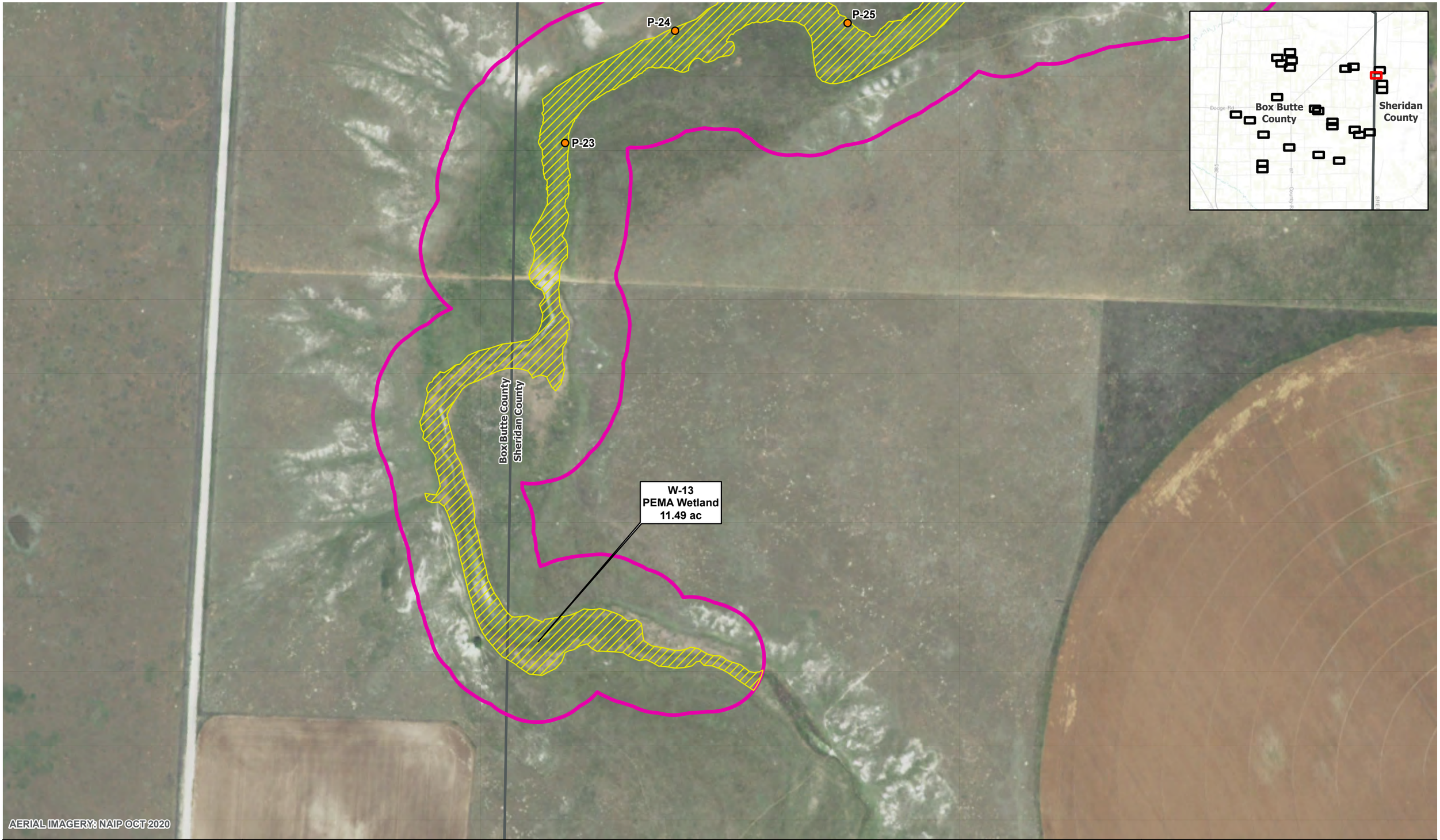

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- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Area 9a

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 10 OF 28

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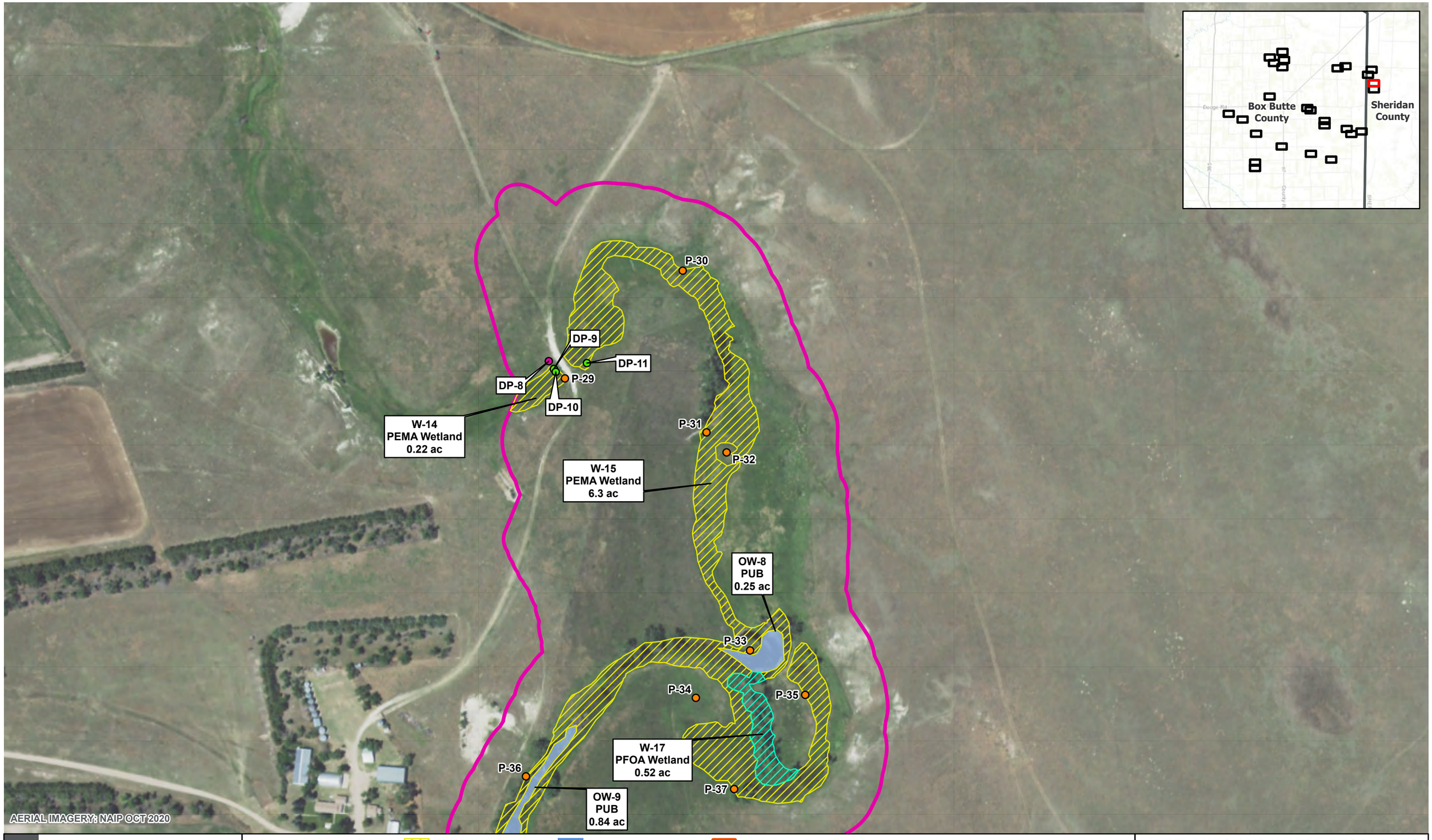

HDR

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- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Area 9b

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 11 OF 28

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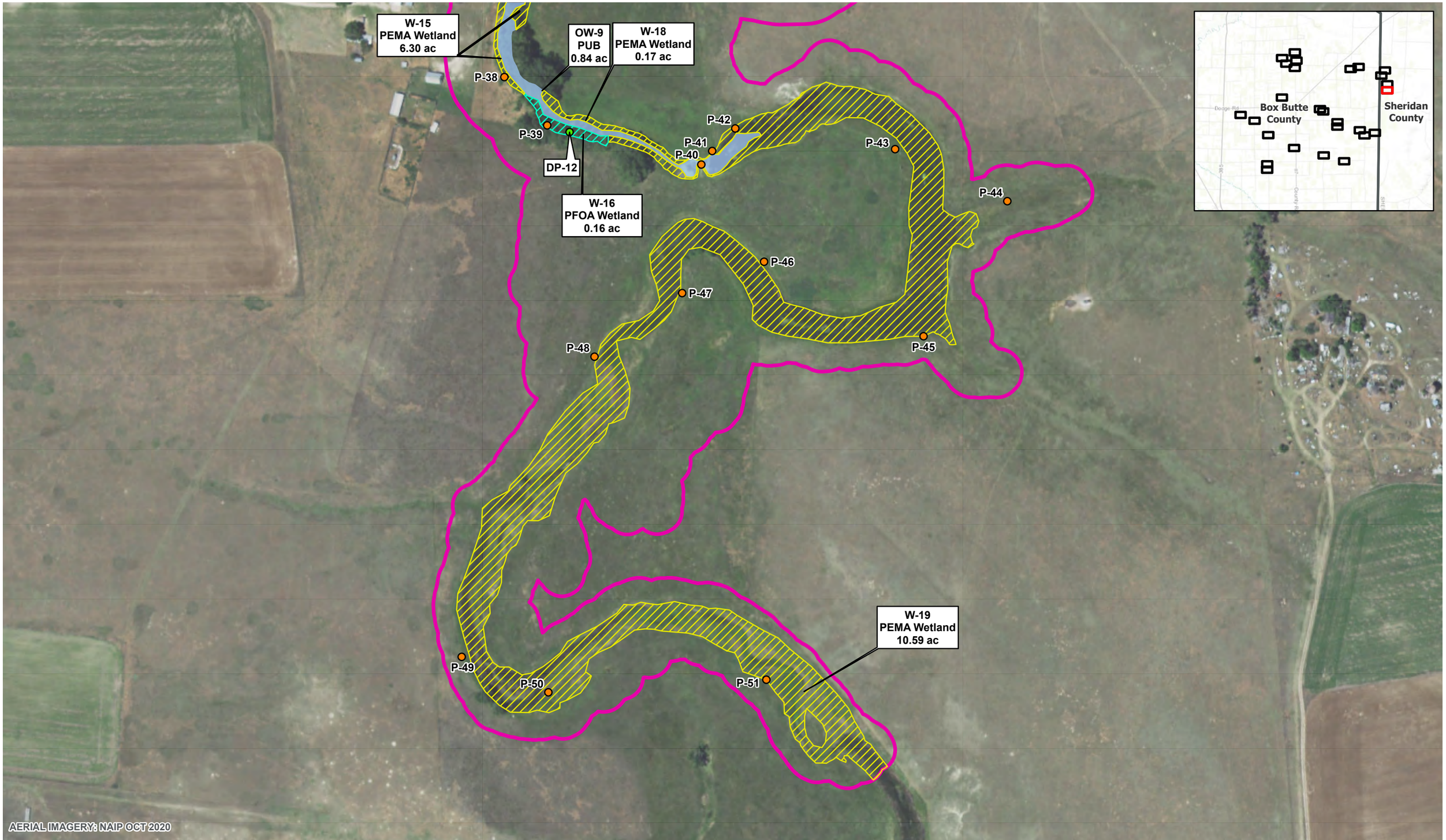


0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

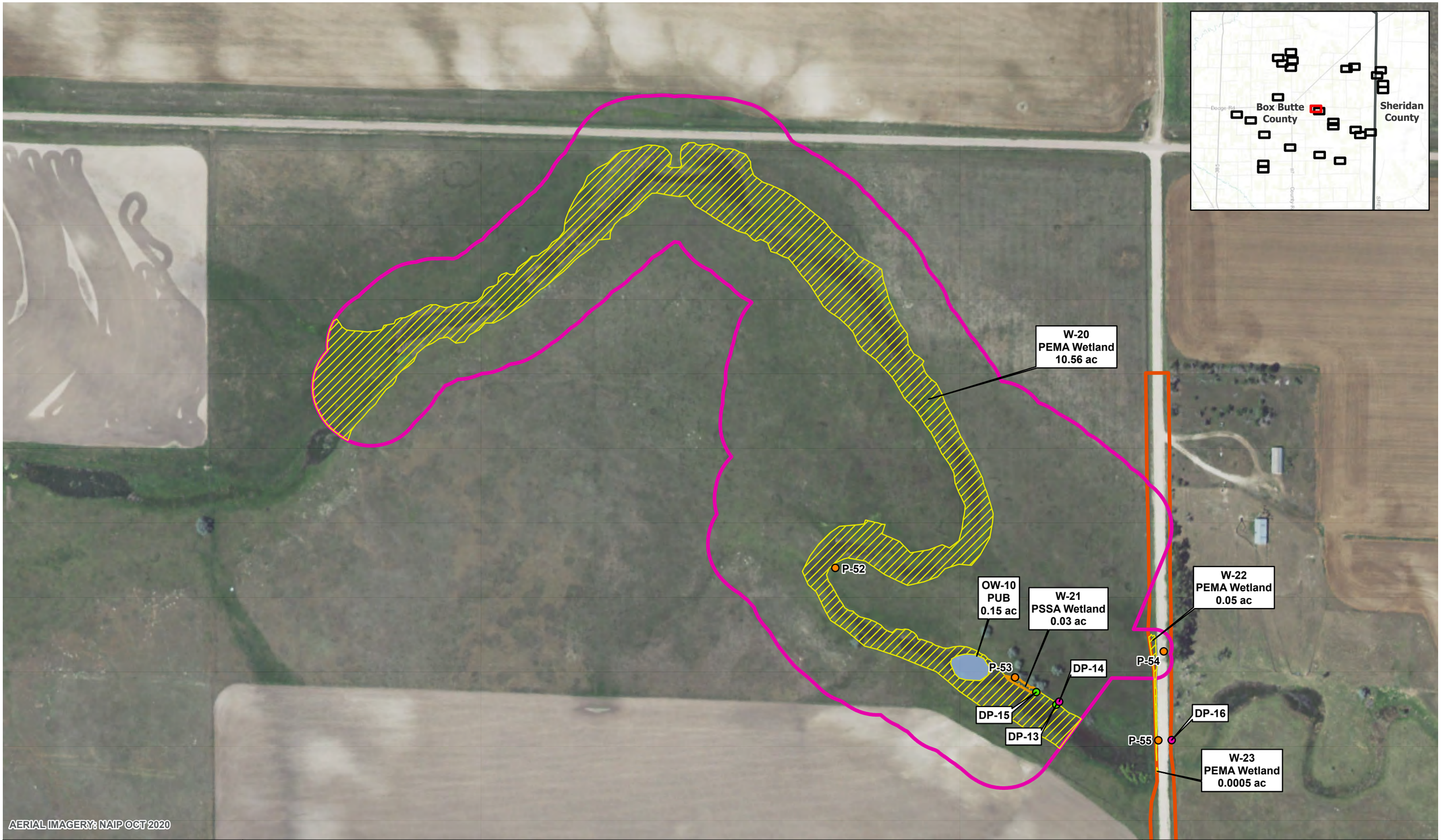
Area 9b

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 12 OF 28

PATH: \\DENPI-GISFS01\GISDATA\PROJECTS\UPPER_NIOBRARA_WHITE_NRD\10257466_BOXBUTTE\7.2_WIP\MAP_DOCS\APRX\BOXBUTTE.APRX - USER: RDONALDSON - DATE: 5/8/2024



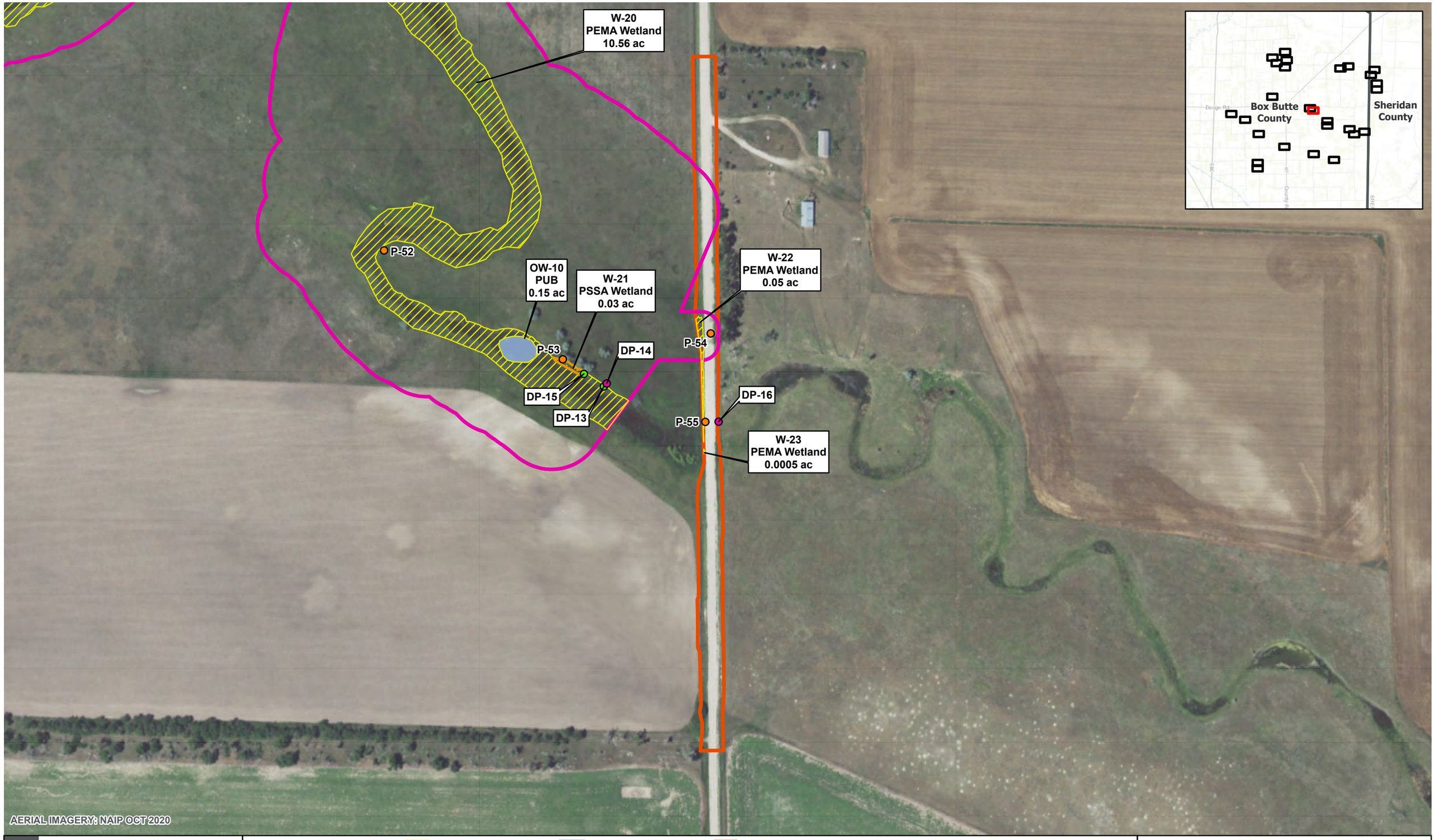
0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Road ROW 8a & Area 8b

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 13 OF 28

PATH: \\DENPI-GISFS01\GISDATA\PROJECTS\UPPER_NIOBRARA_WHITE_NRD\10257466_BOXBUTTE\7.2_WIP\MAP_DOCS\APRX\BOXBUTTE.APRX - USER: RDONALDSON - DATE: 5/8/2024



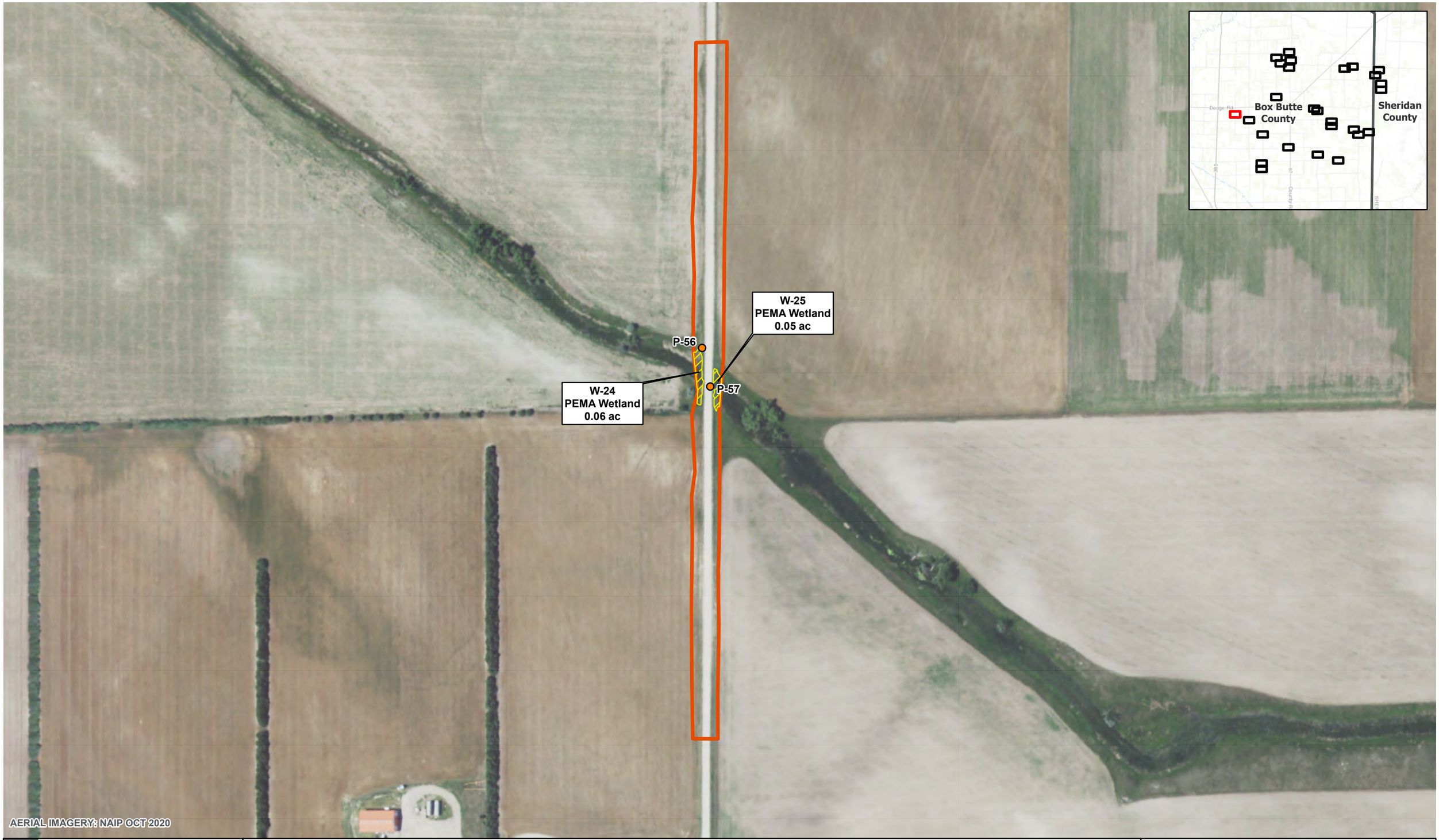
0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Road ROW 8a & Area 8b

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 14 OF 28

PATH: \\DENPI-GISFS01\GISDATA\PROJECTS\UPPER_NIOBRARA_WHITE_NRD\10257466_BOXBUTTE\7.2_WIP\MAP_DOCS\APRX\BOXBUTTE.APRX - USER: RDONALDSON - DATE: 5/8/2024



0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Road ROW 22

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 15 OF 28

HDR

0 Feet 200

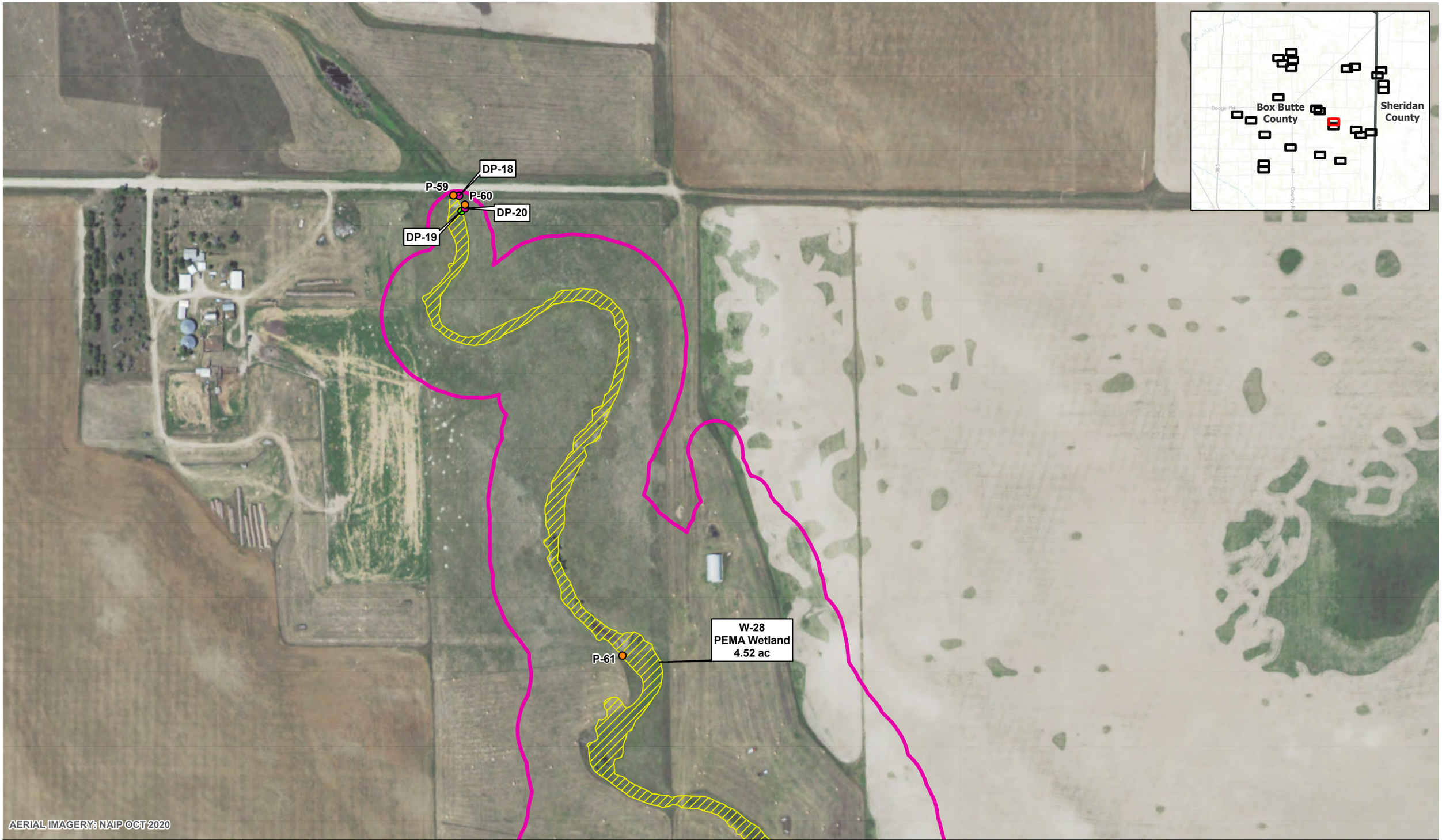
- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Road ROW 23

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 16 OF 28



HDR

0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

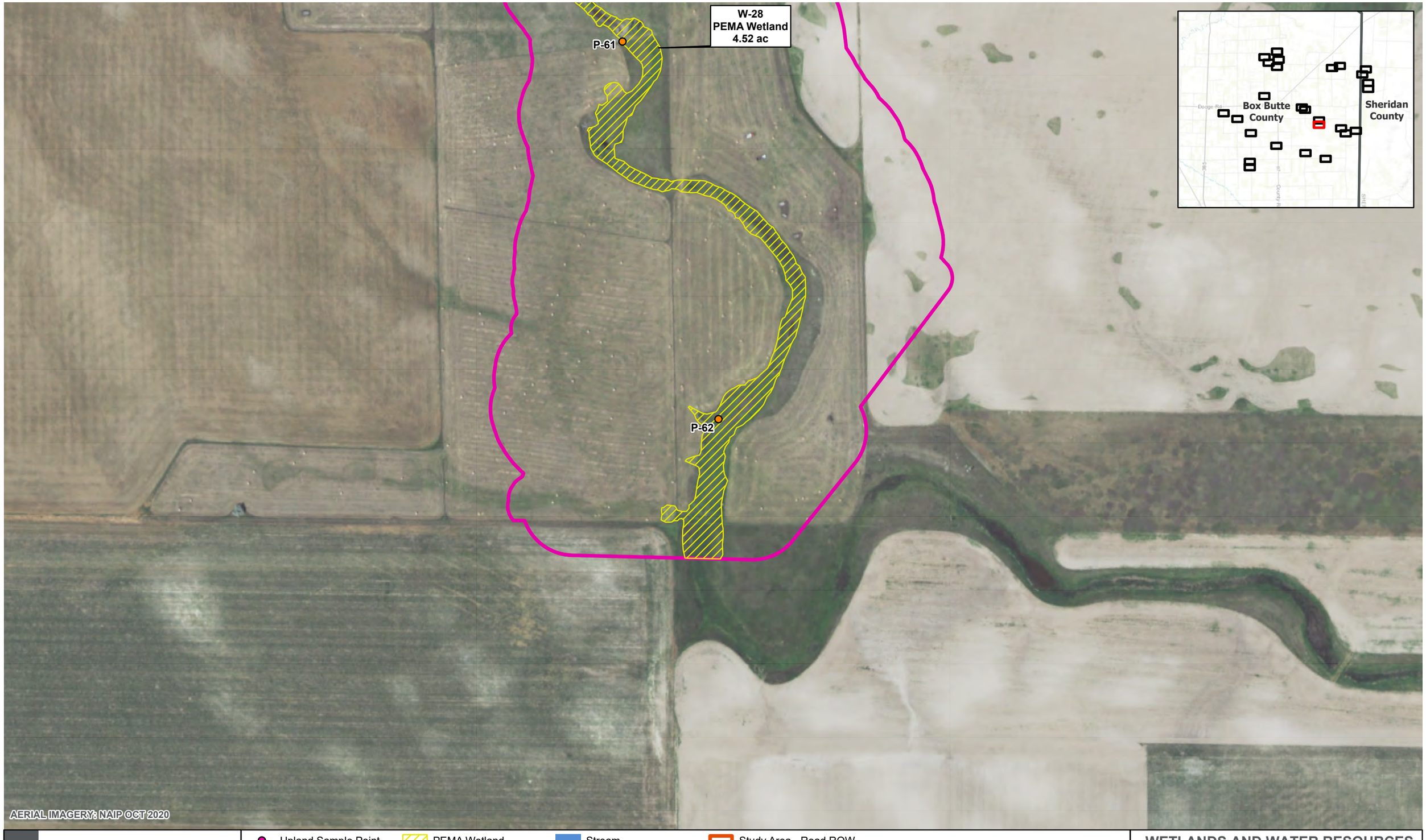
Area 6

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 17 OF 28

PATH: \\DENPI-GISFS01\GISDATA\PROJECTS\UPPER_NIOBRARA_WHITE_NRD\10257466_BOXBUTTE\7.2_WIP\MAP_DOCS\APRX\BOXBUTTE.APRX - USER: RDONALDSON - DATE: 5/8/2024



HDR

N

0 Feet 200

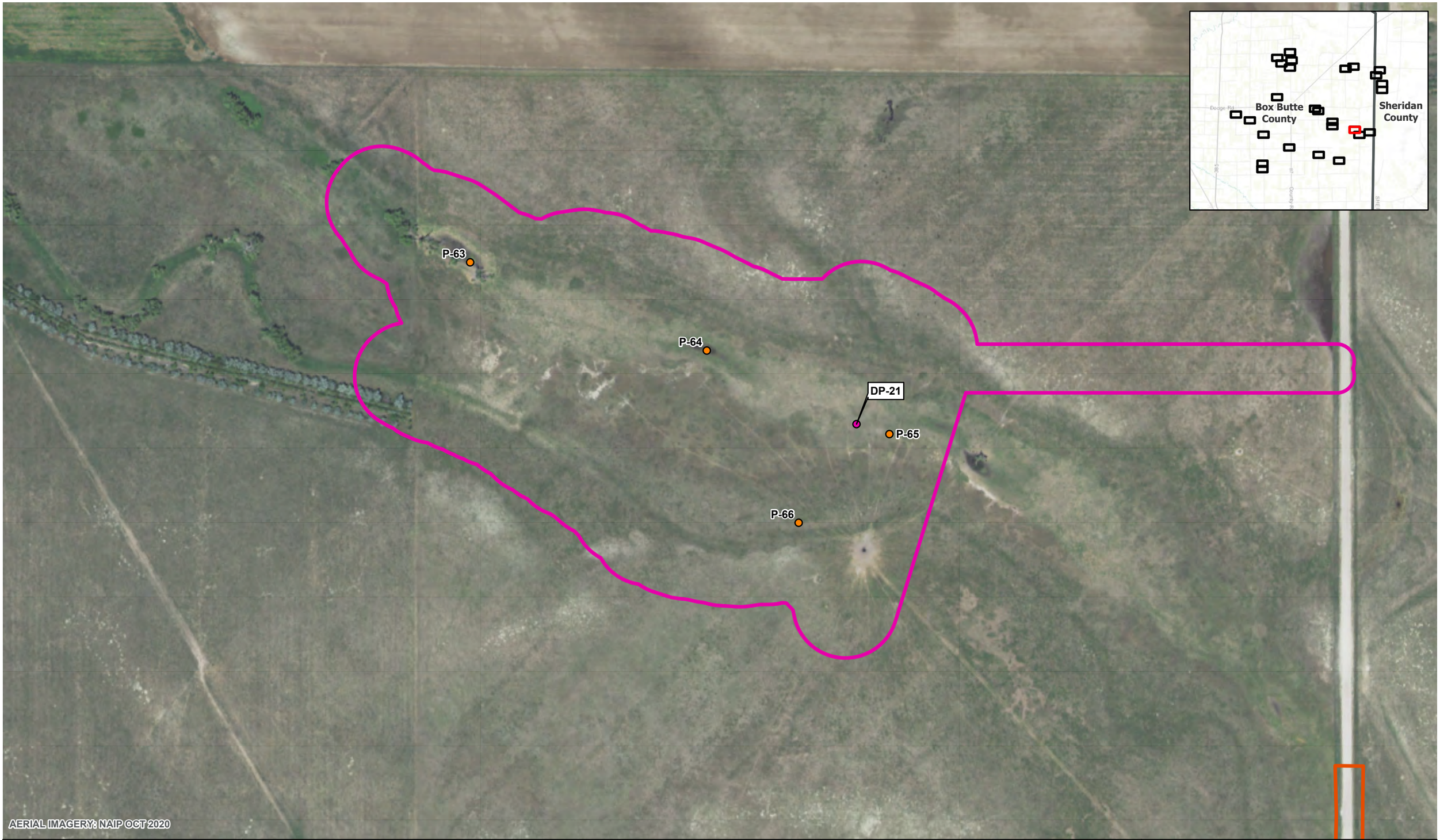
- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Area 6

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 18 OF 28



0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Area 4a

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 19 OF 28

PATH: \\DENPI-GISFS01\GISDATA\PROJECTS\UPPER_NIOBRARA_WHITE_NRD\10257466_BOXBUTTE\7.2_WIP\MAP_DOCS\APRX\BOXBUTTE.APRX - USER: RDONALDSON - DATE: 5/8/2024

0 Feet 200

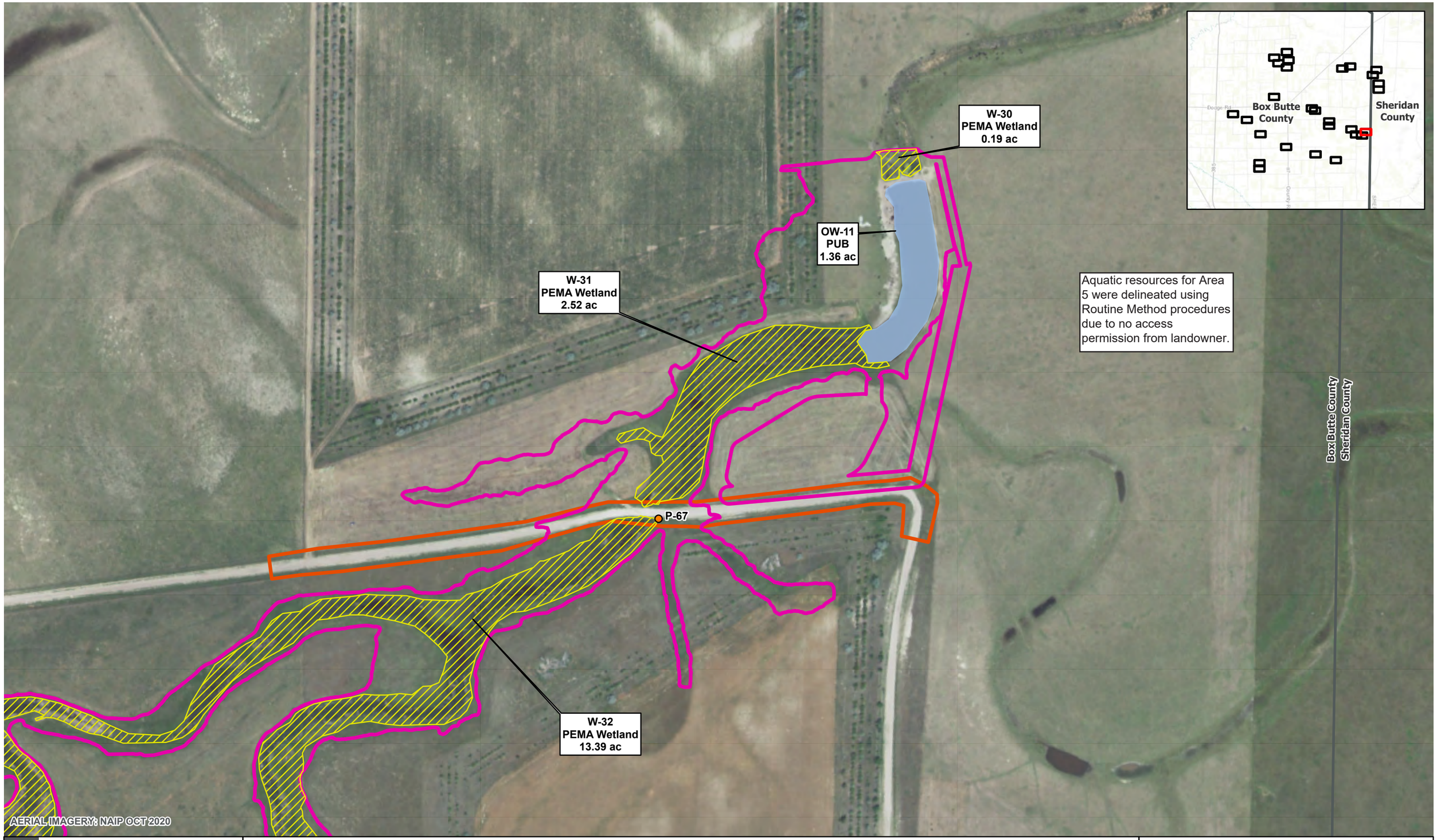
- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Road ROW 26

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 20 OF 28



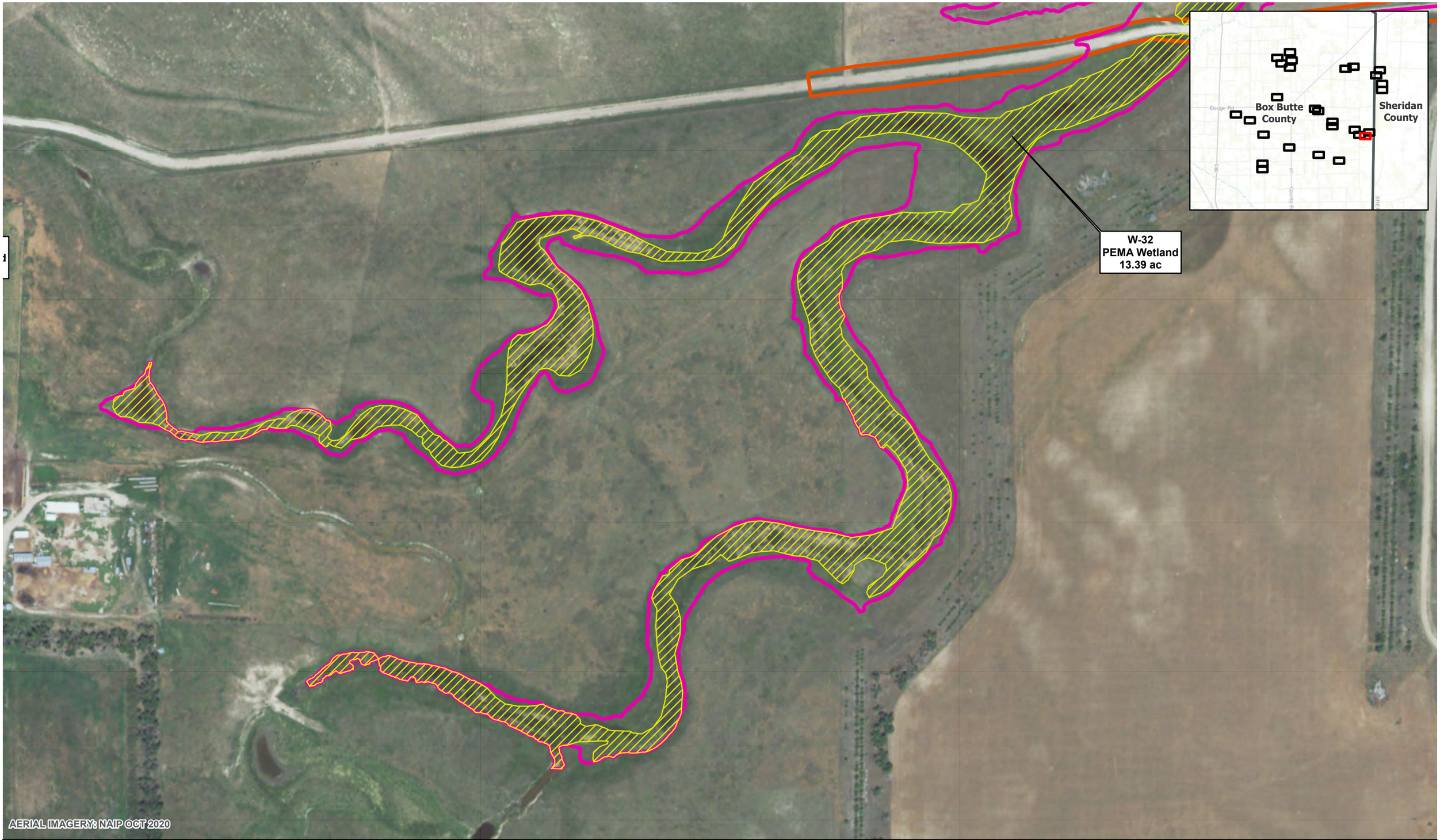
0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Area 5 & Road ROW 25

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 21 OF 28

PATH: \\DENPI-GISFS01\GISDATA\PROJECTS\UPPER_NIOBRARA_WHITE_NRD\10257466_BOXBUTTE\7.2_WIP\MAP_DOCS\APRX\BOXBUTTE.APRX - USER: RDONALDSON - DATE: 9/11/2024



0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Area 5 & Road ROW 25

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 22 OF 28

PATH: \\DENPI-GISFS01\GISDATA\PROJECTS\UPPER_NIOBRARA_WHITE_NRD\10257466_BOXBUTTE\7.2_WIP\MAP_DOCS\APRX\BOXBUTTE.APRX - USER: RDONALDSON - DATE: 9/11/2024

0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

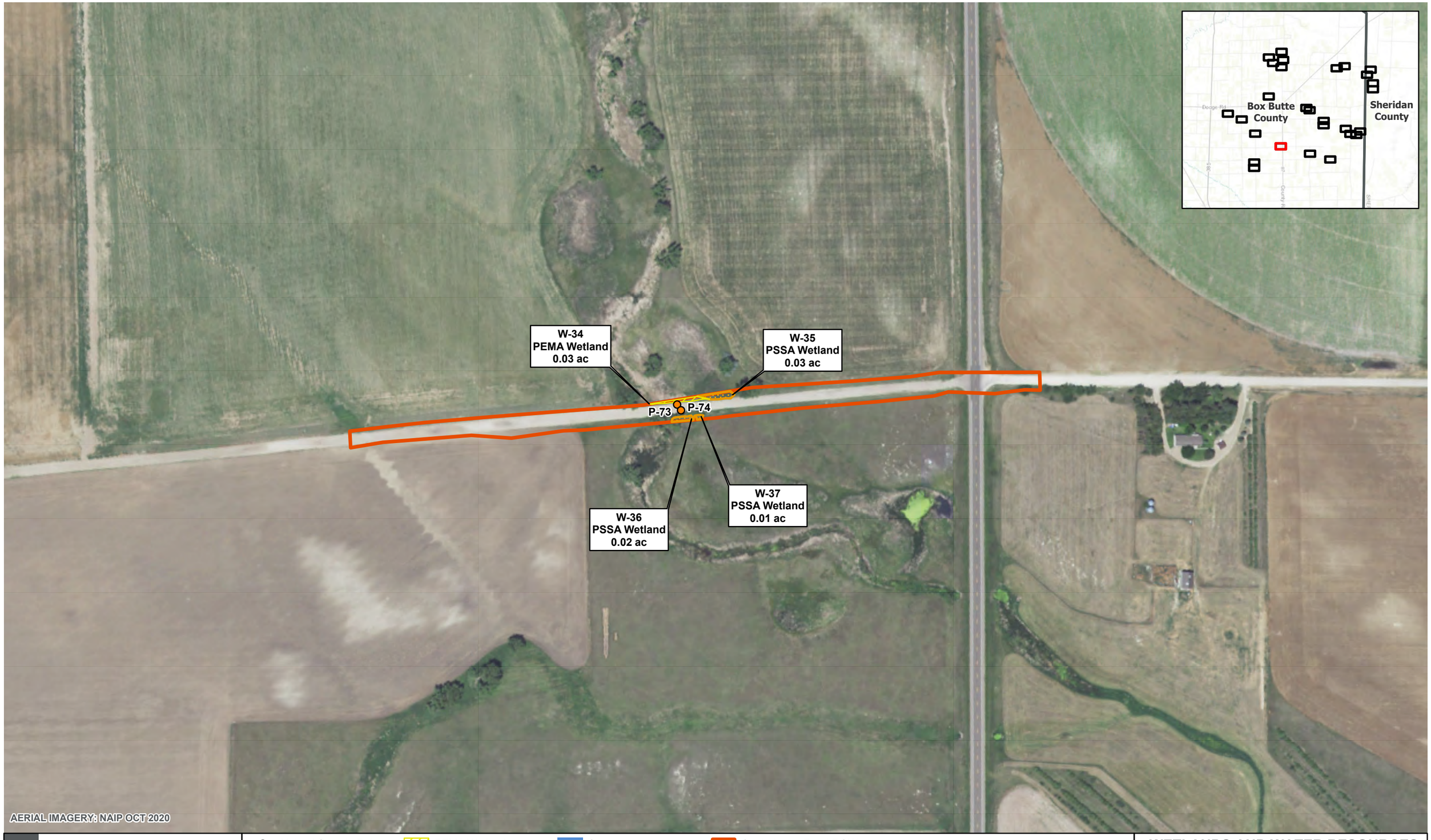
Road ROW 14

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 23 OF 28

PATH: \\DENPI-GISFS01\GISDATA\PROJECTS\UPPER_NIOBRARA_WHITE_NRD\10257466_BOXBUTTE\7.2_WIP\MAP_DOCS\APRX\BOXBUTTE.APRX - USER: RDONALDSON - DATE: 9/11/2024



0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Road ROW 21

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 24 OF 28

0 Feet 200

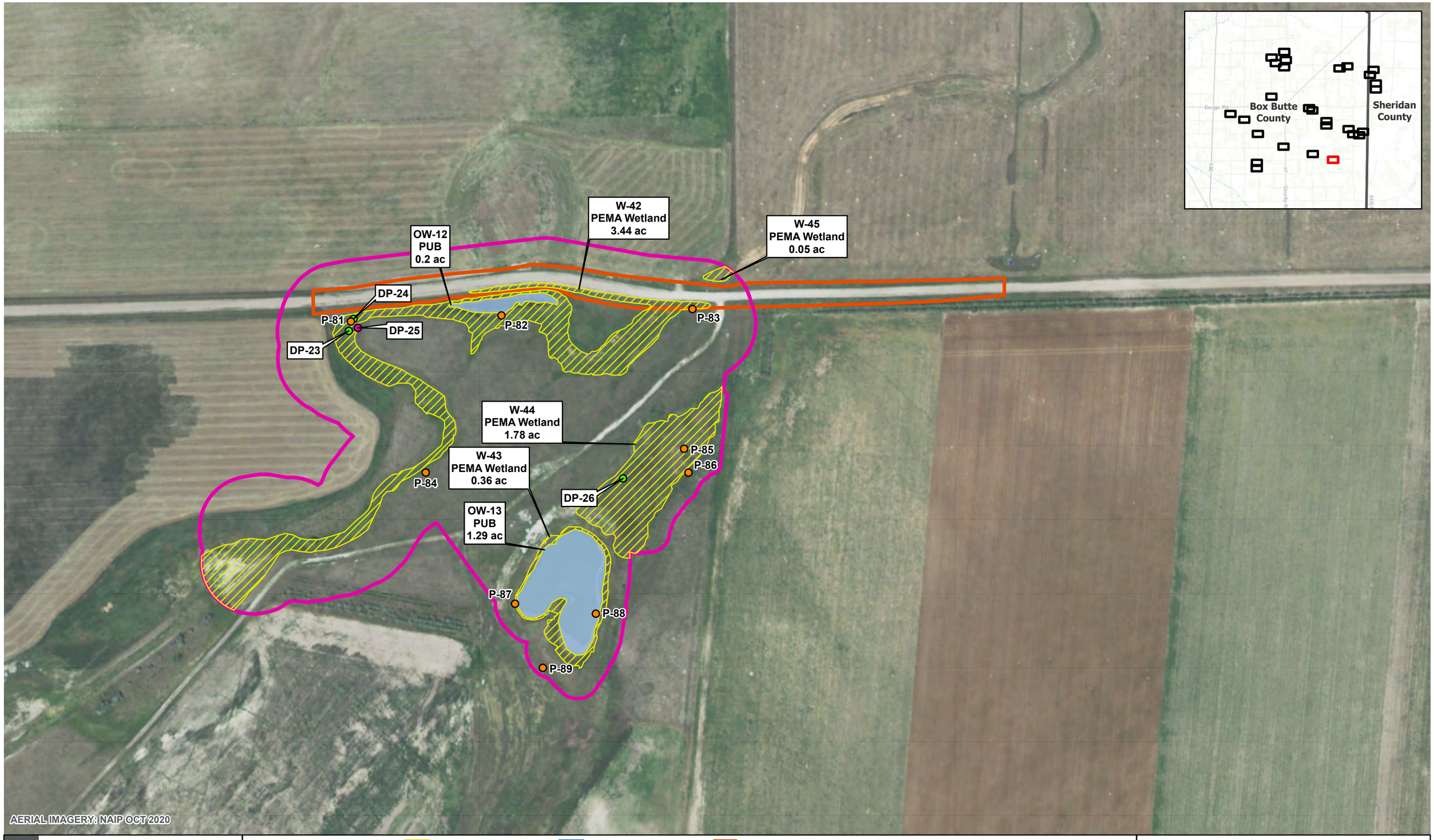
- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Road ROW 19

WETLANDS AND WATER RESOURCES

BOX BUTTE WATERSHED STUDY

FIGURE 2 PAGE 25 OF 28



HDR

0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Road ROW 2a & Area 2b

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 26 OF 28

PATH: \\DENPI-GISFS01\GISDATA\PROJECTS\UPPER_NIOBRARA_WHITE_NRD\10257466_BOXBUTTE\7.2_WIP\MAP_DOCS\APRX\BOXBUTTE.APRX - USER: RDONALDSON - DATE: 9/11/2024

0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

Area 1

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 27 OF 28

PATH: \\DENPI-GISFS01\GISDATA\PROJECTS\UPPER_NIOBRARA_WHITE_NRD\10257466_BOXBUTTE\7.2_WIP\MAP_DOCS\APRX\BOXBUTTE.APRX - USER: RDONALDSON - DATE: 9/11/2024

0 Feet 200

- Upland Sample Point
- Wetland Sample Point
- Photo Point
- PEMA Wetland
- PFOA Wetland
- PSSA Wetland
- Stream
- Open Water
- Study Area - Area
- Study Area - Road ROW
- County

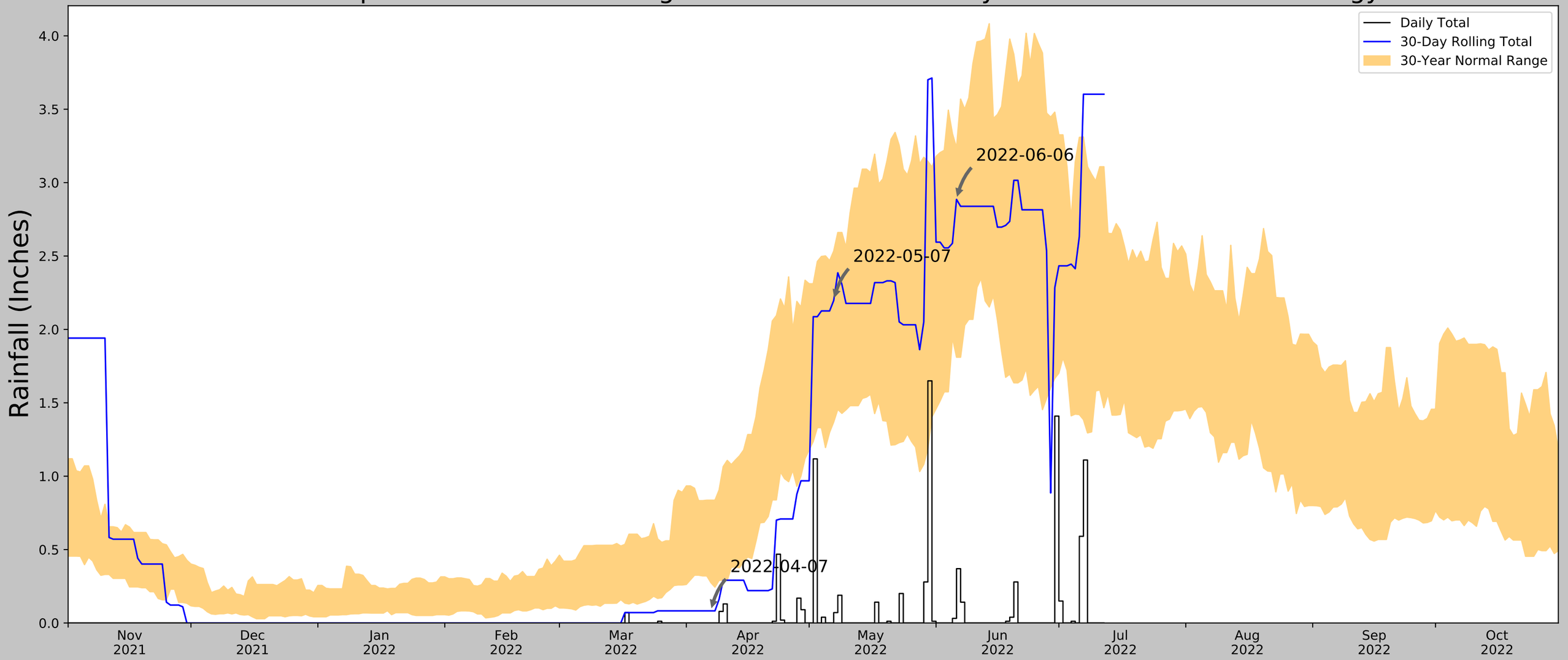
Area 7

WETLANDS AND WATER RESOURCES
BOX BUTTE WATERSHED STUDY
FIGURE 2 PAGE 28 OF 28

PATH: \\DENPI-GISFS01\GISDATA\PROJECTS\UPPER_NIOBRARA_WHITE_NRD\10257466_BOXBUTTE\7.2_WIP\MAP_DOCS\APRX\BOXBUTTE.APRX - USER: RDONALDSON - DATE: 9/11/2024

Appendix B.
ANTECEDENT PRECIPITATION TOOL

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	42.314936, -102.834987
Observation Date	2022-06-06
Elevation (ft)	3958.92
Drought Index (PDSI)	Severe drought
WebWIMP H_2O Balance	Dry Season

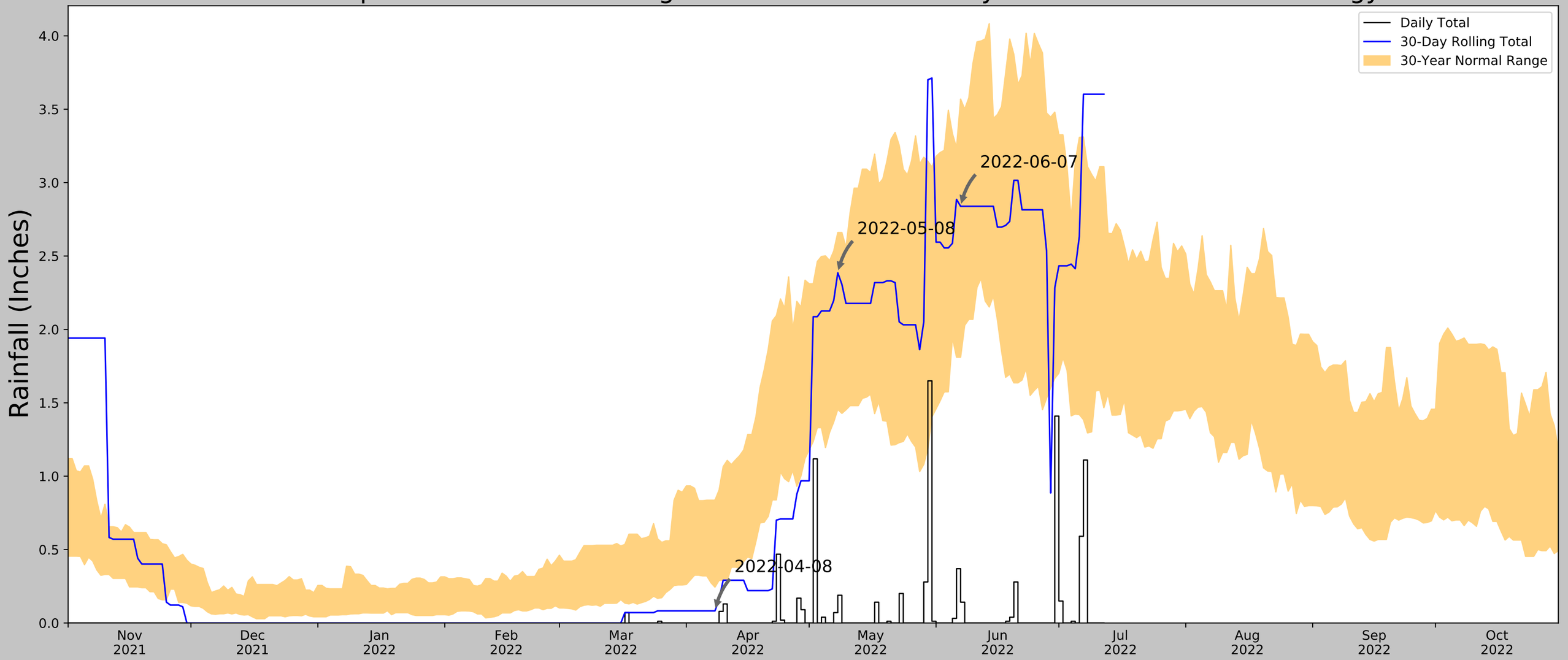
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-06-06	1.81063	3.237795	2.885827	Normal	2	3	6
2022-05-07	1.368898	2.533858	2.19685	Normal	2	2	4
2022-04-07	0.274803	0.836614	0.082677	Dry	1	1	1
Result							Normal Conditions - 11

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates			Elevation Δ	Δ		
ALLIANCE MUNI AP	42.0572, -102.8	3923.885	17.898	35.035	8.681	8348	90
ALLIANCE 13.6 N	42.2981, -102.8596	4300.853	1.713	341.933	1.357	220	0
ALLIANCE 20.3 ENE	42.3968, -102.8848	3982.94	6.202	24.02	2.94	5	0
ALLIANCE 21.7 NNE	42.4093, -102.7894	4300.853	6.923	341.933	5.482	2	0
ALLIANCE 7.2 ENE	42.1486, -102.749	3923.885	12.306	35.035	5.969	1	0
HEMINGFORD 10.1 NNE	42.4525, -102.9868	3920.932	12.263	37.988	5.984	2	0
ALLIANCE 1WNW	42.1103, -102.8967	3994.095	14.487	35.175	7.029	2424	0
HEMINGFORD	42.3208, -103.0733	4270.013	12.182	311.093	9.272	350	0
HAY SPRINGS 12 S	42.5119, -102.6944	3805.118	15.383	153.802	9.288	1	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	42.314936, -102.834987
Observation Date	2022-06-07
Elevation (ft)	3958.92
Drought Index (PDSI)	Severe drought
WebWIMP H_2O Balance	Dry Season

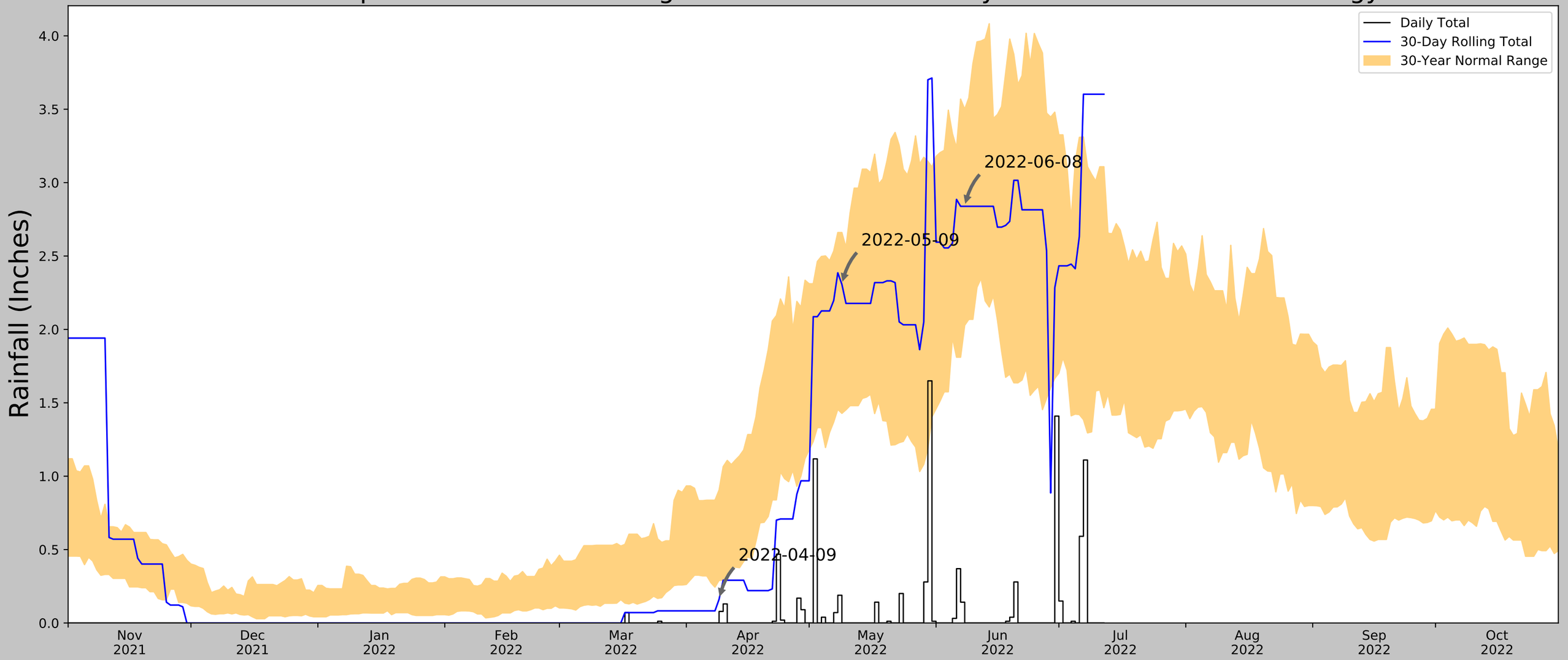
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-06-07	1.81063	3.569291	2.838583	Normal	2	3	6
2022-05-08	1.455512	2.660236	2.385827	Normal	2	2	4
2022-04-08	0.244094	0.836614	0.082677	Dry	1	1	1
Result							Normal Conditions - 11

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ		
ALLIANCE MUNI AP	42.0572, -102.8	3923.885	17.898	35.035	8.681	8348	90
ALLIANCE 13.6 N	42.2981, -102.8596	4300.853	1.713	341.933	1.357	220	0
ALLIANCE 20.3 ENE	42.3968, -102.8848	3982.94	6.202	24.02	2.94	5	0
ALLIANCE 21.7 NNE	42.4093, -102.7894	4300.853	6.923	341.933	5.483	2	0
ALLIANCE 7.2 ENE	42.1486, -102.749	3923.885	12.306	35.035	5.969	1	0
HEMINGFORD 10.1 NNE	42.4525, -102.9868	3920.932	12.263	37.988	5.984	2	0
ALLIANCE 1WNW	42.1103, -102.8967	3994.095	14.487	35.175	7.029	2424	0
HEMINGFORD	42.3208, -103.0733	4270.013	12.182	311.093	9.272	350	0
HAY SPRINGS 12 S	42.5119, -102.6944	3805.118	15.383	153.802	9.288	1	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	42.314936, -102.834987
Observation Date	2022-06-08
Elevation (ft)	3958.92
Drought Index (PDSI)	Severe drought
WebWIMP H_2O Balance	Dry Season

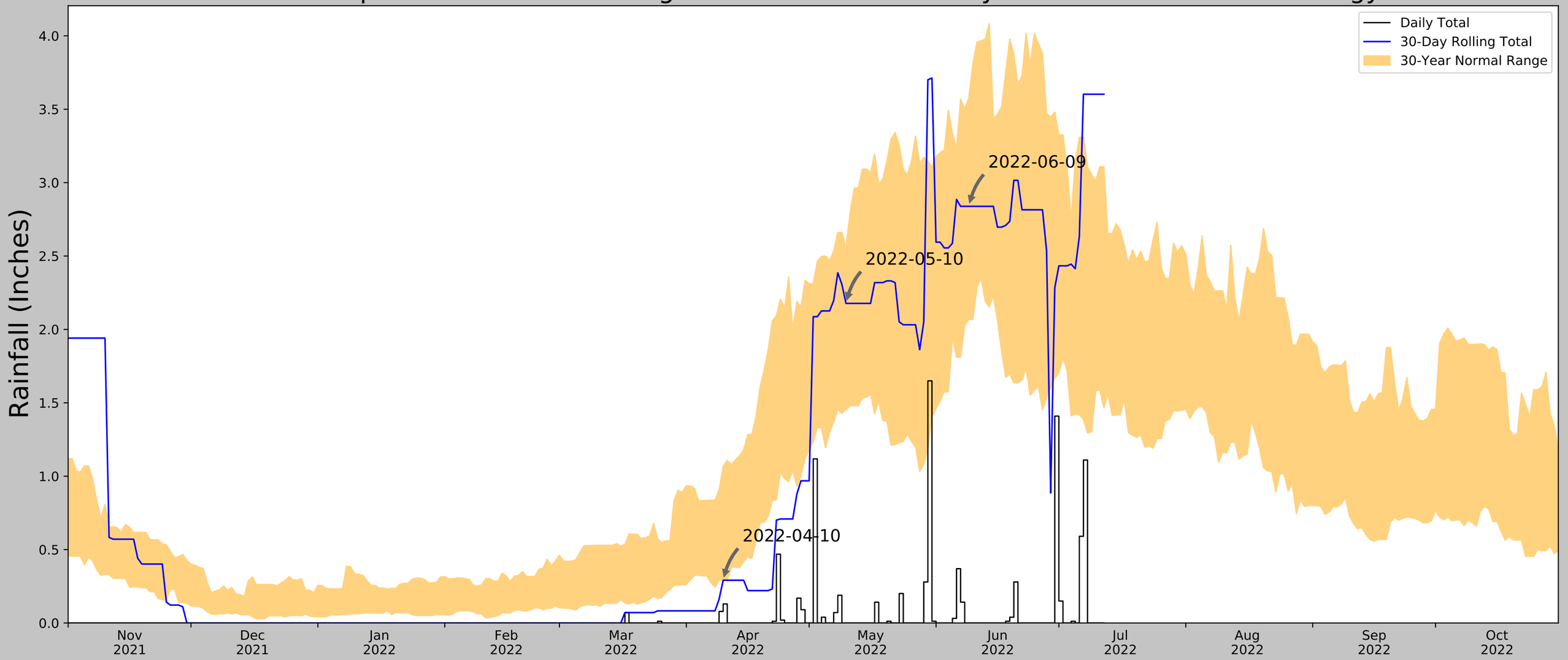
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-06-08	2.027953	3.500394	2.838583	Normal	2	3	6
2022-05-09	1.427953	2.660236	2.307087	Normal	2	2	4
2022-04-09	0.290551	0.905906	0.161417	Dry	1	1	1
Result							Normal Conditions - 11

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ		
ALLIANCE MUNI AP	42.0572, -102.8	3923.885	17.898	35.035	8.681	8348	90
ALLIANCE 13.6 N	42.2981, -102.8596	4300.853	1.713	341.933	1.357	220	0
ALLIANCE 20.3 ENE	42.3968, -102.8848	3982.94	6.202	24.02	2.94	5	0
ALLIANCE 21.7 NNE	42.4093, -102.7894	4300.853	6.923	341.933	5.483	2	0
ALLIANCE 7.2 ENE	42.1486, -102.749	3923.885	12.306	35.035	5.969	1	0
HEMINGFORD 10.1 NNE	42.4525, -102.9868	3920.932	12.263	37.988	5.984	2	0
ALLIANCE 1WNW	42.1103, -102.8967	3994.095	14.487	35.175	7.029	2424	0
HEMINGFORD	42.3208, -103.0733	4270.013	12.182	311.093	9.272	350	0
HAY SPRINGS 12 S	42.5119, -102.6944	3805.118	15.383	153.802	9.288	1	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	42.314936, -102.834987
Observation Date	2022-06-09
Elevation (ft)	3958.92
Drought Index (PDSI)	Severe drought
WebWIMP H_2O Balance	Dry Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-06-09	2.068504	3.577559	2.838583	Normal	2	3	6
2022-05-10	1.452362	2.559449	2.177165	Normal	2	2	4
2022-04-10	0.290551	1.065354	0.291339	Normal	2	1	2
Result							Normal Conditions - 12

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ		
ALLIANCE MUNI AP	42.0572, -102.8	3923.885	17.898	35.035	8.681	8348	90
ALLIANCE 13.6 N	42.2981, -102.8596	4300.853	1.713	341.933	1.357	220	0
ALLIANCE 20.3 ENE	42.3968, -102.8848	3982.94	6.202	24.02	2.94	5	0
ALLIANCE 21.7 NNE	42.4093, -102.7894	4300.853	6.923	341.933	5.483	2	0
ALLIANCE 7.2 ENE	42.1486, -102.749	3923.885	12.306	35.035	5.969	1	0
HEMINGFORD 10.1 NNE	42.4525, -102.9868	3920.932	12.263	37.988	5.984	2	0
ALLIANCE 1WNW	42.1103, -102.8967	3994.095	14.487	35.175	7.029	2424	0
HEMINGFORD	42.3208, -103.0733	4270.013	12.182	311.093	9.272	350	0
HAY SPRINGS 12 S	42.5119, -102.6944	3805.118	15.383	153.802	9.288	1	0

Appendix C. WETLAND DETERMINATION DATA FORMS

Please contact Melissa Baier, Assistant State Conservationist for Water Resources and Easements at melissa.baier@usda.gov for copies of the Wetland Determination Data Forms

Appendix D.
SITE PHOTOGRAPHS

Please contact Melissa Baier, Assistant State Conservationist for Water Resources and Easements at melissa.baier@usda.gov for copies of site photographs