Natural Resources Assessment
Expedition Water Solutions, EWS #7 Site
Arapahoe County, Colorado

Prepared for—

Zachary Neal
Chief Commercial Officer / Chief Financial Officer
Expedition Water Solutions
9360 Station Street, Suite 375
Lone Tree, Colorado, 80124

Prepared by—

ERO Resources Corporation
1842 Clarkson Street
Denver, Colorado 80218
(303) 830-1188
ERO Project #10136

September 19, 2018
Contents

Executive Summary ................................................................................................................. iii

Introduction ............................................................................................................................. 1

Project Area Description ......................................................................................................... 1

Air Quality ............................................................................................................................... 4
Regulatory Setting .................................................................................................................... 4
Airshed Description .................................................................................................................. 5
Criteria Pollution Sources ......................................................................................................... 5
Existing Air Quality ................................................................................................................... 6
Visibility ................................................................................................................................... 7

Terrestrial and Aquatic Animals and Habitat ............................................................................. 8
Threatened, Endangered, and Candidate Animal Species and Habitat ......................................... 8
Preble’s Meadow Jumping Mouse ............................................................................................... 9
Other Species of Concern .......................................................................................................... 9
State-Listed Species .................................................................................................................... 9
Other Wildlife ............................................................................................................................ 13

Terrestrial and Aquatic Plant Life .............................................................................................. 14
Vegetation Community .............................................................................................................. 14
Mixed Native and Nonnative Grassland .................................................................................... 14
Aquatic Plant Life ....................................................................................................................... 14

Threatened, Endangered, and Candidate Plant Species and Habitat ........................................... 15
Ute Ladies’-Tresses Orchid ....................................................................................................... 15
Background ............................................................................................................................... 15
Potential Habitat and Possible Effects ....................................................................................... 15
Recommendations ..................................................................................................................... 15
Other Species of Concern ......................................................................................................... 15
Rare and Sensitive Plant Species .............................................................................................. 15

Visual Quality .......................................................................................................................... 16
General Setting ........................................................................................................................ 16

References ................................................................................................................................ 16

Tables

Table 1. National and State Ambient Air Quality Standards ............................................................... 4
Table 2. Monitoring results ............................................................................................................ 7
Table 3. Federally threatened, endangered, and candidate animal species potentially found in Arapahoe County or potentially affected by projects in Arapahoe County ........................................... 8
Table 4. State-listed species that occur in Arapahoe County .......................................................... 10
Table 5. Plant species considered rare or imperiled by the CNHP that potentially occur in Arapahoe County ......................................................................................................................... 15
Figures

Figure 1. Project Location Map ........................................................................................................ 2
Figure 2. Existing Conditions ............................................................................................................. 3

Appendices

Appendix A Photo Log
Executive Summary

Expedition Water Solutions (EWS) retained ERO Resources Corporation (ERO) to provide a natural resources assessment for a proposed saltwater injection facility located at site EWS #7 in Arapahoe County, Colorado (project area). EWS will use the information in this document to support their Arapahoe County 1041 documentation. This assessment includes a description of the existing air quality, the general vegetation, a description of plant and animal species and habitat, and visual quality in the project area. This report provides information on existing site conditions and resources, as well as current regulatory requirements related to those resources. ERO assumes the landowner or project proponent is responsible for obtaining all federal, state, and local permits for construction of the project.

The natural resources and associated regulations described in this report are valid as of the date of this report and may be relied on for the specific use for which it was prepared by ERO under contract to EWS. Because of their dynamic natures, site conditions and regulations should be reconfirmed by a qualified consultant before relying on this report for a use other than that for which it was specifically prepared.

Air Quality

The project area is located in the Denver Metro/North Front Range monitoring region. Since 2002, the region has been an attainment area for all criteria pollutants, except ozone (O₃). In 2007, the area was formally designated as a nonattainment area and reaffirmed in 2012 when the U.S. Environmental Protection Agency designated the region as a “marginal” nonattainment area for O₃ standard. Recently, the region failed to attain the ozone standard and was reclassified as a “moderate” nonattainment area, which triggered the requirement to develop an updated ozone plan in 2016 (Colorado Department of Public Health and Environment (CDPHE) 2017). In 2016, none of the monitors in the vicinity of the project area recorded concentrations exceeding federal and state standards. The monitor closest to the project area did not record concentrations of O₃ in exceedance of the federal standards (CDPHE 2017).

Terrestrial and Aquatic Animals and Habitat

Wetlands and Other Waters of the U.S. — No potential wetlands or waters of the U.S. occur in the project area. No further action or consultation is required.

Threatened, Endangered, and Candidate Species and Habitat — The project area does not contain habitat for federally listed threatened and endangered species. No further action or consultation is required, but the Client has requested U.S. Fish and Wildlife input.

State-Listed Species — The project area contains potential habitat for three Colorado state-listed special concern, threatened, and endangered species. Black-tailed prairie dog, ferruginous hawk, and mountain plover have potential habitat within the project area but are unlikely to be adversely affected by the project. No black-tailed prairie dog colonies occur in the project area, making it unlikely that the project...
would adversely affect this species. Ferruginous hawk likely use the area for foraging and have a potential to build ground nests in the project area. The site however lacks potential nest locations due to the lack of trees, rocky outcrops, or cliffs in the project area. In addition, no nests were observed in the project area during the 2018 site visit. Therefore, it is unlikely that project would adversely affect ferruginous hawk. Mountain plover nest in habitat with vegetation that has been grazed to below 6 inches, in or near prairie dog colonies, and have approximately 30 percent bare ground cover. The project area vegetation has been grazed but the height of the vegetation remained over 6 inches at the time of the 2018 site visit. The bare ground in the project area is much lower than 30 percent and, as stated above, no prairie dog colonies occur in the project area. The project is unlikely to adversely affect mountain plover. All three of these species are state species of special concern, which is not a statutory categorization, and would not require further action or consultation.

Migratory Birds — ERO did not observe any active bird nests in the project area during the 2018 site visit. No trees occur in the project area. Both the U.S. Fish and Wildlife Service’s Denver Field Office (2009) and Colorado Department of Transportation (2011) have identified the primary nesting season for migratory birds in eastern Colorado as occurring between April 1 and mid to late August. However, some birds, such as bald eagles, red-tailed hawks, and great horned owls, can occupy nests as early as December. Because of variability in breeding seasons of various bird species, including ground-nesting birds, ERO recommends a nest survey be conducted within one week prior to construction to determine if any active nests are present in the project area so they can be avoided. If active nests are found, any work that would destroy the nests could not be conducted until the birds have vacated the nests.

Other Wildlife — The project area is located within the overall ranges of mule deer and pronghorn and the peripheral range of mountain lion. Due to the presence of humans and large equipment, it is unlikely that large mammal species would be adversely affected by the project. The project area provides potential habitat for several animal species that occur in shortgrass prairie, but would not likely have overall negative effects on the species with abundant populations. Evidence of livestock grazing was observed during the 2018 site visit and these activities would likely decline after construction. No aquatic species or habitat was observed in the project area.

Terrestrial and Aquatic Plants and Habitat

Mixed Native and Nonnative Grassland — The project area consists of a single vegetation community characterized predominantly by a mix of native and nonnative grasses and grass-like forbs and is dominated by smooth brome, blue grama, crested wheatgrass, and threadleaf sedge. The shrub stratum is dominated by rubber rabbitbrush and soapweed yucca. Three upland vegetated swales occur in the project area and are dominated by smooth brome.

Threatened, Endangered, and Candidate Species and Habitat — One federally listed species – Ute ladies-tresses orchid – potentially occurs in Arapahoe County; however, the project area does not contain wetland habitat required by this species. No further action or consultation is required.
Rare and Sensitive Plant Species — The Colorado Natural Heritage Program (CNHP) maintains a list of plant species considered rare or imperiled in Colorado by county. These species are not formally protected but are considered rare or imperiled by the CNHP. Four rare or imperiled species potentially occur in Arapahoe County and potential habitat for one of those species – dwarf milkweed – occurs in the project area. American currant, broadfruit bur-reed, and yellow stargrass all require either wetland or mesic habitat not found in the project area. Although dwarf milkweed is associated with shortgrass prairie species that occur in the project area, there are indications that the species only occurs within intact native prairie not found in the project area. Dwarf milkweed populations are typically small and isolated. No known occurrences of dwarf milkweed occur in the project area and the species was not observed during the 2018 site visit. It is unlikely that the project would adversely affect dwarf milkweed. No further action or consultation is required.

Visual Quality

The project area consists of native and nonnative grassland with chain-link fences running throughout the area and abuts an electrical power substation to the west. The permanent structures associated with the project would alter the existing viewshed after construction has concluded. Revegetation of temporarily impacted areas would have minimal changes to the visual quality of the landscape. The visual quality of the project area would not be considerably altered from the project.
Natural Resources Assessment
Expedition Water Solutions, EWS #7 Site
Arapahoe County, Colorado

September 19, 2018

Introduction

Expedition Water Solutions (EWS) retained ERO Resources Corporation (ERO) to provide a natural resources assessment for a proposed saltwater injection facility located at site EWS #7 in Arapahoe County, Colorado (project area). The assessment included a review of publicly available air quality, vegetation and wildlife data, as well as a site visit. On May 7, 2018, Matt Boyer, a Staff Biologist with ERO, conducted a field assessment of the project area (2018 site visit). Matt Boyer has over five years experience conducting floristic and faunistic surveys in a professional capacity. During the 2018 site visit, ERO identified existing vegetation cover types, potential habitat for federally listed threatened and endangered species habitat, significant wildlife attributes such as seasonal wildlife habitat, wildlife corridors, nests, dens, and roost areas, as well as potentially jurisdictional wetlands. This report provides the results of the data review and 2018 site visit. ERO assumes the landowner or project proponent is responsible for obtaining all federal, state, and local permits for construction of the project.

Project Area Description

The project area is in Section 5, Township 5 South, Range 64 West of the 6th Principal Meridian in Arapahoe County, Colorado (Figure 1). The UTM coordinates of the approximate center of the project area are NAD 83 536548mE, 4387812 Zone 13 North. The longitude/latitude of the project area is 104.574070°W/39.639310°N. The elevation of the project area is approximately 5,900 feet above sea level. Photo points of the project area are shown on Figure 2 and the photo log is in Appendix A.

The project area is generally located north of East Quincy Avenue (County Road 30) between South Watkins Road and South Manilla Road. The project area is on undeveloped land. Light industrial uses border the project area to the west and east. One 8-foot-tall chain-link fence with a three-strand barbed-wire arm attached to the top runs along the southwest corner of the project area and then north for the entire length of the project area (Photo 1). Another similar fence connects with the first approximately 400 feet south of the northern project area boundary and runs east for approximately 1,500 feet and then turns north, continuing beyond the extent of the project area (Figure 2).

The vegetation in the project area is dominated by a mix of native and nonnative grasses including smooth brome (*Bromus inermis*), blue grama (*Boutoula gracilis*), crested wheatgrass (*Agropyron cristatum*), and threadleaf sedge (*Carex filifolia*) (Photo 2). Soapweed yucca (*Yucca glauca*) and rubber rabbitbrush (*Ericameria nauseosa*) dominate the shrub stratum (Photo 3). Three upland vegetated swales, dominated by smooth brome and crested wheatgrass, occur in the project area and appear to flow south into three culverts under East Quincy Avenue just south of the project area (Photo 4). Evidence of recent grazing by cattle west of the fenceline and wildlife east of the fenceline was observed over the entire project area during the 2018 site visit.
EWS #7 Site
Section 5, T5S, R64W; 6th PM
UTM NAD 83: Zone 13N; 536548mE, 4387812mN
Longitude 104.574070°W, Latitude 39.639310°N
USGS Watkins, CO Quadrangle
Arapahoe County, Colorado

Figure 1
Project Location Map

Prepared for: Expedition Water Solutions
File: 10136 Figure 1.mxd (GS)
May 15, 2018

Portions of this document include intellectual property of ESRI and its licensors and are used herein under license. Copyright © 2017 ESRI and its licensors. All rights reserved.
Air Quality

Regulatory Setting

The Clean Air Act of 1970 (42 United States Code (U.S.C.) Section 7401), and its amendments, established National Ambient Air Quality Standards (NAAQS) to protect public health and regulate the emissions of hazardous air pollutants. The U.S. Environmental Protection Agency (EPA) has set NAAQS for six pollutants, commonly referred to as criteria pollutants, which are carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM₂.₅ and PM₁₀), lead (Pb), and sulfur dioxide (SO₂). The Colorado Department of Public Health and Environment (CDPHE) has adopted the national standards, and in 2016 established a state standard for SO₂. The national and state standards are included in Table 1.

Table 1. National and State Ambient Air Quality Standards.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>National Standard</th>
<th>State Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Primary</td>
<td>Secondary</td>
</tr>
<tr>
<td>Carbon Monoxide (CO)</td>
<td>8 hours</td>
<td>9 ppm</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1 hour</td>
<td>35 ppm</td>
<td>-</td>
</tr>
<tr>
<td>Lead (Pb)(1)</td>
<td>Rolling 3-month average</td>
<td>0.15 μg/m³</td>
<td>0.15 μg/m³</td>
</tr>
<tr>
<td>Nitrogen Dioxide (NO₂)</td>
<td>1 hour</td>
<td>100 ppb</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1 year</td>
<td>53 ppb(2)</td>
<td>53 ppb(2)</td>
</tr>
<tr>
<td>Ozone (O₃)</td>
<td>8 hours</td>
<td>0.070 ppm(3)</td>
<td>0.070 ppm(3)</td>
</tr>
<tr>
<td>Particulate Matter (PM₁₀)</td>
<td>24 hours</td>
<td>150 μg/m³</td>
<td>150 μg/m³</td>
</tr>
<tr>
<td>Fine Particulate Matter (PM₂.₅)</td>
<td>24 hours</td>
<td>12.0 μg/m³</td>
<td>15 μg/m³</td>
</tr>
<tr>
<td></td>
<td>3 hours</td>
<td>35 μg/m³</td>
<td>35 μg/m³</td>
</tr>
<tr>
<td>Sulfur Dioxide (SO₂)</td>
<td>1 hour</td>
<td>75 ppb</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>3 hours</td>
<td>-</td>
<td>0.5 ppm(4)</td>
</tr>
</tbody>
</table>

ppm = parts per million; ppb = parts per billion; μg/m³ = micrograms per cubic meter
(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 μg/m³ as a calendar quarter average) also remain in effect.
(2) The level of the annual NO₂ standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.
(4) The previous SO₂ standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (a) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (b) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO₂ standards or is not meeting the requirements of a State Implementation Plan (SIP) call under the previous SO₂ standards (40 Code of Federal Regulations (CFR) 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its SIP to demonstrate attainment of the required NAAQS.
Source: EPA 2016a; CDPHE 2016a.

Areas that meet the NAAQS and state standard are classified as attainment areas, while areas that exceed the NAAQS or state standard are classified as nonattainment. Areas can be attainment or nonattainment for one or more of the six criteria pollutants (EPA 2017a). Areas designated as nonattainment are required to prepare implementation plans for attaining the standard for each pollutant. Once the nonattainment area has met the NAAQS over the averaging times, a maintenance
plan is prepared to ensure future compliance with the standard. The CDPHE Air Pollution Control Division (APCD) oversees air quality policies and develops the State Implementation Plans for all areas that currently violate or have violated federal or state standards. The Regional Air Quality Council (RAQC), established in 1989, serves as the lead air quality planning agency for the Denver metropolitan area. The RAQC coordinates with various government agencies, private sector representatives, stakeholder groups, and citizens to develop strategies to ensure compliance with federal and state air quality standards and administer public education programs (RAQC 2016).

**Airshed Description**

The project area is southeast of the Denver metropolitan area, in a mostly undeveloped area characterized by undulating to rolling plains and grasslands. The project area is located within the Middle South Platte-Cherry Creek watershed, with no distinct topographic features nearby.

The average annual temperature ranges between 46°F and 54°F, with the warmest temperatures occurring in July (average daily temperature range of 55°F to 88°F) and the coldest temperatures occurring in January (average daily temperature range of 11°F to 40°F). Prevailing winds in the project area can be variable but tend to be from the west throughout the year. Average wind speeds range from 7.2 to 9.8 miles per hour with higher wind speeds occurring from November to May (Weatherspark n.d.).

**Criteria Pollution Sources**

Main contributors of CO concentrations in the Denver metropolitan area are mobile sources, such as cars, trucks, buses, power plants, and off-road equipment; however, wildfires, controlled burns, and oil and gas development likely contribute to these levels (CDPHE 2017).

Major sources of lead (Pb) are ore and metal processing facilities and piston-engine aircraft using leaded fuel (EPA 2017b). In 2005 the Centennial Airport had the second highest lead emissions estimate of any airport in the country, but by 2014 Pb concentrations were well below the standards (CDPHE 2017).

NO₂ is one of a highly reactive group of gasses known as nitrogen oxides (NOₓ), and mobile sources continue to be the main source of NO₂ concentrations. O₃ is created by the chemical reaction of volatile organic compounds (VOCs) and NOₓ in the presence of sunlight. The O₃ molecule typically forms downwind from the VOC and NOₓ emission sources. Emissions from industrial facilities and electric utilities, motor vehicles, gasoline vapors, and chemical solvents are some of the major sources of NOₓ and VOCs. Urban areas typically have higher ozone concentrations, but rural areas can have increased concentrations due to local or regional wind patterns (CDPHE 2017).

Particulate matter is a mixture of suspended microscopic solids and liquid droplets made up of various components including acids, organic chemicals, metals, dust particles, and pollen or mold spores. Particulate matter can be directly emitted or can be formed in the atmosphere when gaseous pollutants react to form fine particles. Sources of PM₁₀ include mobile and stationary combustion sources (e.g., motor vehicles, power plants, fires, and stoves), as well as some industrial, manufacturing, and
agricultural processes. Sources of fine particulate matter (PM$_{2.5}$) also include mobile and stationary combustion sources, as well as some industrial activities, including oil and gas development and operation (CDPHE 2017).

SO$_2$ is an indicator used to measure a larger group of gaseous sulfur oxides that are found in lower concentrations than SO$_2$. Sources of SO$_2$ emissions include the combustion of fossil fuels by power plants and other large heavy equipment including ships, locomotives, and other large vehicles (EPA 2016b).

**Existing Air Quality**

The project area is located in the Denver Metro/North Front Range monitoring region, one of eight monitoring regions identified by the CDPHE for air quality management purposes. These multicounty monitoring regions include areas with similar topography and airshed characteristics, including wind speed, direction, and temperature (CDPHE 2015). The Denver Metro/North Front Range monitoring region covers 13 counties, including Arapahoe County.

Since 2002, the Denver Metro/North Front Range monitoring region has been in attainment for all criteria pollutants, except O$_3$. In 2007, the area was formally designated as a nonattainment area and reaffirmed in 2012 when the EPA designated the region as a “marginal” nonattainment area for O$_3$ standard. Recently, the region failed to attain the ozone standard and was reclassified as a “moderate” nonattainment area, which triggered the requirement to develop an updated ozone plan in 2016 (CDPHE 2017).

Within the region, the APCD operates 29 gaseous and 33 particulate monitors at 16 sites (CDPHE 2017). The results from the air quality stations closest to the project area are summarized in Table 2. Due to low concentrations of lead in the region since the 1980s, and only one exceedance of the federal lead standard in 2011, only limited monitoring of lead emissions occurs. While ambient lead concentrations are measured at some PM$_{2.5}$ monitors, the results from 2016 were not published by CDPHE. Because not all stations monitor all pollutants, stations were selected at increasing distances from the project area until all of the pollutants were included.

---

1 Other counties in the Denver Metro/North Front Range monitoring region include Adams, Boulder, Broomfield, Clear Creek, Denver, Douglas, Elbert, Gilpin, Jefferson, Larimer, Park, and Weld.
Table 2. Monitoring results.

<table>
<thead>
<tr>
<th>Monitoring Station</th>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>08-031-0002 (Denver CAMP)</td>
<td>Carbon Monoxide (CO)</td>
<td>8 hours (Max)</td>
<td>1.8 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 hour (Max)</td>
<td>3.2 ppm</td>
</tr>
<tr>
<td>08-031-0002 (Denver CAMP)</td>
<td>Nitrogen Dioxide (NO₂)</td>
<td>1 hour (2014-2016 Design Value²)</td>
<td>74.0 ppb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 year (Average)</td>
<td>21.23 ppb</td>
</tr>
<tr>
<td>08-005-0006 (Aurora-East)</td>
<td>Ozone (O₃)</td>
<td>8 hours (Max)</td>
<td>0.070 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 hours (4th Max)</td>
<td>0.070 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2014-2016 Design Value</td>
<td>0.066 ppm</td>
</tr>
<tr>
<td>08-031-0027 (I-25 Denver)</td>
<td>Particulate Matter (PM₁₀)</td>
<td>24 hours (Max)</td>
<td>105 μg/m³</td>
</tr>
<tr>
<td>08-005-0005 (Arapahoe Community College)</td>
<td>Fine Particulate Matter (PM₂₅)</td>
<td>1 year (Design Value)</td>
<td>5.9 μg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 hours Design Value</td>
<td>17 μg/m³</td>
</tr>
<tr>
<td>08-031-0002 (Denver CAMP)</td>
<td>Sulfur Dioxide (SO₂)</td>
<td>1 hour (Max)</td>
<td>0.009 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2014-2016 Design Value</td>
<td>0.014 ppm</td>
</tr>
</tbody>
</table>

ppm = parts per million; ppb = parts per billion; μg/m³ = micrograms per cubic meter


In 2016, none of the monitors in the vicinity of the project area recorded concentrations exceeding federal and state standards. While the monitor closest to the project area did not record concentrations of O₃ in exceedance of the federal standards, three monitors in the Denver metropolitan area (Chatfield State Park, Rocky Flats, and National Renewable Energy Laboratory recorded exceedances and the region remains as nonattainment for O₃ (CDPHE 2017).

**Visibility**

Due to the regional topography, the Denver metropolitan area is prone to temperature inversions, which traps cooler air near the ground, preventing pollutants from rising into the atmosphere. In the 1970s and 1980s, these temperature inversions trapped air pollution, creating the infamous brown cloud. During this time, the Denver metro area exceeded EPA air quality standards nearly 200 days annually.

Causes of visibility impairment in the metropolitan area is often PM₂₅, mostly from manmade sources including wood burning, electric power generation, industrial combustion of coal or oil, and vehicle emissions. Since the 1980s, visibility within the Denver metropolitan area has improved due to stricter federal vehicle emission guidelines, industrial pollution controls, and best practices.

Visibility in the Denver metropolitan area is monitored using a digital camera and a long-path transmissometer, both located in downtown Denver. Between November 1 and March 31 each year, CDPHE issues daily air pollution advisories for the seven-county Denver metropolitan area, including Arapahoe County. These advisories are called “Action Days for Visibility” and indicate that the Visibility Standard Index for visual air quality is expected to be poor on the following day. The index provides a value that reports the visual air quality compared to CDPHE’s visibility standard. An index value greater

² Design value is a statistic that describes the air quality status of a given location relative to the level of the NAAQS (EPA 2018).
than 101 indicates poor or extremely poor visual air quality (CDPHE n.d.). During Action Days for Visibility, CDPHE issues mandatory restrictions that limit indoor burning (such as fireplaces) and voluntary driving reductions for the Denver metropolitan area. In 2016, the Denver metropolitan area exceeded the visibility standard 33 percent of the year, with the most exceedances occurring in December, January, and August (CDPHE 2016b).

**Terrestrial and Aquatic Animals and Habitat**

**Threatened, Endangered, and Candidate Animal Species and Habitat**

During the 2018 site visit, ERO assessed the project area for potential habitat for threatened, endangered, and candidate species under the Endangered Species Act (ESA). Federally threatened and endangered species are protected under the ESA. Adverse effects on a federally listed species or its habitat require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 or 10 of the ESA. The Service lists several threatened and endangered species with potential habitat in Arapahoe County, or that would be potentially affected by projects in Arapahoe County (Table 3).

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status*</th>
<th>Habitat</th>
<th>Habitat Present</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preble’s meadow jumping mouse (Preble’s)</td>
<td>Zapus hudsonius preblei</td>
<td>T</td>
<td>Shrub riparian/wet meadows</td>
<td>No habitat, no potential to affect</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior least tern**</td>
<td>Sterna antillarum athalassos</td>
<td>E</td>
<td>Sandy/pebble beaches on lakes, reservoirs, and rivers</td>
<td>No habitat, no depletions anticipated</td>
</tr>
<tr>
<td>Mexican spotted owl</td>
<td>Strix occidentalis</td>
<td>T</td>
<td>Closed-canopy forest in steep canyons</td>
<td>No habitat, no potential to affect</td>
</tr>
<tr>
<td>Piping plover**</td>
<td>Charadrius melodus</td>
<td>T</td>
<td>Sandy lakeshore beaches and river sandbars</td>
<td>No habitat, no depletions anticipated</td>
</tr>
<tr>
<td>Whooping crane**</td>
<td>Grus Americana</td>
<td>E</td>
<td>Mudflats around reservoirs and in agricultural areas</td>
<td>No habitat, no depletions anticipated</td>
</tr>
<tr>
<td><strong>Fish</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pallid sturgeon**</td>
<td>Scaphirhynchus albus</td>
<td>E</td>
<td>Large, turbid, free-flowing rivers with a strong current and gravel or sandy substrate</td>
<td>No habitat, no depletions anticipated</td>
</tr>
</tbody>
</table>

*T = Federally Threatened Species; E = Federally Endangered Species.

**Water depletions in the South Platte River may affect the species and/or critical habitat in downstream reaches in other counties or states.

Source: Service 2018.

The proposed project would not affect the Mexican spotted owl due to the lack of potential habitat in the project area. The interior least tern, piping plover, whooping crane, and pallid sturgeon are species that are affected by continued or ongoing depletions to the Platte River system. Based on ERO’s current knowledge of the project, the project would not result in any change in water delivery and would not result in any depletions to the South Platte River watershed.
Potential habitat for Preble’s is generally more prevalent in areas across the Front Range. Because these species are more likely to be addressed by counties and regulatory agencies such as the U.S. Army Corps of Engineers, a more detailed discussion is provided below.

**Preble’s Meadow Jumping Mouse**

*Species Background*

Preble’s was listed as a threatened species on May 13, 1998. Under existing regulations, either a habitat assessment or a full presence/absence survey for Preble’s is required for any habitat-disturbing activity within areas determined to be potential Preble’s habitat (generally stream and riparian habitats along the Colorado Front Range). Typically, Preble’s occurs below 7,600 feet in elevation, generally in lowlands with medium to high moisture along permanent or intermittent streams and canals (Meaney et al. 1997). Preble’s occurs in low undergrowth consisting of grasses and forbs, in open wet meadows, in riparian corridors near forests, or where multilevel shrubs and low trees provide adequate cover (Service 1999; Meaney et al. 1997).

*Potential Habitat and Possible Effects*

During the 2018 site visit, ERO assessed the project area for potential Preble’s habitat. Potential habitat for Preble’s does not occur in the project area. The project area lacks riparian vegetation, dense multilayer shrub cover, and streams or canals usually associated with Preble’s habitat. Additionally, from previous trapping data, the nearest trapping site to the project area with a confirmed capture was approximately 11.65 miles to the south along Running Creek in Elbert County (Service 2014).

*Recommendations*

No action or consultation is required regarding Preble’s.

**Other Species of Concern**

*State-Listed Species*

Numerous species in Arapahoe County are considered state species of concern by Colorado Parks and Wildlife (CPW 2018). The habitat affinities and potential impacts on these species are provided in the following discussion and summarized in Table 4.
**Table 4. State-listed species that occur in Arapahoe County.**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status*</th>
<th>Habitat Type</th>
<th>Potential Habitat Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bald eagle</td>
<td><em>Haliaeetus leucocephalus</em></td>
<td>SC</td>
<td>Trees and cliffs, rivers, large lakes; forages in rivers and lakes</td>
<td>No</td>
</tr>
<tr>
<td>Black-tailed prairie dog</td>
<td><em>Cynomys ludovicianus</em></td>
<td>SC</td>
<td>Rangeland; shortgrass prairie</td>
<td>Yes**</td>
</tr>
<tr>
<td>Burrowing owl</td>
<td><em>Athene cunicularia</em></td>
<td>ST</td>
<td>Prairie dog colonies</td>
<td>No</td>
</tr>
<tr>
<td>Common garter snake</td>
<td><em>Thamnophis sirtalis</em></td>
<td>SC</td>
<td>Wetlands and riparian</td>
<td>No</td>
</tr>
<tr>
<td>Common shiner</td>
<td><em>Luxilus cornutus</em></td>
<td>ST</td>
<td>Clear creeks, small to medium rivers with gravel bottoms</td>
<td>No</td>
</tr>
<tr>
<td>Ferruginous hawk</td>
<td><em>Buteo regalis</em></td>
<td>SC</td>
<td>Grasslands</td>
<td>Yes</td>
</tr>
<tr>
<td>Long-billed curlew</td>
<td><em>Numenius americanus</em></td>
<td>SC</td>
<td>Shortgrass prairie near lakes</td>
<td>No</td>
</tr>
<tr>
<td>Mountain plover</td>
<td><em>Charadrius montanus</em></td>
<td>SC</td>
<td>Prairie grasslands, arid plains, and fields</td>
<td>Yes</td>
</tr>
<tr>
<td>Northern leopard frog</td>
<td><em>Rana pipiens</em></td>
<td>SC</td>
<td>Permanent water bodies</td>
<td>No</td>
</tr>
<tr>
<td>Peregrine falcon</td>
<td><em>Falco peregrinus</em></td>
<td>SC</td>
<td>Open spaces associated with high cliffs and bluffs near rivers and coast</td>
<td>No</td>
</tr>
<tr>
<td>River otter</td>
<td><em>Lontra canadensis</em></td>
<td>ST</td>
<td>Riparian habitats</td>
<td>No</td>
</tr>
<tr>
<td>Sandhill crane</td>
<td><em>Grus canadensis</em></td>
<td>SC</td>
<td>Wetlands, shallow marshes, dry fields, and agricultural areas</td>
<td>No</td>
</tr>
<tr>
<td>Swift fox</td>
<td><em>Vulpes velox</em></td>
<td>SC</td>
<td>Shortgrass prairie, believed to be extinct in Arapahoe County</td>
<td>No</td>
</tr>
<tr>
<td>Townsend’s big-eared bat</td>
<td><em>Corynorhinus townsendii pallescens</em></td>
<td>SC</td>
<td>Mines, caves, and large rock cavities below 9,500 feet in elevation</td>
<td>No</td>
</tr>
<tr>
<td>Western snowy plover</td>
<td><em>Charadrius alexandrinus nivosus</em></td>
<td>SC</td>
<td>Beaches, playas, and ponds</td>
<td>No</td>
</tr>
</tbody>
</table>

*SC = State Species of Special Concern; ST = State Threatened Species.
**No black-tailed prairie dogs occur in the project area.

Source: CPW 2018.

The proposed project would not affect the bald eagle, burrowing owl, common garter snake, common shiner, long-billed curlew, northern leopard frog, peregrine falcon, river otter, sandhill crane, swift fox, Townsend’s big-eared bat, or western snowy plover because of the lack of potential habitat in the project area. Black-tailed prairie dog, ferruginous hawk, and mountain plover have potential habitat in the project area and are discussed further below.

**Black-Tailed Prairie Dog**

**Background**

The black-tailed prairie dog is a Colorado State Species of Special Concern and is an important component of the short and mesic grasslands systems. Threats to this species include habitat loss and degradation, habitat fragmentation, disease (sylvatic plague), and lethal control activities. Typically, areas occupied by prairie dogs have greater cover and abundance of perennial grasses and annual forbs compared with nonoccupied sites (Whicker and Detling 1988; Witmer et al. 2002).
Black-tailed prairie dogs are commonly considered a “keystone” species because their activities (burrowing and intense grazing) provide food and shelter for many other grassland species and have a large effect on community structure and ecosystem function (Power et al. 1996). Prairie dogs can contribute to overall landscape heterogeneity, affect nutrient cycling, and provide nest sites and shelter for wildlife (Whicker and Detling 1988). Species such as black-footed ferret, burrowing owl, prairie rattlesnake, and mountain plover are closely linked to prairie dog burrow systems for food and/or cover. Prairie dogs also provide an important prey resource for numerous predators including American badger, coyote, red fox, bald eagle, golden eagle, ferruginous hawk, and other raptors. Prairie dogs also can denude the surface by clipping aboveground vegetation and contributing to exposed bare ground by digging up roots (Kuford 1958; Smith 1967).

**Potential Habitat and Possible Effects**
Although prairie dogs occur throughout eastern Colorado and the Great Plains, no active prairie dog colonies were observed in or near the project area during the 2018 site visit. The project would not adversely affect the overall area population of black-tailed prairie dogs.

**Recommendations**
No further action is required regarding this species.

**Ferruginous Hawk**

**Background**
The ferruginous hawk is a Colorado State Species of Special Concern and is the largest hawk in North America. This species inhabits open prairie and desert habitats and is strongly associated with primary prey species such as ground squirrels and jackrabbits. Ferruginous hawks are relatively common winter residents in eastern Colorado, particularly in association with the black-tailed prairie dog (Beane 1996). Ferruginous hawks may forage in open grasslands in Arapahoe County.

**Potential Habitat and Possible Effects**
The project area contains the prairie habitat preferred by ferruginous hawks for foraging. A prey species, black-tailed jackrabbit (*Lepus californica*), was observed in the project area during the 2018 site visit. No trees, cliffs, or rocky outcrops, other potential nest sites, were observed during the 2018 site visit. Ferruginous hawks build ground nests on the tops of hillslopes and could possibly nest in or near the project area. No individuals or nests were observed in or near the project area during the 2018 site visit. The proposed project would not likely have an adverse effect on the ferruginous hawk.

**Recommendations**
No further action is required regarding this species.

**Mountain Plover**

**Background**
The mountain plover is a Colorado State Species of Special Concern. The mountain plover is a bird of the dry tablelands and Colorado Plateau, nesting primarily in shortgrass prairie sites used historically by prairie dogs, bison, and pronghorn. This species breeds in shortgrass prairie from northern Montana,
Wyoming, and Colorado to central New Mexico. The wintering range extends from central California to southern Arizona into northern Mexico. The habitat requirements of this bird generally consist of open flat tablelands and short intensively grazed grasslands. Typically, plovers nest in areas that maintain about 30 percent bare ground and are often found in disturbed habitats, burned prairie, fallow agricultural fields, and prairie dog colonies (Knopf and Wunder 2006). Plovers avoid vegetation greater than 6 inches high and hillsides or steep slopes. Known mountain plover nesting sites in Colorado are in eastern and southeastern Colorado and South Park (Kuenning and Kingery 1998). Mountain plovers typically nest in Colorado between April 1 and July 10. Plovers will renest on tilled fields if their initial nests are destroyed, and research suggests that the benefits of nesting in predator-free croplands may compensate for nests lost due to tillage practices (Dreitz and Knopf 2007). Threats to mountain plovers include conversion of native prairie grasslands to cultivation, loss of prairie dog colonies, alteration of grazing regimes, habitat fragmentation, control of insects that provide a food resource, exposure to pesticides, and oil and mineral development (Dinsmore 2003).

**Potential Habitat and Possible Effects**

Though the project area appears to be actively grazed, the height of the vegetation was more than 6 inches throughout the project area. No prairie dog colonies occur in or near the project area. The bare ground cover was less than 30 percent throughout the project area during the 2018 site visit. The proposed project would not likely have an adverse effect on the mountain plover. In addition, no nests or individuals were observed in or near the project area during the 2018 site visit.

**Recommendations**

No further action is required regarding this species.

**Migratory Birds and Raptor Nests**

**Background**

Migratory birds, as well as their eggs and nests, are protected under the Migratory Bird Treaty Act (MBTA). While destruction of a nest by itself is not prohibited under the MBTA, nest destruction that results in the unpermitted take of migratory birds or their eggs is illegal (Service 2003). The regulatory definition of a take means to pursue, hunt, shoot, wound, kill, trap, capture, or collect; or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect (50 CFR 10.12).

Under the MBTA, the Service may issue nest deprecation permits, which allow a permittee to remove an active nest. The Service, however, issues few permits and only under specific circumstances, usually related to human health and safety. Obtaining a nest deprecation permit is unlikely and involves a process that may take a significant amount of time. In addition, CPW has recommended buffers for nesting raptors, depending on the species (generally ⅓ or ¼ mile) (Colorado Division of Wildlife 2008). The best way to comply with the MBTA is to remove vegetation outside of the active breeding season, which typically falls between March and August, depending on the species. Public awareness of the MBTA has grown in recent years, and most MBTA enforcement actions are the result of a concerned member of the community reporting noncompliance.
Potential Habitat and Possible Effects
The breeding season for most birds in Colorado is March through August, with the exception of a few species that begin breeding in February, such as great horned owls. No active bird nests were observed during the 2018 site visit. No trees occur in or near the project area. There is potential for ground-nesting bird nests to occur in the project area.

Recommendations
ERO recommends removing vegetation outside of the breeding season (typically September through February). Both the Denver Field Office of the Service (2009) and the Colorado Department of Transportation (2011) have identified the primary nesting season for migratory birds in eastern Colorado as occurring between April 1 and mid to late August. However, a few species such as bald eagles, great horned owls, and red-tailed hawks can nest as early as December (eagles) or late February (owls and red-tailed hawks). Because of variability in the breeding seasons of various bird species, ERO recommends that a nest survey be conducted within one week prior to construction to determine if any active nests are present in the project area so they can be avoided. Additional nest surveys during the nesting season may also be warranted to identify active nesting species that may present additional development timing restrictions (e.g., eagles or red-tailed hawks).

Nest removal may occur during the nonbreeding season to discourage future nesting and avoid violations of the MBTA. No permit or approval is necessary for removing nests during the nonbreeding season; however, nests must be destroyed and may not be collected under MBTA regulations. If the construction schedule does not allow vegetation removal outside of the breeding season, a nest survey should be conducted within one week prior to vegetation removal to determine if the nest is active and by which species. If active nests are found, any work that would destroy the nests could not be conducted until the birds have vacated the nests.

Other Wildlife
Large Mammals
The project area is within the overall ranges of mule deer (Odocoileus hemionus) and pronghorn (Antilocarpa americana), and along the peripheral range of the mountain lion (Puma concolor) (Natural Diversity Information Source (NDIS) 2017). Due to the presence of the fences throughout the project area, it is unlikely that large mammals currently use the project area for breeding or foraging. Additionally, no migration corridors or calving areas occur near the project area (NDIS 2017). The vegetation in the project area would provide cervid species some opportunity for grazing; however, due to the presence of humans and large equipment during and after construction, the project would not likely have an adverse effect on these species.

Other Game and Nongame Species
Areas within the project area provide potential habitat for other animals including the coyote (Canis latrans), red fox (Vulpes vulpes), raccoon (Procyon lotor), jackrabbit (Lepus sp.), American badger (Taxidea taxus), and striped skunk (Mephitis mephitis). Smaller animals such as cottontail rabbit (Sylvilagus sp.), deer mouse (Peromyscus maniculatus), meadow vole (Microtus pennsylvanicus), and
pocket gopher (*Geomys* sp. and *Thomomys* sp.) may also use the habitat in the project area (Armstrong et al. 2011). Prairie rattlesnake (*Crotalus viridis viridis*), bullsnake (*Pituophis catenifer sayi*), and lesser earless lizard (*Holbrookia maculata*), as well as many other reptile species may occur in the project area (Hammerson 1986). The project would displace some individuals during construction and may cause some mortality, but would not have a significant negative impact on these animals because these species are common and widespread throughout the eastern plains.

**Livestock**

The entire project area has been used for livestock grazing. Livestock would be moved to other secure areas during construction if fencing would be removed. There would be short-term adverse effects on areas temporarily impacted by the project and long-term adverse effects on grazing after construction, where the permanent impacts would occur.

**Aquatic Species and Habitat**

No aquatic habitat or aquatic animal species occur in or near the project area.

**Terrestrial and Aquatic Plant Life**

**Vegetation Community**

**Mixed Native and Nonnative Grassland**

Mixed native and nonnative grassland constitutes the only vegetative community in the project area (Appendix A). The project area consists of low rolling hills with three upland vegetated swales dominated by smooth brome, blue grama, crested wheatgrass, and threadleaf sedge. Shrubs occur sporadically in the project area and are dominated by rubber rabbitbrush and soapweed yucca. Hedgehog cactus (*Echinocereus* sp.), prickly pear (*Opuntia* sp.), prairie false dandelion (*Nothocalais cuspidate*), and wild leafparsley (*Musineon divaricatum*) are prominent in the herb stratum.

**Potential Habitat and Possible Effects**

The project would have long-term effects on vegetation within the footprint of the permanent impacts. Many noxious weed species compete well in recently disturbed areas and have potential to dominate these areas after construction activities have concluded.

**Recommendations**

ERO recommends reseeding temporarily impacted areas with a native seed mix after construction activities have concluded. ERO also recommends using topsoil free of noxious weed species seeds and conducting weed management after reseeding to assist native revegetation.

**Aquatic Plant Life**

No aquatic plant species or habitat to support aquatic plant life occurs in the project area.
Threatened, Endangered, and Candidate Plant Species and Habitat

One plant species listed as federally threatened, Ute ladies'-tresses orchid (*Spiranthes diluvialis* or ULTO), has potential to occur in Arapahoe County or be affected by projects occurring in Arapahoe County. The Service’s Information for Planning and Conservation application website (Service 2018) also lists one species, western prairie fringed orchid, as having potential to be affected by projects that deplete water in the South Platte River Basin. This project would not result in depletions to the South Platte River Basin. ERO assessed the project area for potential habitat for ULTO.

Ute Ladies’-Tresses Orchid

Background
ULTO is federally listed as threatened. ULTO occurs at elevations below 7,800 feet in moist to wet alluvial meadows, floodplains of perennial streams, and around springs and lakes. Once thought to be fairly common in low-elevation riparian areas in Colorado, Utah, and Nevada, currently only 16 populations are reported to occur in Colorado, with most populations occurring along the Front Range. Generally, the vegetative cover is relatively open; dense overgrown sites are not conducive to ULTO establishment. Where the ULTO is found, soils are typically alluvial deposits of sandy, gravelly material that are saturated to within 18 inches of the surface for at least part of the growing season (Service 1992).

Potential Habitat and Possible Effects
The project area lacks the perennial streams, alluvial meadows, springs, or lakes required for ULTO establishment. Additionally, plant species associated with ULTO do not occur in the project area. The project would not affect ULTO.

Recommendations
No further action or consultation is required regarding this species.

Other Species of Concern

Rare and Sensitive Plant Species
The Colorado Natural Heritage Program (CNHP) maintains a list of plant species considered rare or imperiled in Colorado by county. These species are not formally protected but are considered rare or imperiled by the CNHP (CNHP 2018). Rare or imperiled plant species potentially found in Arapahoe County with potential habitat in the project area are summarized in Table 5.

Table 5. Plant species considered rare or imperiled by the CNHP that potentially occur in Arapahoe County.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Ranking*</th>
<th>Habitat Type</th>
<th>Potential Habitat Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>American currant</td>
<td><em>Ribes americanum</em></td>
<td>G5/S2</td>
<td>Swamps, sedge meadows, stream banks, open woodlands</td>
<td>No</td>
</tr>
</tbody>
</table>
### Natural Resources Assessment

**Expedition Water Solutions, EWS #7 Site**

**Arapahoe County, Colorado**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Ranking</th>
<th>Habitat Type</th>
<th>Potential Habitat Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadfruit bur-reed</td>
<td><em>Sparganium eurycarpum</em></td>
<td>G5/S2</td>
<td>Marshes, fens, swamps, ponds, and slow-moving rivers</td>
<td>No</td>
</tr>
<tr>
<td>Dwarf milkweed</td>
<td><em>Asclepias uncialis</em></td>
<td>G3G4T2T3/S2, USFS, BLM</td>
<td>Forest clearings, dry prairies, in well drained soils</td>
<td>Yes</td>
</tr>
<tr>
<td>Yellow stargrass</td>
<td><em>Hypoxis hirsuta</em></td>
<td>G5/S1</td>
<td>Moist meadows, seeps, and fens associated with blue spruce, river birch, willow, sedges, and rushes</td>
<td>No</td>
</tr>
</tbody>
</table>

*CNHP Ranking: G1 = Critically imperiled globally, G2 = Imperiled globally, G3= Vulnerable throughout its range, G4 = Apparently secure globally, G5 – Demonstrably secure globally, S1 = Critically imperiled in state, S2 = Imperiled in state, S3 = Vulnerable in state. Q = Indicates uncertainty about taxonomic status, ? = Indicates uncertainty about ranking. USFS = United States Forest Service Sensitive Species, BLM = Bureau of Land Management Sensitive Species.

Source: CNHP 2018.

One species, dwarf milkweed, has potential to occur in the project area. The primary threat to dwarf milkweed appears to be loss of habitat from agricultural development. Dwarf milkweed is associated with plant species of the shortgrass prairie (CNHP 2018). Dwarf milkweed population occurrences are typically small and isolated from one another. There is some indication that dwarf milkweed requires intact habitat for successful reproduction, although appropriate conservation elements have yet to be established (Decker 2006). No known dwarf milkweed populations occur in the project area. Species associated with shortgrass prairie occur in the project area, though it is not intact habitat. It is unlikely that the project would adversely affect any rare or sensitive species.

### Visual Quality

**General Setting**

The project area consists of native and nonnative grassland with chain-link fences running throughout the area and abuts an electrical power substation to the west. The permanent structures associated with the project would alter the existing viewshed after construction has concluded. Revegetation of temporarily impacted areas would have minimal changes to the visual quality of the landscape. The visual quality of the project area would not be considerably altered from the project.

### References


Natural Diversity Information Source (NDIS). 2017. On-line mapping tool formerly available through Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO.


U.S. Fish and Wildlife Service (Service). 2009. Personal communication between Pete Plage (U.S. Fish and Wildlife Service) and ERO Resources Corporation.


Appendix A Photo Log
Photo 1 - Overview of southwest corner of the project area with fence in the foreground. View is to the north.

Photo 2 - Overview of uplands in the project area. View is to the northwest.
Photo 3 - Overview of uplands in the project area. View is to the west.

Photo 4 - Overview of eastern upland vegetated swale in the project area. View is to the south.