

Biological Resource Technical Memorandum

Date: November 15, 2022
To: Craig Lamacraft, Denver Water
From: Becky Burink, Biologist, Pinyon Environmental, Inc.
Subject: Denver International Airport/E-470 Pipeline Project

Introduction

Denver Water has contracted with Pinyon Environmental, Inc., (Pinyon), to complete preliminary raptor bird surveys, black-tailed prairie dog (*Cynomys ludovicianus*) mapping, and a waters of the United States (WOTUS) delineation (which included non-wetland waters and wetlands), for the Denver International Airport/E-470 Pipeline project. Design for this approximate six-mile waterline pipeline will be conducted in the future and Denver Water plans to go to construction next year (2023). As such, Denver Water contracted Pinyon to perform a preliminary raptor bird survey and WOTUS/wetland delineation to understand the potential for constraints from these resources, and to help avoid and minimize impacts to these resources during the design process. This Biological Resources Technical Memorandum (tech memo) has been prepared to address existing conditions regarding the following federal and state regulations or policies:

- *Migratory Bird Treaty Act (MBTA)*: Protects birds, their active nests, and their eggs (except for pigeons, starlings, and some other non-native birds). The U.S. Fish and Wildlife Service (USFWS) administers these requirements.
- *Section 404 of the Clean Water Act (CWA)*: Regulates WOTUS, which include wetlands and non-wetland waters. Impacts to these features requires authorization from the U.S. Army Corps of Engineers (USACE).

Project Location

The project is located within the portions of Denver and Adams Counties, Colorado. The project location is shown in Figure I and described below in Table I.

Table 1. Project Location

County	Denver/Adams
U.S. Geological Survey (USGS) 7.5-Minute Quadrangle	Denver International Airport (USGS, 2022a) and Mile High Lakes (USGS, 2022b)
Section, Township, and Range (6th Principal Meridian)	Sections 1, 11, 12, 13, 22, 23, and 24, Township 2 South, Range 66 West; Sections 5 and 6, Township 2 South, Range 65 West
Approximate Average Elevation of the Study area (feet above mean sea level)	Approximately 5,170 to 5,330
Approximate Center Location of the Study Area (Decimal Degrees, World Geodetic System [WGS] 84)	39.865879°, -104.754014° 39.904215°, -104.682701°

Methodology

Prior to the site visit, Pinyon conducted a desktop analysis using aerial imagery, Colorado Parks and Wildlife (CPW) Species Activity Mapping data, USFWS National Wetlands Inventory Mapper, USGS 7.5-Minute Quadrangle Maps, USGS National Hydrography Dataset, and other existing data sources to identify potential biological resources at the project (Google Earth Pro, 2022; CPW, 2022; USFWS, 2022; USGS, 2022a; USGS 2022b; USGS, 2020).

Following the desktop review, Pinyon biologists Becky Burink and Haley Stratton visited the site October 27 and 28, 2022, to assess the study area for potential raptors and raptor nests, black-tailed prairie dog colonies, and WOTUS. Pinyon was provided with the boundaries where the maximum extent of project impacts is anticipated to occur (Figure 1 and Figure 2). This area is further referred to in this memorandum as the “study area”. The study area was evaluated by vehicle and on foot on existing roads within the study area. Notes and photographs were taken to record field conditions. A Photographic Log is attached.

Wetlands were delineated in accordance with the 1987 USACE Wetland Delineation Manual and the 2010 USACE *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0)* (Environmental Laboratory, 1987; USACE, 2010). The boundaries of the ordinary high water mark (OHWM) were identified in accordance with the 2014 USACE *A Guide to Ordinary High Water Mark Delineation for Non-Perennial Streams in the Western Mountains, Valleys, and Coast Region of the United States* (USACE, 2014). Sampling points (SP) were placed in representative wetland and upland locations, and the data was recorded in the wetland determination data forms (Figure 2; Attachment).

Results

General Habitat and Vegetation Description

The study area includes approximately six miles of proposed pipeline and a 100-foot buffer on both sides of the proposed pipeline. The area immediately surrounding the proposed alignment is primarily agricultural or property of the Denver International Airport (Photos 1 and 2 in Photographic Log). A majority of the alignment generally parallels existing transportation right-of-way (ROW). Due to the presence of the roadway and the use of the surrounding area, natural vegetation, soils, and hydrology have likely been altered by past filling, grading, and improvement activities in the past.

The study area was primarily characterized by disturbed upland roadside habitat and landscaped areas, as well as the paved roadside itself. The upland roadside habitat consisted of agricultural vegetation and herbaceous

species such as sand dropseed (*Sporobolus cryptandrus*), smooth brome (*Bromus inermis*), prickly lettuce (*Lactuca serriola*), and kochia (*Bassia scoparia*) (Photo 3 in Photographic Log). Scattered cottonwood (*Populus deltoides*) and Russian olive (*Elaeagnus angustifolia*) trees were also noted.

One wetland system, Wetland 1 (WL-1), located along Third Creek, was mapped within the study area, and is discussed further below (Figure 2, Photos 4-6 in Photographic Log, Appendix A).

Raptors and Migratory Birds

Migratory birds (including raptors), their nests, and their eggs are protected by the MBTA, with the exception of a few non-native species. Bald Eagles (*Haliaeetus leucocephalus*) and Golden Eagles (*Aquila chrysaetos*) are provided with further protection by the Bald and Golden Eagle Protection Act. In Colorado, most migratory bird nesting and rearing activities occur between April 1 and August 31, but raptors may nest as early as February 15; eagles can nest even earlier. These dates are guidelines and nesting birds are always protected.

No raptor nests were noted within the study area. However, several raptors were observed soaring above and foraging in the study area, including five Northern Harriers (*Circus hudsonius*) and two Red-tailed Hawks (*Buteo jamaicensis*) (Photo 7 in Photographic Log). Potential nesting raptor habitat (e.g., large deciduous trees) was present within 0.5 mile of the study area, but no raptor nests (active or inactive) were noted during the site visit. However, it is possible that nesting raptors may have been undetected, as it was not feasible to survey every tree within 0.5 mile of the study area due to property access constraints.

Non-raptor migratory bird nests, namely Cliff Swallow (*Petrochelidon pyrrhonota*) nests, were observed lining concrete box culverts within the study area (Photo 8 in Photographic Log). Like raptors, Cliff Swallows are protected by the MBTA.

Black-tailed Prairie Dogs and Burrowing Owls

Black-tailed prairie dogs are a state species of special concern and create burrows that provide habitat for Western Burrowing Owls (*Athene cunicularia*). Burrowing Owls are a state-listed threatened species and are federally protected by the MBTA. Five black-tailed prairie dog colonies were mapped within the study area during the site visit (Figure 2). Review of aerial photographs indicated the potential presence of prairie dog colonies along some areas of the proposed alignment (Figure 2). However, active agricultural activities in and near the project area appear to have displaced some of those colonies, and many of the burrows visible via aerial imagery that appear to be prairie dog burrows were found to be anthills, as confirmed during the site reconnaissance. Black-tailed prairie dog colonies may expand or shrink prior to the start of project activities, and Burrowing Owls may use old prairie dog burrows as well as dig their own nearby. No Burrowing Owls were observed during the site visit. However, surveys were conducted outside of the Burrowing Owl nesting season (March 15 through October 31) and Burrowing Owls have the potential to be present in these colonies during the nesting season.

Aquatic Resources

Eagle's Run, and two unnamed ditches are located in the northeastern section of the study area (Figure 2, page 1 and 2). These features are visible via aerial imagery, topographic imagery, and the NWI (Google Earth, 2022; USFWS, 2022). Eagle's Run and the two unnamed ditches both extend under East 114th Avenue within the study area. No OHWM and no open water were identified for these features within the study area during the site visit.

Third Creek and its associated wetland (WL-1) were mapped within the study area on both the east and west sides of West Cargo Road (Figure 2, page 3; Photos 4-6 in Photographic Log; Appendix A). Third Creek is a perennial stream, with a defined OHWM, that flows toward the northwest through the study area, ultimately

discharging into the South Platte River, a traditional navigable water (TNW), approximately eight miles northwest of the study area (USGS, 2020). Third Creek was flowing during the time of the site visit, and had a variable width of between 5 and 7 feet within the study area.

WL-1 was observed to be a palustrine emergent (PEM) wetland dominated in the herbaceous stratum by narrowleaf cattail (*Typhus angustifolia*), an obligate wetland species. Other common herbaceous plants associated with WL-1 included softstem bulrush (*Schoenoplectus tabernaemontanii*), an obligate wetland species. The wetland hydric soil indicator observed was Hydrogen Sulfide (A4). The hydrology indicators observed were Surface Water (A1), High Water Table (A2), Saturation (A3), and Hydrogen Sulfide Odor (C1). Sampling Point 1 (SP-1) was completed in WL-1 (Appendix A). Sampling Points 2 and 3 (SP-2 and SP-3) were upland pits dug west and east of West Cargo Road, respectively (Appendix A).

Conclusions and Recommendations

Pinyon has completed this Biological Resources Technical Memo for the proposed Denver International Airport/E-470 Pipeline in City and County of Denver, Colorado. The study area was assessed for the presence of biological resources including raptor and raptor nests, black-tailed prairie dog colonies, and WOTUS (including non-wetland waters and wetlands).

Raptors and Migratory Birds

Several raptors were observed foraging within the study area. Additionally, raptors may use large, deciduous trees noted within 0.5 mile of the study area for nesting, roosting, or foraging. Non-raptor birds may use shrubs and grasses in and adjacent to the study area for nesting. Therefore, due to the potential for MBTA constraints, Pinyon recommends that future development follow MBTA nest survey guidelines during the nesting season. The Colorado Department of Transportation (CDOT) has developed a specification (Section 240: Protection of Migratory Birds Biological Work Performed by the Contractor's Biologist), which addresses a contractor's responsibilities to avoid impacts to migratory birds. Pinyon recommends that Denver Water consider including this specification into the project plans and specifications to address migratory bird protection during construction. Prior to construction activities commencing during the nesting season, a survey for raptors and other migratory birds is recommended to identify nests and limit the potential for incidental take. If nests are identified, coordination with the USFWS or CPW may be required.

If construction activity is planned to take place during the migratory bird nesting season, and within 50 feet of active nests (e.g. the Third Creek culvert), Pinyon recommends removal of Cliff Swallow nests prior to construction, and prior to bird nesting activities, and continued monitoring and removal of inactive nests from these culverts throughout construction – this can be in accordance with the above-cited 240 specification. If nests are found to be active, construction activity within 50 feet of the active nests should cease until nesting activities are completed, to avoid incidental take of protected Swallows. Note that Cliff Swallow nesting activities may take several weeks to months, depending on the number of swallows that are able to lay eggs. Alternatively, should construction activity take place outside of the migratory bird nesting season (between September 1 and March 31), then no further action regarding migratory birds is needed.

Black-tailed Prairie Dogs

Black-tailed prairie dog burrows are present in the study area, which provide suitable nesting habitat for Burrowing Owls. With regards to prairie dogs, it is likely that the prairie dogs can be humanly “passively relocated” from the proposed work areas prior to construction.

Passive relocation involves creating an exclusion zone (i.e., silt fence) to encourage prairie dogs to vacate their burrows and leave the site prior to earth-work disturbances. Potential options include:

Consider Creating an Exclusion Zone

- A rectangular shaped prairie dog exclusion zone should be created around the prairie dog town. One side of the rectangle should consist of the roadway, and the other three sides should be created by installing black, opaque silt fencing material.
- The silt fences should be installed at least 24 inches above the ground to create a visual barrier for prairie dogs and buried at least six inches into native soils.
- The two sides of silt fencing that are perpendicular to the highway should be 30 feet long. This distance effectively limits the field of view of the prairie dogs and encourages them to vacate the exclusion zone in the desired direction away from the roadway (and the proposed construction limits). If the limits of disturbance exceed 30 feet from the highway, then additional exclusion zones should be constructed in increments of 30 feet. However, each additional exclusion zone should only be constructed after the passive relocation process, as described below, is completed in the preceding exclusion zone and final clearance in the preceding exclusion zone is provided.
- The silt fence that parallels the highway should extend the length of the prairie dog town.
- Prairie dogs may create holes in the silt fence by clawing and chewing at the fabric. Therefore, proper installation of the silt fence and proper maintenance should be conducted to prevent the passage of light along the bottom edge, along seams, or through holes in the fabric. Holes in the fabric may be patched with duct tape and seams may be reworked or sealed with tape.
- Another rectangular silt fence area should be installed parallel to the highway and five feet from the exclusion zone to further reduce prairie dog sight distance and encourage individuals to vacate the area.

Light Ground Disturbance

- To encourage passive relocation of the prairie dogs, light ground-disturbing activities should be performed in the exclusion zone at least once a day. Ground-disturbing activities should consist of disking or grading to a depth of up to six inches. A ground disturbance depth of six inches will disturb burrow entrances but will not bury any animals within burrows. The soil should not be compacted or tamped down because this may prevent animals from escaping collapsed burrows and cause them to be buried alive.
- Between 12 to 24 hours after light ground-disturbing activities, the entire exclusion zone should be visually inspected during a single site visit for any evidence of active prairie dogs that have not yet vacated the exclusion zone. Evidence of active prairie dogs include: a prairie dog, a prairie dog burrow entrance that has been repaired/re-excavated or show signs of digging, a hole in the ground that is greater than two inches in diameter at the entrance/opening (late season pups will likely fit an opening of this size), or fresh scat on the ground surface. Any burrows not clearly inactive should be treated as active.
- Light ground disturbances should be repeated daily until a visual inspection 12 to 24 hours later results in no evidence of prairie dog activity within the exclusion zone. At this point, a qualified biologist must re-survey the area within 24 hours of the ground disturbance to provide a final clearance for the exclusion zone. After final clearance has been obtained, heavy construction work should commence in the work zone within 24 hours of the ground-disturbing activity and continue daily until all construction work has been completed in the work zone.
- If prairie dogs continue to occupy the exclusion zone after five days of light ground disturbances, a qualified biologist should conduct a survey of the exclusion zone. The qualified biologist should coordinate with the

project team to discuss alternative control options to manage the remaining prairie dogs within the exclusion zone.

Burrowing Owls

Burrowing Owls are a state-threatened species and are also protected under the MBTA. Therefore, Burrowing Owl surveys should be completed prior to construction activities between March 15 to October 31 in or near black-tailed prairie dog colonies, as outlined in CPWs Recommended Survey Protocol and Actions to Protect Nesting Burrowing Owls (CPW, 2021). If active Burrowing Owl nests are found during the surveys, work should be avoided within 660 feet of the active nest (CPW, 2021). Note that it could take several months for Burrowing Owls to complete their nesting cycle. Alternatively, should construction activity take place outside of the Burrowing Owl nesting season (between November 1 and March 14), then no further action regarding Burrowing Owls is needed.

Aquatic Resources

Three non-wetland waters (Eagle's Run and two unnamed ditches) were identified in the study area. These features did not have a defined OHWM during the site visit, and are likely not under the jurisdiction of the USACE; however, only the USACE has the authority to make jurisdictional determinations. To determine whether these features would require a Section 404 permit for impact, the project can submit an Approved Jurisdictional Determination (JD) request to the USACE. Third Creek and its associated wetland complex (WL-1) were delineated within the study area. Third Creek has a downstream connection to the South Platte River, a TNW, and is likely under the jurisdiction of the USACE. Therefore, these features, if impacted, would require authorization under Section 404 of the CWA. Pinyon recommends the project avoid impacts to potential WOTUS, if practicable. If it is not feasible to avoid impacts to potential WOTUS, Section 404 authorization would be required.

The amount and type of impacts will determine the level of Section 404 Permit required (Individual Permit or Nationwide Permit). Given the anticipated small footprint of potential impacts, it is likely the project would be authorized under a Nationwide Permit 58 (Utility Line Activities for Water and Other Substances). This Nationwide Permit may not require notification (i.e., Pre-construction Notification) to the USACE, so long as certain thresholds are not exceeded. Those include 1) impacts at each crossing must result in less than 1/10 of an acre; 2) no impacts to federally listed species can occur; and 3) no adverse impacts to resources eligible to the National Register of Historic Places as defined by Section 106 of the National Historic Preservation Act can occur. Pinyon recommends that Denver Water evaluate impacts to these resources during design to evaluate if any of these thresholds are exceeded. Additional evaluation, such as habitat assessments for federally listed species and cultural resources, may need to be conducted.

If impacts to potential WOTUS cannot be avoided, Pinyon recommends minimizing the footprint of temporary and/or permanent impacts to the maximum extent practicable and returning areas to pre-construction contours after construction. It is recommended the project follow stormwater best management practices (BMPs) to minimize indirect impacts to these features.

Limitations

This technical memorandum was prepared by Pinyon, at the request of and for the sole benefit of Denver Water, or any entity controlling, controlled by, or under common control with Denver Water. The conclusions and recommendations offered in this technical memorandum are based on the data obtained from a limited number of assessments, within a prescribed study area as described in the text. Soil, hydrologic, vegetation, biological and ecological conditions typically vary even over short distances, by season, by elevation, and by meteorological conditions. Thus, the nature and extent of variations outside this biological investigation may

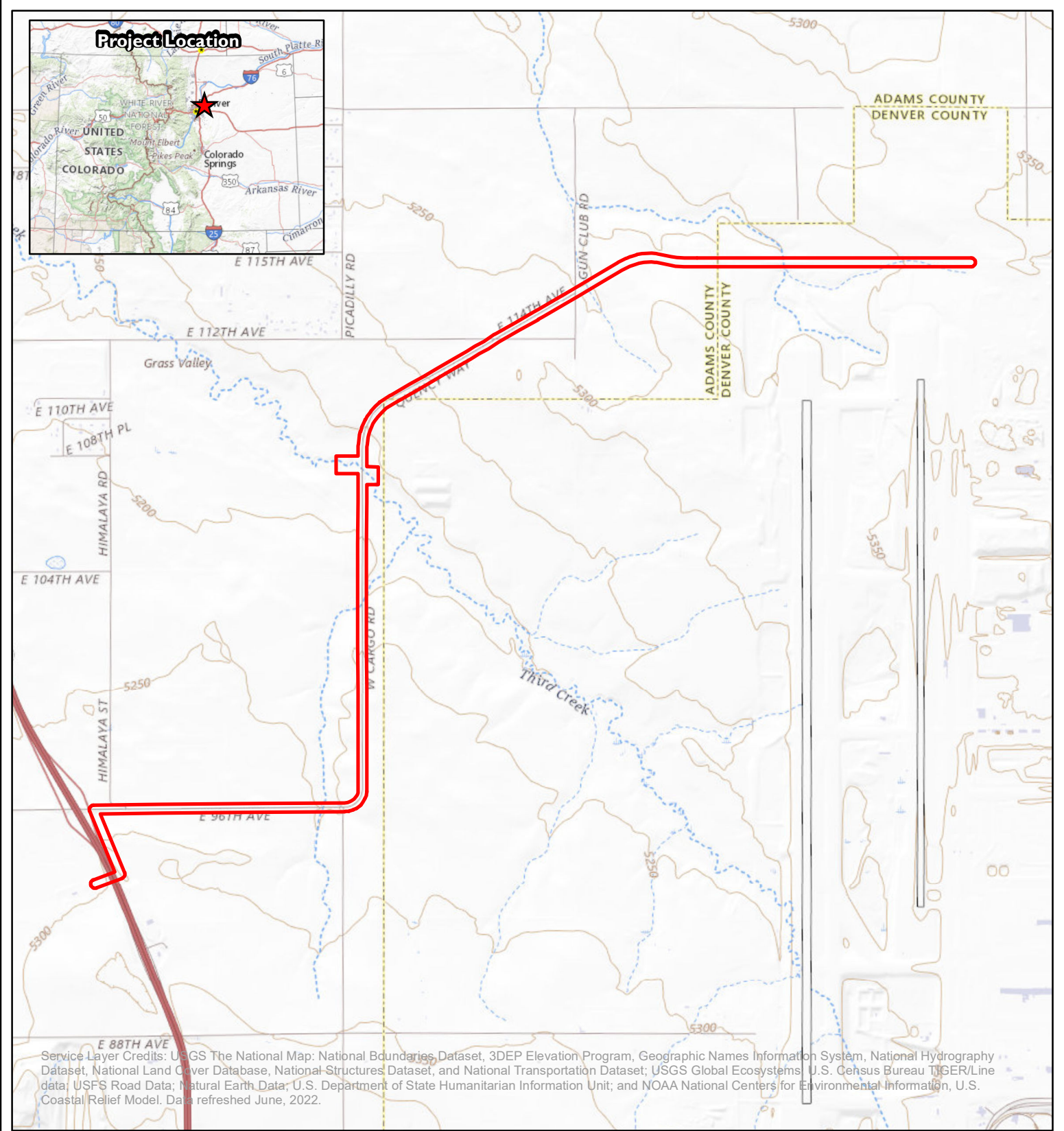
not become evident except through further investigation. It is possible that ecological conditions may change from those observed, particularly over time.

Attachments

Figure 1. Project Location
Figure 2. Biological Resources
Photographic Log
Wetland Determination Data Forms


References

- CPW, 2021. "Recommended Survey Protocol and Actions to Protect Nesting Burrowing Owls," Colorado Parks and Wildlife. Available at: <https://cpw.state.co.us/Documents/WildlifeSpecies/LivingWithWildlife/Recommended-Survey-Protocol-Burrowing-Owls.pdf>. Accessed October 2022.
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Legend

 Study Area



0 1,500 3,000
 Feet



PROJECT LOCATION
 Denver International Airport/E-470
 Pipeline Project
 Denver and Adams County, Colorado

Site Location: S 1, 11, 12, 13, 22, 23, and 24, T2S, R66W; S 5 and 6, T2S, R65W; 6th Principal Meridian

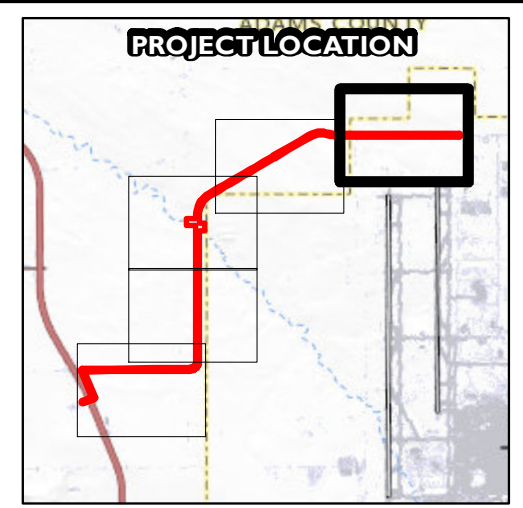
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Reviewed By: BB

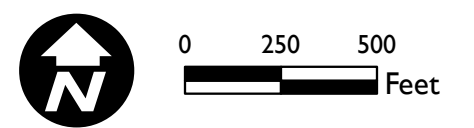
Figure 1

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Legend

 Study Area



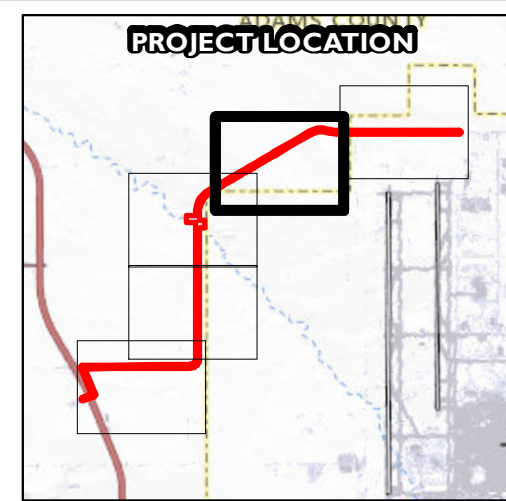
BIOLOGICAL RESOURCES
 Denver International Airport/E-470
 Pipeline Project
 Denver and Adams County, Colorado

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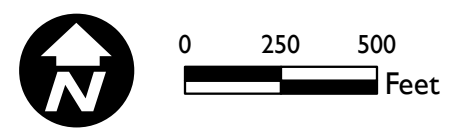
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Legend

 Study Area



Pinyon
Environmental, Inc.

BIOLOGICAL RESOURCES
Denver International Airport/E-470
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Denver and Adams County, Colorado

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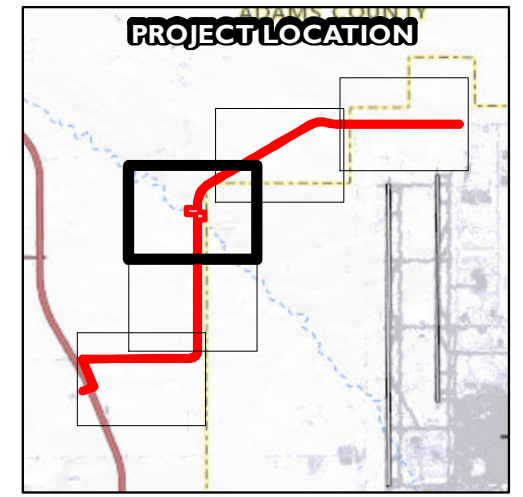
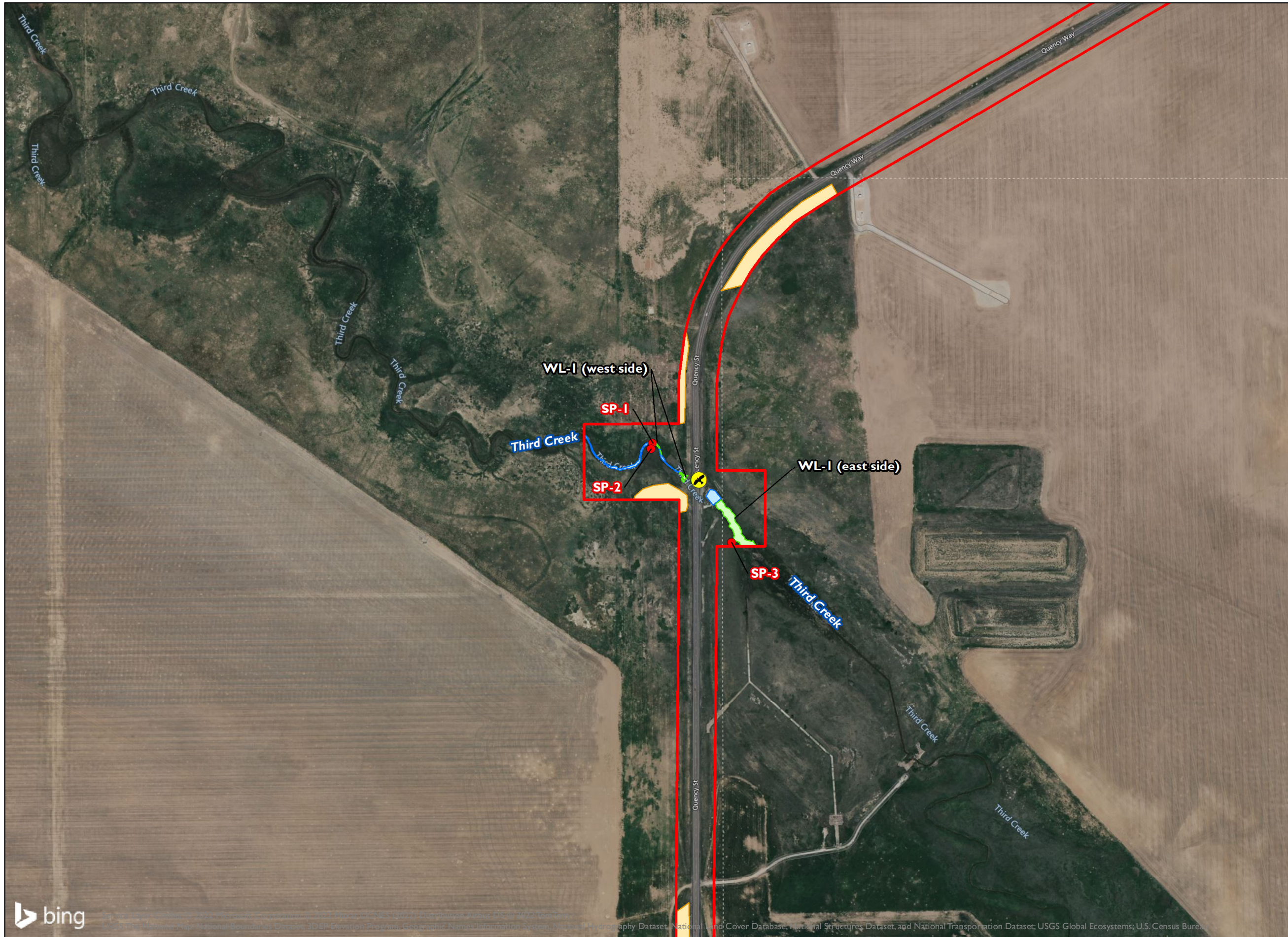
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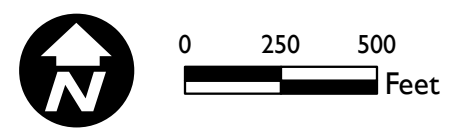
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Legend

-  Study Area
-  Sampling Point
-  Cliff Swallow Nests
-  Wetlands
-  Non-Wetland Waters
-  Black-tailed Prairie Dog Area



BIOLOGICAL RESOURCES
 Denver International Airport/E-470
 Pipeline Project
 Denver and Adams County, Colorado



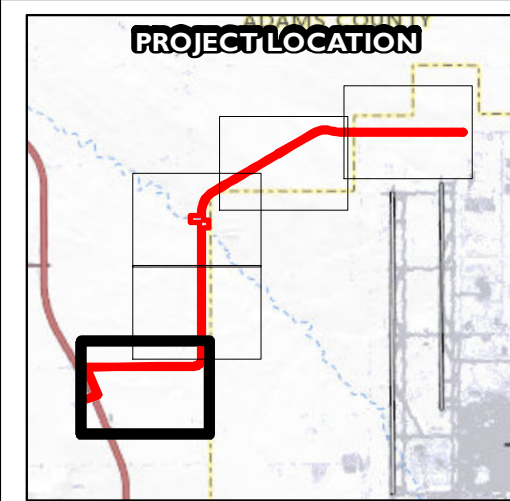
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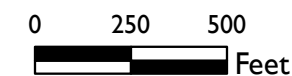
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Legend

-  Study Area
-  Black-tailed Prairie Dog Area



BIOLOGICAL RESOURCES
 Denver International Airport/E-470
 Pipeline Project
 Denver and Adams County, Colorado

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Figure: 2; page 5 of 5

Date: 11/16/2022

Photo 1. The study area included both sides of mowed Right-of-Way (ROW) bordered by agricultural fields. Photo taken facing east.



Photo 2. Facing south towards the Denver International Airport property border at the north end of the study area.



Photo 3.
General
vegetation in the
study area
includes sand
dropseed
(*Sporobolus
cryptandrus*),
annual sunflower
(*Helianthus
annuus*), Russian
thistle (*Salsola
tragus*), and
smooth brome
(*Bromus
tectorum*). Photo
taken in the
southern portion
of the study
area, facing east.



Photo 4.
Wetland I (WL-
I) east of West
Cargo Road
along Third
Creek. Photo
taken facing
west.



Photo 5. WL-1
west of West
Cargo Road
along Third
Creek, facing
east.



Photo 6. WL-1
west of West
Cargo Road
along Third
Creek, facing
northwest.
Sampling Points
1 and 2 taken
nearby.



Photo 7. One of the five Northern Harriers (*Circus hudsonius*) observed in the study area. Two Red-tailed Hawks (*Buteo jamaicensis*) were also observed during field surveys.



Photo 8. Cliff Swallow (*Petrochelidon pyrrhonota*) nests lined the box culvert along Third Creek. Photo taken in west entrance to culvert, facing east.



WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: _____ City/County: _____ Sampling Date: _____
 Applicant/Owner: _____ State: _____ Sampling Point: _____
 Investigator(s): _____ Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____
 Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No _____ Hydric Soil Present? Yes _____ No _____ Wetland Hydrology Present? Yes _____ No _____	Is the Sampled Area within a Wetland? Yes _____ No _____
Remarks: _____ _____ _____	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	
1. _____	_____	_____	_____	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): _____ (A) Total Number of Dominant Species Across All Strata: _____ (B) Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
_____ = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
Sapling/Shrub Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
_____ = Total Cover				
Herb Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
_____ = Total Cover				
Woody Vine Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
_____ = Total Cover				
% Bare Ground in Herb Stratum _____				
Remarks: _____ _____ _____				

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)		Indicators for Problematic Hydric Soils³:
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> 1 cm Muck (A9) (LRR I, J)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Coast Prairie Redox (A16) (LRR F, G, H)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Dark Surface (S7) (LRR G)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Mucky Mineral (F1)	<input type="checkbox"/> High Plains Depressions (F16)
<input type="checkbox"/> Stratified Layers (A5) (LRR F)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	(LRR H outside of MLRA 72 & 73)
<input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Reduced Vertic (F18)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)
<input type="checkbox"/> Sandy Mucky Mineral (S1)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H)	<input type="checkbox"/> High Plains Depressions (F16)	³ Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.
<input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F)	(MLRA 72 & 73 of LRR H)	

Restrictive Layer (if present):	Hydric Soil Present? Yes _____ No _____
Type: _____ Depth (inches): _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:	
<u>Primary Indicators (minimum of one required; check all that apply)</u>	<u>Secondary Indicators (minimum of two required)</u>
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)
<input type="checkbox"/> Sediment Deposits (B2)	(where tilled)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> FAC-Neutral Test (D5)
<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Frost-Heave Hummocks (D7) (LRR F)
<input type="checkbox"/> Salt Crust (B11)	
<input type="checkbox"/> Aquatic Invertebrates (B13)	
<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	
<input type="checkbox"/> Dry-Season Water Table (C2)	
<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	
(where not tilled)	
<input type="checkbox"/> Presence of Reduced Iron (C4)	
<input type="checkbox"/> Thin Muck Surface (C7)	
<input type="checkbox"/> Other (Explain in Remarks)	

Field Observations:	Wetland Hydrology Present? Yes _____ No _____
Surface Water Present? Yes _____ No _____ Depth (inches): _____ Water Table Present? Yes _____ No _____ Depth (inches): _____ Saturation Present? Yes _____ No _____ Depth (inches): _____ (includes capillary fringe)	

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: _____ City/County: _____ Sampling Date: _____
 Applicant/Owner: _____ State: _____ Sampling Point: _____
 Investigator(s): _____ Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____
 Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No _____ Hydric Soil Present? Yes _____ No _____ Wetland Hydrology Present? Yes _____ No _____	Is the Sampled Area within a Wetland? Yes _____ No _____
Remarks: _____ _____ _____	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
_____ = Total Cover				
Sapling/Shrub Stratum (Plot size: _____)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
_____ = Total Cover				
Herb Stratum (Plot size: _____)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
_____ = Total Cover				
Woody Vine Stratum (Plot size: _____)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
_____ = Total Cover				
% Bare Ground in Herb Stratum _____				

Dominance Test worksheet:
 Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): _____ (A)
 Total Number of Dominant Species Across All Strata: _____ (B)
 Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species _____ x 1 = _____
 FACW species _____ x 2 = _____
 FAC species _____ x 3 = _____
 FACU species _____ x 4 = _____
 UPL species _____ x 5 = _____
 Column Totals: _____ (A) _____ (B)
 Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:
 ___ 1 - Rapid Test for Hydrophytic Vegetation
 ___ 2 - Dominance Test is >50%
 ___ 3 - Prevalence Index is ≤3.0¹
 ___ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
 ___ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: _____

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)		Indicators for Problematic Hydric Soils³:
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> 1 cm Muck (A9) (LRR I, J)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Coast Prairie Redox (A16) (LRR F, G, H)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Dark Surface (S7) (LRR G)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Mucky Mineral (F1)	<input type="checkbox"/> High Plains Depressions (F16)
<input type="checkbox"/> Stratified Layers (A5) (LRR F)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	(LRR H outside of MLRA 72 & 73)
<input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Reduced Vertic (F18)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)
<input type="checkbox"/> Sandy Mucky Mineral (S1)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H)	<input type="checkbox"/> High Plains Depressions (F16)	³ Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.
<input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F)	(MLRA 72 & 73 of LRR H)	

Restrictive Layer (if present):	Hydric Soil Present? Yes _____ No _____
Type: _____ Depth (inches): _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:	
<u>Primary Indicators (minimum of one required; check all that apply)</u>	<u>Secondary Indicators (minimum of two required)</u>
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)
<input type="checkbox"/> Sediment Deposits (B2)	(where tilled)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> FAC-Neutral Test (D5)
<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Frost-Heave Hummocks (D7) (LRR F)
<input type="checkbox"/> Salt Crust (B11)	
<input type="checkbox"/> Aquatic Invertebrates (B13)	
<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	
<input type="checkbox"/> Dry-Season Water Table (C2)	
<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	
(where not tilled)	
<input type="checkbox"/> Presence of Reduced Iron (C4)	
<input type="checkbox"/> Thin Muck Surface (C7)	
<input type="checkbox"/> Other (Explain in Remarks)	

Field Observations:	Wetland Hydrology Present? Yes _____ No _____
Surface Water Present? Yes _____ No _____ Depth (inches): _____ Water Table Present? Yes _____ No _____ Depth (inches): _____ Saturation Present? Yes _____ No _____ Depth (inches): _____ (includes capillary fringe)	

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: _____ City/County: _____ Sampling Date: _____
 Applicant/Owner: _____ State: _____ Sampling Point: _____
 Investigator(s): _____ Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____
 Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No _____ Hydric Soil Present? Yes _____ No _____ Wetland Hydrology Present? Yes _____ No _____	Is the Sampled Area within a Wetland? Yes _____ No _____
Remarks: _____ _____ _____	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	
1. _____	_____	_____	_____	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): _____ (A) Total Number of Dominant Species Across All Strata: _____ (B) Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
0 = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
Sapling/Shrub Stratum (Plot size: _____)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
80 = Total Cover				
Herb Stratum (Plot size: _____)				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation ___ 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
_____ = Total Cover				
Woody Vine Stratum (Plot size: _____)				Hydrophytic Vegetation Present? Yes _____ No _____
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
_____ = Total Cover				
% Bare Ground in Herb Stratum _____				
Remarks: _____ _____ _____				

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

<p>Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)</p> <p>___ Histosol (A1)</p> <p>___ Histic Epipedon (A2)</p> <p>___ Black Histic (A3)</p> <p>___ Hydrogen Sulfide (A4)</p> <p>___ Stratified Layers (A5) (LRR F)</p> <p>___ 1 cm Muck (A9) (LRR F, G, H)</p> <p>___ Depleted Below Dark Surface (A11)</p> <p>___ Thick Dark Surface (A12)</p> <p>___ Sandy Mucky Mineral (S1)</p> <p>___ 2.5 cm Mucky Peat or Peat (S2) (LRR G, H)</p> <p>___ 5 cm Mucky Peat or Peat (S3) (LRR F)</p>	<p>___ Sandy Gleyed Matrix (S4)</p> <p>___ Sandy Redox (S5)</p> <p>___ Stripped Matrix (S6)</p> <p>___ Loamy Mucky Mineral (F1)</p> <p>___ Loamy Gleyed Matrix (F2)</p> <p>___ Depleted Matrix (F3)</p> <p>___ Redox Dark Surface (F6)</p> <p>___ Depleted Dark Surface (F7)</p> <p>___ Redox Depressions (F8)</p> <p>___ High Plains Depressions (F16)</p> <p style="text-align: center;">(MLRA 72 & 73 of LRR H)</p>	<p>Indicators for Problematic Hydric Soils³:</p> <p>___ 1 cm Muck (A9) (LRR I, J)</p> <p>___ Coast Prairie Redox (A16) (LRR F, G, H)</p> <p>___ Dark Surface (S7) (LRR G)</p> <p>___ High Plains Depressions (F16)</p> <p style="text-align: center;">(LRR H outside of MLRA 72 & 73)</p> <p>___ Reduced Vertic (F18)</p> <p>___ Red Parent Material (TF2)</p> <p>___ Very Shallow Dark Surface (TF12)</p> <p>___ Other (Explain in Remarks)</p> <p>³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.</p>
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<p>Restrictive Layer (if present):</p> <p>Type: _____</p> <p>Depth (inches): _____</p>	<p>Hydric Soil Present? Yes _____ No _____</p>
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Remarks:

HYDROLOGY

<p>Wetland Hydrology Indicators:</p> <p><u>Primary Indicators (minimum of one required; check all that apply)</u></p> <p>___ Surface Water (A1)</p> <p>___ High Water Table (A2)</p> <p>___ Saturation (A3)</p> <p>___ Water Marks (B1)</p> <p>___ Sediment Deposits (B2)</p> <p>___ Drift Deposits (B3)</p> <p>___ Algal Mat or Crust (B4)</p> <p>___ Iron Deposits (B5)</p> <p>___ Inundation Visible on Aerial Imagery (B7)</p> <p>___ Water-Stained Leaves (B9)</p>		<p><u>Secondary Indicators (minimum of two required)</u></p> <p>___ Salt Crust (B11)</p> <p>___ Aquatic Invertebrates (B13)</p> <p>___ Hydrogen Sulfide Odor (C1)</p> <p>___ Dry-Season Water Table (C2)</p> <p>___ Oxidized Rhizospheres on Living Roots (C3)</p> <p style="text-align: center;">(where not tilled)</p> <p>___ Presence of Reduced Iron (C4)</p> <p>___ Thin Muck Surface (C7)</p> <p>___ Other (Explain in Remarks)</p>	<p>___ Surface Soil Cracks (B6)</p> <p>___ Sparsely Vegetated Concave Surface (B8)</p> <p>___ Drainage Patterns (B10)</p> <p>___ Oxidized Rhizospheres on Living Roots (C3)</p> <p style="text-align: center;">(where tilled)</p> <p>___ Crayfish Burrows (C8)</p> <p>___ Saturation Visible on Aerial Imagery (C9)</p> <p>___ Geomorphic Position (D2)</p> <p>___ FAC-Neutral Test (D5)</p> <p>___ Frost-Heave Hummocks (D7) (LRR F)</p>
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<p>Field Observations:</p> <p>Surface Water Present? Yes _____ No _____ Depth (inches): _____</p> <p>Water Table Present? Yes _____ No _____ Depth (inches): _____</p> <p>Saturation Present? Yes _____ No _____ Depth (inches): _____ (includes capillary fringe)</p>	<p>Wetland Hydrology Present? Yes _____ No _____</p>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: