APPENDIX A

THURSTON ENERGY ENVIRONMENTAL ASSESSMENT & BIOLOGICAL ASSESSMENT OURAY NATIONAL WILDLIFE REFUGE 2-WELL DEVELOPMENT PROGRAM

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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

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ACRONYMS & ABBREVIATIONS

	-A-
AADT	Annual Average Daily Traffic
AHPA	Archaeological and Historic Preservation Act
AIRFA	American Indian Religious Freedom Act
AMSL	Above Mean Sea Level
AO	Authorized Officer
APD	Application for Permit to Drill
APE	Area of Potential Effect
AQRV	Air Quality Related Values
ARPA	Archaeological Resources Protection Act of 1979
AST	Aboveground Storage Tank
ATV	All-terrain Vehicle
	-B-
BA	Biological Assessment
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
BHCA	Bird Habitat Conservation Area
BLM	United States Bureau of Land Management
BMP	Best Management Practices
BOD	Biological Oxygen Demand
BOP	Blowout Preventer
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene isomers
	-C-
°C	Degrees Celsius
ca	Circa
CAA	Clean Air Act
$CaCO_3$	Calcium Carbonate
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
CH_4	Methane
CIAA	Cumulative Impact Assessment Area
CO	Carbon Monoxide
COA	Conditions of Approval
CS	Species receiving special management under a Conservation Agreement
CWA	Clean Water Act
CWCS	Comprehensive Wildlife Conservation Strategy
	-D-
DOT	Department of Transportation
DR	Decision Record

dV	Deciview
	-E-
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act of 1973
ESO	Ecological Services Office
	-F-
°F	Degrees Fahrenheit
FEIS	Final Environmental Impact Statement
FONSI	Finding of No Significant Impact
FY	Fiscal Year
	-G-
g/bhp-hr	Grams per Brake Horsepower per Hour
GHG	Greenhouse Gas
GIS	Geographic Information System
GLO	General Land Office
GNB	Greater Natural Buttes
gpm	Gallons per Minute
GWP	Global Warming Potential
	-H-
HAP	Hazardous Air Pollutants
HDPE	High-density Polyethylene
	-K-
K_w	Whole Soil Erosion Potential
	-L-
LOP	Life of Project
	-M-
Manual	The Service Manual, Land Use Series, 612 FW 2, Oil and Gas
MBCA	Migratory Bird Conservation Act
MBTA	Migratory Bird Treaty Act
MCL	Maximum Contaminant Level
mg/L	Milligrams per Liter
MOU	Memorandum of Understanding
MSDS	Material Safety and Data Sheets
	-N-
NAAQS	National Ambient Air Quality Standards
NAD	North American Datum
NAGPRA	Native American Grave Protection and Reparation Act
NASA	National Aeronautical and Space Administration
NEPA	National Environmental Policy Act

NFH	National Fish Hatchery
n-Hexane	Normal-Hexane
NHPA	National Historic Preservation Act of 1966
NO_2	Nitrogen Dioxide
NOI	Notice of Intent
NO_X	Nitrogen Oxide
NPS	United States National Park Service
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NVCS	National Vegetation Class Standard
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
NWRSAA	National Wildlife Refuge System Administration Act
-O-	
O_3	Ozone
OSHA	Occupational Health and Safety Administration
-P-	
pH	Hydrogen Ion Concentrations
PM	Particulate Matter
PM_{10}	Particulate Matter less than 10 Microns in Diameter
$PM_{2.5}$	Particulate Matter less than 2.5 Microns in Diameter
POD	Plan of Development
ppb	Parts per Billion
ppm	Parts per Million
PVMRM	Plume Volume Molar Ratio Method
-R-	
RCRA	Resource Conservation Recovery Act on 1976
Recovery Program	Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin
RIPRAP	Recovery Implementation Program Recovery Action Plan
ROW	Right-of-way
-S-	
Sagebrush	Sagebrush Consultants, LLC
SAR	Sodium Absorption Ratio
Service	U.S. Fish and Wildlife Service, Refuge Planning Division
SH	State Highway
SHPO	State Historic Preservation Office
SITLA	School and Institutional Trust Land Administration
SMCL	Secondary Maximum Contaminant Level
SO_2	Sulfur Dioxide
SO_X	Sulfur Oxides

SPC	Wildlife Species of Concern
SPCC	Spill Prevention, Control and Countermeasure
spp.	Species
SUP	Special Use Permit
SUPO	Surface Use Plan of Operations
SWReGAP	Southwest Regional Gap Analysis Project
	-T-
TDS	Total Dissolved Solids
Thurston	Thurston Energy, LLC
TSL	Toxic Screening Level
TSS	Total Suspended Solids
TVD	True Vertical Depth
	-U-
µg/L	Micrograms per Liter
µg/m3	Micrograms per Cubic Meter
µnhos/cm	Micromhos per Centimeter
µS/cm	Microsiemens per Centimeter (Specific Conductance)
U.S.C.	United States Code
UDAQ	Utah Division of Air Quality
UDEQ	Utah Division of Environmental Quality
UDNR	Utah Division of Natural Resources
UDOGM	Utah Division of Oil, Gas and Mining
UDOT	Utah Department of Transportation
UDWaR	Utah Division of Water Resources
UDWQ	Utah Department of Water Quality
UDWR	Utah Division of Wildlife Resources
UNHP	Utah Natural Heritage Program
USACE	United States Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USFWS-ESO	U.S. Fish and Wildlife Service, Ecological Services Office
USGCRP	United States Global Change Research Program
USGS	United States Geological Survey
US-NVCS	U.S. National Vegetation Classification System
	-V-
VOC	Volatile Organic Compound
	-Y-
YOY	Young-of-Year

1.0 INTRODUCTION

The U.S. Fish and Wildlife Service (USFWS) Refuge Planning Division (Service) has prepared this Environmental Assessment (EA) and Biological Assessment (BA) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations to analyze proposed oil and natural gas development by Thurston Energy, LLC (Thurston) within the Ouray National Wildlife Refuge (NWR or Refuge) boundary. The proposed oil and gas exploration and development project constitutes an externally initiated proposal for a Federal action that is subject to analysis by the Service under NEPA. This EA discloses the direct, indirect, and cumulative environmental impacts that would result from the Proposed Action and Alternatives, including the No Action Alternative. The EA also provides evidence for determining whether a statement of "Finding of No Significant Impact" (FONSI) will be prepared or whether an Environmental Impact Statement (EIS) will be required. A FONSI is a document that briefly presents the reasons why implementation of the Proposed Action or an Alternative would not result in "significant" environmental impacts. If the Service decision maker determines that this project has no "significant" impacts following the analysis in the EA, a Decision Record (DR) and FONSI would be prepared that approve the selected alternative or combination of alternatives. If the project is found to have "significant" impacts, an EIS would be prepared.

1.1 Ouray National Wildlife Refuge

The Ouray NWR was established on May 25, 1960, under authority of the Migratory Bird Conservation Act of 1929 and Public Land Order 2730. Land acquisition was initiated in 1961 using Duck Stamp funding. The Refuge covers some 11,987 acres and includes 12 miles of the Green River. Most of the surface acreage is owned in fee title (5,032 acres), in which 3,110 acres was transferred from the Bureau of Land Management (BLM), 2,692 acres is leased from the Ute Tribe, and 1,153 are leased from the State of Utah. Approximately 559 acres of private in-holdings exist within the Refuge boundary (USFWS 2000a). The minerals underlying the Refuge are owned by various entities including the State of Utah, the Federal government, the Ute Tribe, and numerous private or fee owners.

The Refuge was originally established to provide prime breeding, resting, and feeding areas for migratory waterfowl traveling along the Green River corridor. Early in its history, much of the Refuge's floodplain and wetland habitats were altered with the construction of dikes and levees to gain control over seasonal water flow from the Green River. Impounded marsh units were created to provide secure water, food, and nesting cover for waterfowl. Since the construction of Flaming Gorge Dam upstream, the Green River system has changed dramatically resulting in long-term loss and degradation of riparian habitats and wildlife species dependent on them. The current management strategy of the Refuge takes into account new biological information and insight into the importance of western riparian and floodplain systems. It also de-emphasizes waterfowl production and shifts management emphasis toward enhancement of riparian and wetland habitat for waterfowl, other migratory birds, and endangered fish species. The Refuge's wetland and riparian habitat is now critically important to protect declining fish and migratory bird species using the Green River corridor.

Management strategies today are focused on managing water to mimic the natural floodplains that existed before dams were erected along the river. Portions of protective levees throughout the Refuge have been removed to allow more frequent flooding. The Refuge includes approximately 19 square miles of bottomland and river surface along the Green River. Five bottomlands within the river floodplain - Johnson Bottom, Leota Bottom, Wyasket Lake, Sheppard Bottom, and Woods Bottom - are all fed by the river as it winds through an otherwise arid landscape. When natural flooding occurs in the spring, ponds

are formed in the bottomland areas, spurring the growth of semi-aquatic plants that provide food and cover for ducks and other wildlife. In addition, these ponds serve as nurseries for the endangered fish species of the Colorado River system.

The Refuge provides food and nesting cover for some 26 species of migratory waterfowl as well as a resting area and food for many additional species of migrating waterfowl. Approximately 237 species of birds use Ouray NWR, along with a variety of mammals such as elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), river otters (*Lontra canadensis*), and white-tailed prairie dogs (*Cynomys leucurus*). The federally threatened yellow-billed cuckoo (*Coccyzus americanus*) and several endangered fish such as the bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*) also use portions of the Green River within the Refuge.

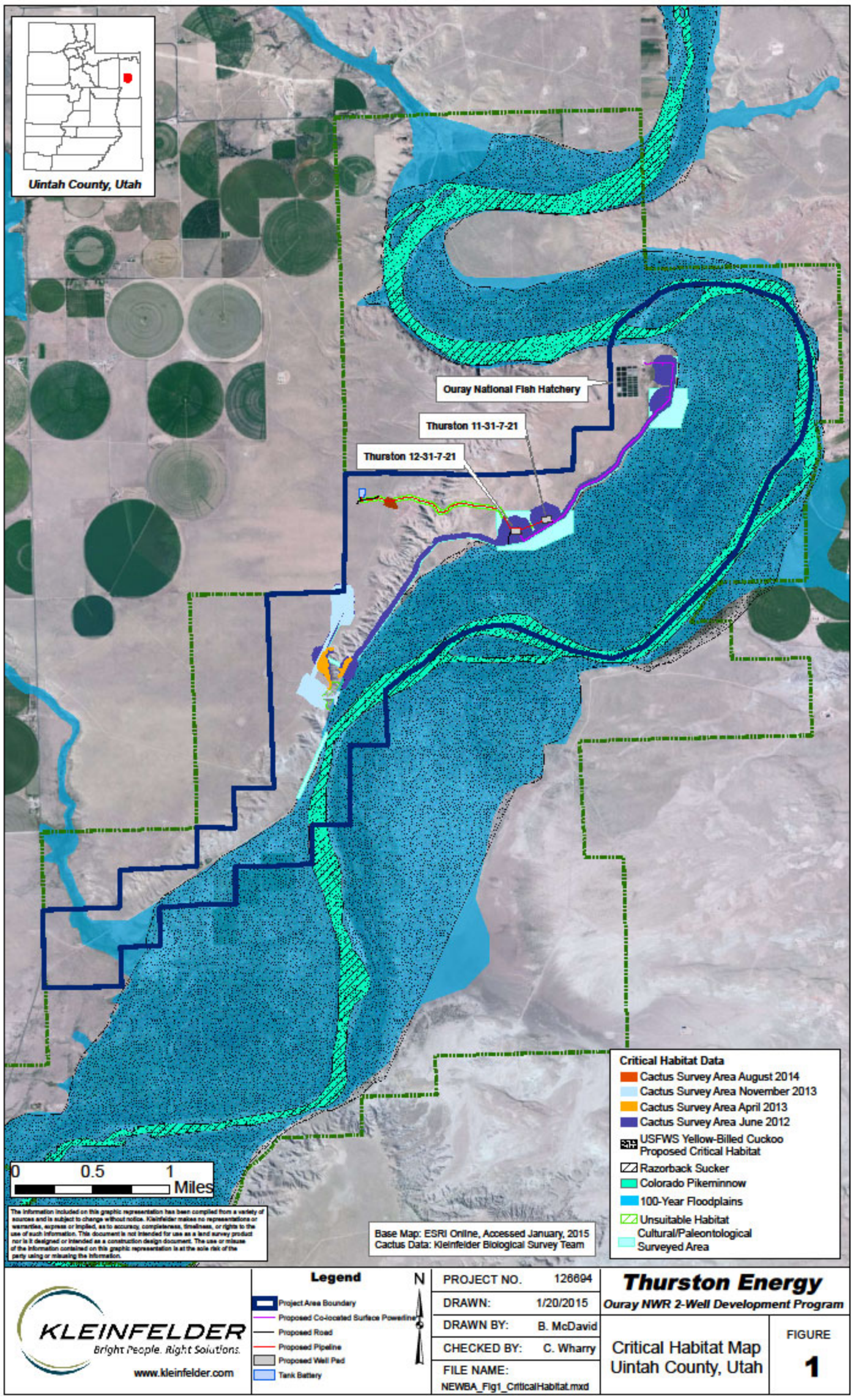
1.2 Background

The Service is evaluating a proposal from Thurston to drill and operate two exploratory oil and natural gas wells, construct associated well pads, pipelines and access roads, above ground power lines (if use of electricity is determined to be economically viable and technically feasible), and upgrade and maintain existing access roads within Ouray NWR. The project is located approximately 32 miles southwest of Vernal in northeastern Utah. The Project Area consists of approximately 3,767 acres on Federal lands administered by the Service. Mineral rights for the proposed project underlying Refuge lands are owned by the State of Utah, which is administered by the School and Institutional Trust Land Administration (SITLA). Well locations and mineral leases are listed in **Table 1-1**. This proposal is referred to as the Ouray NWR 2-Well Development Program (see **Figure 1-1**).

The Federal government owns the surface estate of the Refuge (including all surface and subsurface natural resources not considered to be minerals), and it is administered by the Service as part of the National Wildlife Refuge System (NWRS) pursuant to the NWRS Administration Act (NWRSAA) of 1997, and other applicable laws and regulations. As the surface owner, the Service has a responsibility to protect the surface estate of the Refuge and its associated resources. The Service policy (612 FW 2.7(c), USFWS 2012a) requires that the Refuge is protected from all unnecessary damage resulting from oil and gas activities. Thus, the Service has the responsibility to require protective measures to ensure that the surface estate (including all surface and subsurface natural resources not considered to be minerals) of the Refuge and associated cultural, socioeconomic, and aesthetic resources are not unreasonably impacted by Thurston's proposed activities.

Table 1-1. Proposed Well Locations and Mineral Leases

Well	Surface Location	Mineral Lease	Lease Stipulations
Thurston 11-31-7-21	LOT 7 SEC 31,T7S, R21E 2295' FLS, 1722' FWL	52015 (State)	Standard terms and conditions
Thurston 12-31-7-21	LOT 8 SEC 31, T7S, R21E 1995' FSL, 639' FWL	52015 (State)	Standard terms and conditions


Uintah County, Utah
Ouray National Fish Hatchery
Thurston 11-31-7-21
Thurston 12-31-7-21
0 0.5 1 Miles
The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.
Base Map: ESRI Online, Accessed January, 2015
Cactus Data: Kleinfelder Biological Survey Team
Critical Habitat Data
Cactus Survey Area August 2014
Cactus Survey Area November 2013
Cactus Survey Area April 2013
Cactus Survey Area June 2012
USFWS Yellow-Billed Cuckoo Proposed Critical Habitat
Razorback Sucker
Colorado Pikeminnow
100-Year Floodplains
Unsuitable Habitat
Cultural/Paleontological Surveyed Area
KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com
Legend
Project Area Boundary
Proposed Co-located Surface Powerline
Proposed Road
Proposed Pipeline
Proposed Well Pad
Tank Battery
N
PROJECT NO. 126694
DRAWN: 1/20/2015
DRAWN BY: B. McDavid
CHECKED BY: C. Wharry
FILE NAME: NEWBA_Fig1_CriticalHabitat.mxd
Thurston Energy
Ouray NWR 2-Well Development Program
Critical Habitat Map
Uintah County, Utah
FIGURE
1

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1.3 Purpose and Need

The Purpose and Need Statement "shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action" (40 Code of Federal Regulations [CFR] §1502.13). Because the Proposed Action is an externally generated action, the Purpose and Need statement addresses the purpose of and need for the action proposed by Thurston and the necessity of a response from the Service.

The purpose of the Proposed Action is to provide Thurston access to and allow for the exploration of leased mineral rights and commence construction and operations to ascertain whether sufficient oil and gas resources exist to commence commercial production of those resources; and if so, to proceed with production. The need for the Proposed Action allows Thurston to exercise its rights under the Mineral Leasing Act (MLA) of 1920 to explore for and develop minerals on Federal lands. The Service is required to respond to the Proposed Action and develop a range of "reasonable alternatives" and/or conservation measures that would meet the Service's requirements for environmental protection under NEPA and the Ouray NWR Comprehensive Conservation Plan (CCP) (USFWS 2000a), while at the same time recognizing a mineral owner's vested right to access and explore the oil and gas mineral estate.

The Service prepared this EA to evaluate potential impacts resulting from the Proposed Action and Alternatives and to assess whether Thurston's proposed oil and gas exploration and development is conducted in a manner most protective to the surface estate while recognizing the mineral owners' right to access. By preparing this EA, the Service is fulfilling its responsibilities under Federal law to protect the surface estate and associated resources of the Refuge from unreasonable damage by Thurston in their Plan of Operations. The Service has included specific conservation measures that will protect the surface estate and associated resources from unreasonable damage, while still recognizing Thurston's vested rights to access and explore the oil and gas mineral estate underlying Refuge lands. This EA will facilitate the Service's decision-making process as to whether to issue a Special Use Permit (SUP) granting Thurston access to Refuge lands and the terms and conditions of the SUP based on an evaluation of the expected impacts. A decision to issue an access agreement/permit would authorize Thurston to exercise the rights of their mineral lease, subject to specific Conditions of Approval (COAs) and additional site-specific review and approval, as necessary.

1.4 Decision Framework

This EA has been prepared to comply with NEPA, the Council on Environmental Quality (CEQ) regulations 40 CFR 1500-1508. This EA discloses the potential environmental consequences associated with Thurston's proposal to drill and operate up to two oil and natural gas wells and construct associated infrastructure on Federal surface and State mineral leases in the Ouray NWR.

This EA provides the Service responsible official, Federal and State agencies, local governments, and the public with information on the Proposed Action and No Action Alternatives and the likely environmental consequences on the human environment. This EA has been prepared for a 30-day public review and comment period. The Service will need to make two decisions based on this EA: (1) select an alternative for implementation based on review of environmental consequences analysis, conservation measures, and public comments; and (2) determine if the selected alternative is a major Federal action significantly affecting the quality of the human environment, thus requiring preparation of an EIS, per CEQ regulations.

A Biological Assessment (BA) has also been prepared for the project and is incorporated into this EA by reference. The BA was prepared pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended (Title 16, United States Code, Section 1531 et seq. [16 U.S.C. §§ 1531 et seq.]), to address potential effects of the proposed oil and gas development on federally listed threatened and endangered species, species proposed for listing, candidate species and, where applicable, their designated critical habitat. The BA Memorandum for the Thurston Ouray NWR 2-Well Development Program is included in **Appendix H**.

The BA is intended to fulfill the compliance requirements of pertinent environmental laws, regulations, and policies in accordance with the requirements of Section 7(b) of the ESA of 1973, as amended, and implementing regulations [16 United States Code (U.S.C.) 1536 (c), 50 Code of Federal Regulations (CFR) 402.12 (f) and 402.14 (c)], and ESA guidance contained in the Endangered Species Consultation Handbook (USFWS and National Marine Fisheries Service 1998).

Federal agencies, in consultation with the U.S. Fish and Wildlife Service, Ecological Services Office (USFWS-ESO), are required to ensure that any action they authorize, fund, or carry out will not jeopardize the continued existence of a federally listed or proposed threatened or endangered species, or adversely modify or destroy designated or proposed critical habitat. As the Federal lead agency for the EA, the Service (Ouray NWR) is responsible for Intra-Service Section 7 consultation with the USFWS-ESO. It is Service policy to consider candidate species when making natural resource decisions and thus, candidate species will be included for consideration in the BA.

The Utah Department of Natural Resources, Division of Oil, Gas and Mining (UDOGM) has regulatory authority for applications for permit to drill (APDs) on State mineral leases. Because Thurston's proposed development accesses State minerals, UDOGM would be responsible for all downhole and regulatory permitting. The Service has consulted with UDOGM in the preparation of this EA to ensure mutual management goals and objectives for oil and gas exploration and development are achieved. The Service will defer to UDOGM regulations for baseline standards, but retains planning and decision-making authority over activities occurring on surface lands within the Ouray NWR boundary, including the authority to add conservation measures to protect the Refuge's natural resources.

1.5 Relation to Statutes, Regulations, and Other Plans

1.5.1 Service Regulations

The Service has managed oil and gas operations on approximately one quarter of the 558 NWRs in the NWRS. Under the NWRSAA of 1966, as amended, the Service is responsible for managing all activities on Refuges including oil and gas operations on non-federally owned (private) mineral rights. It is the policy of the Service "to protect Service resources to the maximum extent possible without infringing on the rights of sub-surface owners". The following sections describe the legal framework under which the Service regulates oil and gas exploration that takes place on Refuge lands when the Service does not own the subsurface rights. In addition to Service regulations concerning oil and gas activities, other statutes and regulations are cited.

1.5.1.1 Excepted Mineral Rights

The Service Manual, Land Use Series, 612 FW 2, Oil and Gas (Manual) (USFWS 2012a) provides standard policy guidance and background information on management of oil and gas activities on NWRS lands (USGAO 2003). In this Manual, the Service provides for the exercise of non-federally owned

mineral rights while protecting Service resources to the maximum extent possible. The provisions of the Service Manual are applicable to Thurston's oil and gas mineral interest that are discussed below.

On a portion of the Refuge, the mineral owner holds "excepted rights" that also are referred to as "outstanding rights" (USFWS 2012a). Excepted rights occur when oil and gas rights are owned by third parties at the time the Service acquires title to the lands. The "owner of excepted (outstanding) oil and gas rights has the right to sell, lease, explore for, and remove those minerals subject to the terms of the instrument by which that interest was acquired or reserved and to the State laws governing protection of the surface and the rights of the surface owner." Section 2.9.B of the Manual provides the procedural requirements for permitting oil and gas activities on Service lands at 612 FW 2.9 (USFWS 2012a).

In addition to the Manual, reserved and excepted rights are addressed in the NWRSAA of 1966 and addressed by the regulation in Title 50 CFR 29.32 (Mineral Rights Reserved and Excepted). This regulation provides general rules governing the exercise of reserved and excepted mineral rights on NWRS lands. 50 CFR 29.32 states the following:

- Persons holding mineral rights in wildlife refuge lands by reservation in the conveyance to the United States and persons holding mineral rights in such lands which rights vested prior to the acquisition of the lands by the United States shall, to the greatest extent practicable, conduct all exploration, development, and production operations in such a manner as to prevent damage, erosion, pollution, or contamination to the lands, waters, facilities and vegetation of the area. So far as is practicable, such operations also must be conducted without interference with the operation of the Refuge or disturbance to the wildlife.
- Physical occupancy of the area must be kept to the minimum space compatible with the conduct of efficient mineral operations. Persons conducting mineral operations on refuge areas must comply with all applicable Federal and State laws and regulations for the protection of wildlife and the administration of the area. Oil field brine, slag, and all other waste and contaminating substances must be kept in the smallest practicable area, must be confined so as to prevent escape as a result of rains and high water or otherwise, and must be removed from the area as quickly as practicable in such a manner as to prevent contamination, pollution, damage, or injury to the lands, waters, facilities, or vegetation of the refuge or to wildlife. Structures and equipment must be removed from the area when the need for them has ended. Upon the cessation of operations, the area shall be restored as nearly as possible to its condition prior to the commencement of operations. Nothing in this section shall be applied so as to contravene or nullify rights vested in holders of mineral interests on refuge lands.

1.5.1.2 Compatible Uses Policy

The NWRSAA of 1966, Policy 603 FW 2 Compatible Uses Policy (USFWS 2000b) and the NWRS Improvement Act, set forth general rules and provides guidelines for determining compatibility of proposed and existing uses of Refuge. However, provisions of 603 FW 2, as they relate to the compatibility standard of the NWRSAA to the exercise of reserved and excepted mineral rights on NWRS lands, state the following:

- The Service must recognize and allow owners' property rights that are not vested in the Federal government, such as reserved or excepted rights, to explore and develop minerals or oil and gas beneath a refuge, regardless of whether the use is compatible. In these situations, a compatibility

determination is not required and should not be completed. Therefore, the compatibility standard of the NWRSAA does not apply to Thurston's development program on the Refuge.

1.5.1.3 Appropriate Refuge Use Policy

The NWRSAA of 1966, Policy 603 FW 1 Appropriate Refuge Uses Policy (USFWS 2006), sets forth general rules and provides guidelines for determining appropriate uses of NWRs. The Appropriate Refuge Use Policy of the NWRSAA does not apply because exercise of the subsurface mineral holder's rights is not at the Service's discretion and jurisdiction. Therefore, the FWS has determined that it should not prepare a compatibility determination for a project that grants reasonable access to minerals for those who own or lease them.

1.5.2 Other Laws Relating to Oil and Gas Activity on NWRS Lands

1.5.2.1 National Historic Preservation Act of 1966, as Amended

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, requires Federal agencies to assess the effects of an undertaking on historical and cultural resource sites. This is accomplished by inventorying proposed disturbance areas or area of potential effect (APE), evaluating site importance and eligibility to the National Register of Historic Places (NRHP), assessing the effect of the undertaking on NRHP-eligible sites, and consulting with appropriate historic preservation agencies. Compliance with section 106 of NHPA was followed for the oil and gas exploration activities described in this EA.

1.5.2.2 Archaeological Resources Protection Act of 1979

The Archaeological Resources Protection Act (ARPA) of 1979 (16 USC 470aa-470mm) and amendments provide for the protection of archaeological resources on public and Native American lands as well as the exchange of information between governmental entities and academic or private archaeological researchers. An archaeological resource under this Act is defined as material remains of past human life or activities that are of archaeological interest and includes, but is not limited to, pottery, basketry, bottles, weapons, tools, structures, rock paintings or carvings, intaglios, graves, and human skeletal materials.

1.5.2.3 Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act (MBTA) of 1918 (16 USC 703-712) implements various treaties between the United States and other nations of the MBTA and provides for the protection of migratory birds and specifies penalties for harming or unlawfully killing migratory birds. Section 715e of the MBTA provides statutory authority for regulation of reserved mineral rights on NWRs (it subordinates oil and gas interests to such rules and regulations as may be prescribed by the Secretary of the Interior from time-to-time).

1.5.2.4 Endangered Species Act of 1973, as Amended

The ESA of 1973, as amended (16 USC 1531-1544), provides for the protection of endangered and threatened species and the habitats upon which they depend. Section 7 of the Act requires Federal agencies to consult with the Secretary of the Interior or the Secretary of Commerce in cases where the agencies' action may affect a listed species to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species. Compliance with Section 7 of the ESA was followed for the oil and gas exploration activities and preparation of a BA was performed in

conjunction with this EA. The Service will complete an intra-service Section 7 evaluation on the Proposed Action.

1.5.2.5 Bald and Golden Eagle Protection Act of 1940, as Amended

The Bald and Golden Eagle Protection Act (BGEPA), as amended (16 USC 668-668c), provides for the protection of bald and golden eagles and prohibits the "taking" of either species, including their parts, nests, or eggs, without a permit issued by the Department of the Interior. The term "take" under the Act is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb". The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import" bald or golden eagles and is punishable by fines and/or imprisonment.

1.5.3 Other Federal Regulations

The proposed Thurston development activities also are governed by all applicable Federal regulatory programs that include, but are not necessarily limited to, the following:

- Clean Water Act (CWA)
- Clean Air Act (CAA)
- American Indian Religious Freedom Act (AIRFA)
- Native American Grave Protection and Repatriation Act (NAGPRA)
- Resource Conservation Recovery Act (RCRA)
- Occupational Health and Safety Administration (OSHA) regulations
- Department of Transportation (DOT) regulations

1.5.4 State Regulations and Rules

1.5.4.1 Utah Code – Statutes and Constitution

Utah Code Ann §23-21-6: Wildlife Resources, Lands and Waters for Wildlife Purposes
Utah Code Title 23: Wildlife Resources, Chapter 21: Lands and Waters for Wildlife Purposes provide for the establishment of migratory waterfowl refuges in accordance with the Migratory Bird Conservation Act (MBCA). As such, mining and oil and gas exploration and development on these lands are subject to "rules and regulations prescribed from time-to-time by the Secretary of the Interior for the occupation, use, operation, protection, and administration of these areas as refuges for migratory birds." Ouray NWR is considered a migratory waterfowl refuge by the U.S. government.

Utah Code Ann §53C-2-409: Mineral Leases, Cancellation, Use of Surface Land, Liability for Damage
Utah Code Title 53C: School and Institutional Trust Lands Management Act, Chapter 2: Activities on Trust Lands establishes policy for mineral lease surface use and liability for damage. Accordingly, lease holders of SITLA administered minerals have the right to reasonable use of surface land but may not injure, damage, or destroy improvements of the surface owner and are liable to the surface owner for all damages to the surface of the land, except for reasonable use.

1.5.4.2 Utah Division of Oil, Gas and Mining

The Utah Division of Oil, Gas and Mining (UDOGM) has developed and implemented rules for regulating oil and gas exploration and production activities (R649). Section 649-2-2 of the Rules provides authority over "all State lands in Utah including lands of the United States and lands subject to the jurisdiction of the United States to the extent lawfully subject to the State's power" (UDOGM 2005). UDOGM regulations cover all phases of oil and gas drilling operations, address pollution prevention, and provide for penalties and fines for non-compliance. The oil and gas rules give UDOGM staff latitude when developing conditions of approval for APDs depending on specific site concerns or conditions.

1.6 Public Scoping

The Service conducted public and internal scoping to solicit input from the public, interested organizations, and Federal, State and local agencies to help inform the Service of concerns associated with the proposed project.

The formal scoping period began on October 22, 2012, with the publication of a press release and a map of the proposed project on the Refuge website (www.ouray.fws.gov). The notice was also posted on the Refuge's information kiosk and published in the *Vernal Express*, a local weekly newspaper, on October 31, November 7, 14, and 21, 2012. The 30-day public scoping period closed on November 23, 2012. The Service received no response from the general public, special interest groups, or Federal and State agencies in response to the public scoping notice. As such, the resources carried forward for analysis in this EA were determined based on input received during internal scoping with the Service and Ouray NWR managers.

The Service released the draft EA for review and initiated a public comment period on March 10, 2014. The 30-day comment period, which was planned to close on April 8, 2014, was extended 15 days to April 22, 2014, to provide the public more time to formulate comments on the proposed development. The Service received 7 letters during the comment period, which generated 79 substantive comments. Comments were considered for incorporation into the environmental analysis and evaluated for their relevancy. Responses to the comments were formulated to describe the actions taken, if any, in response to the individual comments received. The Response to Comments table is available at Appendix K.

2.0 PROPOSED ACTION AND ALTERNATIVES

Alternative approaches to satisfy the purpose and need described in **Chapter 1.0** are briefly identified and described in this chapter. These alternatives have been chosen to provide a reasonable range of options for consideration by decision makers in terms of their capacity to meet project objectives. NEPA requires that a practical range of reasonable alternatives be considered and evaluated. Such alternatives must meet the project's purpose and need while minimizing or avoiding environmental impacts. This range of reasonable alternatives is formulated to address issues and concerns raised by agencies during scoping and the public.

Reasonable alternatives are defined by CEQ as those that are technically, economically, and environmentally practical and feasible, and meet the project proponent's stated purpose and need for the project. NEPA also requires the analysis of a No Action Alternative for comparison to the other alternatives in the EA. If alternatives are proposed or suggested during the EA process and those alternatives are not reasonable or do not otherwise meet the project proponent's purpose and need of the project, a detailed analysis is not required. Rather, the rationale for eliminating them from detailed analysis must be briefly explained.

Alternative A is Thurston's Proposed Action for oil and gas development. The Service has identified Alternative A as the agency preferred alternative because it best addresses issues raised in scoping about potential impacts to resources while meeting the purpose and need for the Project. Alternative A also incorporates additional conservation measures to protect Refuge resources. Based on accepted industry standards and FWS management guidelines, the conservation measures to be implemented under the Proposed Action will be supervised, monitored, and evaluated through an ongoing process. Alternative B is the No Action Alternative.

Eight additional action alternatives were initially identified. However, after preliminary screening, all eight were eliminated from further consideration because they clearly were incapable of meeting the needs of the proposed project.

2.1 Alternative A – Proposed Action

Since the draft EA was released for public comment, the Service and Thurston have collaborated to modify the project to reduce environmental impacts. These modifications include moving the tank battery and associated equipment to the upper area of the Refuge on SITLA land that already supports well pads, and away from sensitive areas in the vicinity of Leota Bottom and the Green River. A surface pipeline will be installed to move oil, gas, and water to the tank battery, thus removing the need to have tanker trucks on the main Refuge road and the well pads near Leota Bottom and the Green River. This would significantly reduce the likelihood of a spill and minimize disturbance to wildlife and visitors. In addition, the revised pipeline route avoids populations of the Uintah Basin hookless cactus (*Sclerocactus wetlandicus*), thereby reducing potential impacts to the species.

Thurston proposes to drill, complete, produce, and reclaim two oil and gas wells located within the Ouray NWR. The proposed wells would target the Green River and Wasatch formations and would require construction and maintenance of associated access roads and pipelines. Thurston understands that access to Refuge lands will be contingent upon the Service's issuance of a SUP, subject to approval of Service terms and conditions (i.e., approval of Plan of Operations, mitigation plans, road maintenance agreement, etc.). A copy of Thurston's Surface Use Plan of Operations (SUPO) is provided in **Appendix A.**

Specifically, Thurston's Proposed Action includes the following primary components:

- Construction of two (2) well pads, each averaging approximately 1.6 acres in size;
- Construction of approximately 1,457 feet of new access road;
- Placement of the tank battery and associated equipment on one new pad (1.6 acres) on State land north of the upper Ouray NWR road;
- Installation of 7,129 feet of bundled high-density polyethylene (HDPE) pipeline laid by hand from a proposed tank battery pad across the road and north of the bluff to the well pads;
- Construction of approximately 9,884 feet of overhead electric power lines; and
- Well testing to evaluate the development potential of the lease.

Figure 2-1 depicts the proposed locations of the wells and infrastructure associated with the proposed project. The proposed wells would be drilled vertically to total depths of approximately 2,500 feet. Although actual operations are subject to change as conditions warrant, Thurston plans to drill the two wells over a 1-year period. The anticipated life of an individual well is 30- to 40-years, and the anticipated time needed for field abandonment and final reclamation is 3 years. Therefore, the anticipated life of the project (LOP) under the SUPO would be 33- to 43-years.

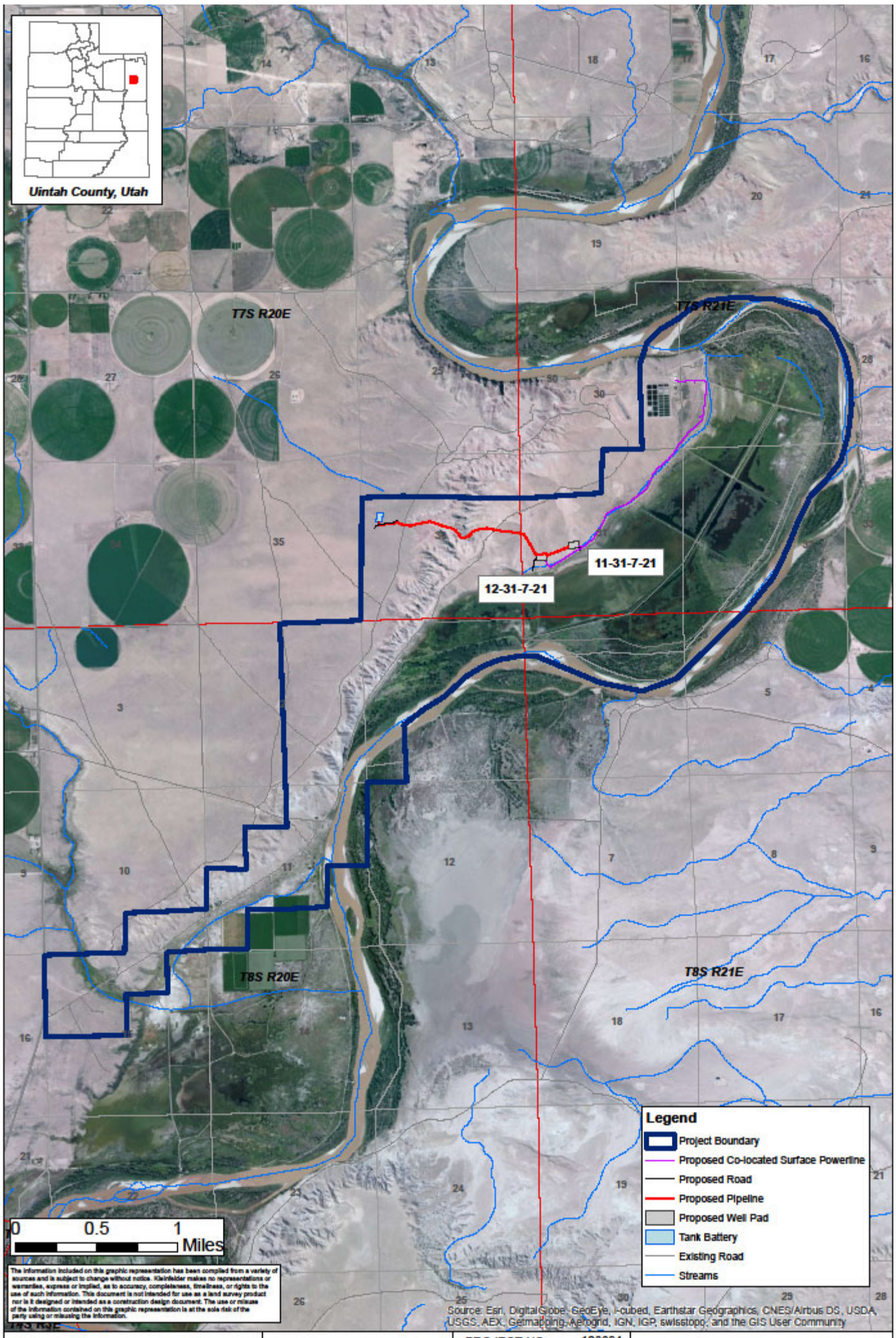
The timeframe for annual construction, drilling, and completion activities would depend on permit approval and compliance with relevant seasonal restrictions.

Included in the Proposed Action are a range of Best Management Practices (BMPs) and conservation measures that would be implemented to avoid, minimize, or offset potential adverse impacts to surface and subsurface resources (see **Section 2.1.10**).

The proposed location of the new well pad reflects the results of an onsite visit conducted by Thurston and representatives from the Service on September 17, 2014. The primary purpose of the onsite inspection was to assess potential resource impacts associated with the construction of the well pad, access roads, and pipeline corridor(s). The proposed pipeline route and tank battery pad were sited to increase the distance of hydrocarbon and produced water storage facilities from the Green River, and remove large tanker truck traffic on the main Refuge road. The new well pad and pipeline route also avoid *Sclerocactus wetlandicus* populations.

Figure 2-2 identifies project activities, components of the Proposed Action including well pads, the tank battery pad, access roads, surface pipeline routes, power lines, the completed cactus surveys delineated and identified by date, and habitat locations for cacti, yellow-billed cuckoo, and two of the Colorado River fish species.

Proposed surface locations depicted in **Figure 2-1** were chosen with consideration of factors such as topography, subsurface geologic conditions, sensitive wildlife and vegetation habitat, and other site-specific conditions. Surface disturbance anticipated under the Proposed Action is shown in **Table 2-1**. Short-term surface disturbance would occur during and immediately after the construction, drilling, completion, and testing activities. Prior to interim reclamation, short-term surface disturbance for the proposed pads, pipeline corridors, and new access roads would be approximately 10.9 acres. Those portions of the pads and access road ROWs not needed for production operations would be reclaimed within one to two growing seasons. The remaining surface disturbance would be long-term disturbance of approximately 7.5 acres for the 33- to 43-year LOP. Long-term disturbance from the proposed


Uintah County, Utah
T7S R20E
T7S R21E
T8S R20E
T8S R21E
11-31-7-21
12-31-7-21
0 0.5 1 Miles
Legend
Project Boundary
Proposed Co-located Surface Powerline
Proposed Road
Proposed Pipeline
Proposed Well Pad
Tank Battery
Existing Road
Streams
The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.
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Thurston Energy
Proposed Action
FIGURE 2-1

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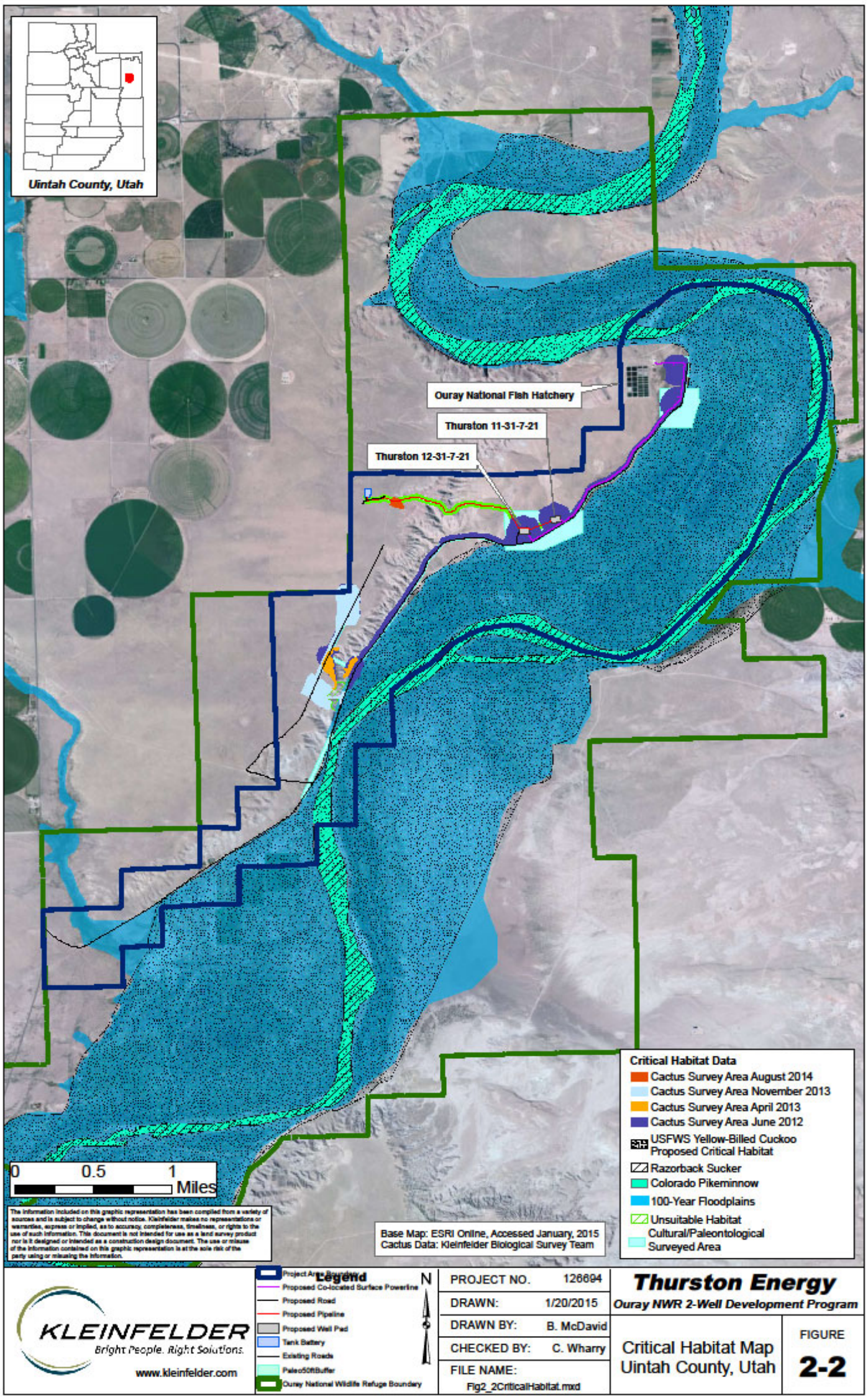
Uintah County, Utah
Ouray National Fish Hatchery
Thurston 11-31-7-21
Thurston 12-31-7-21
0 0.5 1 Miles
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Base Map: ESRI Online, Accessed January, 2015
Cactus Data: Kleinfelder Biological Survey Team
Critical Habitat Data
Cactus Survey Area August 2014
Cactus Survey Area November 2013
Cactus Survey Area April 2013
Cactus Survey Area June 2012
USFWS Yellow-Billed Cuckoo Proposed Critical Habitat
Razorback Sucker
Colorado Pikeminnow
100-Year Floodplains
Unsuitable Habitat
Cultural/Paleontological Surveyed Area
Legend
Project Area Boundary
Proposed Co-located Surface Powerline
Proposed Road
Proposed Pipeline
Proposed Well Pad
Tank Battery
Existing Roads
Paleo50ftBuffer
Ouray National Wildlife Refuge Boundary
N
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DRAWN BY: B. McDavid
CHECKED BY: C. Wharry
FILE NAME: Fig2_2CriticalHabitat.mxd
Thurston Energy
Ouray NWR 2-Well Development Program
Critical Habitat Map
Uintah County, Utah
FIGURE
2-2

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pads and new access roads equates to approximately 0.3 percent of the total acreage within the Project Area.

Table 2-1. Estimated Disturbance of Project Facilities under the Proposed Action

Project Feature	Quantity or Feet	Short-term (disturbance width[feet] or acres/facility)	Short-term Surface Disturbance (acres)	Long-term (disturbance width[feet] or acres/facility)	Long-term Surface Disturbance (acres)
Well and Tank Battery Pads					
Thurston 11-31-7-21	1	1.6 acres	1.6	1.2	1.2
Thurston 12-31-7-21	1	1.6 acres	1.6	1.2	1.2
ML-505101 (Tank Battery)	1	1.6 acres	1.6	1.2	1.2
Subtotal	***3***	**--**	***4.8***	***3.6***	***3.6***
Access Roads					
New Roads	1,457 feet	36 feet	1.2	18 feet	0.6
Subtotal	***1,457 feet***	**--**	***1.2***	**--**	***0.6***
Pipelines					
Bundled Surface HDPE Pipeline	7,129 feet	30 feet	4.9	20 feet	3.3
Subtotal	***7,129 feet***	**--**	***4.9***	**--**	***3.3***
Power Line					
Overhead Electric Power Line	9,884 feet	--	--	--	--
Subtotal	***9,884 feet***	**--**	**--**	**--**	**--**
Total New Disturbance	**--**	**--**	**10.9**	**--**	**7.5**

Assumptions: The working area for installation of a surface pipeline of similar diameter is typically 30' in width and permanent ROW width of 20'. The access roads for the well sites are typically designed with a finished running surface 18' in width in a total disturbed width of 36'. All proposed pads would be approximately 1.6 acres in size initially that would be reduced to 1.2 acres following interim reclamation.

The life cycle of an individual well and its associated facilities/required infrastructure (e.g., roads and pipelines) is composed of six primary phases: (1) construction, (2) well drilling, (3) well completion and testing, (4) interim reclamation, (5) production and maintenance, and (6) final reclamation and abandonment. Specific details of these six primary phases are described in the following sections.

2.1.1 Construction Activities

Construction activities would follow procedures specified by the Service, as well as other applicable industry standards and governmental guidelines, such as the BLM/U.S. Forest Service (USFS) publication, Surface Operating Standards for Oil and Gas Exploration and Development, the "Gold Book" (USDI-USDA 2007 as revised). Well construction would be designed based on these Gold Book standards, which are implemented to support well integrity and reduce future unforeseeable releases. All surface disturbing activities would be supervised by a qualified Thurston representative who is familiar with the conservation measures defined in the SUPO and DR for this EA, APDs, and right-of-way

(ROW) permit with the Service Realty Division. The Service could implement additional site-specific conservation measures as necessary.

2.1.1.1 Well and Tank Battery Pads

Prior to well pad construction or surface disturbing activities, Thurston would obtain approval of an APD by the appropriate UDOGM Authorized Officer (AO) for the lease. The APD would contain site-specific COAs that would apply to construction and well operations.

Pad construction would typically begin with stripping and stockpiling topsoil. The top 4- to 6-inches of topsoil material suitable for plant growth would be removed from areas to be disturbed and stockpiled for eventual use in reclamation. Vegetation removed from the disturbed area would be re-spread to provide protection, nutrient recycling, and a seed source for reclamation.

Following vegetation and topsoil removal, each pad would be constructed using standard cut-and-fill techniques to create a level pad for the drill rig and graded surface for the support equipment. Thurston would employ the use of erosion control measures, including proper grading to minimize slopes, diversion terraces and ditches, mulching, terracing, riprap, fiber matting, temporary sediment traps, and broad-based drainage dips or low water crossings as necessary and appropriate to minimize erosion and surface runoff during pad construction and operation activities. Earthen berms approximately 12-inches in height would be constructed using excess material from pad construction around each pad. Each berm would be lined with an impermeable liner. Runoff from undisturbed areas around the pad would be directed into ditches and energy dissipaters (if needed) around the site and then released to grade, which is consistent with Utah Division of Water Quality (UDWQ) BMPs for stormwater. Stormwater management efforts may include additional engineering measures such as the installation of culverts to divert water flow away as needed. With associated cut-and-fill slopes, each well would be constructed to average dimensions of approximately 210 x 345 feet (1.6 acres in size).

Once the pad has been leveled and graded, it would be compacted to establish a level and solid foundation for the drilling rig or other surface facilities. Completing the site preparation process will require approximately 3- to 4-days on average.

Primary surface equipment to be installed at each well pad would include a drilling rig, mud tank, dog house flare pit, pipe racks, pump house, trailers, water storage tanks, and generators. The typical layout for a single well pad is illustrated in **Figure 2-3**. If the well is productive, interim reclamation would occur within 90 days of completion of the last well drilled on the well pad. Topsoil reserved for interim reclamation and previously stockpiled along the edges of the well pad would be re-spread across the disturbed area. The area would then be seeded with a seed mixture prescribed by the Service. Interim reclamation would result in an estimated 25 percent reduction in well pad size to about 1.2 acres over the productive LOP (approximately 33- to 43-years).

The two proposed wells to be drilled would use a closed-loop mud and drill cuttings system that would eliminate the need for a reserve pit. Drill cutting and fluids will be temporarily stored in tanks and then removed from the Refuge.

Following completion of the tank battery pad, Thurston would install seven 400-barrel tanks, a separator, and a boiler. Four tanks would be used for the storage of oil while the remaining three would store water.

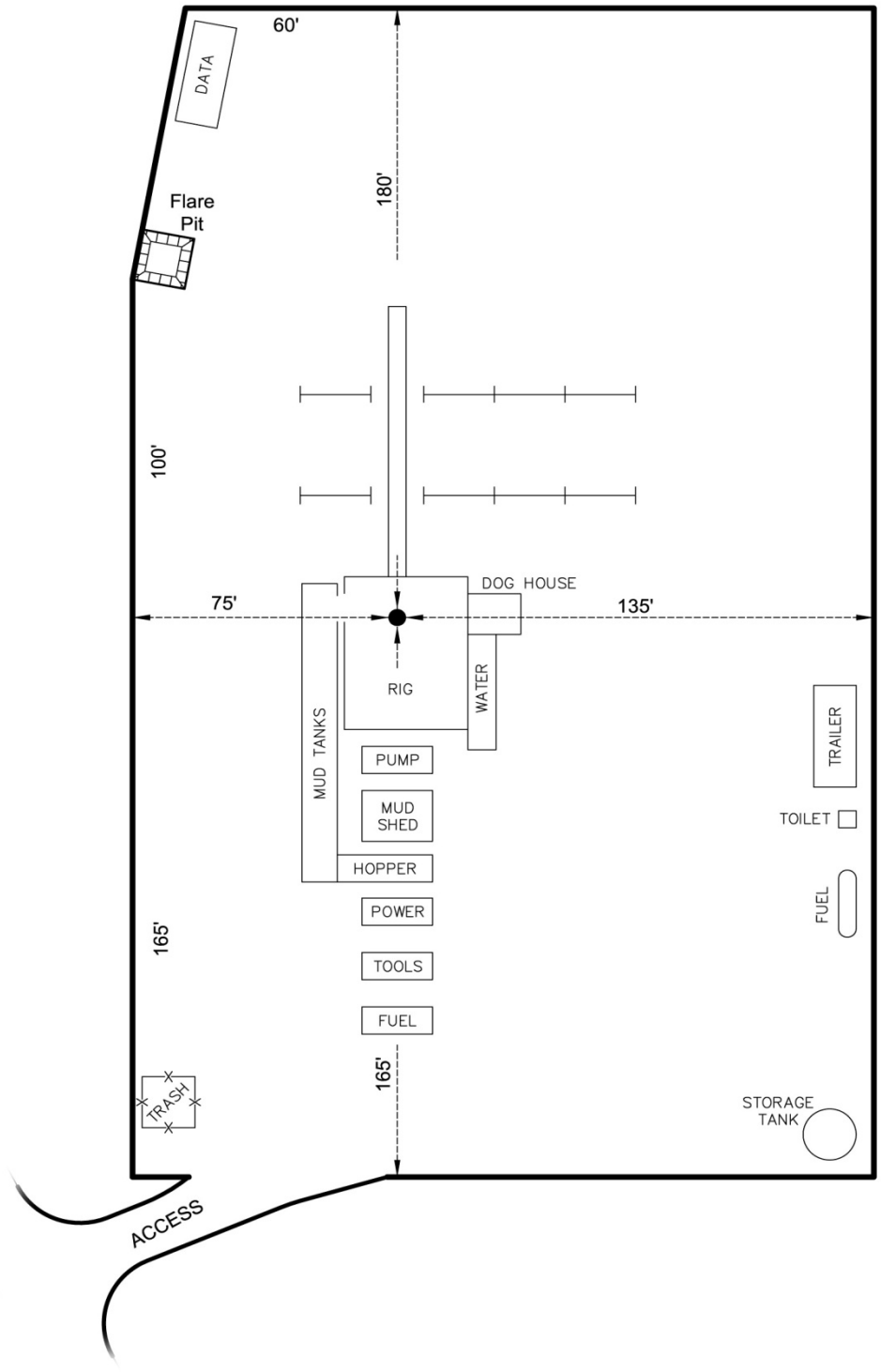
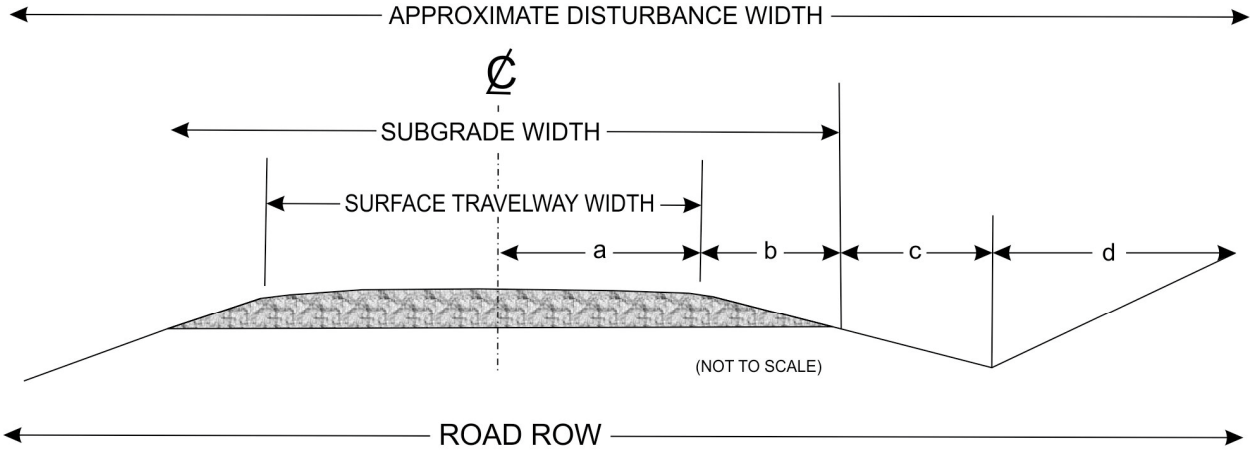


Figure 2-3. Typical Well Pad Layout

2.1.1.2 Access Roads

A network of roads already exists within the Project Area. These roads would be used as-is or upgraded where acceptable for access to well pads and the proposed tank battery pad. New roads would be constructed only where necessary because they have been sited and designed to minimize disturbances and maximize transportation efficiency. New roads would be built and maintained to provide year-round access, as needed. Bulldozers, graders, and other types of heavy equipment would be used to construct and maintain the access road and Refuge roads.

All new access roads would be constructed out of native material and to the standards outlined in the "*Gold Book"*. This publication provides practices and standards to guide compliance with all applicable agency policies, operating guidelines, and BMPs. After APD approval, standard cut-and-fill construction methods and construction equipment (such as crawler tractors, graders, and scrapers) would be used to construct new roads. A typical roadway cross-section with width specifications is shown in **Figure 2-4.**



a: half-width of surface travel-way b: shoulder c: drainage ditch foreslope d: drainage ditch backslope

	Minimum Subgrade Width (ft.)	Minimum Surfaced Travelway Width (ft.)	a (ft.)	b (ft.)	c (ft.)	d (ft.)	Approximate Disturbance Width (ft.)	Total ROW Width (ft.)	Design Speed (mph)
Resource Road	16	12	6	2	4	8	40	50	15-30
Local Road	24	20	10	2	4	8	48	55	20-50
Collector Road	28	24	12	2	4	8	52	60	30-50

Figure 2-4. Typical Roadway Cross-section with Width Specifications

The standard methodology for building new roads involves the use of a crawler tractor or track hoe to clear vegetation and topsoil materials from the road surface. Both materials would be windrowed for future redistribution during reclamation. All roads would be constructed with appropriate and adequate drainage and erosion control features where appropriate (e.g., cut-and-fill slope and drainage ditch stabilization, relief and drainage culverts, wing ditches, and rip-rap). Where needed, road base or gravel would be placed on upgraded and newly-constructed roads to provide a stable travel-way surface. Aggregate for road surfacing would be obtained from existing permitted sources. Aggregate would be weed free and of sufficient size, type, and amount to allow all weather access and to help minimize fugitive dust.

Safety, sight distance, grade, topography, anticipated traffic flow, and visual resource management concerns would be considered in determining the optimal road width of specific road segments. Roads would be crowned (two to three percent), ditched, and constructed to meet the anticipated traffic flow and provide a well-constructed and safe travel-way surface in all weather conditions. New roads would be constructed to a width of 36 feet including a finished 18-foot running surface.

Revegetation of road edges, drainage ditches, and cut-and-fill slopes would help stabilize exposed soil and reduce sediment loss, growth of noxious weeds, and maintenance costs while minimizing impacts to scenic quality, water quality, and wildlife forage and cover. To ensure successful growth of seeded plants, topsoil would be stripped and stockpiled during road construction and re-spread on cut slopes, fill slopes, and borrow ditches prior to seeding.

Under the Proposed Action, approximately 1,457 feet of new road would be constructed to provide access to the proposed well pads and tank battery pad, which would result in a short-term surface disturbance of about 1.6 acres. Following interim reclamation, the proposed access roads would be reduced to an 18-foot running surface which would reduce the total surface disturbance to 0.6 acres for the remainder of the LOP.

Existing roads would be upgraded as necessary to accommodate anticipated traffic loads and all-weather road requirements. Thurston would enter into a Road Maintenance Agreement with the Service to upgrade and maintain existing roads that would be used for project access. Upgrading would include ditching, drainage, graveling, crowning, and capping of the roadbed as necessary.

2.1.1.3 Power Lines

Under the Proposed Action, Thurston would install electricity to provide power for separators on the tank battery pad and pumpjacks on the two proposed well pads to reduce the level of noise for both wildlife and visitors if the wells are determined to be economically viable and it is feasible. Natural gas or diesel powered engines will be utilized initially. Approximately 9,884 feet of overhead distribution lines would be installed along a 15-foot wide power line ROW corridor and extended to the well pads. The electric distribution lines would be built on single wood utility poles approximately 65 feet in height. The span between poles would be approximately 200 feet and poles would be installed in the same 15 foot-wide ROW corridor that is used for the existing Refuge road (see **Figure 2-1**). No additional surface disturbance would be anticipated from installation of the electric distribution line. The proposed distribution line would tie into an existing power source at the Ouray National Fish Hatchery (NFH). Construction of the power line to the associated infrastructure would be in compliance with raptor protection requirements. Thurston would agree to meet APLIC standards for the new overhead power line as discussed in **Section 2.1.10**.

2.1.1.4 Pipelines

Natural gas, produced water, and oil would be transported from the well head through a bundled HDPE pipeline to a tank battery that would be installed north of the bluff on the proposed ML-50510 pad north of the upper Refuge road. The pipeline bundle will consist of four pipes: a 3-inch diameter oil and water line, a 2-inch diameter natural gas line and two ¾ -inch heated water lines (forming a closed loop) to maintain even flow of the fluid in the 3-inch diameter line. The bundle will be insulated with fiberglass matting and wrapped with drab color-clad aluminum sheeting to minimize visibility and heat loss. Installing the gathering lines aboveground would be necessary to reduce surface disturbance. One of the two proposed well pads would be used as a staging area for gathering line assembly. The amount of surface required to install gathering lines is based upon a temporary use width of 30 feet, which corresponds to the width of land required by pipeline installation equipment.

The proposed surface pipeline would take off from the western side of the Thurston 11-31-7021 well pad and travel cross country to the Thurston 12-31-7-21 well pad. The pipeline then travels west and over the bluff where it ties in to the tank battery located on the proposed ML-50510 pad (see **Figure 2-1**). The pipeline would be approximately 7,129 feet in length and be laid by hand from the tie-in on top of the bluff to the well pads. The entire length of the pipeline, with exception of a short length required to tie-in to the Thurston 12-31-7-2E and a short length near the tank battery pad, would be installed cross-country and would not be co-located with existing or proposed ROW routes. All pipeline installation would occur within a 30-foot wide ROW. Each segment of bundled pipe will be joined together and tested prior to completion of construction. Upon installation, portions of the "cross-country" surface pipeline would be anchored in place to prevent lateral movement and subsequent disturbance to soils on steeper slopes.

Pipelines would be constructed of HDPE gas pipe (black) and would meet all applicable American Petroleum Institute (API) and industry standards. Each proposed pipeline would be pressure tested with air to locate any leaks for 100 percent Maximum Allowable Working Pressure (MAWP). After testing, site-specific stabilization barriers, water bars, silt fences or other erosion control devices would be installed in the disturbed areas. Erosion blankets and hand seeding may also be used in these areas.

Surface disturbances resulting from pipeline installation under the Proposed Action would primarily be limited to the crushing of vegetation and minor soil disturbances related to assembly and placement of the pipeline. Thus, no appreciable surface disturbance associated with installation of the surface pipeline is expected.

Standard construction techniques for a hand laid surface pipeline would be used along the pipeline route, which typically involves the following sequential operations: (1) preconstruction survey, (2) vegetation preparation, (3) pipe alignment and joining, (4) anchoring, (5) testing, and (6) cleanup and restoration. Construction of the pipeline would begin after all required Federal, State, and local approvals have been obtained. Company personnel, construction contractors, and the Service AO would discuss procedures and permit approvals prior to construction.

Prior to pipeline construction, a preconstruction survey would be conducted to delineate the centerline and outside ROW boundaries of the pipeline corridor. The limits of disturbance would be clearly marked/staked prior to construction including the construction ROW and temporary use areas. Any sensitive areas to be protected from disturbance or that require monitoring would also be marked. Flagging, signs, and other markings identifying the limits of disturbance would be maintained through all phases of pipeline construction. Erosion and sediment control would be installed as outlined in the approved SUPO.

Construction activity would be limited to approved-staked areas. Brush would generally be cut by hand as needed and would be cut as close to the ground as possible. Vegetative material would typically be shredded and scattered back across the surface to increase roughness, facilitate seeding establishment, and protect the construction ROW.

The surface disturbance associated with installation of the new bundled HDPE pipeline assumes that all portions of the 30-foot wide ROW would be disturbed for the pipeline. The short-term surface disturbance associated with installation of the new bundled surface HDPE pipeline would be approximately 4.9 acres and long-term surface disturbance would be 3.3 acres.

Individual joints of pipe would be would be aligned, joined together, and laid by hand on the surface. All joints would be visually inspected and tested by a qualified inspector. Non-destructive radiographic inspection methods would be conducted in accordance with current requirements. A specialized contractor would be employed to perform this work. Any joint defects would be repaired or cut out as required under the specified regulations and standards.

Cleanup and restoration would occur after the pipeline is installed. Cleanup of the surface along the construction ROW would include removal of construction debris. Permanent erosion control measures would be installed and seeding would occur in accordance with Service requirements.

2.1.1.5 Rights-of-Way

In accordance with Service Manual 105, Part 340: Real Property Management, a ROW covers "uses that will encumber real property by granting a right to use and alter the landscape through construction of a facility such as a road, pipeline, power line, or building. Generally, such uses are for a relatively long period of time (i.e., 10 years or longer)" (USFWS 1993). Thurston would apply for a ROW permit with the Service Realty Division for proposed access roads, well pads, tank battery pad, and pipelines in the proposed SUPO and would acquire a SUP for any activities that would result in temporary disturbance or land use.

2.1.2 Well Drilling

Once construction of a well pad is complete, drilling equipment would be moved on-site. All drilling operations would be conducted in compliance with all Federal Onshore Oil and Gas Orders, all applicable rules and regulations, and COAs applied by UDOGM. The proposed wells would target the Green River and Wasatch Formation, which is approximately 2,500 feet below the ground surface. No abnormal pressures, temperatures, or other hazards are anticipated. Wells that have been previously drilled in the vicinity of the Proposed Action have not encountered over-pressured zones or hydrogen sulfide gas. Each well would require approximately 10 days to drill and 21 days for completion and production testing operations. Drilling activities typically occur around the clock, 24-hours per day, 7-days per week.

The drilling operation would be conducted in three primary phases using three specialized drilling rigs for each wellbore. In the first phase, a drill rig would drill the conductor hole and set the conductor pipe. In the second phase, a conventional mechanically-powered mobile drilling rig would be transported to the well site and erected on the well pad by tractor-trailer trucks to drill the surface hole and run and cement surface casing. The well would be initially drilled with air and/or freshwater to approximately 3,000 feet below ground surface and below the base of any freshwater aquifers encountered. Beyond approximately 3,000 feet, drilling fluids would consist of a water and gel mixture, with water being the main constituent. Non-toxic chemicals such as a potassium chloride substitute and commercial clay stabilizer may be added

to the mud to maintain borehole stability, minimize possible damage to the formations, provide adequate viscosity to carry the drill cuttings out of the wellbore, and reduce downhole fluid losses. Prior to drilling the production hole, the surface hole would be cased with steel casing and cemented in place entirely from the total depth of the surface hole up to ground level. The surface casing and its design would provide protection for freshwater aquifers and contain pressure that may be encountered while drilling the production hole. UDOGM would be notified in advance of running surface casing and cement to observe these operations if so desired. This part of the drilling operation would normally take 2 to 3 days to complete.

Prior to drilling below the surface casing, a Blowout Preventer (BOP) would be installed on the surface casing and a flow control manifold consisting of manual and hydraulically operated valves would be installed below the rig floor. Both the BOP and surface casing would be tested for pressure integrity in order to meet the minimum standards of BLM *Onshore Oil and Gas Order No. 2, Drilling Operations.* UDOGM would be notified in advance of all pressure tests in order to be present and witness the tests, if desired. The BOP would be mechanically checked daily during drilling operations. During this phase the rig would pump fresh water as a circulating fluid to drive the mud motor, cool the drill bit, and remove cuttings from the wellbore. To achieve borehole stability and minimize possible damage to the hydrocarbon producing formations, a potassium chloride substitute and commercial clay stabilizer may be added to the drilling fluid. From time to time, other materials may be added to the fluid system, such as sawdust, natural fibers, or paper flakes, to reduce downhole fluid loss.

The final stage of drilling includes drilling the production hole, running and cementing the casing. Prior to setting production casing, well logs would be run to evaluate a well's potential. If the evaluation concludes that sufficient hydrocarbons are present and recoverable, then steel production casing would be run and cemented in place in accordance with the well design, as specified in the APD and COAs. Cementing the production casing back to the bottom of the surface casing would prevent damage to the wellbore from the targeted formation pressure, retard corrosion, and prohibit pressure communication or fluid migration between productive zones. After drilling operations are completed, the drilling rig would be dismantled and demobilized from the location.

Freshwater used for drilling would be contained in above ground storage tanks (ASTs) located on site. Additional ASTs would be used during drilling and testing operations to hold non-flammable materials such as cuttings, salt, drilling fluids, chemicals, produced fluids, etc. All drilling fluids used for each well would be recycled using a closed-loop drilling system, thereby eliminating the need for a reserve pit. The closed-loop drilling method involves removing and treating drilled soils from the system and collecting solid and liquid waste in modified steel catch tanks rather than open reserve pits. The method includes a mud de-watering system that separates the soils from the liquids. The soils (natural rock cuttings) would be processed to remove excess drilling fluids and stored on location in segregated piles or within a cutting storage area. The recovered drilling fluid would be stored in ASTs to be re-used at the next drilling site or removed and disposed of at an approved offsite disposal facility.

Any additives to the mud system would conform to *Subtitle C of the Resource Conservation and Recovery Act* (RCRA) of 1976 as amended 1996. Material Safety and Data Sheets (MSDS) would be located onsite and readily available at all times. Drill cuttings from each wellbore (consisting of mainly shale, sand, and miscellaneous rock materials) would be transported to an approved offsite disposal facility.

2.1.3 Well Completion and Testing

If drilled wells indicate economic productivity, completion operations would commence after drilling is complete. After the production casing has been cemented in place, completion equipment would be mobilized into the well pad location. Well completion would consist of running a cement bond log to evaluate the cement integrity, perforating the casing across the hydrocarbon-bearing zones, and stimulating the formation to enhance the production of oil and gas. The typical method used for stimulation consists of hydraulic fracture treatment of the reservoir, in which water with relatively small concentrations of sand and stimulation fluids are pumped down the well through perforations in the casing and into the formation. Pumping pressures would be increased to the point at which fractures occur in the rock formations and radiate outward from the perforations into the target formation. The slurry flows into the fractures and the sand in the slurry mix serves as a proppant (sized particles mixed with fracturing fluid) to keep the created fracture open after the fracture treatment, thereby allowing reservoir fluids to move more readily into the well.

Post-stimulation flow tests would allow for recovery of stimulation fluids and evaluation of well productivity. The duration of flow testing would vary according to individual well performance and would typically be conducted only long enough for fluid rates to drop to a level to ensure safe operation of permanent production equipment. During completion operations, gas may be vented to the atmosphere from the flowback tank prior to installing production equipment; however, Thurston does not anticipate the need to flare gas.

Depending on the concentration of water and proppant in the flow from the well and the availability of a gas transportation pipeline, “test” gas would be vented, flared, or sold down the pipeline.

Typical equipment and vehicles used during completion activities would include: sand transport trucks; water trucks; oil service trucks to transport pumps and equipment for hydraulic fracturing; flat beds and gin trucks to move water tanks, rigs, tubing and hydraulic fracturing chemicals; logging trucks (cased hole wireline trucks); and pickup trucks to haul personnel and miscellaneous small materials.

Completion activities on individual wells will occur 24-hours per day, 7-days per week, and would generally take approximately 3 weeks, depending on conditions at the individual well.

2.1.4 Interim Reclamation

Upon well completion, the well locations and surrounding area(s) would be cleared of all unused tubing, materials, trash, and debris not required for production. All pits, cellars, rat holes, and other bore holes unnecessary for further well operations would be promptly backfilled. In accordance with UDOGM regulations, drilling fluids and cuttings contained within the closed system tank would be hauled from the site and disposed of at an approved facility.

In accordance with BLM *Oil and Gas Onshore Order Number 1, Approval of Operations*, after completion activities have been finalized for all planned wells, Thurston would reduce the size of the pads to the minimum surface area needed for production facilities and/or adequate room for trucks to turn around, while providing for reshaping and stabilization of cut-and-fill slopes. Interim reclamation would be accomplished by grading, leveling, and seeding, as required by the Service, and would reduce the disturbed area at each of the pads to approximately 1.2 acres or less. Interim reclamation of areas disturbed along portions of the access road cuts and shoulders would also be conducted.

Initial reclamation would establish a vegetative cover sufficient to maintain a biologically active soil, control erosion, and minimize habitat and forage loss during production operations. Reclamation activities would commence within 90 days of well completion, weather permitting per the Reclamation Plan included in **Appendix F**. Earthwork would be completed within 6 months of well completion.

Under the SUPO, approximately 3.4 acres of short-term disturbance associated with construction of proposed pads, pipeline corridors, and access road ROWs not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the SUPO to approximately 7.5 acres.

Thurston would monitor interim reclamation operations on an annual basis to ensure timely achievement of its reclamation goals by documenting the progress of reclamation and weed control to baseline data collected prior to commencing operations. Thurston would modify its reclamation procedures as necessary to achieve the reclamation outcomes mutually agreed-upon with the Service AO.

2.1.5 Production and Maintenance Operations

Well production facilities, including oil and gas gathering lines, would be installed after drilling and completion operations. Facilities on each well pad would include a well head, valves and piping, dehydrator, and meter that would either be housed in a small building or enclosed by a fence. The bundled HDPE line would be anchored down as necessary from the well head to the tank battery located on the ML-50510 pad (**Figure 2-1**). Wells would likely be fitted with a pumpjack, Roto-flex unit, or gas lift to assist liquid production in liquid volumes and/or as low formation pressures require it. Plunger lift systems do not require outside sources of energy; however, a pumpjack or Roto-flex unit would require the installation of electrical service to run the electric motors or the installation of natural gas-powered engines.

The tank battery would include seven 400-barrel tanks for storing oil and water condensate, a boiler, and a separator. The tanks would be approximately 12-feet in diameter and 20-feet high. They would be surrounded by a secondary containment berm of sufficient capacity to contain 110 percent storage capacity of the largest tank and sufficient freeboard to contain precipitation. All loading lines and valves would be placed inside the berm surrounding the tank battery or would use catch basins to contain spills. Thurston would maintain the integrity of the dike throughout the production lifetime of the well.

All measurement facilities would conform to American Petroleum Institute (American Gas Association) standards for gas and liquid hydrocarbon measurement. Thurston would adhere to all site security guidelines and regulation identified in 43 CFR 3126.7. A gas meter would be initially calibrated and tested periodically thereafter with measurement results provided to the UDOGM as required. If feasible, telemetry equipment would also be installed at the well pad location to remotely monitor well conditions and reduce traffic to and from the well pad.

All permanent (onsite for 6 months or longer) structures either constructed or installed would be painted a flat, non-reflective, earth-tone color using one of the standard environmental colors, as determined by the Service AO. All facilities would be painted within 6 months of installation.

Periodically, a workover or recompletion on a well may be required to ensure that efficient production is maintained. Workovers can include repairs to the well bore equipment (casing, tubing, rods, or pump), the wellhead, or the production facilities. These repairs would usually be completed in 7 days per well, during daylight hours. The frequency for this type of work cannot be accurately projected because workovers vary by well; however, an average work time may be one workover per well per year after about 5 years of production. In the case of a recompletion, where the wellbore casing is worked on or valves and fittings

are replaced to stimulate production, all byproducts would be stored in tanks and hauled from the location. For workover operations, it may be necessary to rework the surface location to accommodate equipment. Thurston would notify the Refuge staff prior to any workover activities. At the completion of the work, the surface location would be re-graded and reclaimed to pre-existing conditions.

2.1.6 Final Reclamation and Abandonment

Thurston would perform final reclamation of the proposed pads and access roads, not including existing Wildlife Refuge Road and county roads, consistent with the Reclamation Plan and well-specific COAs. Prior to abandonment of any well location, Thurston would file a Notice of Intent (NOI) to abandon with UDOGM, detailing the proposed procedures. During plugging and abandonment, all other surface equipment, including tanks, pumping unit, three-phase separator, and aboveground flow lines, gas system pipelines, and water pipelines, would be removed from the site. The bundled HDPE pipeline would be removed by hand. Wellbores would be plugged with cement to prevent fluid or pressure migration and to protect mineral and water resources. Wellheads would be removed, both the surface casing and production casing would be cut off below ground level, and an appropriate dry hole marker would be set in compliance with UDOGM regulations.

A monitoring plan would be implemented to provide quantifiable data to assess interim reclamation operations, including annual site visits to ensure timely achievement of reclamation goals and weed control. Thurston would modify reclamation procedures as necessary to achieve reclamation success as determined by the Service. For more information regarding the monitoring strategy and success criteria, refer to the Reclamation Plan included in **Appendix F** of this EA.

Thurston would restore the pad locations and access roads to approximately their original contours. During reclamation of these sites, fill material would be pushed into cuts and up over the back slope. No depressions would be left that would trap water or form ponds. Upon completion of backfilling, leveling, and recontouring, the remaining topsoil would be evenly spread over the reclaimed areas. All disturbed surfaces would be reseeded with a seed mixture prescribed by the Service. The seedbed would then be prepared by disking and roller packing following the natural contours. Seed would be drilled on contours at an appropriate depth depending on soil condition and plant requirements. In areas that cannot be drilled, seed would be broadcast at double the seeding rate and harrowed into the soil. Seeding should occur within 24 hours following completion of final seedbed preparation to reduce the potential for establishment of weeds and before crusting of the soil, which can impede germination. If the seeding is unsuccessful, Thurston would be required to conduct reseeding in subsequent years.

Thurston would monitor final reclamation operations on an annual basis to ensure timely achievement of its reclamation goals by documenting the progress of reclamation and weed control against baseline data collected prior to commencing operations. Thurston would modify its reclamation procedures as necessary to achieve the reclamation outcomes mutually agreed-upon with the Service AO. Unreclaimed areas or reclaimed areas that do not meet the objective of 3 to 4 years of sustained progress toward reclamation success (known as "operator complete") would undergo the reclamation retreatment measures described in the SUPO (see **Appendix A**), which is referenced with each APD. Thurston would also be required to meet the UDOGM bonding requirements of at least $30,000 for each well (UDOGM 2005 R649-3-1-5.3).

2.1.7 Water Use and Supply

Drilling operations would be responsible for most of the water consumed during the project. Water for use during drilling operations would be obtained from existing permitted water supply sources, including

but not necessarily limited to, J.D. Field Services (State Water Right No. 49-2307) and RNI (State Water Right No. 49-2367).

No water would be used or taken from Refuge impoundments or from the Green River inside the Refuge boundary. The Refuge's water right will not be used for any of this project. Approximately 0.5 acre-feet (3,879 barrels, or 162,925 gallons) of water would be needed for the drilling of each well, using mud as the circulation medium. Thus, a maximum of one acre-foot of water would be required to drill the two proposed wells. Approximately 2.3 acre-feet (18,000 barrels, or 756,000 gallons) of additional water would be used per well for completion purposes, for a total of approximately 4.6 acre-feet of water for the two proposed wells. Approximately 0.1 acre-feet of water would be used on Wildlife Refuge Road for dust control. The total amount of water required for drilling, completion, and dust control operations is anticipated to be approximately 5.7 acre-feet over the LOP. Water used for completion and dust control purposes would be obtained from the Vernal City municipal water supply and transported to the well pads by truck. Water would be transported to the well pad by licensed haulers, and the appropriate water permits would be filed by the licensed haulers. An estimated 84-137 truck round trips (assuming the truck volumes will be between 5,500 and 9,000 gallons) would be required for drilling and completion operations per well.

2.1.8 Hazardous Materials and Solid Waste

A variety of chemicals (i.e., lubricants, paints, and additives) is used to drill, complete, and operate a well. Some of these substances may contain constituents that are hazardous. Hazardous materials can include some greases or lubricants, solvents, acids, paint, and herbicides, among others. Even though these materials would not be stored at well locations, they may be kept in limited quantities on drilling sites and at production facilities for short periods of time. Eventually these hazardous substances would need to be stored, transported, and disposed of according to applicable requirements.

None of the chemicals that would be used during drilling, completion, or production operations meet the criteria for being an acutely hazardous material/substance or meet the quantities criteria per the BLM *Instruction Memorandum No. 93-344*. Wastes that would be generated at project locations are excluded from regulation by the RCRA under the exploration and production exemption in Subtitle C (40 CFR 261.4[b] [5]) and are considered to be solid wastes. These wastes include those generated at the wellhead, through the production stream, and through the inlet of the gas plant. Exempt wastes include produced water, production fluids such as drilling mud or well stimulation flowback, and crude oil impacted soils. During drilling operations, Thurston could potentially store and use diesel fuel, sand (silica), described as hazardous substances in 40 CFR Part 302, Section 302.4, in quantities exceeding 10,000 pounds. In addition, small quantities of retail products (i.e., paint, spray paint, solvents [e.g., WD-40], and lubrication oil containing non-reportable volumes of hazardous substances) may be stored and used on site at any time.

Any release of oil, gas, saltwater, or other such fluids would be cleaned up and removed to an approved disposal site. The spills would be reported to the Service AO and other appropriate authorities. In accordance with U.S. Environmental Protection Agency (EPA) regulation, Thurston would prepare and implement a site-specific Spill Prevention, Control and Countermeasure (SPCC) Plan within 6 months of commencing operations (40 CFR Part 112.3.3[b]). A Draft SPCC Plan is provided in **Appendix G**. An approved SPCC plan will be reviewed and certified by a licensed Professional Engineer when the final SUP and APD are approved. The SPCC plan describes spill prevention, control, reporting, and cleanup procedures to help prevent impacts to surface waters and subsurface waters and to address potential threats to Colorado River endangered fish species and designated critical habitat. A copy of the drilling company's SPCC plan will be kept on site during drilling operations. In addition, Thurston has provided a

spill response plan supplement in **Appendix G** that includes information about spill avoidance and management.

All produced liquid hydrocarbons would be stored in tanks surrounded by a secondary containment berm of sufficient capacity to contain 110 percent of the total capacity of the largest tank within the tank battery and sufficient freeboard to contain precipitation. All loading lines and valves would be placed inside the berm surrounding the tank or would use catchment basins to contain spills. The tanks would be emptied as necessary to prevent overflow, and the liquids transported to market through trucks and/or pipelines.

Portable toilets and trash containers would be located on active construction sites throughout the Project Area. A commercial supplier would install and maintain portable toilets and equipment and would be responsible for removing sanitary waste. Sanitary waste facilities (i.e., toilet holding tanks) would be regularly pumped and their contents disposed of at approved sewage disposal facilities in Uintah County, in accordance with applicable rules and regulations regarding sewage treatment and disposal.

Accumulated trash and nonflammable waste materials would be hauled to an approved landfill once a week or as often as necessary. All debris and waste materials not contained in the trash containers would be cleaned up, removed from the construction ROW or well pad, and disposed of at an approved landfill. Sanitary waste equipment and trash bins would be removed from the Project Area upon completion of the construction of well pads, access roads, and other surface facilities, and following drilling and completion operations at well pads.

2.1.9 Workforce Requirements and Schedule

Drilling of each well would commence following issuance of a SUP from the Service and APD approval from the UDOGM. Personnel would commute to the Project Area from Vernal or the surrounding area.

Construction of access roads, well pads, and the tank battery pad would be completed by local contractors during daylight hours and would require approximately 7 days. Construction crews would be made up of two to six individuals who would access the project location using an average of three light trucks. During construction, two to three pieces of heavy equipment (i.e., bulldozers and motor graders) would be used to perform earth moving operations.

When drilling commences, the operation would become a continuous 24-hour operation until the well is drilled to total projected depth. Following road and pad construction, the following personnel would be on site for any given shift: rig hands, well pusher, mud logger, and a Thurston representative. The rig crew would work one 12-hour shift per 24-hour day. Drilling and completion crews would be allowed access to the project location outside of normal refuge hours. Overnight personnel would be restricted to the drilling site during Refuge off-hours. Any necessary personnel, vehicles, materials, and/or equipment shall be transported to the project site before sunset each day, and shall not depart the project site until after sunrise, except for materials/equipment transport needed for emergencies (e.g., rig repairs, spill response). Approximately 40 truckloads of equipment would be required to transport the drilling rig and associated equipment to a location for assembly. During drilling operations, up to 10 light trucks would transport one to four crew members, service personnel, materials and equipment. Approximately five trailers would remain on location for the duration of drilling operations for staff use and equipment storage.

Completion and testing operations would require approximately 21 days for each well. During completion operations, fracture stimulation would be required and approximately 15 large trucks would access each well location twice. Trucks would also be required to deliver water to each location and

remove fracturing fluids to an approved disposal facility. Up to 10 pickup trucks transporting a total of 7 to 10 crew members as well as other service personnel, materials, and equipment would access the drilling location daily.

2.1.10 Conservation Measures

Thurston would implement conservation measures to reduce the potential short-term, long-term, and cumulative impacts to existing resources as a result of implementation of the Proposed Action. Specific references to Federal and State laws are not intended to be all inclusive. Therefore, all applicable Federal and State laws (in addition to those highlighted) would still apply to the proposed exploration and production activities. These conservation measures would represent the Service's specific terms and conditions for the issuance of the Special Use Permit.

2.1.10.1 General

1) Thurston will secure all required permits and approvals from the Service, State of Utah, and Uintah County prior to construction. Thurston will adhere to all applicable Federal, State, and county regulations while performing all operations associated with the Proposed Action.

2) Thurston will annually monitor its facilities to ensure that normal operations will be in compliance with: its SUP; other rules and regulations that apply to the Proposed Action; the Thurston Reclamation and Weed Plan; commitments presented by Thurston (as contained in this EA); and any conditions that may result from approval of the Proposed Action.

3) Thurston and/or its contractors shall save, hold harmless, defend, and indemnify the United States, its agents and employees for loss, damages, or judgments and expenses on account of bodily injury, death, or property damage, or claims for bodily injury, death or property damage of any nature whatsoever, and by whomever made, arising out of the Operator, their employees, subcontractors, or agents with respect to the exploration of any and all mineral rights within the lands administered by the Refuge.

4) Proof of general liability insurance in an agreed upon amount (as required by State law) must be furnished to repair/mitigate any damages. This does not limit the liability for damages to this amount.

5) Construction operations will be conducted in consideration of the *Surface Operating Standards for Oil and Gas Exploration and Development, 4th Edition* (Gold Book) (USDI-USDA 2007 as revised). Thurston will maintain existing and new roads and well pads in conformance with "Gold Book" standards.

6) Thurston will implement hiring policies that would encourage the employment of area residents and will purchase equipment and materials from local area merchants to the extent feasible.

7) Thurston's drug and alcohol policies will be rigorously enforced.

8) Summaries of all the results generated from existing water quality data, cultural resource surveys, biological resource surveys, paleontological surveys, and any other sampling or monitoring must be provided to the Refuge Manager or the Service Authorized Officer (AO) prior to the onset of construction. The Service requests that Thurston provide information on the depths at which groundwater was encountered during drilling of the surface hole.

9) Impacts on sensitive habitat (e.g., wetlands, riparian areas), wildlife, plants, and other sensitive natural or historical resources must be avoided to the extent possible while constructing the access road and well pads. Existing roads shall be used to the greatest extent practicable to avoid erosion and minimize the footprint devoted to oil and gas operations. Roadbeds shall be engineered to avoid or minimize impacts to riparian areas or wetlands to the extent practicable. Unavoidable impacts shall be mitigated.

10) The Operator must provide detailed maps or plats of the proposed project layout (as required by the Refuge Manager or the Service AO) that shows routes, staging areas, construction areas, and work locations. The map should include the following minimum information:

    a. Dimensions on adjacent exterior section lines sufficient to completely describe the quarter section that contains the proposed well shall be indicated. If dimensions are not field measured, state how the dimensions were determined.

    b. The latitude and longitude of the proposed well location shall be provided on the drawing with a minimum of five decimal places of accuracy and precision using the North American Datum (NAD) of 1983 (e.g.; latitude 37.12345 N, longitude 104.45632 W).

    c. For irregular, partial or truncated sections, dimensions will be furnished to completely describe the entire section containing the proposed well.

    d. The field-measured distances from the nearer north/south and nearer east/west section lines shall be measured at 90 degrees from said section lines to the well location and referenced on the plat.

    e. A map legend.

    f. A north arrow.

    g. A scale expressed as an equivalent (e.g. - 1” = 1000’).

    h. A bar scale.

    i. The ground elevation.

    j. The basis of the elevation (how it was calculated or its source).

    k. The basis of bearing or interior angles used.

    l. Complete description of monuments and/or collateral evidence found; all aliquot corners used shall be described.

    m. The legal land description by section, township, range, principal meridian, baseline and county.

    n. Operator name.

    o. Well name and well number.

    p. Date of completion of scaled drawing.

    q. A line designating the 100-year floodplain for the Green River relative to pad and well placement.

11) Refuge officials will conduct an onsite meeting before rig-up with representatives of the Operator, drilling contractor, subcontractors, suppliers, and service companies. The purpose of the meeting is to review and reiterate regulations and conditions that apply to planned activities and work crew conduct on the Refuge. Thurston will be responsible for ensuring that employees,

representatives, consultants, contractors, and subconsultants adhere to the Conditions of Approval (COAs), conservation measures, and BMPs identified in the SUP and DR for this EA.

12) Service personnel will be subject to Thurston's safety procedures. Thurston shall provide any needed safety briefings for Refuge and Hatchery personnel prior to commencement of any operations at the site.

13) Prior to rig-up, Thurston must prepare an Emergency Preparedness Plan covering exploratory drilling, well control, materials, hauling, spill response, HAZMAT, and medical and fire evacuation. The plan must also identify the availability and capability of local and regional emergency services and must delineate strategies for addressing potential shortfalls or inadequacies contained in these resources. The Emergency Preparedness Plan must be provided to the Refuge Manager, the Ouray National Fish Hatchery Manager (and any other local governments and emergency response units required by Utah State law) and discussed in a pre-operation meeting to be held by Thurston. The plan must contain a telephone list naming key contacts for emergency operations and activation.

14) The Operator must upgrade and maintain all access routes, roads, and bridges designated for its use across the Refuge in accordance with acceptable specifications and standards as described by the "Gold Book" (USDI-USDA 2007 as revised). The Operator must have road maintenance equipment and operator(s) readily available to perform road repairs and maintenance as needed, or as directed by the Refuge Manager or Service AO.

15) General Refuge access conditions:

    a. Thurston and/or its contractors shall be allowed access to portions of the Refuge for the purpose of carrying out drilling of oil and gas exploration wells previously identified (50 CFR 26.22).

    b. The Refuge Manager is the coordinating official having immediate jurisdiction and administrative responsibility for surface use and access related to oil and gas operations on Refuge lands and property; all entry upon the Refuge must be coordinated with the Refuge Manager or the Service AO. The Refuge Manager must be advised at least 48 hours prior to initiation of construction (50 CFR 26.22).

    c. Any necessary personnel, vehicles, materials, and/or equipment shall be transported to the project site before sunset each day, and shall not depart the project site until after sunrise, except for materials/equipment transport needed for emergencies (e.g., rig repairs, spill response).

    d. The failure of the United States to require strict performance of the terms, conditions, covenants, agreements, or stipulations of this permit for access to conduct exploration activities on NWR lands shall not constitute a waiver or relinquishment of the right of the United States to strictly enforce thereafter such terms, conditions, covenants, agreements, or stipulations, which shall, at all times, continue in full force and effect.

    e. Operator shall be responsible for the actions of all exploration, and production and support personnel. Violations of applicable laws or regulations will subject the Operator and/or their employees to prosecution under State and/or Federal laws. Individuals using the Refuge under the Operator's authorization are subject to inspections of vehicles and their contents by Federal and State law enforcement officers.

f. Operators will act in a manner that is respectful of Refuge habitats, wildlife, and property. Gates are to be locked or unlocked as they are found (50 CFR 27.21; 50 CFR 27.51).

g. If necessary, a lockbox or similar security system will be provided to Thurston for after-hours access to the project site during drilling and completion operations. No unauthorized entry of non-project related personnel will be permitted on the Refuge after normal operating hours.

h. All vehicle access will be restricted to developed roads. All-terrain vehicle (ATV) use and deviations to vehicle use must be pre-approved by the Refuge Manager in writing prior to any action taken (50 CFR 27.31).

i. Vehicle speed limits are not to exceed 10 miles per hour traveling on access roads from the main Refuge road to the well pad; and not to exceed 25 miles per hour on the main Refuge road during construction, drilling/completion, production, or normal daily activities to discourage the generation of fugitive dust. These speed limits are set at the discretion of Refuge Manager and limits will be strictly adhered to (50 CFR 27.31).

j. No pets will be allowed on the Refuge.

k. Person(s) entering or remaining on the Refuge when under the influence of alcohol is prohibited (50 CFR 27.81).

l. Possession of drugs or controlled substances is strictly prohibited on the Refuge (50 CFR 27.82).

m. Possession, transportation, or discharge of firearms, fireworks, or explosives on the Refuge is prohibited unless specifically authorized (50 CFR 27.41; 50 CFR 27.42).

n. Open fires are strictly prohibited in any areas of the Refuge (50 CFR 27.95).

o. Operators will not be considered agents of the Service and will not represent the Service in any matters (50 CFR 27.84).

p. Operators will perform all work in accordance with the highest standards of the industry and to the satisfaction of the Service.

q. Operators will perform all work in accordance with all applicable laws and regulations and will obtain all necessary permits or licenses when required to do so. Thurston must complete or obtain all necessary permits, contacts and clearances prior to the start of the activity (50 CFR 25.13; 50 CFR 29.32).

r. Thurston will modify drilling operations, as necessary, to reduce conflicts with regular Refuge management and public use activities.

s. All personnel and activities shall be restricted to the immediate drilling area and the direct access road to the drill site (50 CFR 26.22).

t. Harming, harassing, and feeding wildlife species are prohibited. Molesting or destroying the home or dens of wildlife is prohibited. If dens are found during the normal course of operations, distinctive flagging will be used to alert all personnel of the den location. Adverse impacts on fish, wildlife, and the environment shall be kept to an absolute

minimum. All road kills will be reported to the Refuge Manager or the Service AO (50 CFR 27.51).

u. Littering is prohibited. All cans, bottles, lunch papers, operations trash, and any other type of litter must be removed. Cigarette butts are considered litter. All vehicles must be equipped with a container to carry out trash (50 CFR 27.94).

v. No overnight quarters will be permitted on the Refuge unless authorized by the Refuge Manager (50 CFR 27.92).

16) A brief Worker Environmental Awareness Program (WEAP) will be implemented by Thurston for construction and drilling crews prior to the commencement of the project activities. Training materials and briefings will include, but not be limited to, discussion of the Federal and State ESAs, the consequences of noncompliance with these acts, identification and values of wildlife and natural plant communities, threatened and endangered species within the Project Area, hazardous substance spill prevention and containment measures, and review of all conservation measures.

2.1.10.2 Reclamation

1) Thurston has developed a Reclamation & Monitoring Plan/Noxious Weed Management Plan that will be used to direct reclamation and monitoring operations and to ensure that the results meet acceptable standards (included as Appendix F of the EA/BA).

2) Thurston will develop vegetation pre-disturbance baseline documentation/data for the proposed well sites or will implement other methods to determine reclamation success, in cooperation with the Service AO.

3) Thurston will provide the Service with an annual report describing the progress of its reclamation operations.

4) Thurston will reclaim as much of a well pad as possible by leaving level ground sufficient for work over operations and re-contouring the remainder of the initial disturbance.

5) All construction of roads and pads will occur in a manner that best facilitates their subsequent complete removal and reclamation once Thurston's activities have ceased at these sites. This includes separating, stockpiling, and covering topsoil layers onsite to be replaced during reclamation. All disturbed areas must be reclaimed with Service input at the time reclamation occurs. Only endemic plants and seed mixtures are to be used in reclamation. Thurston shall separate and store the topsoil horizon or the top 6 inches, whichever is deeper, and mark or document stockpile locations to facilitate subsequent reclamation. When separating the topsoil layers, the operator shall segregate the horizon based upon noted changes in physical characteristics such as organic content, color, texture, density, or consistency. All stockpiled soils shall be protected from degradation due to contamination, compaction and, to the extent practicable, from wind and water erosion during drilling and production operations. BMPs to prevent weed establishment and to maintain soil microbial activity shall be implemented. Final reclamation of all disturbed areas shall be considered complete as follows:

a. When all activities disturbing the ground have been completed and;

b. When all disturbed areas have been either built upon, compacted, covered, revegetated, paved, or otherwise stabilized in such a way as to minimize erosion, or;

c. When a uniform vegetative cover has been established that reflects pre-disturbance or;

d. When reference area forbs, shrubs, and grasses with total percent plant cover of at least 80 percent of pre-disturbance or reference area levels (excluding noxious weeds) or equivalent permanent, physical erosion reduction methods have been employed. Re-seeding alone is not sufficient.

6) Within 120 days following completion of drilling and testing operations, the Refuge Manager or the Service AO will be advised whether the well is to be retained or plugged. If the well site is to be abandoned, the well is to be plugged to meet the standards of the State requirements, all above-ground structures must be removed, and the site and road restored to near original condition as directed by the Refuge Manager or the Service AO. Any damage to existing surface vegetation, water channels, or other physical features must be restored to original site conditions. All costs shall be borne by the Operator.

2.1.10.3 Erosion and Sedimentation Control

1) The drill site and immediate access roads must be constructed of Refuge-approved material for all drilling locations. All existing drainage patterns within roads to be constructed must be maintained uninterrupted by the use of culverts, bridges, or other applicable techniques as specified and authorized by the Refuge Manager or the Service AO.

2) Thurston must provide a Stormwater Pollution Prevention Plan (SWPPP) that would be reviewed by the Service prior to the commencement of construction activities. This plan should be prepared according to industry guidelines and should include sufficient information and narrative descriptions regarding construction activities along the existing waterways, locations of all proposed potential discharges, identification of potential pollutant sources, maps detailing all ground-disturbing activities at sites, and details and figures for proposed BMPs for these construction activities.

3) Thurston shall implement and maintain BMPs at all oil and gas locations to control stormwater runoff in a manner that minimizes erosion, transport of sediment offsite, and site degradation. BMPs shall be maintained until the facility is abandoned and final reclamation is achieved. Operators shall employ BMPs, as necessary, to comply with this rule at all oil and gas locations, including, but not limited to, well pads, soil stockpiles, access roads, tank batteries, and pipeline ROWs. BMPs shall be selected based on site-specific conditions, such as slope, vegetation cover, and proximity to water bodies, and may include maintaining in-place some or all of the BMPs installed during the construction phase of the facility. Where applicable, based on site-specific conditions, operators shall implement BMPs in accordance with good engineering practices.

4) Stormwater drainage should be segregated from loading/unloading facilities, and operations areas from unimpacted areas.

5) No project vehicles will be operated along dirt access roads or at drilling pad sites during periods of saturated soil conditions when surface ruts greater than 4 inches would occur along straight travel routes.

6) As necessary during construction, drilling, and production operations, appropriate BMP sedimentation controls will be used in areas susceptible to erosion. The BMPs would be selected and constructed as described in “The Gold Book” (USDI - USDA 2007).

7) Sediment traps, swales, and mulching should be used during construction activities to reduce loss of sediment and contamination of runoff.

8) Straw bales and/or silt fences would be used as energy dissipaters where the possibility of erosional down-cutting exists. If straw bales are used for erosion and sediment control, the straw/hay must be certified weed-free; otherwise, only silt fencing would be allowed for this purpose. These structures would be installed prior to construction, and would be left in place and maintained for the LOP or until the adjacent disturbed slopes have revegetated and stabilized.

9) Project vehicles will be restricted to use of the project-related travel routes and surfaces, including turn-outs on approved travel routes.

10) Thurston would perform re-grading and watering of the access routes following inclement weather conditions as needed.

2.1.10.4 Spill Procedures

1) In accordance with EPA regulations (40 CFR Part 112) and UDOGM requirements, Thurston must prepare and implement a SPCC plan for each well within 6 months of beginning operations. Copies of the SPCC plans shall be provided to the Refuge Manager within 6 months of commencing production operations.

2) A Draft SPCC Plan, which illustrates the types of spill prevention measures that will be developed and implemented for each well, is included in **Appendix G** of the EA/BA. This plan will be reviewed by the Service and should include a listing of secondary containment and/or diversionary structures or equipment for all oil handling containers, equipment, and transfer areas. It should also include a table identifying tanks and containers at the facility with the potential for an oil discharge, the mode of potential failure, and the likely flow direction and potential quantity of the discharge, as well as provide the secondary containment method and containment capacity. In addition, the SPCC Plan should include the physical layout of the facility and a facility diagram that marks the location and contents of each container. The facility diagram must also include all transfer stations and connecting pipes.

3) All open-top oil, condensate, or produced water tanks, dehydration unit tubs, secondary containment tubs, and any other open tub, tank, pan, or similar item will be netted or screened to prevent entrapment and mortality of migratory birds. Where there are open-top tanks that do not contain harmful substance, such as stock water tire tanks, we recommend the use of escape ramps in these tanks to minimize the potential drowning of migratory birds and possible violations of the Migratory Bird Treaty Act (MBTA).

4) Thurston will construct a secondary containment berm of sufficient capacity to contain 110 percent of the storage capacity of the largest tank in the tank battery and sufficient freeboard to contain precipitation. Thurston will install containment for the chemical injection tanks.

5) Catch pans or other secondary containment systems consistent with industry standards are required for equipment and locations such as mud pumps, bulk mud additive tanks, fuel tanks, mixing sheds, generators, accumulator and lines, and under the entire rig floor. The catch pans must cover the entire surface area under the equipment. The rig floor catch pan (collector) must be properly secured to allow for wash down and mud drainage from the drill pipe. The catch pans must be kept free of accumulated debris and spill materials must be emptied on a regular basis.

6) Earthen berms and storage tank containment areas would be lined with a non-permeable liner in order to reduce the risk of groundwater and soil contamination. These liners will be maintained and replaced per manufacturer guidelines.

7) Substitute organic additives, polymers, or biodegradable additives for oil-based mud to reduce toxicity.

8) Lubricate with mineral oil and lubra-beads instead of diesel oil.

9) All on-site personnel would be trained in the proper management of waste types encountered at the site.

10) A copy of all MSDS sheets shall be provided prior to use of any chemicals or compounds that have an MSDS data sheet.

11) Thurston shall provide Refuge staff with any needed safety equipment for periodic inspection;

12) Fuel and lubricants will be temporarily stored in transportable containment trucks and trailers to minimize potential for accidental releases.

13) No other hazardous or potentially hazardous materials will be brought into the Project Area;

14) During daily site visits, visual inspections will be conducted to assure that no leaks of oil, brine, or chemicals are occurring.

15) All spills or leaks of drilling muds, diesel fuel, hydraulic fluid, lubricating oil, and coolant, including contaminated soil material will be excavated and placed in an appropriate container and then transported to an approved off-site disposal location.

16) The soils at the location site must be tested by a USFWS-approved laboratory using approved standards to determine levels of heavy metals, chemical pollutant, and other contaminants prior to rig-up operations. Duplicate tests must be conducted before completion or at abandonment to determine impacts from potential undiscovered spills and releases of oil or other chemical constituents. If the exit test reveals levels above the background established by the pre-drilling test, clean-up will be required. The most practical method of clean-up is soil removal. Any quantity of soil removed must be replaced with a Service-approved equal and to the original contours.

2.1.10.5 Human Health and Safety

1) Trash containers and a portable toilet will be located on site during construction. Upon completion of drilling operations, Tri-County Health Department would permit sewage system disposal at an off-Refuge location.

2) Accumulated trash and nonflammable waste materials will be hauled to an appropriate receiving landfill.

3) All debris and waste materials not contained in the trash containers and surrounding area would be cleaned up, removed from the well pads and access road corridors, and disposed of at the landfill.

4) No potentially harmful materials or substances would be left on the well pads, access road corridors, or the vicinity. Scrap metal and other recyclable refuse would be hauled to an approved recycling facility.

5) Project-related vehicle traffic would be limited to Service-approved access routes.

6) Thurston and subcontractor crew members would minimize daily personal vehicular traffic in and out of the Project Area by carpooling from surrounding towns.

7) A sign warning the public of project-related activity would be located at the closest road or travel route intersection on either side of the proposed drill-sites.

8) Fencing and appropriate signage would be installed on all well pads if needed to prevent Refuge visitors from gaining access.

2.1.10.6 Fire Hazards

1) To protect and minimize the possibility of fires during the construction phase, all project vehicles and construction equipment, including welding trucks, would be equipped with fire extinguishers and shovels.

2) Brush or vegetation located within 15 feet of mufflers, radiators, headers, and other engine parts would be avoided, and periodic checks would be conducted to prevent this build-up.

3) Smoking would only be allowed in company vehicles and/or designated smoking areas; all cigarette butts would be placed in appropriate containers.

4) Cooking fires, campfires, or fires of any kind are not allowed. Portable generators used in the Project Area would be required to have spark arresters.

5) Thurston would coordinate project activities with appropriate Service and/or County fire-fighting personnel when operating within the Project Area.

6) Thurston contractors would have a site-specific Health and Safety Plan that includes fire protection.

2.1.10.7 Air Quality

1) All internal combustion equipment would be kept in good working order.

2) To reduce potential impacts to air quality, all equipment associated with drilling and completion activities, as well as service equipment used for fracking and cementing, would be with Tier II or better drilling rig engines.

3) To reduce any potential impact on air quality, the Service requires that all vehicles with diesel engines be manufactured after 1996 and be kept in good working order.

4) Low bleed or no bleed pneumatics would be installed on separator pump valves and other controllers. The use of low bleed pneumatics would result in lower emission of volatile organic compounds (VOCs).

5) Thurston has agreed to use similar air pollution control technologies that are currently being applied for other oil and gas operations on Federal lands in the Uinta Basin. At a minimum, the following air pollution control practices will be used to address recognized issues with winter ozone formation:

    a. Dehydrator VOC emission controls to +95% efficiency;

    b. Tank VOC emission controls to +95% efficiency; and

c. If and when gas-powered engines are used, they will be required to meet the following standard: Stationary internal combustion engine standard of 2g NOx/bhp-hr for engines <300HP and 1g NOx/bhp-hr for engines >300HP.

6) During completion, flaring would be limited as much as possible. Production equipment and gas gathering pipelines would be installed as soon as possible.

7) Telemetry would be installed to remotely monitor and control production. This would reduce truck traffic and decrease associated dust and tailpipe emissions.

8) During production, tighten connections and replace packing to minimize leaks and fugitive emissions.

9) During production, use and maintain proper hatches, seals, and valves to minimize air emissions.

10) During daily site visits, or as needed, inspections will be conducted using soap solutions to identify and repair fugitive gas leaks from leaking compressors, valves, connectors, seals, and open-ended lines.

11) Eliminate unnecessary vehicle idling.

12) Thurston would prohibit any open burning of garbage or refuse at well sites or other facilities.

2.1.10.8 Noxious and Invasive Weeds

1) All vehicles and equipment originating from outside the Refuge must be decontaminated prior to arriving at the Refuge per Service procedures to prevent the introduction of noxious weeds to the Refuge. Decontamination would include removal of skid plates for inspection and cleaning if necessary. It is recommended that the operator consult with the local weed control agency or other weed control authority if weed infestation occurs. It is the responsibility of the operator to monitor affected and reclaimed lands for noxious weed infestations. The Refuge will require a weed control plan.

2) Any materials brought into the Refuge as fill material for construction must be certified weed-free or authorized by the Refuge Manager or the Service AO. To minimize the spread of invasive species, no top soils will be brought in from outside the Refuge.

3) To reduce the likelihood of introducing noxious and invasive weed species as a result of project-related vehicles and equipment entering the Project Area, Thurston and its contractors will remove weed seed and soil from all construction equipment and vehicles prior to the start of construction.

4) Any weed infestations noted at drilling sites and along project-constructed access roads would be treated as necessary and as approved by the Service to prevent additional spread.

5) Thurston would implement an intensive weed control program at the beginning of the first growing season after construction in accordance with the site-specific reclamation and weed management plan.

2.1.10.9 Wildlife

1) Project personnel would be subject to the following requirements: (1) no harming, harassing, or shooting of wildlife or horses, (2) no dogs or other pets admissible in the Project Area, (3) no firearms permitted, and (4) no littering. Workers will be required to check under their vehicles prior to departing the project site.

2) Thurston will conduct preconstruction surveys, as needed.

3) Thurston will install electricity (if feasible) to provide power for separators and pumpjacks on the two proposed well pads to reduce the level of noise for both wildlife and visitors. Should electrified systems be used, an aboveground distribution line would be built on single wood utility poles located within the proposed road ROW. If feasible, the proposed distribution line would tie into an existing power source at the Ouray National Fish Hatchery (NFH). If and when gas-powered engines are used, noise abatement methods (e.g., acoustic barriers and mufflers) will be implemented to reduce noise impacts to levels at or below noise levels of an electrified system. Thurston will communicate its intentions for power supply and noise mitigation methods to the Service as determinations are made.

4) Construction and drilling operations conducted during the Refuge's sensitive wildlife period (May 1st through August 31st) must be coordinated with and authorized by the Refuge Manager or the Service AO to avoid conflicts with wildlife. At the discretion of the Refuge Manager or the Service AO, additional wildlife monitoring or mitigation may be required during this sensitive period based on site-specific conditions.

5) Should the project schedule construction activities between March 1st and August 31st, all areas within 0.5 miles of the proposed project would be surveyed for the presence of raptor nests by a Service-approved biologist. If occupied raptor nests are found within the recommended spatial buffers, the Utah ESO would be consulted to determine if the recommended spatial buffers can be modified on a nest-by-nest basis by considering the species, timing, nest status, disturbance type and duration, vegetation, and topography.

6) Burrowing owl surveys would be conducted concurrently with the raptor surveys within 0.25 miles of the proposed project if the project schedule occurs between March 1st and August 31st. If occupied burrowing owl nests are found within the recommended spatial buffers, the Utah ESO would be consulted to determine if the recommended spatial buffers can be modified on a nest-by-nest basis by considering the species, timing, nest status, disturbance type and duration, vegetation, and topography.

7) Project activities would comply with applicable requirements of the MBTA, Bald and Golden Eagle Protection Act (BGEPA), and ESA, as amended.

8) Potential impacts to raptors from increased risk of electrocution would be mitigated by designing poles for the new power lines according to criteria presented in *Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 2006* (APLIC 2006). In addition, strategies for minimizing collision risk with power lines would follow criteria presented in *Reducing Avian Collisions with Powerlines: the State of the Art in 2012* (APLIC 2012). Depending on the alternative selected, specific standards to be followed will be identified in the Decision Record for the EA.

9) To avoid and minimize impacts to birds during construction and operations and to ensure ground-disturbing activities do not result in the "take" of an active nest or migratory bird protected under the MBTA, the Service requires the following of Thurston:

    a. Any groundbreaking activities or vegetation treatments should be performed before migratory birds begin nesting or after all young have fledged to avoid take;

    b. Time tree and shrub removal and ground disturbing activities should occur during the non-nesting season (approximately September 1st to February 28th). If this is not possible, surveys should be conducted prior to disturbance to determine whether active nests are present; active nests found in the area should be left untouched until the young have fledged;

    c. If activities must be scheduled to start during the migratory bird breeding season, appropriate steps to prevent migratory birds from establishing nests in the potential impact area should be taken. These steps could include covering equipment and structures and use of various excluders (e.g., noise). Birds can be harassed to prevent them from nesting on the site;

    d. If activities must be scheduled during the migratory bird breeding season, a site-specific survey for nesting birds should be performed starting at least 2 weeks prior to vegetation treatments. Established nests with eggs or young cannot be moved, and the birds cannot be harassed (see item b above), until all young have fledged and are capable of leaving the nest site; and

    e. If nesting birds are found during the survey, appropriate spatial buffers should be established around nests. Vegetation treatments within the buffer areas should be postponed until the birds have left the nest. Confirmation that all young have fledged should be made by a qualified biologist.

10) The Refuge Manager or the Service AO may require drill pads to be fenced and signed, if necessary, to prevent both wildlife and Refuge visitors from gaining access to the sites. All appropriate warning signs should be placed along all sides of the fence.

11) As necessary, Thurston will notify the appropriate authorities (Utah Department of Transportation [UDOT] on highways and Utah Division of Wildlife Resources [UDWR] or USFWS on County and Refuge roads) of the presence of roadside carrion and ask that they remove the carrion as soon as possible. Carcasses may be covered in the interim to discourage scavenging by bald eagles and other raptors. However, only authorized personnel may touch or remove the carcasses.

2.1.10.10 Special Status Species

Yellow-billed Cuckoo

1) Thurston would not commence or conduct construction, drilling, or completion activities during the yellow-billed cuckoo nesting season (June 15th to August 31st).

2) Noise mitigation measures listed under "Wildlife" apply to the yellow-billed cuckoo, and will reduce noise disturbance to this species.

Colorado River Endangered Fish

1) Conservation measures listed under "Erosion and Sedimentation Control," " Spill Procedures," "Water Resources, Including Wetlands and Floodplains," and "Hazardous Materials and Solid Waste" apply to the Colorado River endangered fish and will reduce the potential for an accidental spill that could contaminate the Green River and associated wetlands, thus greatly reducing the likelihood that these species could be adversely affected.

Uintah Basin Hookless Cactus

1) Pre-project habitat assessments were completed across 100 percent of the project disturbance area within potential habitat prior to any ground-disturbing activities to determine if suitable Uinta Basin hookless cactus habitat was present. Within suitable habitat, site inventories were conducted to determine occupancy. No cacti were found within the project disturbance area or associated buffers. In addition, the following conservation measures that are part of the project design will reduce the likelihood that cactus could be affected:

    a) Limit new access routes created by the project;

    b) Roads and utilities should share common ROWs where possible;

    c) Vehicles will stay on designated routes and other cleared/approved areas; and

    d) All disturbed areas will be re-vegetated with native species comprised of species indigenous to the area and non-native species that are not likely to invade other areas.

2.1.10.11 Water Resources, Including Wetlands and Floodplains

1) Thurston must provide the Refuge Manager or the Service AO a copy of the wetland determination/delineation that was issued by the U.S. Army Corps of Engineers (USACE) for the Project Area showing that none of the well pad locations or roads will impact wetland areas. The USACE would also need to be contacted if any wetlands may be disturbed by the proposed exploration activities.

2) The Operator will be responsible for providing all water needed for drilling operations from outside the Refuge. No wastewater will be discharged onto Refuge lands, ditches, or water bodies. The Operator will provide a containerized or temporary septic system for domestic sewage disposal during drilling operations, which must be removed upon completion of drilling. Use of portable toilets at the drill site or the installation of a temporary septic system, or similar treatment system or tanks, will be required for any trailer onsite. No surface discharge of septic system or portable toilet water is permitted. Septic tanks must be inspected weekly during operations and pumped as necessary. Upon completion of operations, the septic tanks must be pumped out, removed, and all material hauled away.

3) Thurston shall provide a detailed map of the Project Area and the location of the well pads and associated roads with respect to wetlands and waters of the United States.

4) Thurston would sample and test any known water wells located within a 0.50 mile radius up-gradient or immediately down-gradient of the oil extraction wells. The testing protocol will be developed jointly by the Service and Thurston.

5) Thurston's proposed casing program will be designed and implemented to adequately protect usable quality groundwater such that impacts to groundwater from drilling and production are not

anticipated. Risks to groundwater from unanticipated downhole failures would be considered low, correctable, and manageable (O'Dell 2014).

2.1.10.12 Dust Abatement

1) Thurston will instruct its employees and contractors: (1) not to exceed 10 miles per hour on well pad access roads; and (2) not to exceed 25 miles per hour on the main Refuge road during construction, drilling/completion, production, or normal daily activities to discourage the generation of fugitive dust from traffic.

2) Dust levels on regularly traveled access routes must be kept to a minimum. During drilling and completion operations, Thurston will perform dust abatement measures on the main Refuge road and proposed access roads and/or well pads at least once a day or as needed, as determined by the Refuge Manager. Thurston must have a water truck and operator(s) readily available to perform dust abatement. Only water from an off-Refuge source will be allowed for dust suppression efforts. Magnesium water or an approved equivalent may be used as needed with prior approval from the Refuge Manager or authorized representative. Dust control measures must be implemented throughout the traveled areas of the Project Area, including construction sites and existing and proposed roads.

2.1.10.13 Hazardous Materials and Solid Waste

1) A closed-loop mud and drill cuttings system must be used to minimize impacts to surrounding habitats. In addition, drill cuttings will be isolated in an AST during drilling. All cuttings and drilling fluids will be temporarily stored in tanks and then removed from the Refuge and disposed of off-site at an approved disposal facility.

2) Onsite disposal of produced water is prohibited. Produced water may only be disposed of at an offsite State-approved facility.

3) All toxic construction and equipment supplies and refuse (oil, grease, gasoline, diesel, paint, and other petrochemical derivatives) must be centrally stored. Wastes must be removed from the Refuge immediately following completion of drilling operations and disposed of properly. In the event of an accidental spill or discharge of oil, brine, or any other petrochemical substance, the Operator must immediately notify the Refuge Manager or authorized representative. The Operator must remove contaminated soils for proper disposal off Refuge and replace them with the same type soils or one specified and approved by the Refuge Manager or the Service AO. A site reclamation plan may be required by the Refuge Manager or the Service AO.

4) All disposable type materials and trash brought onto the Refuge or generated at the drill site must be removed from the Refuge on a weekly basis and upon completion of the drilling activities. The drill site and operational area must be kept free of debris and trash at all times. Trash must be contained securely at the drill site in such a manner (fully enclosed trash cages) to prevent trash from being spread by wind or wildlife. No trash may be disposed of or buried on the Refuge.

5) Pits, ponds, and/or open tanks are prohibited. Fully enclosed portable tanks must be used in circulating operations for the temporary storage of all drilling fluids, cuttings, mud, and contaminants. All drilling fluids, cuttings, mud, contaminants, portable tanks, and other equipment must be transported off the Refuge to a State-approved facility upon cessation of drilling activity. Onsite disposal of drilling fluids is prohibited.

2.1.10.14 Cultural Resources and Native American Concerns

1) Thurston has conducted a Class III cultural resource survey on lands that would be affected by surface-disturbing activities and will avoid all sites determined to be eligible to the NRHP or will perform mitigation as recommended by the cultural resource consultant and directed by the AO. The results of the survey were submitted to the Service.

2) In the event that unanticipated cultural resources are uncovered during surface-disturbing activities, procedures outlined in the Service's 614 FW 2, Survey and Identification Manual (USFWS 1992) and other applicable regulations would be followed. Thurston would suspend operations at the site and immediately contact the Service, who will arrange for a determination of eligibility in consultation with the State Historic Preservation Office (SHPO) and if necessary, will recommend a recovery or avoidance plan.

3) If the proposed surface disturbance will affect an NRHP-eligible site, data recovery will be performed. Data recovery will include detailed recordation and archival research. The gathered information will be analyzed and described in a report that details the results of the investigation. The report will be submitted to the Service and the SHPO in Salt Lake City.

4) Thurston is responsible for informing all persons in the area who are associated with this project that they may be subject to prosecution for knowingly disturbing historic or archaeological sites or for collecting artifacts. All vehicular traffic, personnel movement, and construction and restoration activities would be confined to the areas evaluated in the pre-disturbance survey.

5) Thurston will educate its contractors and employees about the relevant Federal regulations intended to protect cultural resources. Furthermore, Thurston will educate staff and contractors regarding illegal collection or destruction of cultural resources. All vehicular traffic, personnel movement, construction, and restoration activities will be confined to existing roads and to areas cleared by the site inventory unless mitigation measures are undertaken. In the event historic or archeological resources are uncovered during construction, work will stop immediately and the Service AO will be notified.

2.1.10.15 Paleontological Resources

1) Thurston has conducted paleontological surveys on lands that would be affected by surface-disturbing activities. Recommendations to minimize potential damage to paleontological resources (e.g., a permitted paleontologist will be present to monitor construction in certain circumstances) will be followed. The results of the survey were submitted to the Service with the APD for each well.

2) Thurston will educate its contractors and employees about the relevant Federal regulations intended to protect paleontological resources. All vehicular traffic, personnel movement, construction, and restoration activities will be confined to existing roads and to areas cleared by the site inventory unless mitigation measures are undertaken. If any potential paleontological resources are uncovered during construction, work will stop immediately in the area and the AO will be notified.

3) Per consultation with the Utah SHPO, a contracted paleontologist will be onsite when construction occurs.

4) If paleontological resources are uncovered during ground-disturbing activities, Thurston would suspend all operations that would further disturb such materials and immediately contact the Authorized Officer, who will arrange for a determination of significance, and, if necessary, recommend a recovery or avoidance plan.

2.1.10.16 Aesthetics

1) Cuts and fills would be kept at a minimum and blended with the natural environment to minimize disturbance to visual resources;

2) During all phases of this project, noise levels must be kept to a minimum and should not exceed the established industry standard above ambient day and nighttime noise levels. Thurston should make every effort to use electric pumping equipment (most quiet) during the production phase of this operation.

3) Thurston must implement the following measures and/or conditions to reduce the impacts on daytime and nighttime visual resources:

   a) All permanent (onsite 6 months or longer) structures either constructed or installed infrastructure must be painted a flat, non-reflective, earth-tone color (Covert Green), as determined by the Service AO, to blend with the natural landscape background.

   b) During pad construction, when erecting or disassembling the drilling rig, and during production, outdoor lighting should be kept to a minimum and turned off when not needed.

   c) Whenever possible, each series of lights must be either on a separate switch, timer, or motion sensor to allow the operator to tailor their use to activity in a specific area of the drill pad.

   d) All area lights must be downward pointing and fully shielded, with the exception that upward angled lighting would be used during the operation of the drilling rig in order to provide a safe working environment for drilling personnel. All lighting focused on a particular apparatus must be laterally shielded so that all light falls upon the intended work area and a minimum amount of light is emitted sideways or upward.

   e) Lights that are required by OSHA for emergencies must be linked to alarms so that they are only operational when an emergency situation arises.

   f) No light shall exceed 400 watts.

   g) All lamps must be ≤ 3500 ° Kelvin color temperature to reduce blue-rich light, which causes greater sky glow and is typically more attractive to wildlife.

   h) A Service designee will observe the facility from critical angles and distances. Excessively glaring lights must be shielded, re-aimed, or otherwise mitigated with an adaptive approach without compromising worker safety requirements.

   i) Following well completion, lights at the pumpjack area and tank battery area will be kept off except when needed for emergency maintenance.

   j) Lighting will be minimized where applicable unless safety is an issue.

2.2 Alternative B - No Action Alternative

Under the No Action Alternative, a SUP for access to construct and develop the two wells associated with the Proposed Action would be denied. The Proposed Action affects State subsurface minerals on Ouray NWR lands. Thurston has purchased these State leases granting them a right to explore and develop oil

and gas on the leased areas. The No Action Alternative constitutes denial of the Proposed Action and could be used to prevent unnecessary and undue degradation of Ouray NWR resources. Absent a non-discretionary statutory prohibition against drilling, the Service cannot deny the right to drill and develop the leasehold. Only the U.S. Congress can completely prohibit development activities (Western Colorado Congress, 130 IBLA 244, 248 [1994], citing Union Oil Company of California v. Morton, 512 F.2d 743, 750-51 [9th Cir. 1975]). However, while Thurston has a legal right to develop minerals somewhere on their lease, analysis of the No Action Alternative is required by CEQ regulation.

Under the No Action Alternative, current management plans for the Ouray NWR would continue to guide management of the Project Area. The proposed wells and pads as well as associated access roads and pipelines would not be implemented to accomplish Thurston's purpose and need. The Wildlife Refuge Road that would be used to access the Project Area would continue to be used for wildlife viewing, hunting, and other forms of dispersed recreational activities on Ouray NWR lands. Future mineral development in the Project area would be considered on a case-by-case basis and would be subject to separate NEPA analysis.

2.3 Alternatives Considered but Dismissed from Analysis

The provisions of NEPA require that a range of reasonable alternatives be explored and evaluated. NEPA also requires that the reasons for eliminating certain alternatives from detailed study be briefly explained. In addition to the Proposed Action described above, seven other action alternatives were identified in this EA. These alternatives include:

- Alternative C – 4-Well Development
- Alternative D – Alternative Pipeline Route 1
- Alternative E – Alternative Pipeline Route 2
- Alternative F – Directional Drilling
- Alternative G – Seasonal Restrictions Alternative
- Alternative H – Land Exchange Alternative
- Alternative I – Lease Buyout Alternative

Each alternative is described in more detail below with rationale for dismissal.

2.3.1 Alternative C – 4-Well Development

A 4–Well Development Alternative was considered that included the following primary components (see **Figure 2-5**):

- Construction of four (4) well pads, each averaging approximately 2.1 acres in size;
- Construction of approximately 581 feet of new access road;
- Upgrades to approximately 413 feet of Wildlife Refuge Road and realignment of approximately 2,366 feet of Wildlife Refuge Road;
- Installation of up to 17,948 feet of co-located surface pipeline and 3,296 feet of "cross-country pipeline." All pipeline installation would occur within a 15-foot wide ROW. Construction of

the "cross country" segment of the surface pipeline would begin near the top of the bluffs area near the tie-in point and proceed south then east to Wildlife Refuge Road.

2.3.1.1 Consideration of Ouray National Fish Hatchery (NFH)

The Ouray National Fish Hatchery (Ouray NFH) was established in May 1996 as a fish refuge and technology development facility to assist in the recovery of the four listed Colorado River endangered fish: razorback sucker, Colorado pikeminnow, humpback chub, and bonytail chub (USFWS 2013g). The mission of the Ouray NFH is to serve as a genetic refuge for priority endangered Colorado River fishes (USFWS 1995a).

The primary goal of the Ouray NFH is to preserve a genetically sound captive razorback sucker broodstock of approximately 500 adults and maintain a propagation program adequate to produce ample larvae needed for floodplain wetland studies as well as hatchery production. The goal will be modified in 2013 to include the production of bonytail chub (USFWS 2013g). The Ouray NFH is the primary source of genetic material that is needed to maintain a large genetic pool and work towards a viable reproduction population (USFWS 1995a).

The end product of the Ouray NFH is to maintain endangered fish in Ouray NWR to prevent extinction; develop genetically sound broodstocks for production of young fish for stocking to stabilize or enhance wild stocks; and to produce captive reared endangered fish for priority laboratory and field experiments (USFWS 2013e).

Refuge populations and broodstocks are often the 'last line of defense' to prevent species extinction or population extirpation. Therefore, they are irreplaceable components that are essential for recovery of these species. Similarly, successful stocking programs are often the first action that must be undertaken for species' recovery. The razorback sucker stocking program (including the Ouray NFH) is a great example of how hatchery programs can avert the extinction of an endangered species (USFWS 2013f).

2.3.1.2 Summary of the Ouray NFH Well Field

The existing Ouray NFH Well Field (groundwater aquifer) consists of seven wells arranged in a roughly triangular pattern on the Leota Bottom of the Green River within the Ouray NWR. The water supply wells are all located within the northwest ¼ of Section 29, Township 7 South, Range 21 East of Uintah County, Utah (USFWS 2001a). Other components of the well field include distribution piping; 12, clay-lined, 0.2-acre ponds; an effluent water dispersal basin; and chain link fence surrounding the pond area (USFWS 1992b). The wells in the groundwater aquifer are the primary freshwater source for the Ouray NFH. **Table 2.2** shows the depths and elevations of the seven wells in the Ouray NFH well field.

Table 2.2. Table of Well Depths, Elevations, and Screen Intervals

Well #	#1	#2	#3	#4	#5	#6	#7
Ground Elev.	4666.10	4667.60	4667.20	4666.00	4661.10	4667.40	4665.60
Depth to Bedrock	52.20	53.00	55.70	56.00	52.00	52.00	53.00
Bedrock Elev.	4613.90	4614.60	4611.50	4610.00	4609.10	4615.40	4612.60
Top of Screen	42.20	40.80	43.20	36.50	40.00	34.90	42.00
Bottom of Screen	52.20	50.80	53.20	46.50	50.00	50.30	52.00
Screen Elev-Top	4623.90	4626.80	4624.00	4629.50	4621.10	4632.50	4623.60
Screen Elev-Bot	4613.90	4616.80	4614.00	4619.50	4611.10	4617.10	4613.60

Source: USFWS 2001a

The final well field configuration consists of four pumping wells of equal capacity, supplying an average of 1,300 gpm of continuous flows within the limits of the existing well field. Any three of the four wells have the capacity to supply the entire 1,300 gpm in the event that any one well is offline. The configuration within the existing well field boundaries that best meets the criteria established by the FWS and the principles of good well design is having pumping wells located at or near the existing wells #2, #5, #6, and #7. Under normal designed operating conditions with four wells operating, and each discharging 325 gpm, there will be minimal interference between adjacent wells. The maximum drawdowns projected within the well field do not exceed 5 feet (USFWS 2001a).

2.3.1.3 Risk Factors

The Service prefers a low-risk threshold approach. Hatchery facilities and endangered fish species are an irreplaceable resource. Because the Ouray NFH contains irreplaceable resources for endangered fish recovery, protection of the facility is of the utmost importance. Water quality contamination, aquatic disease inoculation, facility breakdowns, and other problems can destroy years of work, cost millions of dollars, and slow the recovery process. As a result, protection of the Ouray NFH's water source and facilities are essential to the recovery of razorback sucker, bonytail, and humpback chub (USFWS 2013f).

Due to the location of two well pads (Thurston 12-29-7-21 is 747 feet southwest and Thurston 13-29-7-21 is 853 feet southwest of the Ouray NFH), the Service is concerned that the 4-Well Alternative would impact the hatchery recovery program as well as the Colorado River fish species and their habitat. As a whole, implementation of the 4-Well Alternative poses increased risk of spills near the Ouray NFH and groundwater contamination in the floodplain over the anticipated life of the project (LOP) (33- to 43-years). These risk factors include:

- Drilling operations for the four proposed wells would generate approximately 450 truck trips, while completion operations would require about 620 vehicle trips. In total, traffic generated during the construction, drilling, and completion phase would average 10 vehicles per day. These activities would increase level of risk of spills or groundwater contamination in the floodplain for the two wells near the fish hatchery and the freshwater aquifers that supply water to the Ouray NFH.
- The storage, transport, disposal of hazardous substances including greases or lubricants, solvents, acids, paint, and herbicides stored near the hatchery drilling sites and production areas would increase level of risk of spills or groundwater contamination in the floodplain for the two wells near the fish hatchery and the freshwater aquifers that supply water to the Ouray NFH.

- Construction activities associated with road upgrades and realignment for the two wells near the Ouray NFH would generate additional surface disturbances and displace soils and vegetation. For example, approximately 413 feet of upgrades to Wildlife Refuge Road and 2,366 feet of realignment of Wildlife Refuge Road would be needed to provide suitable access for equipment and vehicles to Thurston 12-29-7-21 near the northern edge of the Project boundary. These road improvements alone would result in 5.8 acres of additional short-term disturbance.
- Short-term impacts from nighttime or artificial lighting at the drilling sites for Thurston 12-29-7-21 and Thurston 13-29-7-21 would be within 747 feet and 853 feet of the Ouray NFH, respectively.
- Long-term impacts from visibility of well production operations for Thurston 12-29-7-21 and Thurston 13-29-7-21 would be within 747 feet and 853 feet of the Ouray NFH, respectively.
- Short-term noise impacts due to drilling and well completion activities.
- Although the surface casing and its design would provide protection for freshwater aquifers and contain pressures that may be encountered while drilling the production hole, the location of the well in relative to the hatchery or freshwater well field poses too great a risk.

If resources were developed at their current proposed well pad locations under the 4-well Alternative, it is likely that the Service would need to consider relocating the entire hatchery facility at the expense of Thurston Energy (USFWS 2013f). Thurston would be responsible for the following actions:

- Completing baseline monitoring of hatchery water supply before development proceeds;
- Undertaking long-term monitoring of the hatchery water supply during resource extraction;
- Making potential improvements of the hatchery water supply and purification system;
- Lining all well pads in a synthetic liner to protect groundwater resources;
- Constructing berms around all well pads to contain spills and runoff;
- Conducting a groundwater risk analysis study to determine potential effects of nearby drilling operations;
- Developing BMPs and a quick response action plan for a surface spill to protect floodplain nursery habitats;
- Replicating or moving the Ouray NFH broodstock and refuge populations, and holding those resources at an alternative location;
- Providing a safer source of hatchery water, such as constructing a river water infiltration gallery upstream of the proposed action;
- Replicating or moving all Ouray NFH facilities and production capabilities to a site with a protected location and water supply system; and
- Ensuring that the Recovery Program stocking goals are met during facility transfer (USFWS 2013f).

The 4-Well Development Alternative would also require further hydrologic risk assessment studies to better understand alluvial aquifer and groundwater hydrology.

2.3.1.4 Rationale for Eliminating Alternative C from Further Consideration

The 4-Well Development Alternative was dismissed for biological reasons due to the location of two well pads in proximity to the Ouray NFH and the floodplains; namely, Thurston 12-29-7-21 is a distance of 747 feet southwest of the hatchery and Thurston 13-29-7-21 is a distance of 853 feet southwest of the hatchery. The risks associated with the implementation of the 4-Well Alternative could lead to increased potential for spills from the two wells near the Ouray NFH and groundwater contamination in the floodplain over the LOP; thus, it would not be considered a preferable alternative to the Proposed Action. Portions of the Utah Ecological Services Field Office (Utah FO) memorandum (USFWS 2013f) were incorporated into the discussion under **Sections 2.3.1.1** and **2.3.1.3** above to further explain the rationale for excluding the two wells near the Ouray NFH from any future oil and gas development activity.

2.3.2 Alternative D – Alternative Pipeline Route 1

An alternate surface pipeline route was considered that would connect to the southwest portion of an existing mainline. This alternative would entail the installation of approximately 969 linear feet of surface pipeline northwest of Wildlife Refuge Road in Section 2, Township 8 S, Range 20 E (see **Figure 2-5**). Based on additional impacts to soil and vegetation, the potential disturbance associated with installation, and increased visual impacts resulting from this alternative, it was not considered to be a preferred alternative to the Proposed Action or the No Action Alternative.

2.3.3 Alternative E – Alternative Pipeline Route 2

A second alternate surface pipeline tie-in route was considered in Sections 1 and 2, Township 8 S, Range 20 E, and Section 11, Township 9 S, Range 20 E. This alternative would entail the installation of approximately 12,524 linear feet (2.4 miles) of surface pipeline, which would travel southwest along Wildlife Refuge Road, turn northwest for approximately 0.75 miles, and then north for approximately 1 mile (see **Figure 2-5**). This alternate pipeline route would travel through *Sclerocactus* Level 1 and Level 2 Core Conservation Areas. The USFWS' working *Sclerocactus* management guidelines model current cactus population data into Level 1 (highest concentration of known cacti, highest level of protection) or Level 2 (pollinator buffer, highly restricted surface disturbance guidelines) areas throughout the species currently known and occupied ranges. Under these guidelines, no new surface disturbance would occur in Level 1 areas and a disturbance cap of five percent would be applied to Level 2 areas.

This alternate pipeline route was eliminated because it was determined not to be economically practical and would impact protected *Sclerocactus* habitat under the USFWS' current management guidelines; thus, it would not be considered environmentally preferable to the Proposed Action or the No Action Alternative.

2.3.4 Alternative F – Directional Drilling Alternative

The Service considered the alternative of directionally drilling all four proposed wells from a single pad (one vertical and three directional wells) to limit surface disturbance to one site. Dismissal of this alternative requires an understanding of the limitations of directional drilling associated with oil and gas development in the Project Area.

Actual borehole configuration of several directionally drilled wells on a single pad would be complex and require larger drill rigs, a larger drilling pad, and higher potential for hole problems (i.e., sticking drill pipe and drilling tools, inadequate ability to test potential zones, losing the hole, etc.).

Additionally, due to the distances required for effective drainage and spacing between wells, it is not technically feasible to rod pump the four wells from one surface location due to the angles required in this directional drilling scenario. Additional information on the technical challenges of drilling the two exploratory wells from one well pad is described below. Specifically:

- Thurston's commence build depth for the proposed surface casing depth is 900 feet. Based on Thurston's knowledge of the Project Area, it is desirable to have 800 – 1,000 feet below surface of vertical section to reduce rod wear and to effectively rod pump the wells. Thus, 900-foot depth is currently the earliest point for Thurston to commence build on these wells.
- The proposed wells have a build and drop angle of three degrees (doglegs) to Thurston's maximum inclination and "back to vertical." Based on Thurston's experience and industry standards, build and drop angles over four degrees causes significant rod wear when rod pumping the wells.
- The Green River formation is Thurston's primary target and completion interval in the Project Area. For this project, the average top of the Green River for the two proposed wells is 2,459 feet true vertical depth (TVD). Based on UDOGM-required 40-acre spacing for the wells, it is necessary to be "back to vertical" by 2,459 feet to adequately drain the resource within the Green River formation.

Based on the information above, the maximum inclination for the proposed exploration wells is 24.1 degrees, with a vertical section or total maximum reach of approximately 333 feet.

For these reasons, directionally drilling the two exploratory wells from a single pad is not technically feasible. As such, the Service has determined that requiring additional directional drilling is not a feasible alternative because it would not meet the purpose and need of the project. Based on Thurston's downhole objectives to target area formations with directional drilling, Alternative F is not feasible due to technological challenges and spacing requirements. Therefore, this alternative has been dismissed from further analysis.

2.3.5 Alternative G – Seasonal Restrictions Alternative

The Service considered the alternative of implementing seasonal restrictions for the proposed project. This alternative would avoid or minimize impacts from construction, drilling, and completion during periods in which these activities could influence wildlife reproduction and recreational activity within the Refuge. Alternative A, the Service's preferred alternative, includes multiple seasonable restrictions to minimize impacts to natural resources. The Service has determined that there is no need for a separate alternative because the seasonal restrictions suggested in public comments are already incorporated into the Alternative A, Thurston's Proposed Action for oil and gas development.

In addition, because seasonal restrictions have already been applied in this EA as conservation measures in **Section 2.1.10**, such as the suspension of construction during the nesting seasons for the yellow-billed cuckoos and other migratory birds, this alternative is duplicative and is unnecessary. Therefore, this alternative has been dismissed from further analysis.

2.3.6 Alternative H – Land Exchange Alternative

The Service considered the alternative of exchanging land for the proposed project. This alternative would exchange land and mineral rights included in Thurston's lease for other lands and mineral rights located outside of the Project Area. **Section 1.3** of this EA states that the purpose and need of the Proposed Action "is to provide Thurston access to and allow for the exploration of leased mineral rights

and commence construction and operations to ascertain whether sufficient oil and gas resources exist to commence commercial production of those resources." However, the land exchange alternative would not allow Thurston access to its existing leased rights, and thus, would not meet the purpose and need of the proposed project.

While an exchange could result in the potential relocation of the proposed well sites, the existing and current leases are considered split estate leases, meaning that more than one interested party has ownership in the rights to minerals and surface areas. Because SITLA owns the subsurface rights, the Service would effectively be denying the State access to its mineral resources within the Project Area. If land were to be exchanged, the Service would need to analyze the potential impacts from the loss of SITLA income and potentially compensate the State for this loss of income. At present, there is no proposal for a land exchange and such exchange is not reasonably foreseeable. Therefore, this alternative has been dismissed from further analysis.

In addition, if a land exchange was completed for the mineral rights of SITLA, Thurston would retain existing oil and gas interests regardless of who owns the mineral rights. A separate negotiation or exchange would also be required to extinguish the mineral lease of Thurston. There is currently no proposal or process for a land exchange.

2.3.7 Alternative I – Lease Buyout Alternative

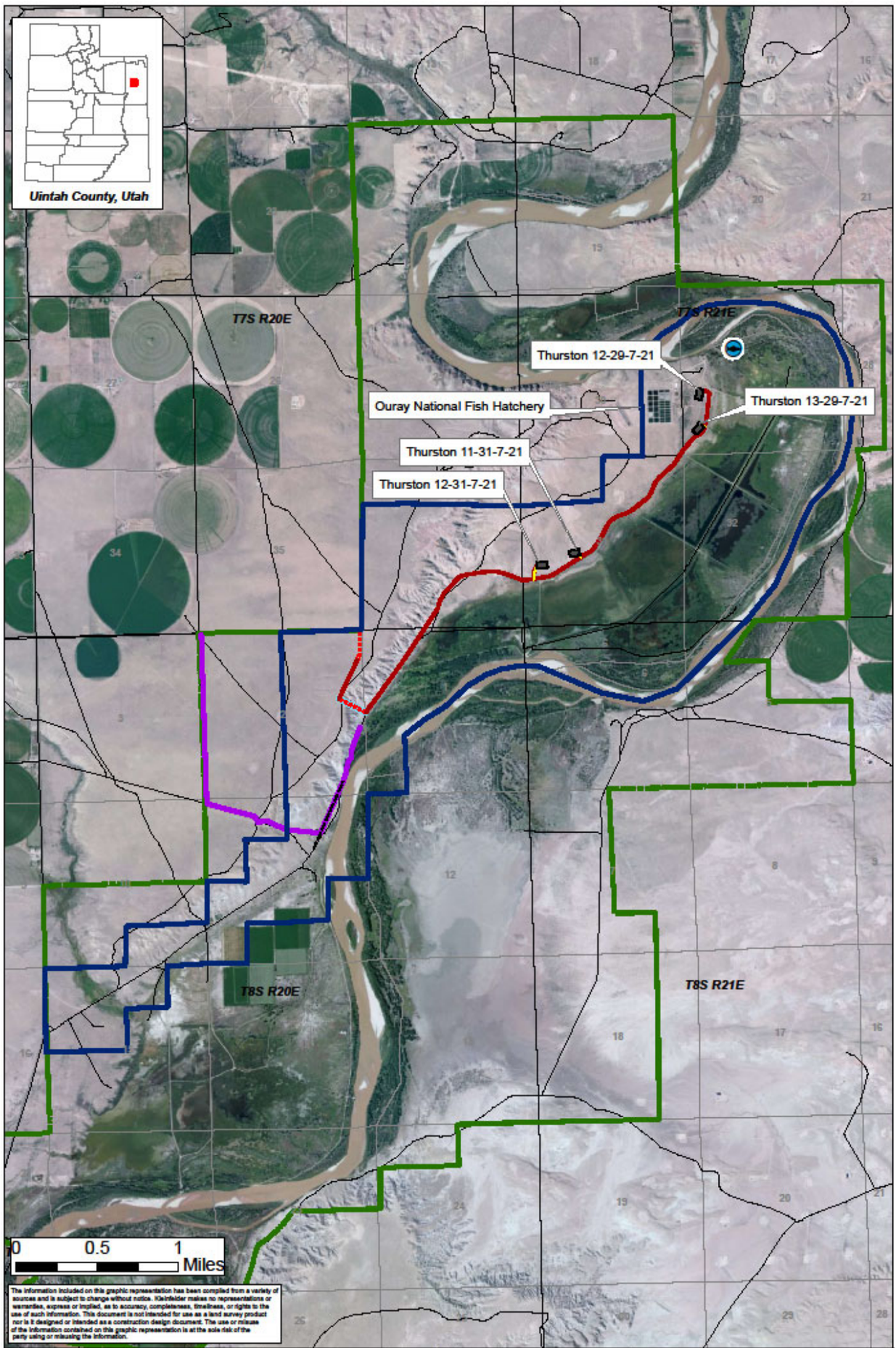
The public suggested that the Service consider the alternative of buying out the mineral rights and/or existing oil and gas lease for the proposed project. This alternative would require the Service to purchase the mineral interests of SITLA and then buy out Thurston's current lease at an agreed upon price based on current market value. SITLA has not suggested or proposed to sell its mineral rights, nor has the Service offered to buy such mineral rights. Even if the Service were to purchase the mineral rights of SITLA, as suggested in public comments, Thurston would retain its existing oil and gas interests regardless of who owns the mineral rights.

Thurston Energy, LLC has submitted a letter to the Service stating that it is not interested in a buyout of its lease. Because, Thurston does not intend, nor is it required to sell its subsurface mineral or surface rights to terminate its lease agreement, this alternative has been dismissed from further analysis.

Section 1.3 of this EA states that the purpose and need of the Proposed Action "is to provide Thurston access to and allow for the exploration of leased mineral rights and commence construction and operations to ascertain whether sufficient oil and gas resources exist to commence commercial production of those resources." Buying the mineral rights and/or Thurston's existing oil and gas lease would not meet the purpose and need of the proposed project. This further justifies dismissal of this alternative from additional and detailed analysis in the EA.

2.3.8 Alternative J – Alternative Pipeline Route 3

The Service considered an alternative where the proposed surface pipeline would travel south along the Wildlife Refuge Road and travel cross country up the bluff in Section 2 of Township 8 S, Range 20 E. The pipeline would then follow an existing road until it tied-in to an existing Ultra Resources, Inc.'s existing pipeline infrastructure. This alternative was dismissed due to the presence of *Sclerocactus* individuals within 87 feet of the cross-country pipeline alignment (**Figure 2-2**). This route was identical to the route described under dismissed Alternative C.


Uintah County, Utah
T7S R20E
T7S R21E
Thurston 12-29-7-21
Thurston 13-29-7-21
Ouray National Fish Hatchery
Thurston 11-31-7-21
Thurston 12-31-7-21
T8S R20E
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The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.
Legend
Project Area Boundary
AS. C Proposed Pad
AS. C Realigned Road
AS. C Proposed Access Road
AS. C Proposed Co-located Surface Pipeline
AS. C Proposed Cross-country Surface Pipeline
AS. D Proposed Pipeline (Route 1)
AS. E Proposed Pipeline (Route 2)
Ouray National Wildlife Refuge Boundary
Fish Hatchery Water Supply Wells
N
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PROJECT NO. 126694
DRAWN: 1/13/2015
DRAWN BY: B. McDavid
CHECKED BY: L. Bridges
FILE NAME: Fig2_4DismissedAlternative.mxd
Thurston Energy
Ouray NWR 2-Well Development Program
Alternatives Dismissed from Analysis Uintah County, Utah
FIGURE
2-5

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3.0 AFFECTED ENVIRONMENT

This chapter describes the existing human environment including biological, physical, and social resources that may be affected by the Proposed Action or No Action Alternative as described in **Chapter 2**. Resources and resource values analyzed in the EA were identified as issues by the Service and/or public during the public scoping process. Where no measureable effects are anticipated, resource descriptions are limited in order to focus the analysis on the principle issues to be considered in the decision making process.

The following resources/elements (while critical) are not present in the Project Area or would not be affected. Therefore, they were dismissed from further analysis for the reasons identified below.

- **Geology/Minerals:** Compliance with existing Service and UDOGM oil and gas guidelines and regulations would make the possibility of project-initiated landslides, other mass movement, or flooding unlikely. In addition, current state-of-the-art drilling and well completion techniques and UDOGM siting and spacing regulations would make the possibility of adverse degradation to energy resources (i.e., oil, natural gas, tar sand, oil shale, etc.) or mineral deposits negligible.
- **Socioeconomics:** The Proposed Action would have negligible impact on socioeconomic conditions within and adjacent to the Project Area.
- **Livestock/Range Management:** The Project Area does not contain rangeland or designated livestock grazing allotments.
- **Wilderness:** There are no designated Wilderness or Wilderness Study Areas within or adjacent to the Project Area.
- **Noise/Light:** The Project Area and surrounding region is in a remote setting with no areas nearby where multiple dwellings or other fixed developed sites would be subject to significant levels of noise and light as a result of the proposed project.

Resources Brought Forward for Analysis

The resources that were considered for analysis in the EA include environmental elements identified by the Service that could potentially be affected by the Proposed Action and Alternatives. These resources are discussed further below with respect to their status in the Project Area.

- Air Quality including Greenhouse Gas Emissions and Climate Change
- Soils
- Water Resources including Surface Water, Groundwater, Floodplains, Wetlands, and Waters of the U.S.
- Biological Resources including Vegetation, Invasive and Noxious Weeds, Fish and Wildlife and their Habitat, and Special Status Plant and Animal Species and their Habitat
- Paleontological Resources
- Cultural Resources
- Transportation
- Recreation
- Visual Resources

3.1 Air Quality Including Greenhouse Gas Emissions and Climate Change

3.1.1 Air Quality

The Project Area is located in the Uinta Basin. The Uinta Basin is a physiographic section of the larger Colorado Plateaus province, which in turn is part of the larger Intermontane Plateaus physiographic division. It is also a geologic structural basin in eastern Utah, east of the Wasatch Mountains and south of the Uinta Mountains. The Uinta Basin is fed by creeks and rivers flowing south from the Uinta Mountains. Many of the principal rivers (Strawberry River, Currant Creek, Rock Creek, Lake Fork River, and Uinta River) flow into the Duchesne River which feeds the Green River—a tributary of the Colorado River. The Uinta Mountains forms the northern border of the Uinta Basin. They contain the highest point in Utah, Kings Peak, with a summit 13,528 feet above sea level. The Uinta Basin is a semiarid, mid-continental climate regime typified by dry windy conditions, limited precipitation, and wide seasonal temperature variations. The Uinta Basin is subject to abundant sunshine and rapid nighttime cooling. Existing point and area sources of air pollution within the Uinta Basin include the following:

- Exhaust emissions (primarily carbon monoxide [CO], nitrogen oxide [NO_X], particulate matter less than 2.5 microns in diameter [$PM_{2.5}$], and hazardous air pollutants [HAPs]) from natural gas fired compressor engines used in transportation of natural gas and pumpjack engines used to mechanically lift liquid out of the well;
- Gasoline and diesel-fueled vehicle tailpipe emissions of volatile organic compounds (VOCs), NO_X, CO, sulfur dioxide (SO_2), particulate matter less than 10 microns in diameter (PM_{10}), and $PM_{2.5}$;
- Natural gas dehydrator still-vent and reboiler emissions of VOC, CO, NO_X, $PM_{2.5}$, and HAPs;
- Sulfur oxides (SO_X), NO_X, and fugitive dust emissions from coal-fired power plants and coal mining and processing;
- Fugitive dust (in the form of PM_{10} and $PM_{2.5}$) from vehicle traffic on unpaved roads, wind erosion in areas of soil disturbance, and road sanding during winter months; and
- Long-range transport of pollutants from distant sources.

The Uinta Basin is currently designated as unclassified or attainment for all criteria pollutants by the EPA under the Clean Air Act (CAA). This classification indicates that the concentration of criteria pollutants in the ambient air is below the National Ambient Air Quality Standards (NAAQS), or adequate air monitoring is not available to determine attainment. NAAQS are standards that have been set for the purpose of protecting human health and welfare with an adequate margin of safety. Pollutants for which standards have been set include ground-level ozone (O_3), SO_2, nitrogen dioxide (NO_2), CO, and PM_{10} or $PM_{2.5}$. Airborne particulate matter (PM) consists of tiny coarse-mode (PM_{10}) or fine-mode ($PM_{2.5}$) particles or aerosols combined with dust, dirt, smoke, and liquid droplets. $PM_{2.5}$ is derived primarily from the incomplete combustion of fuel sources and secondarily formed aerosols, whereas PM_{10} is primarily derived from crushing, grinding, or abrasion of surfaces. **Table 3-1** lists ambient air quality background values for the Uinta Basin and NAAQS standards.

Two year-round air quality monitoring sites were established in summer 2009 near Redwash (southeast of Vernal, Utah) and Ouray (southwest of Vernal). The monitors were certified as Federal Reference Monitors in the fall of 2011. These monitors can be used to make NAAQS compliance determinations (EPA AQS 2012). There are additional monitors at Dinosaur National Monument, Meeker, Colorado, and Rangely, Colorado that also provide an indication as to the air quality in the Uinta Basin.

Since 2010 and in the winter of 2013, several of the monitoring sites have recorded exceedances of the current NAAQS 8-hour ozone standard of 75 parts per billion (ppb). These exceedances occurred during the winter months (January through March). **Table 3-2** presents the maximum and fourth-highest monitored ozone values at the regional monitoring stations. Note that there were no exceedances of the NAAQS observed in the 2012 monitoring season with the highest fourth-high 8-hour observation being 75 ppb at Dinosaur National Monument and the highest maximum value in the Uinta Basin (as reported by the Redwash and Ouray monitors) being 74 ppb with the highest fourth-high of 70 ppb. The relatively lower values in the winter of 2011/2012 are speculated to be due to the lack of sufficient snow cover during the winter of 2011/2012.

The ozone standard is a 3-year average, not a single maximum value. Accordingly, although there have been exceedances of the numerical value of the standard, the region is currently (as of November 2013) still considered attainment or unclassifiable for ozone. It is possible that the Uinta Basin will be declared non-attainment after the monitoring data are quality assured and evaluated. Should the area become a nonattainment area, the EPA will require the Utah Division of Air Quality (UDAQ) to prepare and implement a State Implementation Plan (SIP) that will require additional emission controls on the sources of emissions causing the ozone exceedances such that the area will reach attainment by federally-specified dates. The SIP could require future emission controls or other restrictions on the Proposed Action and Alternatives, but the nature of such requirements is not known at this time.

Table 3-1. Ambient Air Quality Background Values

Pollutant	Averaging Period(s)	Uinta Basin Background Concentration (µg/m^3)	NAAQS (µg/m^3)
SO_2	Annual	---	--[1]
	24-hour	---	--[1]
	3-hour	16.7[2]	1,300
	1-hour	21.7[2]	197
NO_2	Annual	9.0[3]	100
	1-hour	69.9[3]	188
PM_{10}	Annual	---	--[6]
	24-hour	18.0[4]	150
$PM_{2.5}$	Annual	12.3[3]	15
	24-hour	21.6[3]	35
CO	8-hour	3,910[4]	10,000
	1-hour	6,325[4]	40,000
O_3	8-hour	See Text	75 ppb

[1] The 24-hour and annual SO_2 NAAQS have been revoked by EPA.

[2] Based on 2009 data from Wamsutter Monitoring Station Data (EPA AQS Database).

[3] Annual value based on 2010/2011 data from Redwash Monitoring Station (EPA AQS Database). The value for $PM_{2.5}$ 24-hour is 2-year average from the Ouray monitor.

[4] Based on 2006 data disclosed in the Greater Natural Buttes FEIS (BLM 2012b).

Table 3-2. Additional Ozone Background Values *

Site	Year	8 hour Average Maximum (ppb)	8-hour Average Fourth High (ppb)	8-Hour Average Three Year Fourth High (ppb)
Dinosaur National Monument	2010	71	68	77.7
	2011	106	90	
	2012	83	75	
Redwash, UT	2010	105	98	88.3
	2011	125	100	
	2012	68	67	
Ouray, UT	2010	123	117	101
	2011	139	116	
	2012	74	70	
Meeker, CO	2010	73	66	64.3
	2011	65	63	
	2012	68	64	
Rangely, CO	2010	67	58	66.7
	2011	88	73	
	2012	71	69	

* US EPA Air Data: http://www.epa.gov/airdata/ (accessed April 16, 2013)

It is thought that relatively high concentrations of ozone in the region are being formed under a "cold pool" process. This process occurs when stagnant air conditions form with very low mixing heights under clear skies, snow-covered ground, and abundant sunlight. These conditions, combined with area precursor emissions (NO_X and VOCs), can create ozone episodes. This phenomenon has also been observed in similar locations in Wyoming. Because the ozone exceedances are occurring in areas where there is extensive oil and gas exploration and production, it is likely that the causes of the exceedances are related to emissions from oil and gas operations in the Basin rather than transport from other regions, although the quantitative cause and effect relationship is still unknown.

Winter ozone formation is a newly recognized issue, and the methods of analyzing and managing this problem are still being developed. Although it is well documented how ozone precursors (VOCs and NO_X) interact in the atmosphere to create ozone, the existing photochemical models are currently unable to reliably replicate winter ozone formation. This is due to the very low mixing heights associated with the unique meteorology of the ambient conditions. Further research is needed to definitively quantify the precise relative contribution of ozone precursor emissions with respect to winter time ozone concentrations. Photochemical models that replicate summer time ozone formation show that the relationship between emissions of ozone precursors and ozone concentrations is non-linear and in some cases ozone formation is driven by NOx emissions while in others it is driven by VOC emissions.

It is possible that the interaction of VOC and NOx emissions with each other may be different for winter time ozone formation than for summer ozone formation and it is not yet known if the winter time ozone formation in the Uinta Basin is VOC limited or NOx limited. Although winter time ozone formation may be different than summer time, the existing photochemical models have demonstrated that if both NOx and VOC emissions are reduced, the potential for ozone formation is also reduced. Although the relative

magnitude of emissions compared to ozone concentrations is not known for winter time ozone formation, it is expected that the same overall relationship (i.e. reduction in both NOx and VOC will reduce the potential for ozone exceedances) is expected to hold in the Uinta Basin. The potential effects of the Proposed Action and Alternatives on ozone formation are discussed in **Chapter 4** of this EA.

The UDAQ conducted limited monitoring of $PM_{2.5}$ in Vernal, Utah in December 2006. During the 2006-2007 winter seasons, $PM_{2.5}$ levels were higher than the $PM_{2.5}$ health standard that became effective in December 2006. The $PM_{2.5}$ levels recorded in Vernal were similar to other areas in northern Utah that experience wintertime inversions. The most likely causes of elevated $PM_{2.5}$ at the Vernal monitoring station are probably those common to other areas of the western United States (combustion and dust) plus nitrates and organics from oil and gas activities in the Uinta Basin. $PM_{2.5}$ monitoring that has been conducted in the vicinity of oil and gas operations in the Uinta Basin by the Redwash and Ouray monitors beginning in summer 2009 have not recorded any exceedances of either the 24-hour or annual NAAQS.

HAPs are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental impacts. The EPA has classified 187 air pollutants as HAPs. Examples of listed HAPs associated with the oil and gas industry include formaldehyde, benzene, toluene, ethylbenzene, isomers of xylene (BTEX) compounds, and normal-hexane (n-Hexane). There are no applicable Federal or State of Utah ambient air quality standards for assessing potential HAP impacts to human health. However, the State of Utah has published toxic screening levels (TSLs) that are used to assess potential health impacts of HAPs.

3.1.2 Greenhouse Gas Emissions and Climate Change

Greenhouse gases (GHGs) keep the planet's surface warmer than it would be otherwise. However, as the concentrations of these gases increase the Earth's temperature is climbing above past levels. The eight warmest years on record (since 1850) have all occurred since 1998, with the warmest year being 1998 (BMO 2009). However, according to the British Meteorological Office's Hadley Centre (BMO 2009), the United Kingdom's foremost climate change research center, the mean global temperature was relatively constant from 2000 to 2009 after the warming trend from 1950 through 2000.

The analysis of the Regional Climate Impacts prepared by the U.S. Global Change Research Program (USGCRP) suggests that recent warming in the region (including the Project Area) was nationally among the most rapid (Karl et al. 2009). Past records and future projections predict an overall increase in regional temperatures, largely in the form of warmer nights and effectively higher average daily minimum temperatures. They conclude that this warming is causing a decline in spring snowpack and reduced flows in the Colorado River. The USGCRP projects a region-wide decrease in precipitation, although with substantial variability in inter-annual conditions. For eastern Utah, the projections range from an approximate five percent decrease in annual precipitation to decreases as high as 40 percent of annual precipitation (Karl et al. 2009).

Ongoing scientific research has identified that the potential impacts of anthropogenic (man-made) GHG emissions are due to the effects of land management activities on global climate. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused carbon dioxide CO_2 equivalent concentrations to increase dramatically, and are likely to contribute to overall global climatic changes (BLM 2012b). CO_2 emissions are the predominant GHG.

In its *Fifth Assessment Report*, the Intergovernmental Panel on Climate Change (IPCC) restated that warming of Earth's climate system is unequivocal and that warming is very likely due to anthropogenic GHG concentrations (IPCC 2013). Many of the observed changes have occurred within the last 60 years and are unprecedented over long periods of time. Global mean surface and land temperatures have increased nearly 0.85 °C from 1880 to 2012. Models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. GHG concentrations in the atmosphere have increased to unprecedented levels based on records found in 800,000 year old ice cores. The largest contributor to increased radiative forcing in the atmosphere is CO_2 emissions. Evidence indicates that humans have not only have impacted the climate system, but also have had an influence in warming of the atmosphere and contributing to increases in surface temperatures. Climate models have improved as predictors of warming trends since the IPCC *Fourth Assessment Report* (IPCC 2007). The issue of global climate change is an important national and global concern that the Federal government is addressing in several ways. For example, the EPA has been working toward specific regulation of GHG through its reporting program (EPA 2014).

For many natural systems on land and in the ocean, new or stronger evidence exists for substantial and wide-ranging climate change impacts (e.g., substantial drought- and heat-induced tree mortality around the globe from 1970-2011) (IPCC 2014); however, it may be difficult to discern whether climate change is already affecting resources in the vicinity of the proposed project. Projected changes are likely to occur over several decades to a century. Therefore, many of the projected changes associated with climate change may not be measurably discernible within the reasonably foreseeable future (BLM 2012b).

3.2 Soils

The Soil Survey of the Uinta Area, Utah – Parts of Daggett, Grand, and Uintah Counties, published by the U.S. Department of Agriculture (USDA) Soil Conservation Service, is the primary source of information concerning soils in the Project Area (USDA-NRCS 2003). This survey has been supplemented by additional information available on the Natural Resource Conservation Service (NRCS) soils survey website (USDA-NRCS 2014).

The development of soils is governed by many factors, including climatic conditions (e.g., the amount and timing of precipitation, temperature, and wind), the parent material that the soil is derived from, topographic position (e.g., slope, elevation, and aspect), geomorphic processes, and vegetation type and cover. Soils textures in the Project Area include stony fine sandy loam, gravelly sandy loam, fine sandy loam, very fine sandy loam, clay loam, and loamy fine sand. Badland-Rock outcrops are also present. Soils within the Project Area belong to the Badland, Green River, Greybull, Utaline, Jenrid, Ohtog, Parohtog, Shotnick, Walkup, Stygee, Tipperary, Blackston, and Turzo general soil series. Soil map units contain one or more of these soil series and are depicted in **Figure 3-1**. **Table 3-3** summarizes the 14 soil map units present in the Project Area as well as their whole soil erosion factors and restoration potentials.

3.2.1 Erosion and Restoration Potential of Project Area Soils

To evaluate potential environmental impacts to Project Area soils, key attributes including whole soil erosion potential and soil restoration potential were identified. Soil mapping conducted by the NRCS provides information about each soil type and can be used to evaluate key attribute data and potential impacts for each soil unit.

Table 3-3. Soils Map Units within Project Area

Soil Map Unit	Acres within Project Area	Whole Soil Erosion Factor (Kw)	Restoration Potential
Badland-Rock outcrop complex, 1 to 100 percent slopes (12)	324	0.10	Not Rated
Green River loam, 0 to 2 percent slopes, occasionally flooded (88)	187	0.37	Low
Greybull-Utaline-Badland complex, 8 to 50 percent slopes (94)	91	0.10	Low
Jenrid sandy loam, 0 to 2 percent slopes (120)	421	0.28	Low
Nakoy loamy fine sand, 1 to 5 percent slopes (160)	213	0.28	Low
Ohtog-Parohtog complex, 0 to 2 percent slopes (166)	245	0.37	Low
Riverwash (191)	94	0.20	Not Rated
Shotnick loamy sand, 0 to 4 percent slopes (205)	332	0.24	Low
Shotnick-Walkup complex, 0 to 2 percent slopes (209)	96	0.32	Low
Stygee clay loam, 0 to 1 percent slopes (221)	38	0.32	Low
Tipperary loamy fine sand, 1 to 8 percent slopes (229)	202	0.43	Low
Turzo loam, 0 to 4 percent slopes (242)	285	0.37	Low
Blackston loam, 0 to 2 percent slopes (23)	76	0.37	Low
Utaline very gravelly sandy loam, 0 to 2 percent slopes (253)	19	0.10	Low
Unclassified (open water, water structures)	1,142	N/A	N/A
Total	**3,767**	**--**	**--**

Source Note: Summations may not total precisely due to rounding.
Source: USDA – NRCS 2014

3.2.1.1 Erosion Potential

Erosion potential can vary widely among soil units within a given geographic boundary. It is dependent upon particle size distribution, slope and aspect, and the amount and type of vegetation cover. The NRCS typically rates each of the soil units according to its whole soil erosion potential (Kw). The erosion potential indicates the general susceptibility of a soil to sheet and rill erosion. The value of Kw ranges from 0.02 to 0.69. The higher the Kw value of a soil type, the more susceptible the soil is to sheet and rill erosion.

Erosion hazards become critical issues when protective vegetation is removed from the soil surface. Typically, soils found on steeper slopes have a higher erosion hazard factor than those found on gentler slopes. Soils with more fine particles are at a greater risk of wind erosion, and conversely, soils with more gravel and/or stones are at a lower risk of wind erosion. The Kw values for soils within the Project Area ranges from 0.10 to 0.43, indicating a range of low to moderately-high whole soil erosion potential across the Project Area (refer to **Table 3-3**).

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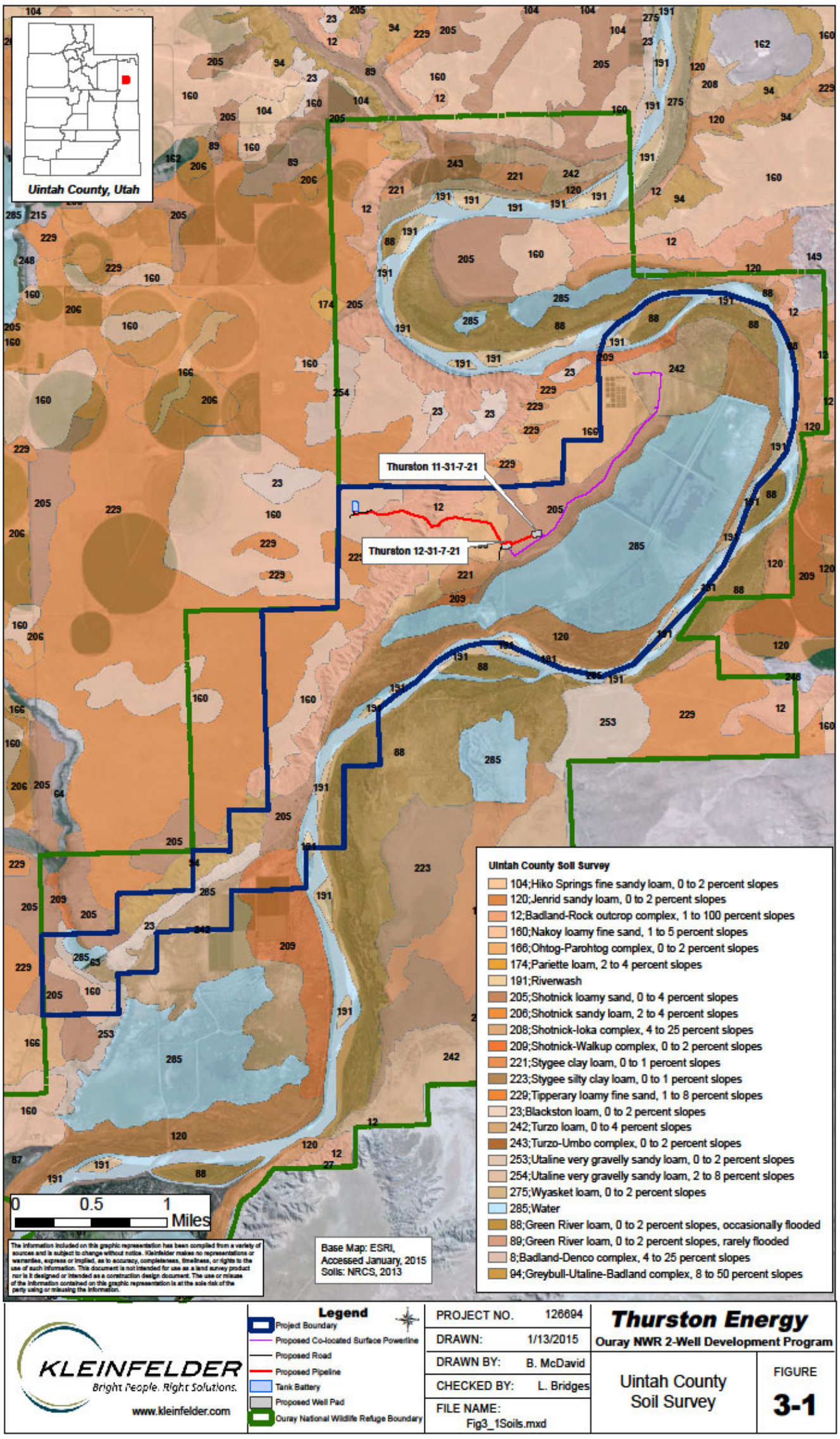
Uintah County, Utah
Thurston 11-31-7-21
Thurston 12-31-7-21
0 0.5 1 Miles
Uintah County Soil Survey
104;Hiko Springs fine sandy loam, 0 to 2 percent slopes
120;Jenrid sandy loam, 0 to 2 percent slopes
12;Badland-Rock outcrop complex, 1 to 100 percent slopes
160;Nakoy loamy fine sand, 1 to 5 percent slopes
166;Ohtog-Parohtog complex, 0 to 2 percent slopes
174;Pariette loam, 2 to 4 percent slopes
191;Riverwash
205;Shotnick loamy sand, 0 to 4 percent slopes
206;Shotnick sandy loam, 2 to 4 percent slopes
208;Shotnick-Ioka complex, 4 to 25 percent slopes
209;Shotnick-Walkup complex, 0 to 2 percent slopes
221;Stygee clay loam, 0 to 1 percent slopes
223;Stygee silty clay loam, 0 to 1 percent slopes
229;Tipperary loamy fine sand, 1 to 8 percent slopes
23;Blackston loam, 0 to 2 percent slopes
242;Turzo loam, 0 to 4 percent slopes
243;Turzo-Umbo complex, 0 to 2 percent slopes
253;Utaline very gravelly sandy loam, 0 to 2 percent slopes
254;Utaline very gravelly sandy loam, 2 to 8 percent slopes
275;Wyasket loam, 0 to 2 percent slopes
285;Water
88;Green River loam, 0 to 2 percent slopes, occasionally flooded
89;Green River loam, 0 to 2 percent slopes, rarely flooded
8;Badland-Denco complex, 4 to 25 percent slopes
94;Greybull-Utaline-Badland complex, 8 to 50 percent slopes
Base Map: ESRI, Accessed January, 2015
Soils: NRCS, 2013
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Legend
Project Boundary
Proposed Co-located Surface Powerline
Proposed Road
Proposed Pipeline
Tank Battery
Proposed Well Pad
Ouray National Wildlife Refuge Boundary
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PROJECT NO. 126694
DRAWN: 1/13/2015
DRAWN BY: B. McDavid
CHECKED BY: L. Bridges
FILE NAME: Fig3_1Soils.mxd
Thurston Energy
Ouray NWR 2-Well Development Program
Uintah County Soil Survey
FIGURE 3-1

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3.2.1.2 Restoration Potential

Restoration potential (also referred to as soil resilience) estimates a soil's inherent ability to restore functional and structural integrity after a disturbance and is measured in terms of the rate and degree of the recovery (USDA-NRCS 2003). Key attributes that factor into a soil's restoration potential include: sustaining biological activity; maintaining diversity and productivity; capturing, storing, and releasing water; storing and cycling nutrients and other elements; filtering, buffering, degrading, immobilizing, and detoxifying contaminants; providing support for plant and animal life; and protecting archaeological sites. Soil resilience is dependent upon adequate stores of organic matter, soil structure, low salt and sodium levels, nutrient levels, microbial biomass and diversity, adequate precipitation for recovery, and other soil properties. A high potential rating indicates that the soil has features that are very favorable for recovery and high restoration performance can be expected. Conversely, a low potential indicates that a soil has one or more features that are unfavorable for recovery, and poor restoration potential can be expected. As indicated in **Table 3-3**, 12 of the 14 soil types identified within the Project Area have low potential for restoration. Reclamation and remediation in this soil types would likely be difficult and may be unsuccessful in some instances. Soil resilience ratings are not provided by the NRCS for the remaining two soil map units in the Project Area.

3.3 Water Resources Including Floodplains, Wetlands, and Waters of the U.S.

3.3.1 Regional Overview

The Project Area lies within an arid to semi-arid region in the Uinta Basin of northeastern Utah. The Uinta Basin covers 6,969,600 acres (10,890 square miles) and is divided into two drainages – the North Slope and the South Slope of the Uinta Mountains. The North Slope is bounded by the Wyoming border to the north, the Uinta Mountains to the south, the Colorado border to the east, and the Bear River Basin to the west. The South Slope is bounded by the Uinta Mountains to the north, the Tavaputs Plateau and the Book Cliffs to the south, Diamond Mountain and the Colorado border to the east, and the Wasatch Mountains to the west. Kings Peak in the Uinta Mountains is the highest point in the basin (13,528 feet above mean sea level [amsl]). The lowest point in the basin (4,150 feet amsl) lies where the Green River exits in the basin above its confluence with the White River.

The North Slope of the Uinta Basin is drained by the Green River. Its primary tributary, the Duchesne River, drains the south slope. The eastern portion of the Uinta Basin, including part of Colorado, is drained by the White River, which is also a tributary to the Green River. The Utah Division of Water Resources (UDWaR) has divided the Uinta Basin into five subunits: Upper Green River, Ashley/Brush, Duchesne/Strawberry, Green River (middle and lower), and White River (UDWaR 1999). The proposed Project Area lies in the Green River watershed.

Water resources within the Project Area include the surface water features, alluvial and bedrock groundwater, floodplains, and wetlands and waters of the U.S.

3.3.2 Surface Water

Figure 3-2 shows the surface water features in the vicinity of the Project Area. The proposed project facilities would lie on nearly level ground adjacent to the 100-year floodplain of the Green River on the Leota Bottom, one of five bottomlands located within the Ouray NWR. The Green River is a major river in the western United States. It originates in Wyoming at the Continental Divide, flows through the Uinta Basin, and joins the Colorado River about 110 miles south of Green River, Utah. Major tributaries to the Green River in the Uinta Basin include the Duchesne and the White Rivers.

As previously discussed, surface water flow on the Leota Bottom has been altered with the construction of dikes and levees that control seasonal flooding of the bottomlands along the Green River within the Ouray NWR. Since construction of the Flaming Gorge Dam, the flow regime of the Green River has changed dramatically resulting in the loss of riparian habitats. In response, portions of the levees have been removed to allow for more frequent flooding of the bottomlands.

3.3.2.1 Stream Classification

The Utah Water Quality Board classifies Utah surface water resources according to quality and degree of protection (UDEQ 2008). All streams and water bodies in Utah are assigned to one or more of five classes. The Green River is classified as Class 1C, 2B, and 3B. Class 1C streams are protected for domestic use with prior treatment by treatment processes as required by the Utah Division of Drinking Water. Class 2B streams are protected for secondary contact recreation such as boating, wading, or similar uses. Class 3B streams are protected for warm water species of game fish and other warm water aquatic life.

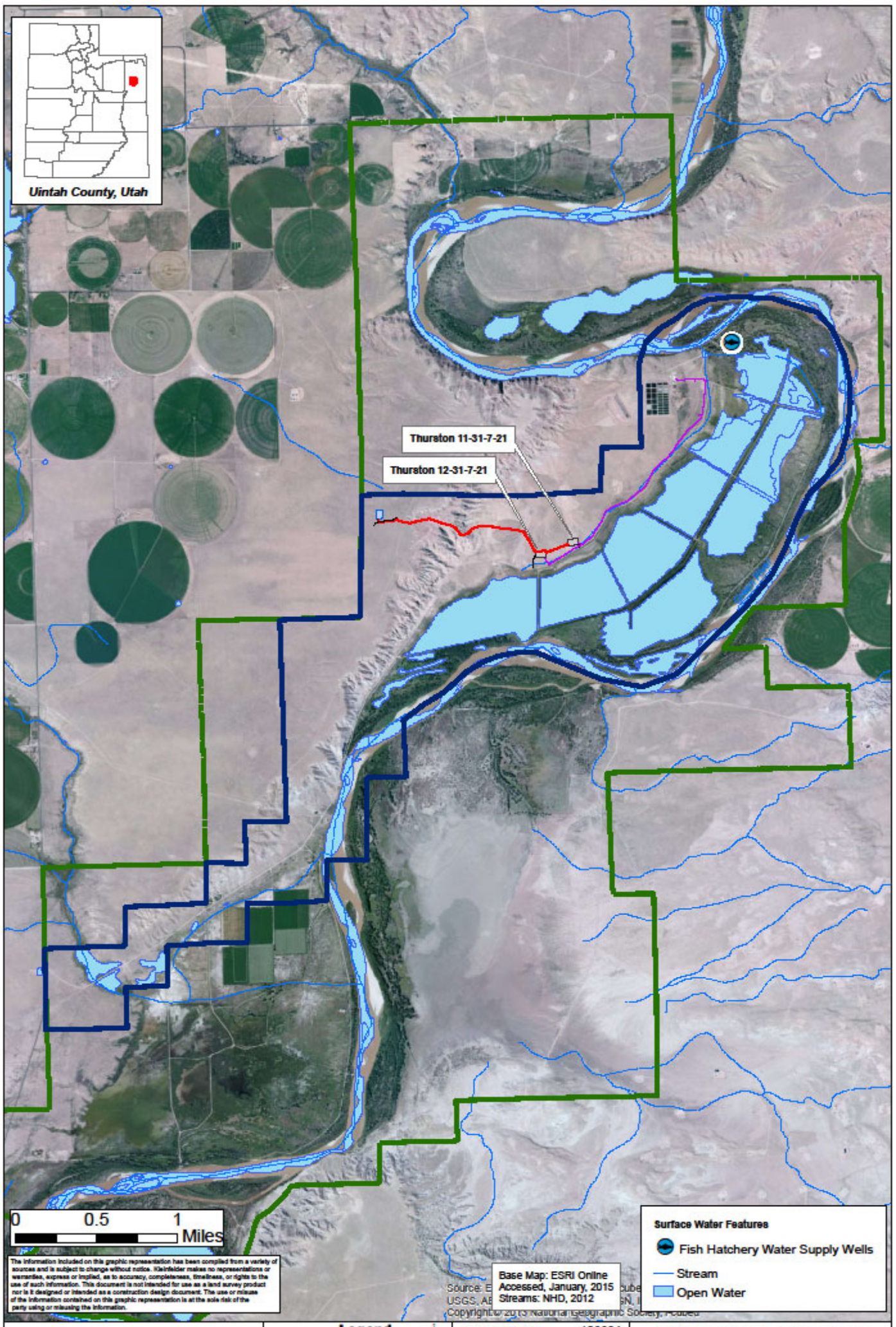
3.3.2.2 Stream Flow

Two United States Geological Survey (USGS) gauging stations are located on the Green River in the vicinity of the Project Area, including one located just downstream near Ouray, Utah (USGS 2013). This station was only monitored for stream flow discharge until 1966. A second gauging station near Jensen, Utah, has been monitored continuously since 1947 and provides a longer period of flow records. **Table 3-4** presents summary flow data for the two USGS stations.

Table 3-4. Stream Flow Data for USGS Gauging Stations

USGS Gauging Station Name and Number	Range of Monthly Mean Discharge (cfs)	Peak Daily Discharge (cfs)	Mean Annual Discharge (cfs)	Period of Record
Green River near Ouray, UT 09307000	1,925 (January) to 17,000 (June)	14,100 (June 11, 1952)	5,614	October 1947 – September 1966
Green River near Jensen, UT 09261000	1,900 (September) to 11,200 (May and June)	40,000 (May 18, 1984)	3,138	October 1946 – September 2012

Source: USGS 2013


Uintah County, Utah
Thurston 11-31-7-21
Thurston 12-31-7-21
0 0.5 1 Miles
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Base Map: ESRI Online
Accessed, January, 2015
Streams: NHD, 2012
Surface Water Features
Fish Hatchery Water Supply Wells
Stream
Open Water
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Tank Battery
Proposed Well Pad
Ouray National Wildlife Refuge Boundary
PROJECT NO. 126694
DRAWN: 1/14/2015
DRAWN BY: B. McDavid
CHECKED BY: L. Bridges
FILE NAME: Fig3_2SurfaceWaterFeatures.mxd
Thurston Energy
Ouray NWR 2-Well Development Program
Surface Water Features Uintah County, Utah
FIGURE 3-2

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Mean monthly stream flows on the Green River at Ouray range from 1,925 cubic feet per second (cfs) to 17,000 cfs, and peak in June and July. Fifty percent of all flows in the Green River are less than 2,760 cfs and 90 percent are less than 14,100 cfs at this location. Mean monthly stream flow for the Green River near Jensen ranges from 1,900 cubic feet per second (cfs) in September to 11,200 cfs in both the months of May and June (USGS 2013). **Figure 3-3** shows the hydrograph for the Green River near Jensen, Utah, for the period of March 1988 to March 2013. Flow patterns during this time period display a pattern of a rising limb, peak, and falling limb for each water year.

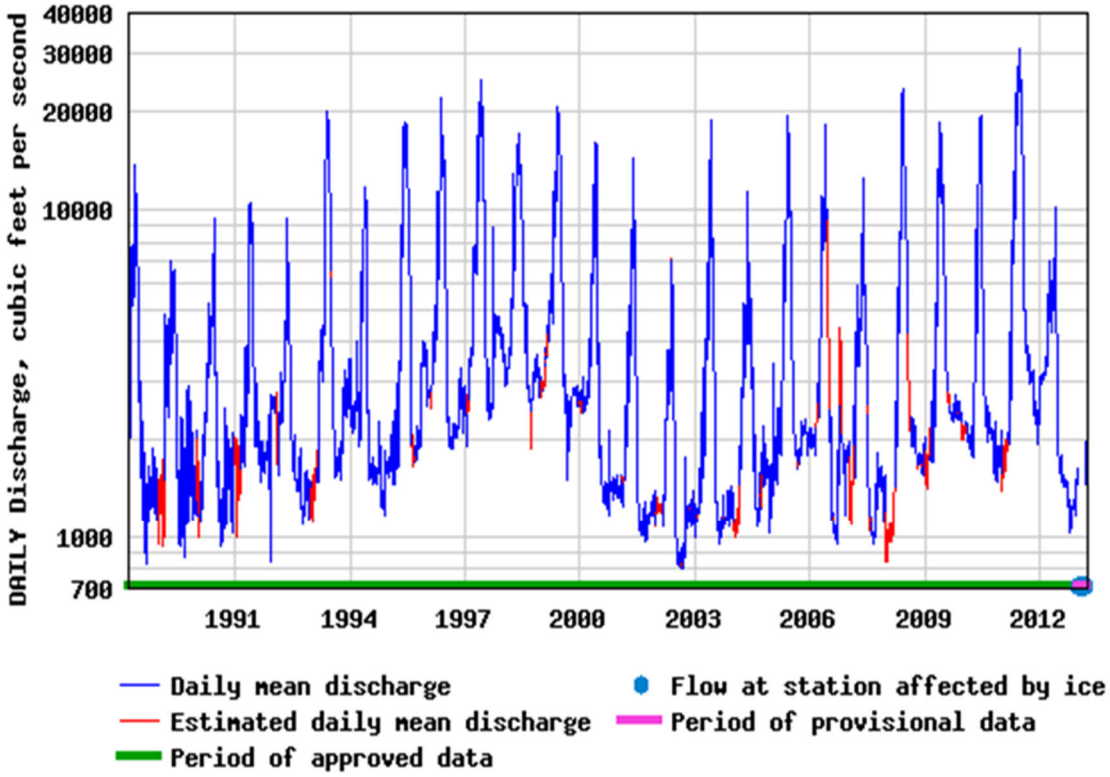

Figure 3-3. Hydrograph for USGS Gauging Station 0926100 Green River near Jensen, Utah (USGS 2013)

3.3.2.3 Surface Water Quality

Water quality refers to biological, chemical, and physical characteristics of a water sample. The sample results may then be compared to a standard defined for protection of drinking water, aquatic organisms, and other water uses. Important indicators of water quality include temperature, electrical conductivity or specific conductance (a measure of the ability of water to conduct electric current), and pH (a measure of the hydrogen ion activity). A pH less than seven indicates the water is acidic and a pH greater than seven indicates alkaline water. Chemical water quality is determined by the concentrations of various chemical constituents in the water, including metals, ionic constituents such as chloride, sulfate, and bicarbonate, and total dissolved solids (TDS). Hardness (a measure of the amount of calcium and magnesium) is also an important indicator and is reported as milligrams per liter (mg/l) of calcium carbonate ($CaCO_3$). Hardness determines the soap-consuming capacity of water as well as the tendency to leave a mineralized crust on plumbing fixtures. In addition, some of the numeric water quality standards for trace metals are dependent on the hardness of the water.

The EPA has established primary and secondary drinking water standards (EPA 2009) for approximately 90 water contaminants as required by the Safe Drinking Water Act, as amended in 1996, and CWA of 1987, as amended. These regulations specify maximum contaminant levels (MCLs) and secondary standards for specific contaminants. The MCLs are health-based. Although these MCLs legally apply only to public drinking water supplies, they are also useful as general indicators of water quality. The secondary standards are for constituents that cause cosmetic effects (such as skin or tooth discoloration) or esthetic effects (such as taste, odor, or color) in drinking water. The CWA delegated the administration of these standards to cooperating States and Tribes, so long as the State standards are at least as stringent as the Federal standards. Most States, including Utah, now have primacy for the administration of the CWA and have also adopted State water-quality standards (UDEQ 2008), including numeric standards protective of aquatic biota.

Salinity refers to the total amount of salts in solution in surface waters, including sodium. The sodium hazard of irrigation water can be estimated by the sodium adsorption ratio (SAR), which is the proportion of sodium to calcium plus magnesium in the water. Waters with SARs in the range zero to six can generally be used on all soils with little problem of a sodium buildup. When SAR's range from six to nine, chances for soil permeability problems increase (Hergert and Knudson 1997). Water with an SAR greater than nine should not be used for irrigation, even if the total salt content is relatively low. Continued use of water having a high SAR can lead to a breakdown in the physical structure of the soil, called dispersion. Dispersion causes the soil to become hard and compact when dry and increasingly impervious to water penetration.

Salinity of surface waters is of concern within the Uinta Basin and other portions of the Colorado River Basin. The 1974 Colorado River Basin Salinity Control Act, Public Law 93-320, authorized the construction, operation, and maintenance of works in the Colorado River Basin to control the salinity of water delivered to Mexico. In 1994, Public Law 98-569 amended the Colorado River Basin Salinity Control Act and directed the Secretary (or Secretary of Agriculture) to develop a comprehensive program for minimizing salt contributions from lands administered by Federal agencies. The Colorado River Basin Salinity Control Program is designed to provide the best management of the resource base and minimize increased salinity in the Colorado River System. Water quality standards for the salinity program are reviewed at least every 3 years with the most recent review occurring in 2011 (CRBSCF 2011).

Table 3-5 provides a summary of water quality analyses for samples collected from the Green River near Ouray from December 1950 to September 1951 and from October 1958 to September 1966 (USGS 2013). Waters in the Green River are described as calcium-sodium bicarbonate-sulfate type waters with moderate to very high hardness (110 – 640 mg/L as $CaCO_3$). Total dissolved solids (TDS) are variable and ranges from 168 mg/L to 1,380 mg/L, with an average of 525 mg/L. The waters are generally alkaline with pH ranging from 7.30 to 8.60 units, with an average of 7.91. Sulfate exceeded to secondary maximum contaminant level (SMCL) of 250 mg/L for 45 of 164 samples (27.4 percent). Values for all other parameters reported are less than the associated water quality standards, except for nitrate and iron. Nitrate exceeded the aquatic water standard of 4 mg/L for three samples out of 59, and iron exceeded the SMCL of 300 ug/L for one of 34 samples. Specific conductance ranges from 323 to 1,890 microsiemens per centimeter (uS/cm) with an average of 789 uS/cm. These values fall within the moderate to high salinity classes (USDA-George E. Brown, Jr., Salinity Laboratory 1954). The SAR of the waters ranges from 0.7 to 5.0 and averages 1.9. These are considered to be safe values for SAR. Total suspended solids (TSS) concentrations are quite variable, ranging from 87 mg/L to 52,300 mg/L, with an average of 4,900 mg/L. These high values are reflective of the high sediment loading to the Green River from sources in the Uinta Basin, Wyoming, and Colorado.

Table 3-5. Summary of Water Quality Analyses for the Green River at Ouray, USGS Gauging Station 09307000 (1950-1966)

Parameters	Standards		Summary Statistics		
	Drinking Water[1]	Aquatic Biota[3]	No. of Samples	Range	Mean
General Water Quality Indicators					
Temperature (°C)	-	-	182	0.6 – 28.3	16.7
Specific Conductance (uS/cm)	-	-	177	323 – 1,890	789
pH (standard units)	6.5-8.5[2]	6.5-9.0	167	7.60 – **8.60**	7.91
Total Hardness (mg/L)	-	-	167	110 – 640	267
Sodium Adsorption Ratio	-	-	156	0.7 – 5	1.90
Total Dissolved Solids (mg/L)	500[2]	1,200	174	168 – **1,380**	**525**
Total Suspended Solids (mg/L)	-	90	194	87 – **52,300**	**4,900**
Ionic Constituents					
Calcium (mg/L)	-	-	107	34 – 191	73.2
Magnesium (mg/L)	-	-	107	8.3 – 66	25.2
Sodium (mg/L)	-	-	157	19 – 250	73.5
Potassium (mg/L)	-	-	58	1.5 – 6.4	2.93
Chloride (mg/L)	250[2]	-	167	7.5 – 197	37.3
Sulfate (mg/L)	250[2]	-	164	50 – **621**	204
Fluoride (mg/L)	4[1], 2[2]	1.2 - 2.4[4]	57	0.2 – 0.8	0.39
Bicarbonate (mg/L)	-	-	168	112 – 320	195
Nitrate, total (mg/L)	10[1]	4	59	0.3 – **4.3**	1.66
Silica (mg/L)	-	-	78	7.3 – 21	12.3
Trace Metals					
Boron (ug/L)	-	-	58	50 – 300	143
Iron, total (ug/L)	300[2]	1,000	42	<0.1 – **330**	29.3

All samples are dissolved (filtered) unless otherwise noted.
Bold values exceed standards.
Average values calculated using one-half the detection limit for non-detect values
[1] Federal Drinking Water Primary Maximum Contaminant Level (MCL)
[2] Federal Drinking Water Secondary Standard
[3] Aquatic life (Utah Water Quality Standards, R317-2 Utah Administrative Code)
[4] Value is dependent on temperature and pH
Source: USGS 2013

The Utah Division of Environmental Quality (UDEQ) also monitors and assesses the Green River on a regular basis to determine if the river is supporting beneficial uses. Water quality data have been collected from the Green River at UDEQ station 4937020 located downstream of the Project Area near Ouray, Utah. These data are stored in the EPA STORET database, which reports all non-detect values simply as "Non-detect". Calculation of any central tendency (mean or median) using non-detect values requires that the instrument detection limit is known for each parameter and individual analysis. Non-detect values cannot simply be assumed to be zero. Therefore, for the STORET stations, a mean was calculated only for parameters with less than 20 percent of the available values reported as non-detect.

Table 3-6 provides a summary of water quality analyses for samples collected from UDEQ station 4937020 from February 1976 to June 2006 (EPA 2012). Values for general water quality parameters are generally lower than those recorded at the USGS station. TDS ranged from 158 to 618 mg/l with an average of 413 mg/l, pH ranged from 6.60 to 9.16, and TSS ranged from 1 to 5,768 mg/l with an average of 344 mg/l. Specific conductance ranged from 222 to 866 µmhos/cm with an average of 624 µmhos/cm. These values fall within the moderate to high salinity classes. Dissolved oxygen, pH, TDS, TSS, ammonia, sulfate, aluminum, copper, silver, and zinc exceeded standards for one or more samples each.

Table 3-6. Summary of Water Quality Analysis for Green River near Ouray, UDEQ Station 4937020 (1976-2006)

Parameters	Standards		Summary Statistics			
	Drinking Water	Aquatic Biota[3]	No. of Samples	No. of Detects	Range of Detects	Mean
General Water Quality Indicators						
Dissolved Oxygen (mg/L)	–	> 6.5	183	183	**3.8** – 14.6	8.79
pH	6.5 to 8.5[2]	6.5 to 9.0	316	316	6.60 – **9.16**	8.22
Hardness (mg/L)	–	–	159	159	88.2 – 298.1	229
Spec. Cond. (umhos/cm)	–	–	364	364	222 – 866	624
Temperature (°C)	–	–	175	175	-0.15 – 28.5	11.8
Total Dissolved Solids (mg/L)	500[2]	1,200	176	176	158 – **618**	413
Total Suspended Solids (mg/L)	–	90	174	174	1 – **5,768**	**344**
Ionic Constituents						
Bicarbonate (mg/L)	–	–	183	183	31 – 280	171
Calcium (mg/L)	–	–	183	183	23 – 82	54.4
Chloride (mg/L)	250[2]	–	181	175	0.85 – 60.1	18.7
Fluoride	2[1], 4[2]	–	17	17	0.11 – 0.34	0.26
Magnesium (mg/L)	–	–	183	183	7 – 33	22.2
Ammonia (mg/L)	–	0.11 to 0.49[4]	176	55	0.047 – **0.7**	NC
Nitrite + Nitrate, total (mg/L)	10(1[5])	4	62	54	0.02 – 1.13	0.28
Phosphate, total (mg/L)	–	–	178	168	0.02 – 4.08	0.24
Potassium (mg/L)	–	–	183	182	1.0 – 5.5	2.70
Sodium (mg/L)	–	–	183	183	13 – 110	50.3
Sulfate (mg/L)	250[2]	–	183	183	40.8 – **417**	168
Trace Metals (Dissolved)						
Aluminum (ug/L)	50 to 200[2]	750	33	14	30 – **220**	NC
Arsenic (ug/L)	10[1]	190	51	8	0.9 – 4	NC
Barium (ug/L)	2,000[1]	1,000	49	44	5.6 – 203	69.0
Boron			20	20	36 – 200	121
Cadmium (ug/L)	5	250	49	1	3	NC
Chromium (ug/L)	100[1]	74	48	1	5.2	NC
Copper (ug/L)	1300[1], 1000[2]	9	50	3	5 – **49**	NC
Iron (ug/L)	300[2]	1,000	50	28	0.4 – 190	NC
Lead (ug/L)	15[1]	2.5	49	1	1	NC
Manganese (ug/L)	50[2]	–	49	15	5 – 39	NC
Mercury	–	0.012	45	0	--	--
Nickel	–	52	3	0	--	--
Selenium (ug/L)	50[1]	5	50	32	0.5 – 5	NC
Silver (ug/L)	100[2]	1.6	49	1	**10**	NC
Zinc (ug/L)	5,000[2]	120	50	9	6 – **210**	NC

Bold values exceed standards NC = Mean not calculated due to undefined non-detect values in database

[1] Federal Drinking Water Primary Maximum Contaminant Level (MCL)

[2] Federal Drinking Water Secondary Standard (SMCL)

[3] Aquatic life (Utah Water Quality Standards, R317-2 Utah Administrative Code).

[4] Value is dependent on temperature and pH

[5] Federal Drinking Water Quality Standard is 1 mg/L for Nitrite and 10 mg/L for Nitrate

Source: EPA 2012

3.3.3 Groundwater

Groundwater in the southern Uinta Basin is contained in a complex system of shallow unconsolidated, perched, and deep confined aquifers. The principal aquifers in the Project Area include unconsolidated alluvial deposits along the Green River and deeper sandstone zones within the Uinta Formation and Green River Formation (Hood and Fields 1978; Schlotthauer et al. 1981).

Unconsolidated materials present in the valley fill beneath Leota Bottom form the principal aquifer in the Project Area. This alluvial aquifer is recharged by direct precipitation and infiltration of stream flow from the Green River. The average thickness of alluvium along the Green River has been reported to be about 30 feet. The hydraulic conductivity of these deposits ranges from about 1 to 25 feet/day (Price and Miller 1975; Holmes and Kimball 1987).

The Uinta Formation contains water-bearing zones within confined sandstone layers surrounded by fine-grained siltstones and mudstones. The Green River Formation is often considered an aquiclude and generally prevents downward movement of groundwater; however, two zones within the formation are considered to be regional aquifers. The Bird's Nest Aquifer, which may be present beneath the Project Area, lies between the upper part of the Parachute Creek Member and the Mahogany Zone. The aquifer is generally 90 to 205 feet thick, with an average thickness of about 115 feet. The hydraulic conductivity of the aquifer is enhanced by the dissolution of the nahcolite and fracturing. The Bird's Nest Aquifer contains an estimated 1.9 million acre-feet of water in storage (Holmes and Kimball 1987). The Douglas Creek Aquifer underlies much of the southern Uinta Basin and is generally about 500 feet thick. The Douglas Creek Member of the Green River Formation also produces water to some wells from fine- to medium-grained sandstone beds (Howells et al. 1987). Aquifer tests conducted in the Douglas Creek aquifer show that transmissivity ranges from about 16 to 170 cubic foot per day, and the storage coefficient ranges from about 7×10^{-4} to 2.5×10^{-4}. The Douglas Creek aquifer contains an estimated 16 million acre-feet in storage (Holmes and Kimball 1987).

3.3.3.1 Groundwater Quality

There is limited information concerning the quality of groundwater in the Project Area. Groundwater in unconsolidated alluvial aquifers in the southern Uinta Basin generally reflects the overall water quality of nearby streams, rivers, or recharge sources (Matthew Fry, personal communication, October 20, 2012). Away from outcrop areas, water quality generally is poorer and becomes much higher in dissolved solids with depth.

The Ouray NFH maintains a water supply well field within the Project Area, as shown on **Figure 3-2**. This well field produces about 630 gallons per minute (gpm) from the shallow alluvium beneath the Leota Bottom. The water from this well shows an average TDS of 396 mg/l, similar to the average value recorded for the Green River. Alkalinity (240 mg/l), ammonia (0.009 to 0.015 mg/l), pH (7.70), and hardness (324 mg/l) are also similar to the River water. The alluvial groundwater contains higher average concentrations of iron (1,500 µg/l) and manganese (900 µg/l) than the River water.

The TDS concentrations in the Uinta Formation are reported to range from 3,260 mg/L to 64,300 mg/L (Schlotthauer et al. 1981). The Bird's Nest Aquifer generally produces water with TDS between 3,000 and 10,000 mg/L, but some water from the zone is unusable (TDS more than 10,000 mg/L). The TDS of water in the Douglas Creek aquifer is also generally between 3,000 and 10,000 mg/L. Use of groundwater from the Uinta and Green River Formations is limited to livestock watering and industrial uses because of its poor quality in terms of TDS and hardness.

3.3.4 Floodplains, Wetlands, and Waters of the U.S.

3.3.4.1 Floodplains

Floodplains are typically dry lands that are susceptible to inundation by adjacent rivers or streams. The extent of floodplain inundation depends in part on the flood magnitude. Floodplains generally contain unconsolidated sediments, often extending below the bed of the stream or river, which consists of accumulations of sand, gravel, silt, and clay formed by deposition of sediment carried by runoff from the mesa tops and canyon walls during storm and snowmelt events (USFWS 1979a). These floodplains support riparian vegetation and wetlands and are often underlain by alluvial groundwater aquifers. Floodplains typically support rich ecosystems, both in quantity and diversity. Nutrient levels, primary productivity, and macro invertebrate populations are highest in the floodplain depressions following a flood event. The Green River floodplains also serve as important nursery and forage habitat for the endangered razorback sucker and bonytail chub.

Currently, floodplains are protected by Executive Order 11988, which requires that all Federal agencies take action to reduce the risk of flood loss; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains.

Within the Project Area, zones likely to be inundated from a 100-year, 24-hour event are indicated on **Figure 3-4**.

3.3.4.2 Wetlands and Waters of the U.S.

Under Section 404 of the CWA, the USACE has authority to regulate the discharge of dredged and fill material into waters of the U.S. including non-navigable tributaries that typically flow year-round or have flow at least seasonally (e.g., typically 3 months). Wetlands can be jurisdictional under Section 404 as a subset of waters of the U.S. Wetlands, as defined by the EPA and the USACE in the Wetland Delineation Manual are "those areas that are inundated or saturated by surface or groundwater at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE, Environmental Laboratory 1987).

Wetland areas can generally be identified in the Project Area during the spring and summer months by the green belt of vegetation adjacent to the Green River or in marsh areas where ground water is close to the soil surface. Drought conditions can make identification of riparian and wetland habitat problematic.

Wetlands can be distinguished from other vegetative communities by the unique combination of hydrology, soils, and vegetation. A location's hydrology is typically the determining characteristic distinguishing wetlands from adjacent upland habitat. The hydrology of any site is linked in part to precipitation, but the development and propagation of wetland habitat is dependent on the long-term presence of available water. As discussed in **Section 1.1** and **Section 3.3.2,** the flow regime of the Green River has changed dramatically since the construction of Flaming Gorge Dam, resulting in loss of wetland and riparian habitat. As a result, surface water flow on the Leota Bottom has been altered with the construction of dikes and levees to control seasonal flooding along the Green River within the Refuge. In more recent years, the Ouray NWR staff has created breaches in the levee to allow overbank flooding to occur when river levels are high enough

INSERT Figure 3-4. 100-Year Floodplain

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As shown in **Figure 3-4**, wetlands comprise approximately 1,183 acres or 32 percent of the Project Area. The USFWS National Wetlands Inventory (NWI) has identified two primary wetland vegetation types: Freshwater Emergent Wetland and Freshwater Forested/Shrub Wetland. These wetlands occur east and south of Wildlife Refuge Road and abut the Green River.

The USACE has established a series of Nationwide Permits (NWP) that authorize certain activities in Waters of the U.S., provided that a proposed activity can demonstrate compliance with standard conditions. Generally, USACE requires an individual permit for an activity that will affect an area equal to or in excess of 0.5 acre of Waters of the U.S. However, the USACE, Utah Regulatory Office verified on February 27, 2012, that none of the project facilities were located within Waters of the U.S., including wetlands (see **Appendix B,** Hollis Jencks, personal communication, May 7, 2012). As such, no USACE Section 404 permit will be required for the Project.

3.4 Biological Resources

3.4.1 General Vegetation

The Project Area is located within the intermountain semi-desert region of the Colorado Plateau Floristic Province. This region mixes an array of geographic substrates, topographic features, climatic regimes, soil types, and other physical factors, which have combined to produce a mosaic of floristic components and associated natural habitats. The plant communities encountered in the Project Area consist of typical inter-mountain basin shrubland associations. These communities are often mixed, transitional, or widely distributed.

The vegetation communities identified in this analysis are derived from data obtained from the Southwest Regional Gap Analysis Project (SWReGAP) as well as vegetation land cover descriptions provided by the USGS Gap Analysis Program (USGS-NGAP 2005). The SWReGAP data provides land cover and vegetation characterization for the southwestern United States (Arizona, Colorado, New Mexico, Nevada and Utah) and encompasses 560,000 square miles within these states. While these data are helpful in identifying general land cover patterns, they are derived from satellite and aerial imagery that may not completely depict the specific vegetation composition, distribution, and quantity within the Project Area at the time of construction due to the scale of the survey. Data on wetlands were supplemented with interpretation of aerial photographs and information from USFWS NWI maps (USFWS-NWI 1983). In this effort, a total of 14 vegetation communities are recognized and mapped within the Project Area, as depicted in **Figure 3-5**.

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INSERT Figure 3-5. Vegetation Cover Types

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Table 3-7 summarizes acreage of vegetation communities within the Project Area. These 13 vegetation types can be grouped into five general land cover types. These include Scrub/Shrub, Grasslands/Herbaceous, Riparian, Barren Lands, and Altered or Disturbed Land.

Table 3-7. National Vegetation Classification Standard Recognized Vegetation Communities within the Project Area

Land Cover Type	Vegetation Community	Acres Within the Project Area[1]	Percent Within the Project Area
Scrub/Shrub	Colorado Plateau Mixed Low Sagebrush Shrubland	3	0.1
	Inter-Mountain Basin Mixed Salt Desert Shrubland	123	3.3
	Colorado Plateau Pinyon-Juniper Shrubland	14	0.4
	Inter-Mountain Basins Big Sagebrush Shrubland	33	0.9
Total		**173**	**4.6**
Grasslands/ Herbaceous	Inter-Mountain Basins Semi-Desert Shrub Steppe	393	10.4
Total		**393**	**10.4**
Riparian	Inter-Mountain Basins Greasewood Flat	400	10.6
	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	879	23.3
Total		**1,279**	**34.0**
Barren Lands	Colorado Plateau Mixed Bedrock Canyon and Tableland	275	7.3
	Inter-Mountain Basins Shale Badland	101	2.7
Total		**376**	**10.0**
Open Water	Open Water	572	15.2
Total		**572**	**15.2**
Altered or Disturbed Land	Invasive Annual Grassland	340	9.0
	Invasive Southwest Riparian Woodland and Shrubland	575	15.3
	Agricultural Lands	48	1.3
	Existing Development	11	0.3
Total		**974**	**25.9**
Grand Total		**3,767**	**100.0**

[1] Total acreage estimates are based on GIS-software calculations and may not equal total acreage by soil map unit due to rounding, removal of overlapping development, and minute boundary discrepancies. GIS-based calculations are considered more accurate than estimates calculated using simple addition and therefore, will be used throughout this document.

*Note: Individual acreages may not equal totals due to rounding.

Source: Lowry et al. 2007.

3.4.1.1 Scrub/Shrub

The Scrub/Shrub land cover type covers approximately 173 acres (4.6 percent) within the Project Area and includes four vegetation cover types: Colorado Plateau Mixed Low Sagebrush Shrubland, Inter-mountain Basins Mixed Salt Desert Shrubland, Colorado Plateau Pinyon-Juniper Shrubland, and Inter-Mountain Basins Big Sagebrush Shrubland. These vegetation types are found on the western half of the Project Area outlining the North American Warm Desert Badlands. The four scrub/shrub vegetation types that occur in the Project Area are described briefly below.

Colorado Plateau Mixed Low Sagebrush Shrubland

This vegetation cover type occurs in the Colorado Plateau, Tavaputs Plateau, and Uinta Basin in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 6,000 feet amsl. Soils are often rocky, shallow, and alkaline. It includes open shrublands and steppe dominated by black sagebrush (*Artemisia nova*) or Bigelow sagebrush (*Artemisia bigelovii*), and sometimes with Wyoming big sagebrush (*Artemisia tridentata spp. wyomingensis*). The Colorado Plateau Mixed Low Sagebrush Shrubland type covers approximately 3 acres (0.1 percent) within the Project Area.

Inter-Mountain Basins Mixed Salt Desert Shrubland

This widespread shrub-steppe system is dominated by perennial grasses and forbs and occurs throughout much of the northern Great Basin and Wyoming. Soils are typically deep and nonsaline, often with a microphytic crust. Shrubs may increase following heavy grazing and/or with fire suppression. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more saltbush species such as shadscale saltbush (*Atriplex confertifolia*), fourwing saltbush (*Atriplex canescens*), cattle saltbush (*Atriplex polycarpa*), or spiny saltbush (*Atriplex spinifera*). Other shrubs present to codominate may include Wyoming big sagebrush, yellow rabbitbrush (*Chrysothamnus viscidiflorus),* rubber rabbitbrush (*Ericameria nauseosa*), Mormon tea (*Ephedra nevadensis*), spiny hopsage (*Grayia spinosa*), winterfat (*Picrothamnus desertorum*), bud sagebrush (*Picrothamnus desertorum*), or shortspine horsebrush (*Tetradymia spinosa*). These shrublands and steppe habitats are the most prevalent vegetation community in the Project Area, covering approximately 123 acres (3.3) percent of the Project Area.

Colorado Plateau Pinyon-Juniper Woodland and Shrubland

This cover type is present in the dry mountains and foothills of the Colorado Plateau region along the Western Slope of Colorado through to the Wasatch Range. Typically found at lower elevations ranging from 5,000 to 8,000 feet amsl, this community is dominated by dwarfed (usually less than 10 feet tall) two-needle pinyon (*Pinus edulis*) and/or Utah juniper (*Juniperus osteosperma*) trees that form extensive tall shrublands. These trees occur in a mosaic with taller (usually greater than 10 feet tall), more dense woodland associations of two-needle pinyon and/or Utah juniper. These stands may be solely dominated by Utah juniper (*Juniperus osteosperma*) or may be co-dominated by other Juniperus species. Other shrubs that may occur in this vegetation community may include black sagebrush (Artemisia nova), Wyoming big sagebrush or yellow rabbitbrush. This vegetation type is present within 14 acres (0.4 percent) of the Project Area.

Inter-Mountain Basins Big Sagebrush Shrubland

Located in basins between mountain ranges, plains, and foothills, this vegetation cover type occurs throughout much of the western U.S., at elevations between 5,000 and 7,500 feet amsl. Soils are typically deep, well drained, and non-saline. These shrublands are dominated by Basin big sagebrush (*Artemisia tridentata ssp. tridentata*) and/or Wyoming big sagebrush. Scattered juniper (*Juniperus spp.*), greasewood (*Sarcobatus vermiculatus*) and saltbush (*Atriplex spp.*) may be present in some stands. Rubber rabbitbrush

(*Ericameria nauseosa*), yellow rabbitbrush, antelope bitterbrush (*Purshia tridentata*), or mountain snowberry (*Symphoricarpos oreophilus*) may co-dominate altered/disturbed stands. This vegetation type covers about 33 acres (0.9 percent) within the Project Area.

3.4.1.2 Grasslands/Herbaceous

The Grasslands/Herbaceous land cover type covers approximately 393 acres within the Project Area and encompasses one vegetation cover type, the Inter-Mountain Basins Semi-Desert Shrub Steppe. Grasslands/Herbaceous is found throughout the Project Area and is most common around wetland and agricultural areas. The description of an Inter-Mountain Basins Semi-Desert Shrub Steppe can be found below.

Inter-Mountain Basins Semi-Desert Shrub Steppe

This cover type includes shrublands of typically saline basins, alluvial slopes, and plains across the intermountain western U.S. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but they can include some coarser-textured soils. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more saltbush species, with a sparse to moderately dense herbaceous layer dominated by perennial grasses. Characteristic grasses include Indian ricegrass, blue grama, saltgrass (*Distichlis spicata*), needle-and-thread grass, James' galleta, Sandberg bluegrass (*Poa secunda*), and alkali sacaton (*Sporobolus airoides*). Characteristic shrub species include fourwing saltbush, sand sagebrush (*Artemisia filifolia*), Greene's rabbitbrush (*Chrysothamnus greenei*), yellow rabbitbrush, rubber rabbitbrush, broom snakeweed (*Gutierrezia sarothrae*), and winterfat. Scattered Basin big sagebrush species may be present but does not dominate. This vegetation type covers approximately 393 acres (10.4 percent) of the Project Area.

3.4.1.3 Riparian

The Riparian land cover type is the most abundant, covering approximately 1,279 acres within the Project Area, and includes two vegetation cover types: Inter-mountain Basins Greasewood Flat and Rocky Mountain Lower Montane Riparian Woodland and Shrubland. These areas are the most abundant in the Project Area and are primarily in the central, northwest, and southwest regions. The descriptions of each of the two cover types can be found below.

Inter-Mountain Basins Greasewood Flat

This vegetation cover type occurs throughout much of the western United States in intermountain basins and extends onto the western Great Plains. It typically occurs near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas. Sites typically have saline soils and a shallow water table. They may flood intermittently but remain dry for most growing seasons. This vegetation cover type usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or codominated by greasewood (*Sarcobatus vermiculatus*), fourwing saltbush, shadscale saltbush, or mulefat may be present to codominant. Occurrences are often surrounded by mixed salt desert scrub. This woody vegetation community covers approximately 400 acres (10.6 percent) of the Project Area.

Rocky Mountain Lower Montane Riparian Woodland and Shrubland

This vegetation cover type is found in the foothills, canyon slopes, and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. These shrublands occur between 5,000 and 9,500 feet amsl in elevation and are usually associated with exposed sites, rocky substrates, and dry conditions, all of which limit tree growth. Dominant trees may include boxelder (*Acer*

negundo), narrowleaf cottonwood (*Populus angustifolia*), balsam poplar (*Populus balsamifera*), eastern cottonwood (*Populus deltoids*), Fremont cottonwood (*Populus fremontii*), Douglas-fir (*Pseudotsuga menziesii*), blue spruce (*Picea pungens*), peachleaf willow (*Salix amygdaloides*), or Rocky Mountain juniper (*Juniperus scopulorum*). Dominant shrubs include Rocky Mountain maple (*Acer glabrum*), speckled alder (*Alnus incana*), water birch (*Betula occidentalis*), red osier dogwood (*Cornus sericea*), river hawthorn (*Crataegus rivularis*), stretchberry (*Forestiera pubescens*), chokecherry (*Prunus virginiana*), skunkbush sumac (*Rhus trilobata*), park willow (*Salix monticola*), Drummond's willow (*Salix drummondiana*), narrowleaf willow (*Salix exigua*), sandbar willow (*Salix irrorata*), shining willow (*Salix lucida*), or silver buffaloberry (*Shepherdia argentea*). The Rocky Mountain Lower Montane Riparian Woodland and Shrubland type occurs on approximately 879 acres (23.3 percent) of the Project Area.

3.4.1.4 Barren Lands

The Barren Lands land cover type covers approximately 376 acres (10.0 percent) within the Project Area and includes two vegetation cover types, which include Colorado Plateau Mixed Bedrock Canyon and Tableland as well as the Inter-Mountain Basins Shale Badland. This cover type is prevalent along a western steep elevation gradient and along the Green River in arid sediment deposits. A description of these cover types can be found below.

Inter-Mountain Basins Shale Badland

This widespread vegetation cover type of the intermountain western U.S. is composed of barren and sparsely vegetated substrates typically derived from marine shales; however, this vegetation community also includes substrates that are derived from siltstones and mudstones (clay) with a high rate of erosion and deposition. Landforms are typically rounded hills and plains that form a rolling topography. Environmental variables that lead to sparse dwarf-shrubs are harsh soil properties and the high rate of erosion and deposition. Species in this category include mat saltbush, Gardner's saltbush, birdfoot sagebrush, and herbaceous vegetation. The Inter-Mountain Basins Shale Badland type covers approximately 101 acres (2.7 percent) within the Project Area.

Colorado Plateau Mixed Bedrock Canyon and Tableland

The distribution of this vegetation cover type is centered on the Colorado Plateau where it is composed of barren and sparsely vegetated landscapes on steep cliff faces, narrow canyons, and open tablelands of predominantly sedimentary rocks, such as sandstone, shale, and limestone. The vegetation is characterized by very open tree canopy or scattered trees and shrubs with a sparse herbaceous layer. Common varieties include two-needle pinyon, Ponderosa pine (*Pinus ponderosa*), Juniper species, littleleaf mountain mahogany (*Cercocarpus intricatus*), and other short-shrub and herbaceous species. These species have adapted to using moisture from cracks and pockets where soil accumulates as habitat. The Colorado Plateau Mixed Bedrock Canyon and Tableland type covers approximately 275 acres (7.3 percent) within the Project Area.

3.4.1.5 Altered or Disturbed Land

Altered or Disturbed Land accounts for approximately 974 acres (25.9 percent) within the Project Area and includes four vegetation cover types: Invasive Annual Grassland, Invasive Southwest Riparian Woodland and Shrubland, Agricultural Lands, and Existing Development. While not a necessarily a vegetation cover type, the Existing Development category includes all scraped or excavated bare land which is, or has been, in transition to a developed state. The four categories of altered or disturbed vegetation communities that occur in the Project Area are described below.

Invasive Annual Grassland and Invasive Southwest Riparian Woodland and Shrubland

The Invasive Annual Grassland type covers approximately 340 acres (9.0 percent) of the Project Area and is concentrated around the Refuge and North American Warm Desert Badlands within the Project Area. These areas are dominated by introduced annual grass species such as cheatgrass (*Bromus tectorum*) and California brome (*Bromus carinatus*). The Invasive Southwest Riparian Woodland and Shrubland type covers approximately 575 acres (15.3 percent) and is dominated by tamarisk (*Tamarix spp*.). This vegetation cover type is found along the Green River and intermixed with Rocky Mountain Lower Montane Riparian Woodland and Shrublands.

Agricultural Lands

The agricultural vegetation type includes areas used for the production of alfalfa and barley. There are also areas of fallowed and disked land that are used for agriculture. The agricultural vegetation community accounts for approximately 48 acres (1.3 percent) of the Project Area and is located in the southwest-most region of the Project Area along near the Green River.

Existing Development

This category, which covers an estimated 11 acres (0.3 percent) of the Project Area, includes all scraped or excavated bare land which is currently in, or has previously been in, transition to a developed state. Included in this category are all lands covered by urban development, including residential, transportation and utility infrastructure, well pads, mines, quarries, and other surface features. Isolated structures such as farmsteads and low density residential areas are also included in this category. Included in this category is an existing Ouray NFH facility which has developments in the northernmost and southernmost portions of the Project Area.

3.4.2 Invasive and Noxious Weeds

A "noxious weed" is legally defined under both Federal and State laws and is often used interchangeably with the term "invasive weed". The Federal Plant Protection Act of 2000 (formally the Noxious Weed Act of 1974 [7 U.S.C. §2801-2814]) states that a noxious weed is defined as "any plant or plant product that that can directly or indirectly injure or cause damage to crops, livestock poultry or other interests to agriculture, irrigation, navigation, the natural resources of the United States, the public health or the environment" (USDA- Animal Plant and Health Inspection Service 2010; Institute of Public Law 1994). Every state is federally mandated to support and enforce the rules and regulations stipulated under the Federal Plant Protection Act and manage their lands accordingly. In addition to Federal legislation regarding noxious weeds, the Utah Department of Agriculture and Food (2010) has crafted the Utah Noxious Weed Act. Under this act, the Commissioner of Agriculture and Food defines a noxious weed as any plant that is especially injurious to public health, crops, livestock, land or other property (Utah State Legislature 2007). The term "invasive weeds" may include plants not listed as noxious weeds, but are not native to their particular area.

In areas of disturbance, vegetation communities may have a heightened susceptibility to the introduction of noxious weeds. Noxious weeds are most abundant in areas of prior surface disturbance such as roadsides, agricultural lands, utility ROW, areas of grazing, well pads, and adjacent washes. The prevention of introduction of noxious weeds is a priority to Federal, State, and county agencies. Under Executive Order (EO) 13112 of February 3, 1999 – Invasive Species, Federal agencies shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere, unless it has been determined that the benefits of such actions outweigh the potential harm caused by invasive species and that all feasible and prudent measures to minimize the risk of harm will be taken in conjunction with the actions.

Some 13 species of noxious weeds are known to occur within the Refuge (see **Table 3-8**). The most abundant within the Project Area is saltcedar (*Tamarix ramosissima*), which occurs on approximately 529 acres (14.3 percent) of the Project Area along the Green River and along the road edges of Refuge Road. Kochia (*Kochia scoparia*) and cheatgrass (*Bromus tectorum*) are also abundant and each occurs on approximately 2,000 acres of the Refuge. Other noxious weeds found on the Refuge include Russian olive (*Elaeagnus angustifolia*), Russian thistle (*Salsola tragus*), Russian knapweed (*Centaurea repens*), broad-leaved peppergrass (*Lepidium latifolium*), and Canada thistle (*Cirsium arvense*). These species are most commonly found along the Green River and other disturbed areas within the Refuge. The distributions of mapped noxious weeds that are known to occur on the Ouray NWR are depicted in **Figure 3-6.**

Table 3-8. Noxious Weeds Known to Occur on the Ouray NWR

Common Name	Scientific Name	State or County Noxious Weed List
Musk Thistle	*Cardus Nutans*	State List Class B
Broad-leaved Peppergrass*	*Lepidium latifolium*	State List Class B
Russian Knapweed*	*Centaurea repens*	State List Class B
Scotch Thistle	*Onopordum acanthium*	State List Class B
Canada Thistle*	*Cirsium arvense*	State List Class C
Field Bindweed	*Convolvulus arvensis*	State List Class C
Saltcedar*	*Tamarix ramosissima*	State List Class C
Russian Olive*	*Elaeagnus angustifolia*	Uintah County List C
Russian Thistle*	*Salsola tragus*	N/A
Bull Thistle	*Cirsium vulgare*	N/A
Siberian Elm	*Ulmus pumila*	N/A
Kochia	*Kochia scoparia*	N/A
Cheatgrass	*Bromus tectorum*	N/A

Source: USFWS 2013b *Known to occur within the Project Area

INSERT Figure 3-6. Noxious Weeds

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3.4.3 Fish and Wildlife

3.4.3.1 Wildlife Habitats

The Project Area and surrounding region support a variety of natural vegetation communities and landscape features that offer a diversity of wildlife habitat types. While these habitat types correspond with the vegetation community types discussed in **Section 3.4.1** above, they are also defined by a number of distinct landscape features such as washes and gullies, rock outcrops and hillsides, cliffs and badlands. All contribute to the diversity and abundance of wildlife in the area as they generally provide a microhabitat for wildlife uniquely adapted to or dependent on these features. Habitats for numerous wildlife species, including small mammals, game species, various species of rodents and bats, migratory birds, raptors, herptiles, and aquatic species occur in the Project Area. These species occupy the area on a year-round or seasonal basis. Species' occurrences are typically dependent on habitat availability, carrying capacities, and the degree of existing habitat quality.

3.4.3.2 General Wildlife

Small mammals potentially found within the Project Area and surrounding region include the white-tailed jackrabbit (*Lepus townsendii*), black-tailed jackrabbit (*Lepus californicus*), coyote (*Canis latrans*), badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), northern river otter (*Lutra canadensis*), American beaver (*Castor canadensis*), and various species of rodents, foxes, and bats. Large non-game mammals include moose (*Alces alces*), bison (*Bos bison*), black bear (*Ursus americanus*), mountain lion (*Felis concolor*), and lynx (*Lynx spp.*). Bird species that may be present include the black-throated sparrow (*Amphispiza bilineata*), Say's phoebe (*Sayornis saya*), ferruginous hawk (*Buteo regalis*), Brewer's sparrow (*Spizella breweri*), sage sparrow (*Amphispiza belli*), grasshopper sparrow (*Ammodramus savannarum*), and horned lark (*Eremophila alpestris*). Herptiles potentially found in the region include the wandering garter snake (*Thamnophis elegans vagrans*), Great Basin gopher snake (*Pituophis catenifer deserticola*), western rattlesnake (*Crotalus viridis*), northern leopard frog (*Rana pipiens*), western whiptail (*Cnemidophorus tigris*), sagebrush lizard (*Sceloporus graciosus*), and short-horned lizard (*Phymosoma douglassii*) (USFWS 2000a).

Although all of these species are important members of wildland ecosystems and communities, most are common and have wide distributions within the region. Consequently, the relationship of most of these species to the proposed project is not discussed in the same depth as species that are threatened, endangered, sensitive, of special economic interest, or are otherwise of high interest or unique value.

3.4.3.3 Big Game

Three resident big game species are known to occur in the Project Area and surrounding region: pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), and American elk (*Cervus elaphus*). Habitats and management prescriptions for these species as well as their distribution within the Project Area and surrounding region are described below.

Pronghorn

Pronghorn typically inhabit grasslands and semi-desert shrublands of the western and southwestern United States. The species is common in Utah, where it can be found in desert, grassland, and sagebrush habitats (UDWR 2009). Of these habitats, nearly all pronghorn populations in Utah occur in shrub steppe habitat, where large expanses of low rolling or flat terrain characterize the topography. Pronghorn are typically less abundant in xeric habitats because the abundance of water is important to long-term population viability. Pronghorn habitat in Utah often shows a scarcity of naturally available water

(UDWR 2009). Pronghorn are commonly found in small groups and tend to be most active during the day (UDWR 2009). Typically, daily movements do not exceed 6 miles. Some pronghorn make seasonal migrations between summer and winter ranges, but these migrations are often tied to the availability of succulent plants and not local weather conditions such as snow accumulations (Fitzgerald et al. 1994).

The UDWR manage pronghorn, along with other big game herds within the State, at the Herd Unit level. Pronghorn that occur within the Ouray NWR and surrounding region are considered to be a part of the Vernal and Bonanza subunits of the South Slope Herd Unit (Herd Units #9B and #9D). Trend counts of pronghorn and other big game populations are conducted annually with fixed-wing aircraft between February and April. Those are supplemented with pre-season classification counts from the ground in August and September to determine fawn production and buck:doe ratios. The historic statewide population trend for pronghorn from 1999 to 2011 has trended upwards from a population estimate just below 10,000 in 1999 to just below 13,000 in 2011 (UDWR 2012c).

The latest (2011) population estimate for the Vernal subunit was approximately 126 individuals (UDWR 2012c). Pre-hunt production ratios in 2011 were estimated at 51 fawns and 43 bucks per 100 does (UDWR 2012c). A total of 41 individuals were successfully harvested from the herd in 2011, including 27 bucks and 14 does. The harvest history for this subunit generally reflects a fluctuating pronghorn population.

The latest (2011) population estimate for the Bonanza subunit is approximately 298 total animals; a 33 percent increase from 2010's estimate of 223 (UDWR 2012c). Pre-hunt production ratios in 2011 were estimated to be 49 fawns and 64 bucks per 100 does (UDWR 2012c). According to spring trend data in this subunit, the population has declined from approximately 836 adults in 2003 to 475 adults in 2009 (UDWR 2011b).

Pronghorn occupy portions of the Project Area on a year-round basis and are found in low numbers in a variety of upland habitats that are characterized by low rolling, wide-open, expansive areas within scrub and shrub vegetation communities. The UDWR has designated approximately 501 acres (13 percent) of the Project Area as year-long substantial habitat for pronghorn. The remaining 3,266 acres (87 percent) of land within the Project Area is unclassified (see **Figure 3-7**). Although there is no year-long crucial habitat for pronghorn within the Project Area, it does occur immediately adjacent to the Project Area on the east side of the Green River.

Mule Deer

Mule deer are common statewide in Utah, where the species can be found in many types of habitat, ranging from open deserts to high mountains to urban areas (UDWR 2012a). Typical habitats include short-grass and mixed-grass prairies, sagebrush and other shrublands, coniferous forests, and shrubby riparian areas. Mating occurs in late fall, and females may produce a litter of one or two fawns in late spring or early summer (UDWR 2012d). Fawn production is closely tied to the abundance of succulent green forage during the spring and summer months, whereas deer are especially reliant on shrubs for forage during the winter (UDWR 2012a). Thick-treed habitats may offer shelter from severe weather, but offer little in the way of forage (UDWR 2012a).

Mule deer that occupy the Project Area are considered to be part of the Vernal and Bonanza subunits of the South Slope Herd Unit (Units #9B and #9D). The Vernal subunit (Unit #9B) had a winter population estimate of 11,600 mule deer (winter population estimates for Unit #9D were not available), which is approximately 11 percent below the 13,000 population objective for this subunit (UDWR 2012a). Pre-

hunt production ratios for Units # 9B and 9D in 2011 were 61 fawns per 100 does, which was slightly below the 3 year average of 66 from 2009 to 2011 (UDWR 2012a).

Mule deer occupy portions of the Project Area on a year-round basis. The UDWR has identified approximately 2,967 acres (79 percent) of the Project Area as year-long, crucial value fawning habitat and about 24 acres (less than 1 percent) as year-long, substantial. The remaining 776 acres (21 percent) of land within the Project Area is unclassified (see **Figure 3-8**).

Elk

Elk have an extremely variable diet and occupy a variety of habitats in Utah (UDWR 2005). Elk are common in most mountainous regions of Utah, where they can be found in mountain meadows and forests during the summer and in foothills and valley grasslands during the winter (UDWR 2010). The species can also be found in the low deserts of Utah (UDWR 2005). Like other members of the deer family, this species relies on a combination of grasses, forbs, and woody plants depending on their availability throughout the year (UDWR 2010). Elk consume mostly grasses and forbs during the summer and browse during the winter (UDWR 2005).

Currently, there are no UDWR-designated seasonal ranges for elk within the Project Area; however, elk have become a significant big game animal of interest within the Ouray NWR. As of 2011, the Project Area has been opened to limited elk hunting for the first time. Elk that occupy the Project Area and surrounding region are considered to be part of the South Slope-Vernal/Diamond Mountain Unit (USFWS 2011b). This herd had a 2011 population estimate of 2,700 animals, which is approximately eight percent above objective for this population (UDWR 2011b). Pre-hunt production ratios for Herd Unit #9B was 43 calves and 8 bulls per 100 cows. No recent information was provided for Herd Unit #9D.

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INSERT Figure 3-7. Pronghorn Seasonal Ranges

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INSERT Figure 3-8. Mule Deer Seasonal Ranges

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3.4.3.4 Upland Game

Upland game with the potential to occur in the Project Area include populations of ring-necked pheasant (*Phasianus colchicus*), California quail (*Callipepla californica*), wild turkey (*Meleagris gallopavo*), mourning dove (*Zenaida macroura*), rock dove (*Columba livia*), band-tailed pigeon (*Columba fasciata*), white-tailed jackrabbit (*Lepus townsendii*), black-tailed jackrabbit (*Lepus californicus*), and desert cottontail rabbit (*Sylvilagus audubonii*). Habitat for these species can be found throughout the Project Area. Annual fluctuations for most upland game populations closely correlate with annual climatic patterns. Mild winters and early precipitation during the spring are associated with increases in upland game populations. Warm, dry weather during the early summer is generally considered vital for the survival of newly born young of many upland game species. Annual surveys are conducted to measure the production, trend, and harvest of each upland game population (UDWR 2012b). Many upland game species (e.g., cottontail rabbits and mourning doves) easily adapt to human disturbance and can often be found near disturbed/built areas such as well sites and along roadsides.

3.4.3.5 Waterfowl

The Ouray NWR was originally established to provide prime breeding, resting, and feeding areas for migratory waterfowl (USFWS 2000a). Some 26 species of migratory waterfowl are known to occur within the Ouray NWR, and at least 12 of these species were documented to nest on the Refuge (see **Table 3-9**). Waterfowl habitat within the Project Area is present within emergent wetlands, open water sites, and along the along the Green River. Pelican Lake, located northwest of the Ouray NWR, is an important wintering area for waterfowl because the Green River serves as a migratory corridor for much of the waterfowl in eastern Utah.

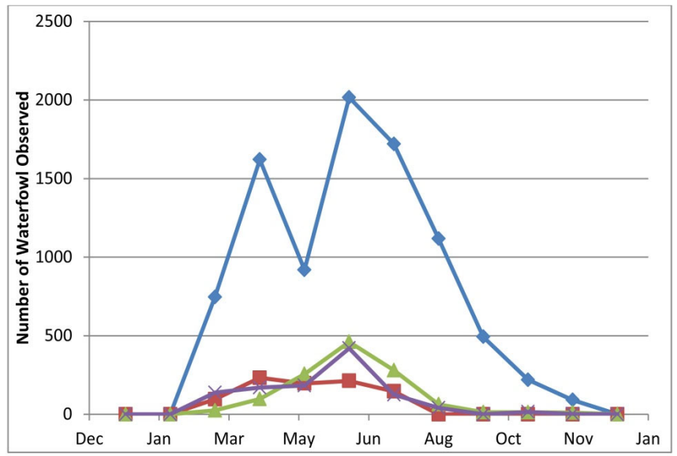
Table 3-9. Waterfowl Species Known to Occur on the Ouray NWR

Common Name	Scientific Name	Confirmed Nesting on Ouray NWR (Yes/No)
Greater White-fronted Goose	*Anser albifrons*	No
Snow Goose	*Chen caerulescens*	No
Canada Goose	*Branta canadensis*	Yes
Trumpeter Swan	*Cygnus buccinator*	No
Tundra Swan	*Cygnus columbianus*	No
Wood Duck	*Aix sponsa*	No
Gadwall	*Anas strepera*	Yes
American Wigeon	*Anas americana*	No
Mallard	*Anas platyrhynchos*	Yes
Blue-winged Teal	*Anas discors*	Yes
Cinnamon Teal	*Anas cyanoptera*	Yes
Northern Shoveler	*Anas clypeata*	Yes
Northern Pintail	*Anas acuta*	Yes
Green-winged Teal	*Anas crecca*	Yes
Canvasback	*Aythya valisineria*	Yes
Redhead	*Aythya americana*	Yes
Ring-necked Duck	*Aythya collaris*	No
Greater Scaup	*Aythya marila*	No

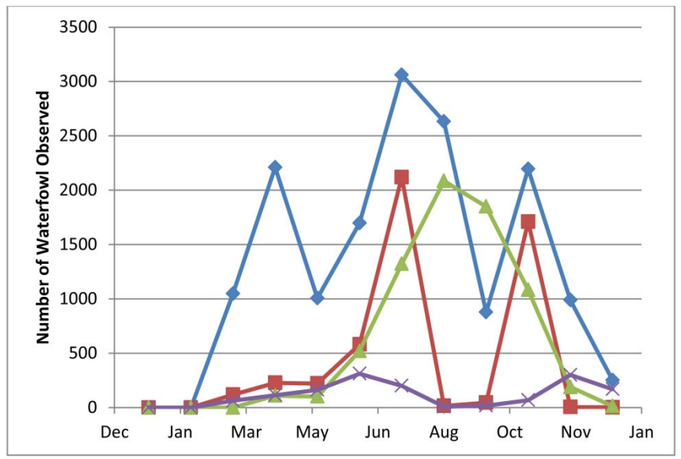
Common Name	Scientific Name	Confirmed Nesting on Ouray NWR (Yes/No)
Lesser Scaup	*Aythya affinis*	No
Bufflehead	*Bucephala albeola*	No
Common Goldeneye	*Bucephala clangula*	No
Barrow's Goldeneye	*Bucephala islandica*	No
Hooded Merganser	*Lophodytes cucullatus*	No
Common Merganser	*Mergus merganser*	Yes
Red-breasted Merganser	*Mergus serrator*	No
Ruddy Duck	*Oxyura jamaicensis*	Yes

Source: USFWS 2013d

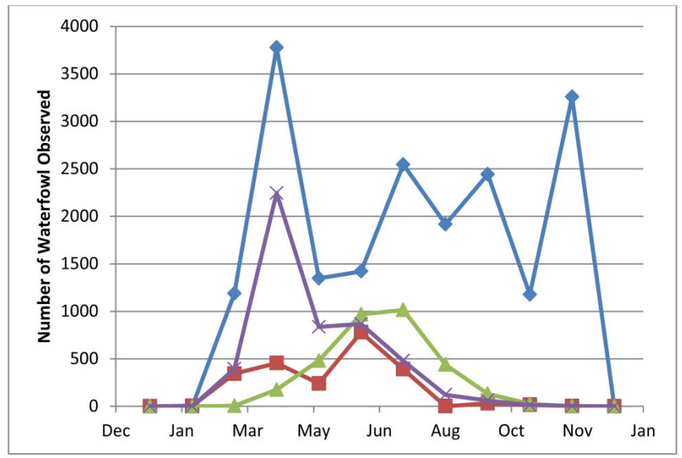
Annual surveys of migratory waterfowl are conducted on the Ouray NWR to describe general trends in the number of waterfowl resting and feeding on the Refuge through the years. Survey results for Leota Bottom for years 2007 through 2011 are presented in **Figure 3-9** (USFWS 2011a). Dabbling ducks were the most common, showing a peak in numbers during April and during the late summer months, followed by diving ducks that often showed a peak in April. Migratory waterfowl use of the Refuge is largely influenced by off-refuge factors, such as annual variations in weather conditions and food resources throughout the Central Flyway. On the Refuge, food availability and the extent of human disturbance, such as hunting and boating, greatly influence the number of birds present.



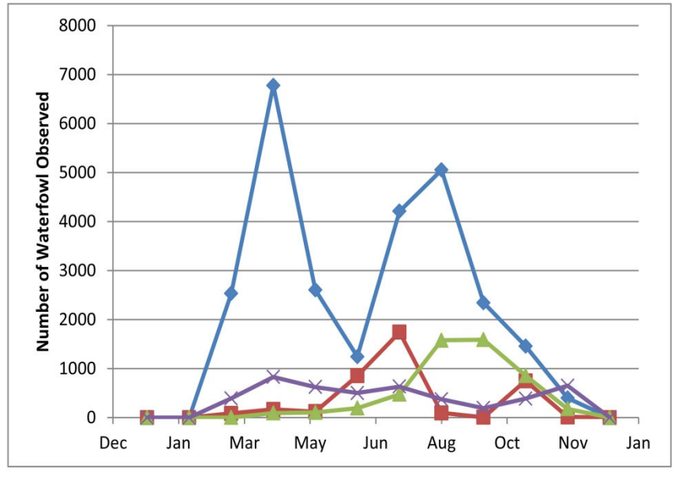
2007



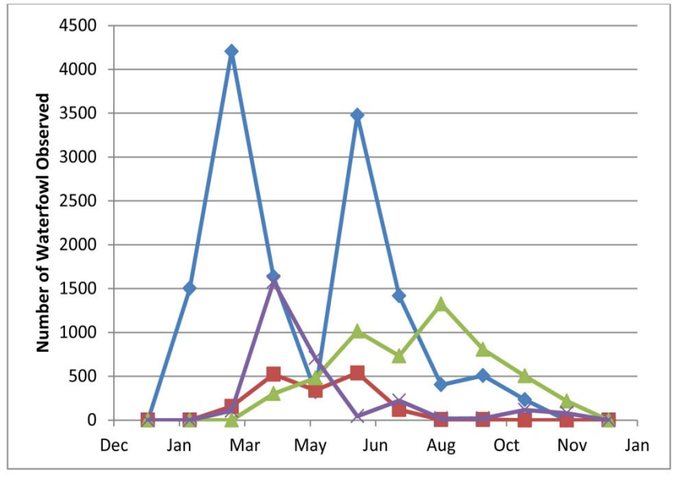
2008



2009



2010



2011

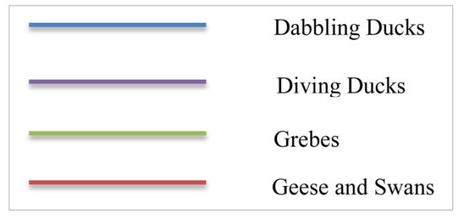


Figure 3-9. Monthly Waterfowl Usage of Leota Bottom, 2007–2011

Source: USFWS 2011a

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3.4.3.6 Migratory Birds

Migratory birds are protected under the MBTA of 1918 (16 USC 703-711) and Executive Order (EO) 13186 (66 Federal Register 3853). Executive Order 13186 sets forth the responsibilities of Federal agencies to implement provisions of the MBTA by integrating bird conservation principles and practices into agency activities and by ensuring that Federal actions evaluate the effects of actions and agency plans on migratory birds.

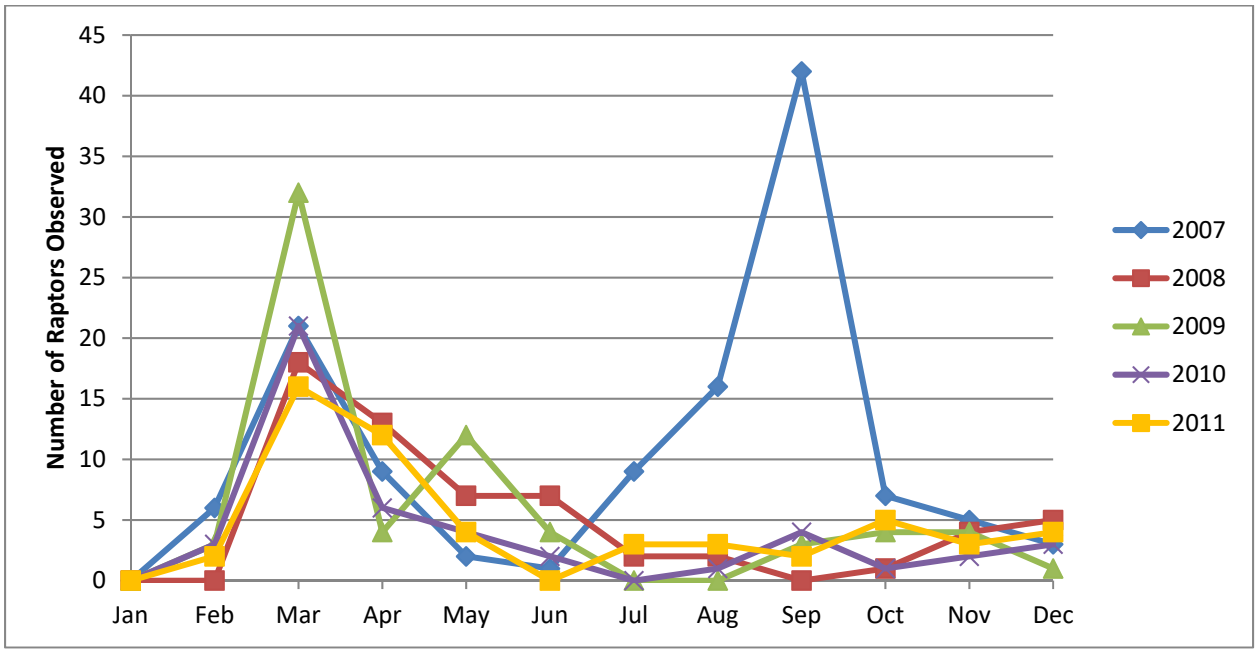
A list of Birds of Conservation Concern (BCC) was developed as a result of a 1988 amendment to the Fish and Wildlife Conservation Act. This Act mandated that the USFWS "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA of 1973." The goal of the BCC list is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions to ensure that these species would be consulted on in accordance with EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. The Project Area is located within BCC Region 16 (Southern Rockies/Colorado Plateau).

The Project Area and surrounding region has been designated by the Utah Partners in Flight program as a Bird Habitat Conservation Area (BHCA). The southern-most portion of the Upper Green River BHCA (#25) contains the entire Project Area and is located near the juncture of BHCA #25, #21 (Duchesne River) and #37 (Green River) (IWJV 2007). BHCAs are intended to identify areas where bird habitat conservation projects may take place, predicated on concurrence, collaboration, and cooperation with all landowners involved; however, BHCAs have no official status (IWJV 2007).

Some 237 species of migratory birds have been documented to occur on the Ouray NWR as seasonal residents or migrants, 114 of which are known to nest within the Refuge (USFWS 2005) (see **Appendix C** for details). Potential occurrence is based on habitat (vegetation) types occurring across the Project Area (see **Table 3-7**) and the bird species that tend to use these habitat types (UDWR 2003). (Note: Most species use more than one habitat.) Migrating birds often have special habitat needs. The UDWR (2012d) has identified that many migrants rely on riparian corridors for nesting and migration purposes in arid country.

3.4.3.7 Raptors

Twenty-two species of raptors are known to occur within the Project Area and surrounding region year-round or on a seasonal basis (USFWS 2005, 2013d). These include the bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*), osprey (*Pandion haliaetus*), northern goshawk (*Accipiter gentilis*), northern harrier (*Circus cyaneus*), prairie falcon (*Falco mexicanus*), merlin (*Falco columbarius*), peregrine falcon (*Falco peregrinus*), turkey vulture (*Cathartes aura*), American kestrel (*Falco sparverius*), great-horned owl (*Bubo virginianus*), burrowing owl (*Athene cunicularia*), short-eared owl (*Asio flammeus*), long-eared owl (*Asio otus*), western screech-owl (*Otis kennicottii*), northern saw-whet owl (*Aegolius acadius*), and rough-legged hawk (*Buteo lagopus*) (USFWS 2005). Most raptor species using the area migrate each fall and return to the region again the following spring. Exceptions include the golden eagle, bald eagle, rough-legged hawk, and great horned owl which are year-round residents. **Figure 3-10** shows the number of raptors observed in Leota Bottom by month for years 2007 through 2011.



Source: USFWS 2011a

Figure 3-10. Number of Raptors Observed in Leota Bottom by Month, 2007 – 2011

Twelve raptor species have the potential to nest in the Ouray NWR. These include the golden eagle, turkey vulture, Swainson's hawk, American kestrel, red-tailed hawk, Cooper's hawk northern harrier, prairie falcon, burrowing owl, long-eared owl, short-eared owl and great-horned owl (USFWS 2005, 2013d). Most identified nest sites within the Ouray NWR are located in trees along riparian areas within the Green River floodplain. Additionally, there are a significant amount of bald eagle roosting sites within the Project Area and in the adjacent tree stands surrounding the Project boundary.

All raptor species and their nests are protected from take or disturbance under the MBTA (16 USC, § 703 et seq.). The bald eagle and golden eagle are also afforded additional protection under the Bald and Golden Eagle Protection Act, amended in 1973 (16 USC, § 669 et seq.). Because golden eagles, bald eagles, ferruginous hawks, and burrowing owls are considered to be special status raptor species, they are discussed in further detail in **Section 3.4.4**.

3.4.3.8 Fish

The Green River immediately upstream and downstream of the Project Area is host to approximately ten fish species: roundtail chub (*Gila robusta*), bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), speckled dace (*Rhinichthys osculus*), bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), razorback sucker (*Xyrauchen texanus*), mottled sculpin (*Cottus biardi*), and brook stickleback (*Culaea inconstans*). Representative nonnative species in the Green River in the vicinity of the Project Area include the green sunfish (*Lepomis cyanellus*), smallmouth bass (*Micropterus dolomieui*), walleye (*Stizostedion vitreum vitreum*), channel catfish (*Ictalurus punctatus*), black bullhead (*Ictalurus melas*), northern pike (*Esox lucius*), fathead minnow (*Pimephales promelas*), common carp (*Cyprinus carpio*), and red shiner (*Notropis lutrensis*) (USFWS 2000a). A complete list of fish species found on the Ouray NWR is provided in **Appendix C.**

3.4.3.9 Ouray National Fish Hatchery (NFH)

The Ouray National Fish Hatchery (Ouray NFH) was established in May 1996 as a fish refuge and technology development facility to assist in the recovery of the four listed Colorado River endangered fish: razorback sucker, Colorado pikeminnow, humpback chub, and bonytail chub (USFWS 2013g).

The Ouray NFH is located 35.2 miles southwest of Vernal, Utah, on the Ouray NWR. The facility consists of a 30,116-gallon indoor recirculation hatchery with 27, 7.9-foot circular fiberglass tanks and 30, 3.9-foot circular fiberglass tanks. The isolation room consists of twelve, 9.7-ft^2 circular fiberglass tanks that can be operated as single pass cold water tanks or as a separate re-use system (USFWS 2013e).

There are a 24, 0.2-acre fish ponds and 12, 0.5-acre fish ponds. The 1.2-acre clarification reservoir has been successfully used as a production pond that increases the total surface area of ponds space available for fish production at the Ouray NFH. The water source consists of seven shallow wells (49.2 feet deep) located near the Green River approximately 0.5 miles from the hatchery (USFWS 2013g). Other facilities associated with the Ouray NFH include an effluent basin; a hatchery office building/rearing facility; water treatment building; a shop garage; a domestic water supply and sewage disposal system; and a chain link fence surrounding the ponds (USFWS 1992b; K. Schnoor, Ouray NFH, pers. comm. 2014).

The primary goal of the Ouray NFH is to maintain endangered fish in the Ouray NWR to prevent extinction; develop genetically sound broodstocks for production of young fish for stocking to stabilize or enhance wild stocks; and to produce captive reared endangered fish (primarily razorback sucker) for priority laboratory and field experiments (USFWS 2013e). The goal was modified in 2013 to include the production of bonytail chub (USFWS 2013g). The Ouray NFH is the primary source of genetic material that is needed to maintain a large genetic pool and work towards a viable reproductive population (USFWS 1995a).

In January 1988, the Upper Colorado River Endangered Fish Recovery Program (Recovery Program) started establishing captive fish propagation facilities to assist in the recovery of the Colorado River fish species. The primary focus of the Ouray NFH has been the propagation of the razorback sucker. However, beginning in 2007, the Recovery Program started capturing humpback chubs, which were transferred to the Ouray NFH to be maintained as a Refuge population and a potential source of future broodstock (USFWS 2013g). The Recovery Implementation Plan for the Endangered Fish Species in the Upper Colorado River Basin includes activities to restore habitat and control non-native fish. The Ouray NFH is the primary refuge for the Middle Green River sub basin (USFWS 1995a). The Recovery Program is also part of a multi-state organization that forms the basis for water recovery.

The Ouray NFH is a critical component of the Recovery Program. The facility offers a protected location for refuge populations and broodstock of three endangered fish species (razorback sucker, bonytail, and humpback chub), and it produces large numbers of endangered fish that are stocked into native habitats. The Ouray NFH harbors a collection of specimens that includes:

- A broodstock of razorback sucker with irreplaceable genetic makeup;
- Over 25,000 razorback suckers of various life stages at all times, and up to as many as 50,000 individuals during some timeframes;
- Approximately 39,000 bonytail of various life stages; and
- A Refuge population of 36 humpback chub from Yampa Canyon to support a possible broodstock for that population.

The Ouray NFH is one of only two facilities to produce razorback sucker for the Recovery Program. In 2012 the Ouray NFH produced over 16,000 razorback sucker averaging 14.7 inches and these fish were stocked in the middle (at Ouray, UT) and lower (at Green River, UT) Green River. In 2013, the Ouray NFH planned to stock 10,000 bonytail averaging 9.8 inches. In addition, it will continue to house the razorback sucker broodstock and the humpback chub refugial population.

In response to dramatically declining wild populations of razorback sucker, the Recovery Program sporadically captured the few remaining wild fish in the Green River between 1980 and 2000 to create a broodstock and a hatchery program. Wild populations were so depleted at the time that the first management action to achieve recovery was to reestablish populations with hatchery-produced fish. An integrated stocking plan was implemented in 2003, and was updated subsequently to improve fish survival. Over the years, the stocking program has been successful, with adult fish surviving, expanding their range, and reproducing.

River and floodplain habitats found on the Ouray NWR are designated as critical habitat and crucial to the recovery of the endangered fish of the Green River, especially the razorback sucker. Adult razorback suckers (stocked hatchery fish) are currently exhibiting significant survival and natural reproduction rates that are encouraging for a future recovery scenario of the species (USFWS 2013f). However, despite high levels of reproduction, very few hatchery-reared razorback suckers recruit (defined as young individuals growing to an age and condition to reproduce) from the larval stage to sexual maturity. Successful recruitment of wild produced razorback sucker is therefore a significant demographic characteristic needed for potential recovery of the species.

Successful recruitment of young-of-year (YOY) razorback sucker requires off-channel floodplain nursery habitats that the YOY can reside in before returning to the main channel. These off-channel nurseries offer higher biological productivity and lower levels of large bodied predators. Availability of these high-quality floodplain nursery habitats is supported by high spring peak flows. In order to attempt to entrain large numbers of naturally produced larval fish into these floodplain habitats, the Bureau of Reclamation (in partnership with other agencies) has altered its spring operations at the Flaming Gorge Dam to provide river connection to floodplain habitats when larval razorback suckers are present.

Floodplain habitats on the Ouray NWR are a substantial subset of the floodplain habitats targeted under Flaming Gorge operations. Specifically, Leota Bottom contains two key areas (Leota 4 and Leota 7) that are targeted by Flaming Gorge Dam operations. Because suitable floodplain habitats are limited in number (especially those easily accessible to biologists), preserving the habitat quality in Leota Bottom is crucial for the recovery of the razorback sucker, including the success of fish stocking programs and reservoir operations (USFWS 2013f).

3.4.4 Special Status Plant and Animal Species

Special status plant and animal species include those listed as threatened or endangered under the ESA of 1973, as amended, species proposed for listing, species of special concern and other species identified either by the USFWS, UDWR, or Utah Natural Heritage Program (UNHP) as unique or rare, and which have the potential to occur within the Project Area and surrounding region.

Based on examination of USFWS, UDWR, and UNHP data, a total of 32 special status plant and animal species were identified as potentially occurring within the Project Area. Of the 32 special status species that were evaluated, 11 species were eliminated from further consideration in this EA because either the geographic or elevational range of the species is located outside of the Project Area and/or the Project Area does not provide suitable habitat for the species. The remaining 21 species that have the potential to

occur within the Project Area and were retained for further evaluation include seven federally listed species and 14 UNHP Wildlife Species of Concern (SPC). These species are described below.

3.4.4.1 Federally Threatened, Endangered, or Proposed Species

Federally listed threatened, endangered, or proposed species identified as potentially occurring within the Project Area are presented in **Table 3-10**. A total of seven species or subspecies of plants and animals are addressed in the EA, of which four are federally listed as endangered and three are federally listed as threatened. Critical habitat has been designated for four of the seven species (all fish), as indicated in **Table 3-10**.

The evaluation of federally listed threatened and endangered species in this document is intended to fulfill the compliance requirements of pertinent environmental laws, regulations, and policies in accordance with the requirements of Section 7(b) of the ESA of 1973, as amended, and implementing regulations [16 U.S.C. 1536 (c), 50 CFR 402.12 (f) and 402.14 (c)], and ESA guidance contained in the Endangered Species Consultation Handbook (USFWS and National Marine Fisheries Service 1998).

Federal agencies, in consultation with the USFWS-ESO, are required to ensure that any action they authorize, fund, or carry out will not jeopardize the continued existence of a federally listed or proposed threatened or endangered species. As the Federal lead agency for the EA, the Service (Ouray NWR) is responsible for Intra-Service Section 7 consultation with the USFWS-ESO. It is Service policy to consider candidate species when making natural resource decisions and thus, candidate species will be included for consideration in this document. Biological information on the above mentioned species is presented below and the impacts associated with the Proposed Action and Alternatives are analyzed in **Section 4.5.4**.

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Table 3-10. Federally Listed Species Considered for Evaluation in the EA/BA

Species	Status	Species Listing		Critical Habitat		Abundance	Primary Refuge Habitat Use
		Date Listed	Federal Register No.	Date Designated	Federal Register No.		
Birds							
Yellow-billed cuckoo (*Coccyzus americanus*)	T	October 3, 2014	79 FR 59991	August 15, 2014 (proposed)]	79 FR 48547	Uncommon Summer	Riparian Habitats
Fish							
Colorado pikeminnow (*Ptychocheilus lucius*)	E	March 11, 1967	32 FR 4001	March 21, 1994	59 FR 13374	Rare; Ouray reach is an important nursing area	Riverine & Wetlands/ Bottomlands
Bonytail chub (*Gila elegans*)	E	April 23, 1980	45 FR 27713	March 21, 1994	59 FR 13374	Rare; No wild caught in several years	Riverine
Razorback sucker (*Xyrauchen texanus*)	E	October 23, 1991	56 FR 54957	March 21, 1994	59 FR 13374	Rare; Severely reduced in numbers. Species is reproducing in the Green River	Riverine & Wetlands/ Bottomlands
Humpback chub (*Gila cypha*)	E	March 11, 1967	32 FR 4001	March 21, 1994	59 FR 13374	Rare; Severely reduced in numbers	Riverine
Plants							
Uinta Basin hookless cactus (*Sclerocactus wetlandicus*)	T	October 11, 1979	44 FR 58869	N/A	N/A	Uncommon; Refuge supports significant numbers of the entire population	Dry Gravel Terraces
Ute ladies'-tresses (*Spiranthes diluvialis*)	T	January 17, 1992	57 FR 2048	N/A	N/A	Uncommon	Floodplains and Perennial Stream Terraces

E = Endangered, T = Threatened

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Yellow-Billed Cuckoo

The yellow-billed cuckoo (*Coccyzus americanus*) is a federally threatened bird under the ESA. This species is a neotropical migratory species that breeds in the U.S. and Canada and winters in South America (USFWS 2001b). Currently, the range of the cuckoo is limited to disjunct fragments of riparian habitats from northern Utah, western Colorado, southwestern Wyoming, and southeastern Idaho, southward into northwestern Mexico, and westward into southern Nevada and California. Cuckoos are long-range migrants that winter in northern South America in tropical deciduous and evergreen forests (Ehrlich et al. 1988).

Historically, cuckoos were probably common to uncommon summer residents in Utah and across the Great Basin (Ryser 1985, Hayward et al. 1976). The current distribution of yellow-billed cuckoos in Utah is poorly understood, though they appear to be an extremely rare breeder in lowland riparian habitats statewide (Walters and Sorenson 1983, Behle 1981, Benton 1987).

Yellow-billed cuckoos are one of the latest migrants to arrive and breed in Utah. They arrive in extremely late May or early June and breed in late June through July. Nesting season on the Refuge is considered June 15th to August 31st. Cuckoos typically start their southerly migration by late August or early September. Yellow-billed cuckoos feed almost entirely on large insects that they glean from tree and shrub foliage. They feed primarily on caterpillars, including tent caterpillars. They also feed frequently on grasshoppers, cicadas, beetles, and katydids, occasionally on lizards, frogs, and eggs of other birds and rarely on berries and fruits (Ehrlich et al. 1988, Kaufman 1996).

The cuckoo is a riparian obligate bird that feeds in cottonwood groves and nests in willow thickets. Nesting habitat is classified as dense lowland riparian that is characterized by a dense sub-canopy or shrub layer (regenerating canopy trees, willows, or other riparian shrubs) within 300 feet of water. Overstory in these habitats may be either large, gallery-forming trees (30-90 feet) or developing trees (10-30 feet), usually cottonwoods. Nesting habitats are found at low to mid-elevations (2,500-6,000 feet) in Utah. Laymon and Halterman (1989) concluded that sites larger than 200 acres and wider than 1,950 feet were optimal for breeding; sites 101 to 200 acres and wider than 650 feet were suitable breeding habitat; sites 50 to 100 acres and 325 to 650 feet in width were marginal breeding habitat; and sites less than 38 acres and less than 325 feet in width were unsuitable breeding habitat (BLM 2003). Cuckoos are not strongly territorial and home ranges may overlap during the breeding season. Nests are usually 4-8 feet above the ground on the horizontal limb of a deciduous tree or shrub, but nest heights may range from 3-20 feet and higher. In Utah, this species nests in riparian areas and has been documented in cottonwood habitat along the Green River. The yellow-billed cuckoo has been confirmed to nest within the Refuge (Howe and Hanberg 2000).

Colorado Pikeminnow

The Colorado pikeminnow (*Ptychocheilus lucius* [formerly the Colorado squawfish]) is a federally endangered fish species under the ESA. This species is endemic to the Colorado River Basin habitat that is characteristic of variable flow, turbulent water, and high silt loads. Within the Colorado River Basin the Colorado pikeminnow is known to inhabit the Colorado, Green, Duchesne, Price, San Rafael, Gunnison, San Juan, White, and Dolores Rivers and numerous associated streams. Today, the species is most abundant in the Green River below the confluence with the Yampa River; the White River from Taylor Draw Dam near Rangely, Colorado, downstream to the confluence with the Green River; and the main stem of the Colorado River from Palisade, Colorado, to Lake Powell. The Gray Canyon and the Yampa River of the lower Green River hold the two critical spawning sites of this species (USFWS 2002a). The species is not known to occur in the direct vicinity of the Project Area.

Some 726 total miles of river and its associated 100-year floodplain in Utah have been designated by the USFWS as critical habitat for the Colorado pikeminnow. The Project Area contains approximately 6.6 miles of critical habitat along the Green River, not inclusive of associated floodplains (USFWS 2007a).

Bonytail Chub

The bonytail chub (*Gila elegans*) is a federally endangered fish under the ESA. The bonytail chub has historically been a common species along the Colorado River system but the population has dwindled in recent years (USFWS 1994). This may be due to the introduction of 40 nonnative species of riverine fish such as the green sunfish, smallmouth bass, and channel catfish. The bonytail chub has adapted to major river habitats where it has been observed in slow moving pools and eddies. Flooded bottomland habitat is important for growth and conditioning for young bonytail chub and acts as a nursery or transitioning habitat. There are currently no self-sustaining wild populations of bonytail chub. While very few individuals have been caught in the Upper Colorado River Basin, there have been several individuals caught in the Green River at Hideout Canyon and Gray Canyon, as well as at the confluence of the Colorado and Green Rivers. The release of hatchery-born bonytail chub into the Upper Colorado River Basin has resulted in low survival reproduction and recruitment to the population (USFWS 2002b).

A total of 139 river miles and their associated 100-year floodplains in Utah have been designated by the USFWS as critical habitat for the bonytail chub in portions of the Green River and Colorado River. The portion of the Green River within the boundaries of Ouray NWR is not listed as bonytail chub critical habitat. However, adult bonytail chub have been found to use the Refuge floodplains for foraging habitat. These flooded areas are also used for stocking of bonytail chub.

Razorback Sucker

The razorback sucker (*Xyrauchen texanus*) is a federally endangered fish species under the ESA. The razorback sucker currently populates the Green River, upper Colorado River, and San Juan River sub-basins in the Upper Colorado River Basin. The general population consists of mostly aged adults with minimal recruitment; however, in the middle Green River, where there are juveniles and young adults, there is a low degree of recruitment. The largest population of razorback sucker exists in low-gradient, flat-water reaches of the middle Green River between the confluences of the Duchesne River and Yampa River (USFWS 2002c). Razorback suckers tend to occupy habitat types such as impounded and riverine areas, eddies, gravel pits, flooded mouths and tributary streams, backwaters, flooded bottoms, and sandy riffles. Adults move into flooded areas in spring to begin spawning migrations as they become reproductively active. Spawning typically occurs over rocky runs and gravel bars (USFWS 2002c).

A total of 688 river miles and their associated 100-year floodplains have been designated by the USFWS as critical habitat for the razorback sucker. The entire length of the Green River within the Project Area is designated as razorback critical habitat. This accounts for approximately 6.6 miles of river within the Project Area, not inclusive of 100-year floodplains (USFWS 2007a).

Humpback Chub

The humpback chub (*Gila cypha*) is listed as a federally endangered fish species under the ESA. In Utah, humpback chub are now confined to a few white-water areas in the Colorado, Green, and White Rivers. Humpback chub are found in river canyons where they occupy habitats such as river pools, riffles, eddies, rocky runs, and travertine dams. The densest concentrations of humpback chub are in the Westwater Canyon and Grand Canyon reaches of the Colorado River. Humpback chub in the Desolation and Gray Canyons of the Green River hold the third most abundant population of this species (USFWS 2002d). The species is not known to occur in the immediate vicinity of the Project Area.

Some 139 river miles and their associated 100-year floodplains have been designated as critical habitat for the humpback chub by the USFWS in portions of the Colorado and Green Rivers. There is no humpback chub critical habitat within the Project Area. The nearest critical habitat occurs approximately 22 miles north and 28 miles south of the Project Area.

Uinta Basin Hookless Cactus

The Uinta Basin hookless cactus (*Sclerocactus wetlandicus*) is federally listed as threatened (USFWS 1979b, 2009) under the ESA. The Uinta Basin hookless cactus was formerly included in the *Sclerocactus glaucus* "complex" (Hochstätter 1989), but is now considered a distinct species by the USFWS and retains its status as federally threatened (USFWS 2007b, 2009). The USFWS-ESO (2010) published a recovery outline for the Uinta Basin hookless cactus in April 2010. The original recovery criteria for the *S. glaucus* species complex are no longer sufficient to address the recovery of the now separated species that require different ecological requisites. A revised recovery plan for the Uinta Basin hookless cactus is currently in development to meet the specific needs of the species.

This member of the cactus family is a perennial that occurs as a solitary, unbranched, round-to-elongate/cylindric succulent stem usually 1.25–3.5 inches in diameter by 2–5 inches tall that produces pink to violet flowers from late April to May (Heil and Porter 2004). Observed pollinators include bees, beetles, ants, and flies. Seed dispersal vectors include gravity, ants, birds, rodents, precipitation, and surface water flows. It is theorized that seed dispersal is a limiting factor in the distribution of the species (USFWS 1990). Very little is known about the factors affecting the distribution and long-term population dynamics of the Uinta Basin hookless cactus.

Information on the habitat requirements and distribution of this species has been rapidly changing as more studies and surveys are conducted in the Uinta Basin. Currently, it is known to occur on Quaternary and Tertiary alluvium soils overlain with cobbles and pebbles of the Duchesne River, Green River, and Uinta Formations between 4,500 to 6,600 feet amsl (BLM 2008, UNPS 2006). It is found on gravelly hills and terraces, river benches, valley slopes, and rolling hills along the Green, White, and Duchesne Rivers. Preferred habitat is generally associated with Pleistocene outwash terraces with coarse-textured, alkaline soils overlain by a surficial pavement of large, smooth, rounded cobble. It can be found in a range of vegetative communities including clay badlands, salt desert shrub, and pinyon-juniper. Associated species include black sagebrush, shadscale saltbush, James' galleta, and Indian ricegrass.

Within designated potential habitat for the Uinta Basin hookless cactus, the USFWS has proposed core conservation areas and management recommendations in response to the ongoing energy development in the Uinta Basin. The purpose of the proposed core conservation areas and management recommendations is to protect the most important populations or sub-populations, and reduce threats to *Sclerocactus*. Two levels of core conservation areas were developed based on pollinator travel distance and habitat connectivity between populations and individuals. The core areas are centered on the densest known areas of *Sclerocactus* within a 400 m (Level 1) and 1,000 m (Level 2) buffer that was developed using kernel density analysis found in geographic information systems (GIS) software.

The distances used to develop core conservation areas were based on travel distances of common bee species that visit individual plants. These bees are in the small and medium size range and travel approximately 400 meters to 1,000 meters between plants and nests (Tepedino et al. 2010). Level 1 polygons were developed using a 400-meter buffer around plants to allow for pollinator travel. They include the densest concentrations of cactus locations and the most restrictive management recommendations as proposed by USFWS. Level 2 polygons were developed using a 1,000-meter buffer around plants while incorporating less-dense cactus areas and less restrictive management

recommendations as proposed by USFWS. These measures are summarized in the Service's draft Energy Development Management Guidelines, which are used by the Service to conduct section 7 consultations under the ESA..

In 2010, the USFWS developed a potential habitat polygon for *S. wetlandicus* to better assess possible impacts to the species within its range. Although *S. wetlandicus* and populations can be found outside of these areas, they tend to occur at greater numbers and at higher densities within these polygons. This polygon is updated annually and was last updated in March 2013 (USFWS 2013c).

The total area of potential habitat for *S. wetlandicus* within its range is currently 442,000 acres and includes Federal, Tribal, State, and private lands. The most recent geographic data for *S. wetlandicus* includes over 18,400 points representing approximately 40,528 individual cacti. The entire Project Area (3,684 acres) is within USFWS-designated potential habitat for *S. wetlandicus*. Approximately 1,154 and 380 acres of Level 1 and 2 Core Conservation Areas occur in the Project Area, respectively.

Surveys for Uinta Basin hookless cactus were conducted during June 11-14, 2012; April 1-3, 2013; November 4, 2013; and August 12, 2014 in accordance with USFWS and BLM survey requirements for *Sclerocactus spp.* (USFWS 2012c, 2013c). Surveys were conducted in areas proposed for well pad, access road, and pipeline development under the Proposed Action as well as areas proposed for alternative pipeline routes. Results of the survey effort identified two populations of Uinta Basin hookless cactus, which were located along the ridgeline of the bluffs. All populations were located outside of Level 1 and 2 Core Conservation Areas. An updated version of the Special Status Plant Survey Report for the Thurston Ouray NWR 2-Well Development Program is included in **Appendix D**.

Ute ladies'-tresses

Ute ladies'-tresses (*Spiranthes diluvialis*) is a federally listed threatened species. This member of the orchid family is a perennial herb that occurs on seasonally flooded river terraces, spring-fed stream channels, lakeshores, and in human-modified and disturbed wetlands, such as canals, gravel pits, and irrigated meadows (Fertig et al. 2005). The species occurs primarily in areas where vegetation is relatively open and not overgrown or overgrazed, generally in sandy or loamy soils that are typically mixed with gravels (USFWS 1992a). Within the Uinta Basin, Ute ladies'-tresses occurs along the Green River near the confluence with the Yampa River, and along Ashley Creek, Big Brush Creek, and the upper Duchesne River and its tributaries (BLM 2005) above 4,300 feet elevation (BLM 2006). Ute ladies'-tresses populations require recurrent disturbance, such as seasonal flooding, grazing, or mowing, for establishment and persistence, and often occur in recently created riparian habitats such as sand bars and backwaters (USFWS 1995b).

There are no known occurrences of Ute ladies'-tresses on the Refuge and the species has not been found south of Highway 40. Potential habitat occurs within the Project Area in the floodplains and riparian areas of the Green River.

3.4.4.2 Utah Natural Heritage Program Species of Concern

Table 3-11 presents UNHP species of concern that were identified as potentially occurring within the Project Area. A total of 14 wildlife species are addressed in the EA. This includes nine species of birds, one mammal, three species of fish, and one reptile species.

Table 3-11. UNHP Species of Concern Considered for Evaluation in the EA

Species	Status	Abundance	Primary Refuge Habitat Use
Birds			
Bald Eagle (*Haliaeetus leucocephalus*)	SPC	Rare Spring; Occasional Fall; Common Winter	Riparian Habitats & Wetland/Bottomlands
Golden Eagle (*Aquila chrysaetos*),	SPC	Common Year-Round	Semi-desert Shrubland, Riparian Habitats
Ferruginous Hawk (*Buteo regalis*)	SPC	Occasional Summer	Semi-desert Shrubland
Northern Goshawk (*Accipiter gentilis*)	CS	Uncommon	Riparian and woodland habitats
Burrowing Owl (*Athene cunicularia*)	SPC	Uncommon Spring, Summer, and Fall	Grassland
Short-eared Owl (*Asio flammeus*)	SPC	Uncommon Spring, Summer, Fall, and Winter	Grassland
American White Pelican (*Pelecanus erythrorhynchos*)	SPC	Occasional Spring and Summer; Common Fall	Wetland/Bottomlands
Long-billed Curlew (*Numenius americanus*)	SPC	Uncommon Spring, Summer, and Fall	Grassland & Wetland/ Bottomlands
Lewis's Woodpecker (*Melenerpes lewis*)	SPC	Rare Spring, Summer, and Fall	Riparian Habitats
Mammals			
White-tailed Prairie Dog (*Cynomys leucurus*)	SPC	Common	Grassland
Fish			
Bluehead Sucker (*Catostomus discobolus*)	CS	Common	Aquatic Habitats
Flannelmouth Sucker (*Catostomus latipinnis*)	CS	Common	Aquatic Habitats
Roundtail Chub (*Gila robusta*)	CS	Rare	Aquatic Habitats
Reptiles			
Smooth Green Snake (*Opheodrys vernalis*)	SPC	Uncommon	Wetlands/Bottomlands

SPC = Wildlife species of concern;
CS = Species receiving special mgmt. under a Conservation Agreement to preclude the need for Federal listing
Source: UDWR-UNHP 2011, UDWR 2011a

Bald and Golden Eagle

The bald eagle (*Haliaeetus leucocephalus*) was previously listed as a federally endangered and threatened (60 FR 36000; July 12, 1995) species, but as of August 8, 2007, has been removed from the Federal List of Endangered and Threatened Wildlife (72 FR 37346, Federal Register 2007). However, the bald eagle will continue to be protected under the Bald and Golden Eagle Protection Act, governed by the MBTA, and is listed as a UDWR SPC (UDWR-UNHP 2011). Similarly, the golden eagle (*Aquila chrysaetos*) is protected under the MBTA because of its similar appearance to juvenile bald eagles. No active bald eagle nesting sites were recorded within the Project Area, though bald eagles have been documented to nest within about 5 miles of the Refuge. Golden eagle nests have been documented on the Ouray NWR and surrounding region, but none within the Project Area. Bald and golden eagles are known to roost all along the Green River with higher numbers found during winter months. Winter roosting generally occurs anytime between early November through late March, and bald eagles may also use the area as foraging habitat during this period.

Ferruginous Hawk

The ferruginous hawk (*Buteo regalis*) is listed as a UDWR SPC (UDWR-UNHP 2011). Ferruginous hawk inhabit grassland, sagebrush/saltbrush/greasewood shrublands, and the boundary of pinyon-juniper woodlands. Breeding season for this species is between March 1 and August 1. Nests for the ferruginous hawk are usually found on cliffs, hills and knolls, trees, and buttes that provide access to prey such as small mammals (Johnsgard 1990). Nesting sites generally are in areas of high visibility, which makes the ferruginous hawk sensitive to human development. Nesting areas within close proximity to human development are characterized by lower productivity during reproductive periods (Collins and Reynolds, 2005). Although the ferruginous hawk is listed as "present" on the Ouray NWR, it was not found to have any nesting sites within or around the Project Area.

Northern Goshawk

The northern goshawk (*Accipiter gentilis*) is listed as a species receiving special management under a Conservation Agreement to preclude the need for Federal listing (UDWR-UNHP 2011). The species occurs as a permanent resident throughout Utah (but is not common in the State) and prefers mature mountain forest and riparian zone habitats (UDWR 2012d). In the western United States, northern goshawks typically nest in old growth forests and generally select larger tracts of forest over smaller tracts (Parrish et al. 2002). Although northern goshawks are listed as "present" and known to occur on the Ouray NWR, no nesting sites have been identified within or around the Project Area (USFWS 2012b).

Burrowing Owl

The burrowing owl (*Athene cunicularia*) is classified as a UDWR SPC. The burrowing owls migrate to the plains of Utah between March and mid-April for breeding and remain residents throughout the summer (Johnsgard 2002). Burrowing owls typically make nests in mammal-burrows (i.e., prairie dog, badger, and ground squirrel) and are relatively tolerant to human disturbance as they have been seen to occupy areas surrounding farm land, highways, and airports. If an existing burrow is not available, an owl may excavate their own for nesting. Burrowing owls primarily eat terrestrial invertebrates and small vertebrates such as birds, reptiles, and small mammals. They also serve as a prey species for large raptors and canids (Kaufman 1996). There are several prairie dog colonies northeast of the Project Area that may serve as suitable nesting habitat for burrowing owls (USFWS 2000a). This species is a confirmed nester on the Ouray NWR (USFWS 2012b).

Short-Eared Owl

The short-eared owl (*Asio flammeus*) is listed as a UDWR SPC. This owl is a resident of grasslands, shrublands, and other open habitats. Its nesting sites vary from year-to-year and are often dependent on foraging capability. The short-eared owl consumes mostly rodents and small vertebrates. It is a ground-nesting bird that typically builds its nest in early April using a small depression in the soil. While some individuals are known to migrate to Mexico during the winter months, most short-eared owls remain within range of their breeding grounds (UDWR 2012d). This species is not commonly observed in northern Utah; as such, no confirmed nesting sites are present within the Project Area or in the Ouray NWR. However, because a short-eared owl may be present in the Ouray NWR during the nesting season, it is considered a nesting species in the region (USFWS 2000a).

American White Pelican

The American white pelican (*Pelecanus erythrorhynchos*) is listed as a UDWR SPC (UDWR-UNHP 2011). The American white pelican migrates north during the summer months, usually not reaching Utah until March. Breeding areas can be found on islands in a range that extend from northern Mexico and Texas to as far north as Canada. Pelicans begin to leave Utah between October and December, which coincides with the waterfowl hunting season, lower access to fisheries, and icing of open water. This species primarily eats fish and is highly cooperative in foraging. The species is social and is often found in flocks (UDWR 2012d). This species is commonly observed in the Ouray NWR (USFWS 2000a).

Long-Billed Curlew

The long-billed curlew (*Numenius americanus*) is listed as a UDWR SPC. This species is known to migrate through Utah during the summer months to breed and continue south towards California, Texas, Northern Mexico, and Florida during the colder winter months. It is common in central and northern Utah valleys but is less common along the Colorado River drainage. Long-billed curlews arrive in Utah in late March and nest in areas surrounding the Great Salt Lake. They prefer nesting habitat in short grass and shade with bare ground components and adequate vertebrate prey. The long-billed curlew diet consists of mollusks, worms, crustaceans, toads, insects, and berries (UDWR 2012d). This species is known to nest on the Ouray NWR (USFWS 2012b).

Lewis's Woodpecker

Lewis's woodpecker (*Melanerpes lewis*) is listed as a UDWR SPC. The Lewis's woodpecker is a permanent resident of western North America. It is listed as a wildlife species of concern because of recent population declines and limited distribution in the State of Utah. This species is primarily found along the Green River in the Uinta Basin and other riparian habitats. The species is known to breed from mid-May to mid-August in cottonwood and ponderosa woodlands (Kingery 1998). Although the species had been documented to nest on the Refuge in the past, it has not been seen there for more than 10 years (Diane Penttila, Ouray NWR, pers. comm. 2014).

White-tailed Prairie Dog

The white-tailed prairie dog (*Cynomys leucurus*) is listed as a UDWR SPC (Tier II species in the Utah Comprehensive Wildlife Conservation Strategy [CWCS]). Colonies of the species occur primarily in mountain valleys, semi-desert grasslands, and open shrublands. In Utah, the white-tailed prairie dog occurs predominantly in the Uinta Basin and the northern part of the Colorado Plateau. This species is the main food source of the endangered black-footed ferret (Fitzgerald et al. 1994). Approximately 50 acres of prairie dog colonies (occupied habitat) exist within the Project Area along the roads west of the Leota Bottom. **Figure 3-11** depicts the distribution and size of the known colonies.

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INSERT Figure 3-11. Prairie Dog Colonies

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Bluehead Sucker, Flannelmouth Sucker, and Roundtail Chub

The bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), and roundtail chub (*Gila elegans*) are all listed as species receiving special management under a Conservation Agreement to preclude the need for Federal listing (UDWR-UNHP 2011) and are all found within the Upper Colorado River Basin. The bluehead sucker occurs in a variety of habitat within the Basin, ranging from headwater streams to large rivers, and generally prefers moderate to high velocity waters and rocky substrates. The flannelmouth sucker is a large river sucker that inhabits a variety of areas including riffles, eddies, and backwaters. The roundtail chub can be found in warm streams and larger rivers, usually in habitats with slow-flowing, murky water adjacent to areas of faster water (UDWR 2012d). The roundtail chub has been described as varying from sedentary to mobile, depending on life stage and habitat conditions (Sigler and Sigler 1996). All three fish currently occupy approximately 45 to 50 percent of their historical habitat in the Colorado River Basin (UDWR 2006).

Smooth Green Snake

The smooth green snake (*Opheodrys vernalis*) is listed as a UDWR SPC. This species is located across the western United States, southern Canada, and northern Mexico. This species is uncommon in Utah, but is a resident of the Abajo, La Sal, Uinta, and Wasatch Mountain Ranges. The smooth green snake prefers moist areas such as grasses and meadows. The smooth green snake relies on small invertebrates as a food source and mainly consumes insects and spiders. Female snakes reproduce in the late summer months and typically have brood sizes of four to six individuals. Following the reproductive period this species hibernates during the winter months and becomes active again the following spring (UDWR 2012d).

3.5 Paleontological Resources

Unless otherwise noted, information for the following discussion was taken from three cultural resources technical reports (Sagebrush Consultants, LLC [Sagebrush], 2011; 2012; 2013). This source is included in the Service project file for this EA but may not be available for public distribution due to sensitive material contained within.

3.5.1 Regulatory Setting

Federal legislation and programs provide a legal environment for documentation, evaluation, and protection of paleontological resources that may be affected by Federal undertakings or by private undertakings operating under Federal license, with Federal funding, or on federally managed lands. These include the Antiquities Act of 1906 (16 USC 431-433), Paleontological Resources Preservation Act (Public Law 111-011. P.L. 111-011, Title VI, Subtitle D), and the National Natural Landmarks Program (established in 1962 under the authority of the Historic Sites Act of 1935, and are administered by the National Park Service [(NPS]). The Ouray NWR 2-Well Development Program is subject to compliance with these laws.

3.5.2 Known Paleontological Resources within the Project Area

Three paleontological resources investigations were conducted for this project: the first was conducted in November 2011, for the well pads; the second in September 2012, for the original pipeline location and access roads; and the third in October 2014 for the revised pipeline route(see **Figure 3-12**).

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Figure 3-12. Location of Cultural/Paleontological Survey Area

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On November 23, 2011, Martha Hayden, State of Utah Department of Natural Resources (UDNR) paleontological assistant, conducted a Paleontological File Search for the area within 1 mile of each of the four proposed well pads. This investigation found that quaternary and recent alluvial deposits that are exposed near the well pads have a low potential for yielding significant fossil localities, and no prior paleontological localities have been recorded in the Project Area.

The second paleontological resources investigation was conducted on September 26, 2012, by Martha Hayden, UDNR paleontological assistant. This investigation found one previously known paleontological locality near the pipelines and access roads and recommended additional paleontological consultation with a permitted paleontologist. Therefore, a paleontology survey was conducted on November 16, 2012, and two new fossil localities were discovered. Based on the records search and survey, there is a potential for paleontological resources to exist near several locations along the surveyed pipeline route and access roads.

The third paleontological survey was conducted for the HDPE pipeline spanning both the proposed well pads east to the bluff where the tank battery pad is located. Several localities of exposed bone fragments in the mudstone exposures of the upper Myton Member of the Uintah Formation were located along the pipeline route. Within this new locality there are several fossiliferous horizons associated with paleosols. While these reptilian and mammalian fossils are degraded and weathered, the horizons containing them have the potential of yielding significant fossils (Paleo Mentors, Inc. 2014).

3.6 Cultural Resources

Unless otherwise noted, information for the following discussion was taken from three cultural resources technical reports (Sagebrush 2011; 2012; 2013; 2014). This source is included in the Service project file for this EA but may not be available for public distribution due to sensitive material contained within.

3.6.1 Regulatory Setting

Federal historic preservation legislation provides a legal environment for documentation, evaluation, and protection of cultural resources that may be affected by Federal undertakings, or by private undertakings operating under Federal license, with Federal funding, or on federally managed lands. These include the NHPA of 1966, as amended; the AHPA of 1974; and the ARPA, as amended. EO 11593 also provides necessary guidance on protection and enhancement of cultural resources.

The Ouray NWR 2-Well Development Program is subject to compliance with Section 106 of the NHPA, as amended (16 USC 470 *et seq*.). Section 106 (36 CFR 800) requires Federal agencies to take into account the effects of their undertakings on historic properties, and consult with the Utah SHPO.

The terms cultural resource and historic properties refer to a broad category of resources, which include prehistoric and historic archaeological sites, buildings, districts, structures, locations, or objects considered important to a culture or community for scientific, traditional, religious, or other reasons. Resources deemed significant for their contribution to broad patterns of history, prehistory, architecture, engineering, and culture are eligible for listing on the NRHP and require specific considerations under the NHPA. Regardless of age, resources listed on or eligible for listing on the NRHP are termed historic properties.

In order to be eligible for inclusion on the NRHP, a property must be significant under one or more of the four evaluation criteria:

- Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history; or
- Criterion B: Associated with the lives of persons significant in our past; or
- Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- Criterion D: Yielded, or may be likely to yield, information important in prehistory or history.

In addition, a property must be able to convey its significance through the retention of specific aspects of integrity, such as location, design, setting, materials, workmanship, feeling, and association. In general, properties less than 50 years of age, unless of exceptional importance, are not eligible for the NRHP.

As outlined in 40 CFR 1508.8, effects to historic properties can include direct effects and indirect effects, as well as adverse and beneficial effects. Additionally, in accordance with 36 CFR Part 800.16(d), an APE has been established within which direct and indirect effects on historic properties resulting from the Proposed Action and Alternatives could occur. The APE for the project includes the 3,684-acre Project Area (see **Figure 1-1**).

3.6.2 Historical Background

3.6.2.1 Prehistoric Period

The prehistory of the current Project Area is complex and poorly understood because of the area's location near the contact zone between the Great Basin, Colorado Plateau, and Northern Plains cultures. The prehistory of the Uinta Basin is a meld of these traditions that has resulted in the identification of many enigmatic archaeological sites. The cultural changes in these areas are classified into the following four general chronological periods: Paleo-Indian, Desert Archaic, Formative, and Post-Formative. The following is a brief description of each period (some of which may overlap in time) and their distinct phases.

Also known as the Clovis Period, the Paleo-Indian Period (ca. 12,000 B.C. to 9,000 B.C.) is poorly understood in the eastern Great Basin and northwestern Colorado Plateau. What little is known about this period comes from a limited number of surface sites and isolated finds of Clovis, Folsom, and Lake Mojave projectile points, which suggest a possible lake edge-marsh adaptation. The Desert Archaic Period (ca. 9,000 B.C. to A.D. 500) is marked by broad range movement and diminished hunting of big game by the native peoples. It also includes a time of climatic change associated with the end of the Pleistocene Epoch and with the subsequent cultural adaptations.

The Formative Period (ca. A.D. 400 to 1300) is characterized by a shift from a hunting and gathering way of life to a more sedentary one based on horticulture. The native peoples associated with this period, the Fremont, were roughly contemporaneous with the Anasazi of southern Utah and the Four Corners region. The Post-Formative Period (ca. A.D. 1200 to 1776) is marked by the apparent replacement of the Fremont peoples by a migratory group of Shoshonean/Numic-speaking people from the southwest. This period also includes the arrival of the direct ancestors of modern-day Ute Indians and their use of the Uinta Basin's resources.

3.6.2.2 Historical Period

The first explorations by Europeans and European-Americans into the Uinta Basin occurred over 200 years ago when the Spanish friars Francisco Atanasio Dominguez and Silvestre Velez de Escalante made their way through the Uinta Basin during their search for an overland route from Santa Fe, New Mexico, to the missions of Monterey, California. Subsequent forays and settlements undertaken by exploratory campaigns, fur trappers, and Mormon pioneers eventually forced the Utes onto a reservation established by President Lincoln in 1861. Unfulfilled promises by the government and unrest among the different bands of Utes forced to cohabitate on the reservation led to a series of uprisings in 1866 known as the Black Hawk War. Many Utes left the reservation at this time to join Chief Black Hawk in his raids on Mormon settlements in the area. The Black Hawk War continued until 1868, at which point Chief Black Hawk agreed to cease hostilities and move onto the Uinta Valley Reservation.

Following the Black Hawk War, between 1869 and 1885 several small communities were established in the area and rudimentary canal systems were set up to irrigate the farms of the new settlers. Water development became an increasingly important and tense issue as more and more settlers made their way into the arid Uinta Basin. Water right arguments resulted in the construction of various canal systems throughout the area. In 1886, a rich gilsonite vein was discovered in the Uinta Basin and additional discoveries of minable ores prompted the government to reopen sections of the Uinta Valley Reservation for leasing to white miners and homesteaders. Road networks and railroads were developed to support the growing mining industry and eventually the reservation was opened in 1905 to allow whites access to the natural resources in the area. Water resources continued to be a source of tension, and by the late 1910s and early 1920s, water development was in full swing in the Uinta Basin with the development of additional canals and reservoirs. The Great Depression greatly affected residents of the Uinta Basin, and it was not until the start of World War II and the accompanying demand for the mineral resources that the economy of the area began to recover. Because of oil discoveries in the post-World War II period, this area has remained prosperous into modern day, though water resources continued to be an issue.

One of the most significant developments in the Uinta Basin in recent years concerns the argument over legal jurisdiction of Ute tribal lands. The argument, which is being settled in a number of current court cases, is debating the exact boundaries of Tribal lands, and more importantly for the Utes, determining who has legal jurisdiction over said lands. It is unclear as to what the outcome of these hearings will be and how that outcome will affect future development in the area.

3.6.3 Known Cultural Resources within the Project Area

Three cultural resources surveys were conducted for this project: the first was conducted in November 2011, for the well pads; the second in September 2012, for the original pipeline location and access roads; and the third in October 2014 for the revised pipeline location and tank battery area (see **Figure 3-12**).

On November 21, 2011, the Utah SHPO conducted a GIS file search of the area within 1 mile of each well pad. On November 22, 2011, a records search was conducted at the SHPO, Division of State History, Antiquities Section. The records showed that a total of 11 cultural resource projects have been previously conducted and two cultural resource sites have been previously identified within 1 mile of the well pads (Sagebrush 2011; 2013). On September 3, 2012, the Utah SHPO conducted a GIS file search of the area within 1 mile of the powerlines and proposed access roads. This survey also included the pipeline and access road routes proposed under dismissed Alternative J as these ROWs were a component of the Proposed Action at the time of the survey. The records showed that a total of 18 cultural resource projects have been previously conducted and three cultural resource sites have been previously identified within 1 mile of the pipelines, powerlines, and access roads (Sagebrush 2012; 2013). On October 22, 2014 a third

GIS file survey was conducted by the Utah SHPO for all areas within 1 mile of the cross-country pipeline route. The records showed that a total of thirty-one cultural resource projects have been conducted and two cultural resource sites have been identified within one mile of the cross-country pipeline route (Sagebrush 2014).The NRHP and General Land Office (GLO) plat maps for the area were also consulted in 2011 and 2012. One GLO plat map depicts the alignment of a canal in the APE.

Three intensive cultural resources field surveys were also conducted within the APE and included the well pads, pipelines, and access roads (see **Figure 3-12**). The first survey was carried out for the four proposed wells on November 22, 2011. A total of 121.5 acres were surveyed by walking in parallel transects spaced no more than 50 feet apart. The second survey was conducted for the original pipeline route (Alternative J) and proposed access roads on September 20, 2012. A total of 56.17 aces were surveyed by walking in parallel transects spaced no more than 50 feet apart. One historic site (42UN7913) and two isolated finds were located during the surveys. The third survey, conducted on October 24, 2014, covered the proposed cross-country pipeline route. A total of 16.37 aces were surveyed by walking in parallel transects spaced no more than 50 feet apart. One historic site (42UN8480) was located within the pipeline corridor.

Based on the nature of the isolated finds, they were not evaluated for inclusion to the NRHP. Site 42UN7913 represents an historic irrigation system that was fundamental to settlement and farming in the Leota Bottom region and may have association with Depression Era programs. This site is associated with events that have made a significant contribution to the broad pattern of the history of the region, specifically irrigation, agriculture, Depression Era resettlement, and, possibly, Depression Era relief programs. Therefore, site 42UN7913 as a whole is recommended as eligible to the NRHP under Criterion A. However, the portion of this site within the APE has lost integrity due to flooding, road construction, etc. and therefore is not significant or eligible to the NRHP.

Site 42UN8480 is located on a low rise on the western border of Leota Bottom is a historic irrigation and water control system. The site consists of three earthen ditches, a small reservoir, and concrete headgates. Site 42UN8480 is associated with events that have made a significant contribution to the broad pattern of the history of the region, specifically settlement, irrigation and agriculture. Therefore, site 42UN8480 as a whole is recommended as eligible to the NRHP under Criterion A. This site at the location of the proposed pipeline crossing has lost its integrity from sheet wash and vegetation. The feature is not visible at the site of the crossing in either direction; therefore, cultural resource clearance is recommended for this project.

3.6.4 Section 106 Consultation

Final consultation with Utah SHPO will be initiated and completed prior to the issuance of a Decision Record for this EA. Preliminary consultation with the Utah SHPO concurred with Service determinations of eligibility and effects regarding the Thurston Energy, LLC's Proposed Ouray NWR 2-Well Development Program. Utah SHPO Consultation has been initiated for the proposed pipeline route and site 42UN8480. Construction of the proposed pipeline corridor would not occur until the Utah SHPO has given concurrence, provided appropriate site specific mitigation, and/or until the 30 day review period has ended. See **Appendix I** and **Appendix J** for details.

3.7 Transportation

U.S. Highway 40 (US 40) and State Highway 88 (SH 88) provide access to the Ouray NWR and Project Area from Vernal and Roosevelt, Utah. Use of these transportation corridors is monitored by the Utah

Department of Transportation (UDOT). **Table 3-12** provides a summary of the average annual daily traffic (AADT) on the highway segments providing access to the Ouray NWR and the Project Area from Vernal (traveling west on US 40), Roosevelt (traveling east on US 40), and SH 88 (traveling south from US 40 junction). AADT represents traffic traveling in both directions.

US 40 is a two- to three-lane all weather highway in Utah's primary highway system. The road provides access to the Project Area from the population centers of Roosevelt and Vernal, Utah, which would serve as the primary service centers for project-related activity. SH 88 is a two-lane all weather State highway providing access to the town of Ouray and the Ouray NWR from US 40.

An existing network of gravel roads is maintained by the Service within the Ouray NWR. Wildlife Refuge Road provides access to the Refuge and the Ouray NFH from SH 88 and will be the primary transportation route used within the Project Area. The current transportation network within the Refuge is used by USFWS employees for Refuge management and maintenance, Ouray NFH employees, and visitors for various recreation uses.

Table 3-12. AADT for Federal and State Highways Providing Access to Project Area

Road Name	Road Segment	Segment Distance	2011 AADT[1]	2010 AADT[1]	2009 AADT[1]
US 40	200 N Roosevelt to 7500 E (road to Fort Duchesne)	6.8 miles	12,578	11,056	10,946
	7500 E (road to Fort Duchesne) to SR 88 (road to Ouray)	19.6 miles	8,222	7,125	6,952
	SR 88 (road to Ouray) to SR 45 Naples	8.3 miles	15,923	15,912	15,837
SH 88	US 40/SH 88 junction to Ouray	16.9 miles	2,300	2,305	2,262

[1] AADT represents average traffic traveling in both directions for route section
Source: UDOT 2011

3.8 Recreation

The Ouray NWR is a popular outdoor recreation destination for local residents, wildlife enthusiasts, anglers and hunters. Most public use occurs April through November. The Refuge received approximately 4,800 visitors in fiscal year (FY) 2012 (October 2011 – September 2012, [USFWS 2012d unpub. data]). **Table 3-13** summarizes public and recreation use on the Refuge for FY12. Due to flooding and high water conditions in 2011, public use and recreation opportunities on the Refuge were limited and below target.

Table 3-13. Public Use on Ouray NWR (Oct. 2011 – Sept. 2012)

Public Use	2012 Target	2012 Actual
Environmental education	50	55
General visitation (visitation to visitor center/contract station)	300	290
Fishing	40	35
Waterfowl hunting	150	155
Upland Game hunting	20	25
Big Game hunting	40	50
Wildlife observation: hiking/pedestrian	100	15
Wildlife observation: auto-tour	1,000	250

Public Use	2012 Target	2012 Actual
Wildlife observation: boating, canoeing, rafting	30	25
Wildlife photography	100	90
Volunteers *Total Volunteer Hours (wildlife/habitat, maintenance)*	18 *710*	30 *1,420*

Source: USFWS 2012d unpublished data

Hunting and fishing are popular activities on the Refuge and harvest is permitted for mule deer, elk, ducks, geese, coots, pheasant, and turkey in designated areas. The Leota, Wyasket, and Johnson Bottoms are open to deer and pheasant hunting, and the Leota Bottom is open for waterfowl hunting during all State prescribed seasons. Season and weapon restrictions apply to elk and turkey hunts (USFWS 2012e). Fishing is allowed on the Green River year-round. Endangered fish species (i.e., razorback suckers, Colorado pikeminnow, humpback chub, and bonytail) must be returned to the river unharmed in accordance with ESA regulations if caught.

3.9 Visual Resources

The Ouray NWR lies within the Uinta Basin section of the Colorado Plateau physiographic province. The general visual characteristics of the Uinta Basin topography west of the Green River can be described as relatively flat wide shallow valleys that are not more than a few hundred feet below the surrounding county (Stokes 1986).

The landscape is composed of scenery that is typical of the central Uinta Basin: a predominance of shallow, gently rolling hills and drainages; shale-colored bluffs and steeply incised drainages near the Green River and Nine Mile Canyon; and distant views of the Uinta Mountains to the north, the Roan Cliffs and Book Cliffs to the south, and the Wasatch foothills to the west.

There is no human habitation within the Project Area, although there are several residences and a bunkhouse in the Refuge Headquarters area nearby. Oil and gas activities, structures, and surface disturbances are present in much of the region. Modifications of the landform and vegetation, as well as placement of structures on the land are prevalent throughout most of the region.

Areas adjacent to the Project Area (Green River corridor) are high-quality recreational and scenic destinations. Public visitation within the proposed Project Area is about 5,000 people per year.

4.0 ENVIRONMENTAL CONSEQUENCES

This Chapter summarizes and analyzes the potential impacts or environmental consequences that would result from implementation of Alternative A – Proposed Action, and Alternative B – No Action Alternative. The impact analysis describes the effects of implementing the alternatives on the physical, biological, and the human environment that were discussed in **Chapter 3**. The resource-specific effects of the alternatives are evaluated both quantitatively and qualitatively, depending on available data and the nature of the resources analyzed. Conservation measures and long-term impacts are discussed, where appropriate, to further minimize impacts.

An environmental consequence or impact is defined as a modification in the existing environment resulting from the Proposed Action or an Alternative. Impacts can be a primary result of the action (direct) or a secondary result (indirect), and can be temporary and of short duration (short-term) or permanent or long-lasting (long-term). Impacts can vary in degree from only a slight discernible change to a total change in the environment.

Direct effects are caused by the action and generally occur at the time the action is implemented and within the Project Area (e.g., removal/loss of vegetation). Indirect effects are caused by the action and occur later in time or further removed from the Project Area (e.g., sediment yield impacts downstream from the Project Area). Short-term impacts are effects on the environment that occur during and immediately after well pad construction, drilling, completion, testing, and/or production facility installation, and can last for several years, or until completion of interim reclamation. Although short in duration, such impacts can be obvious and disruptive. For this Project, short-term impacts are defined as lasting 4 years or less. Long-term impacts are changes made in the environment during construction and operation of the project that remain longer than 4 years and perhaps for the LOP (approximately 33- to 43-years) and beyond.

For the purposes of the environmental consequences analysis of this EA, the term "Proposed Action" represents the construction footprint (area of disturbance), while the term "Project Area" also includes the 3,756 acres of surrounding lands outside but adjacent to the Proposed Action. The term "surrounding region" includes surrounding lands (outside but adjacent to the Project Area) and denotes a more expansive landscape context. Where appropriate, the analysis of impacts considers effects to resources in the surrounding region outside the immediate Project Area (e.g., air quality impacts, transportation, etc.).

As defined by CEQ regulations, cumulative impacts result from the incremental impacts of an action when added to past, present, and reasonably foreseeable future actions, regardless of who takes the action (40 CFR 1508.7). Concurrently, the ESA defines cumulative impacts as effects of future State or private activities (not involving Federal activities) that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR §402.02). The ESA definition only applies to Section 7 analysis and should not be confused with the broader use of this term in NEPA or other environmental laws.

Several large scale EISs have recently analyzed the cumulative impacts of oil and gas development in the Uinta Basin, including all of Uintah and Duchesne Counties, as well as the proposed development in and adjacent to the Ouray NWR. The cumulative impacts analyses in the Gasco Energy Inc. Uinta Basin Natural Gas Development Project (Gasco), Anadarko Greater Natural Buttes Uinta (including the Air Quality Technical Document), and the Draft EIS for the Newfield Monument Butte project fully considered the impacts to all of the resources identified in this EA. In order to reduce duplicative analysis, this EA tiers to and incorporates by reference these cumulative impacts analyses.

In these EISs, BLM completed comprehensive and quantitative air quality analyses that included complex air models. The Proposed Action and the two proposed wells are within the cumulative impacts analysis areas for the models and are covered by these analyses. These air models studied the impacts of thousands of oil and gas wells and concluded that there would be no appreciable increase or impacts to air quality. The incremental impacts from these two wells will not be significant when compared to other oil and gas development.

This EA has determined that there are no cumulative impacts, beyond those analyzed and explained in these EISs that would require additional analysis beyond the cumulative impacts analysis area of the Ouray NWR.

Cumulative impact analysis is presented for each resource following the direct and indirect effects discussion and provides a framework for forecasting and evaluating future environmental changes that may affect the quality and extent of the natural and human environment. Although the Ouray NWR boundary may be considered a generalized cumulative impact assessment area (CIAA), cumulative impacts in this EA were analyzed using CIAAs with spatial boundaries that vary by resource. **Table 4-1** defines the CIAA for each resource examined in this EA and provides rationale for selecting each CIAA boundary.

Table 4-1. Cumulative Impact Assessment Areas

Resource	Cumulative Impact Assessment Areas	Assessment Area Rationale
Air Quality	Uinta Basin	Construction, development, and production activities from implementation of the Proposed Action would cumulatively contribute to changes in air quality occurring immediately adjacent to the Project Area and within the greater Uinta Basin.
Soils	Ouray NWR Boundary and its adjacent lands	Project activities impacting soils would only affect soil types present within the Ouray NWR boundary and its adjacent lands and would not cause additive effects to those occurring elsewhere.
Water Resources[1]	Green River System	Project activities impacting water resources could contribute to cumulative impacts within the Green River system.
Biological Resources[2]	Ouray NWR Boundary and its adjacent lands and waters	Project activities impacting biological resources would only affect those present within the Ouray NWR boundary and its adjacent, lands and waters. Furthermore, proposed conservation measures would reduce impacts to special status plant and animal species and their potential habitat within the Ouray NWR.
Paleontological Resources	Project Area Boundary	Project activities impacting paleontological resources would only affect those present in the Project Area and would not cause additive effects to those occurring elsewhere.
Cultural Resources	Project Area Boundary	Construction activities impacting cultural resources would only affect those present in the Project Area and would not cause additive effects to those occurring elsewhere.

Resource	Cumulative Impact Assessment Areas	Assessment Area Rationale
Transportation	Project Area Boundary and primary access roads to the area	Impacts to transportation would be most pronounced within the Project Area; however, less noticeable impacts may be realized on primary, public transportation corridors (i.e., US 40 and SH 88) leading to the Refuge.
Recreation	Ouray NWR Boundary and its adjacent lands	Project activities impacting recreation would be limited to the Ouray NWR boundary and its adjacent lands and would not cause additive effects elsewhere.
Visual Resources	Ouray NWR Boundary and its adjacent lands	Project activities impacting visual resources would only affect those present within the Ouray NWR boundary and its adjacent lands and would not cause additive effects elsewhere.

[1] Includes Floodplains, Wetlands, and Waters of the U.S.

[2] Includes Vegetation, Invasive and Noxious Weeds, Fish and Wildlife, and Special-Status Plant and Animal Species

As stated previously, cumulative impacts are derived from past, present, and reasonably foreseeable future actions. Reasonably foreseeable future actions are those for which there are existing decisions, funding, formal proposals, or which are highly probable and based on known opportunities or trends. For purposes of assessment in this EA, it is reasonably assumed that energy-related actions would have the greatest effect within the previously defined CIAAs. All other actions that could affect the CIAAs are assumed to remain at current trends, with only minor deviations.

The following discussion for present and reasonably foreseeable energy development (RFD) is based on UDOGM data and pending NEPA documents with the Service within the Ouray NWR boundary. As of April 2013, there are seven well pads, six active wells, and two pending APDs on State-owned lands within the Refuge boundary, 48 planned wells on SITLA lands (Golob 2014) and 9 wells proposed for development under an ongoing EA with the Service. **Table 4-2** provides the estimated surface disturbance for the past, present, and reasonably foreseeable future energy development within the Ouray NWR.

Table 4-2. Estimated Maximum Surface Disturbance Associated with Past, Present, and Reasonably Foreseeable Energy Development within Ouray NWR

	No. of Wells [2]	No. of Well Pads[2]	Estimated Surface Disturbance[1]			
			Well Pads (acres)	Access Roads, Pipelines, and/or Power Lines (acres)	Other Supporting Infrastructure (acres)	Total (acres)
Past	--	--	--	--	--	--
Present	6	7	14.7	10.5	--	25.2
RFD: Ultra 9-Well EA	9	3	11.1	5.8	--	16.9
Ultra Development in Section 2, T8S, R20E	21	4-11[4]	15.8	--	--	15.8
Ultra Development in Section 36, T7S, R20E	27	5-14[4]	20.3	--	--	20.3
Proposed Action[3**]	2	3	4.8	6.1	--	10.9
Total	**65**	**22-38**	**66.7**	**22.4**	**0**	**89.1**

[1] Surface disturbance is the short-term disturbance value for each of the defined project components. (Note: Projects without a designated surface disturbance rate were assigned a total equivalent of 3.6 total acres per well pad [BLM 2012c]).

[2] Number of proposed wells for each project was compiled from NEPA documents and UDOGM data.

[3] Estimated short-term surface disturbance set out in the Proposed Action, **Section 2.1.1**.

[4] Well pads within these developments would be co-located on pads with up to six wells or as few as two wells. As a result, it is assumed the average disturbance area for each well would be 0.75 acres.

[**] Includes 9,768.1 feet of proposed above ground power line.

As shown in **Table 4-2,** surface disturbance associated with implementation of the Proposed Action, when added to past, present, and other reasonably foreseeable actions, would incrementally increase the total cumulative disturbance within the Ouray NWR to 89.1 acres, or 0.7-percent of the total acreage within the Refuge.

4.1 Air Quality and Greenhouse Gas Emissions

4.1.1 Alternative A – Proposed Action

Emissions under Alternative A - Proposed Action are considered to be a minor source under the CAA. The Proposed Action would result in different types of emission sources associated with two project phases: well development and well production. Under Alternative A – Proposed Action the pumpjack engines and wellsite heaters would be powered by commercial electricity rather than hydrocarbon fuel from the wells if the wells are determined to be productive and it is determined to be feasible. However, natural gas-powered engines would be used initially while the wells are assessed. This would reduce emissions of NO_x, CO, and Greenhouse gas. Annual estimated emissions from the Proposed Action are summarized in **Table 4-3.** For purposes of analysis, it is assumed in the emissions inventory that the pumpjack engines and wellsite heaters would be powered by commercial electricity. As such, actual emissions from the operation of the two proposed wells and associated infrastructure are expected to be

higher if the Proposed Action is selected and natural gas-or diesel-powered engines are used until it is determined whether electricity will be installed. A more detailed overview of emissions calculations are presented in **Appendix D.**

Table 4-3. Estimate of Annual Emissions *(tons per year)*[1] for Well Development and Production Under the Proposed Action

Pollutant	Development	Production	Total
Criteria Pollutants			
NO_X	4.19	2.22	6.41
CO	1.93	3.97	5.90
VOC	0.34	17.5	17.87
SO_2	0.028	0.003	0.031
PM_{10}	5.62	13.9	19.49
$PM_{2.5}$	0.81	1.65	2.46
Greenhouse Gases			
Carbon Dioxide (CO_2)	369.4	1,168.6	1,538.0
Methane (CH_4)	0.20	22.0	22.2
Nitrous Oxide (N_2O)	0.003	0.003	0.005
Global Warming Potential (GWP)[2]	375.3	1,718.7	2,094.0
Hazardous Air Pollutants			
Benzene	0.001	0.44	0.44
Toluene	0.0006	0.77	0.77
Ethylbenzene	0.000004	0.03	0.03
Xylene	0.0004	0.43	0.43
n-Hexane	0.0007	0.48	0.48
Formaldehyde	0.0002	0.0002	0.0005

[1] Emissions include development of 3 pads, production from 2 wells, and associated operations traffic during the year in which the project is developed.

[2] Global Warming Potential (GWP) = CO_2 + 25 x CH_4 + 298 x N_2O

Well Development includes NO_X, SO_2, and CO tailpipe emissions from earth-moving equipment, vehicle traffic, drilling, and completion activities. Fugitive dust emissions would occur from vehicle traffic on unpaved roads and from wind erosion where soils are disturbed. Drill rig and fracturing pump engine operations would result mainly in NO_X and CO emissions, with lesser amounts of SO_2 and $PM_{2.5}$. These emissions would be short-term during the drilling and completion phases and would not be expected to cause or contribute to an exceedance of the NAAQS.

Drilling operations are the main contributor to well development emissions as shown in **Table 4-4**. These emissions are summarized from **Appendix D** and are calculated based on the average time needed for the

drilling of a single well multiplied by the total number of wells (2) assuming Tier 2 drill rig engines are used.

Table 4-4. Estimate of Annual Emissions *(Tons per Year)* [1] for Well Development Under the Proposed Action

Pollutant	Construction	Drilling	Well Completion	Interim Reclamation	Wind Erosion	Total Well Development Emissions
NO_X	0.61	2.24	1.33	0.009	---	4.19
CO	0.22	1.18	0.51	0.020	---	1.93
VOC	0.051	0.14	0.15	0.002	---	0.34
SO_2	0.00002	0.002	0.026	0.00002	---	0.03
PM_{10}	0.18	1.93	3.32	0.10	0.082	5.62
$PM_{2.5}$	0.060	0.29	0.44	0.012	0.012	0.81

[1] Emissions include construction, drilling, and well completion from 2 wells and 3 pads as well as associated operations traffic during the year in which the project is developed. Summations may not precisely add due to round off differences.

During well production, continuous NO_X, CO, VOC, and HAP emissions (plus relatively small amounts of SO_2, PM_{10}, and $PM_{2.5}$) will be produced from well pad dehydration units with emission control combustion units, tank battery condensate and produced water storage tanks, pneumatics, boiler, and tailpipe and fugitive dust emissions from operations traffic. Well production emissions are summarized in **Table 4-5.**

Table 4-5. Estimate of Annual Emissions *(Tons per Year)* [1] for Well Production Under the Proposed Action

Pollutant	Stock Tanks	Truck Loading	Dehydrator Units	Flares	Boiler	Fugitives	Operations Vehicle	Pneumatics	Total Well Production Emissions
NO_X	---	---	---	0.54	0.32	---	1.35	---	2.22
CO	---	---	---	2.96	0.27	---	0.73	---	3.97
VOC	12.73	0.55	2.48	---	0.02	1.55	0.072	0.13	17.5
SO_2	---	---	---	---	0.002	---	0.001	---	0.003
PM_{10}	---	---	---	---	0.02	---	13.8	---	13.9
$PM_{2.5}$	---	---	---	---	0.02	---	1.63	---	1.65

[1] Emissions include production and operation of 2 wells and 1 tank battery using commercial electricity rather than fuel combustion (see discussion above under 4.1.1). Summations may not precisely add due to round off differences.

Potential impacts of oil and gas well development and production emissions in the region have been extensively analyzed in the Greater Natural Buttes Final Environmental Impact Statement (FEIS) (BLM, 2012). The Greater Natural Buttes (GNB) Project was approved for a total of 3,675 producing wells, with 336 wells developed per year. Despite the fact that the GNB Project has a substantially greater number of wells, the GNB analysis found that the annual NAAQS for criteria pollutants would not be exceeded as a result of implementation of the GNB Project. Therefore, development of the Proposed Action would not cause an exceedance of the annual NAAQS.

Potential 1-hour, 3-hour, 8-hour, and 24-hour impacts are not based on the total number of wells being developed or operated, but rather are a function of a single or small number of wells. The GNB FEIS analyzed a worst case scenario where four wells were drilled simultaneously at the four corners of a square 400 meters on a side (i.e., the wells were 400 meters apart). All of the short-term and annual potential impacts were evaluated, including the 1-hour NO_2 and 1-hour SO_2 standards. For the 1-hour NO_2 standard, the GNB analysis used the Plume Volume Molar Ratio Method (PVMRM) to account for NO to NO_2 conversion, assuming initial in-stack NO_2 was 10 percent of the total NO_X emissions, Tier 2 drill rig engines, and the AERMOD dispersion model. The GNB analysis also accounted for seasonal and diurnal variation in ozone concentrations (since ozone is needed for the conversion of NO to NO_2).

The GNB FEIS found that the 1-hour NO_2 standard would not be exceeded even at receptors located as close as 100 meters to the drill rig engines. The GNB analysis assumed at a minimum that Tier 2 drill rig engines (4.8 grams per brake hp hour [g/bhp-hr]) be used. Therefore, Tier 2 engines are recommended as a conservation measure for potential air quality impacts associated with the Proposed Action. Since the GNB FEIS indicated that none of the NAAQS would be exceeded with the four drill rig scenario, the Proposed Action would also not result in an exceedance of the NAAQS since only one drill rig will be operating at a time. While Tier 4 engines are not being evaluated in this analysis, emissions would be decreased if Tier 4 engines were used instead of Tier 2.

The GNB 1-hour NO_2 analysis was conducted prior to the EPA issuing extended guidance on how to conduct such analyses. However, although the analysis does not precisely match the guidance, it is similar to the most recent guidance. For example, the EPA guidance suggests a default in-stack NO to NO_2 ratio of 0.5 if no project-specific stack testing data are available. Although the GNB analysis did not have project specific stack testing data available, the 10 percent assumption is consistent with stack testing data that are available for large diesel-fueled engines as presented by the EPA on its In Stack Ratio (ISR) database of actual stack test results, available at www.epa.gov/scram001/no2_isr_database.htm.

This database was designed specifically to address the default ISR problem. As the EPA states on the web site for the ISR database:

> " *... the recommended default ISR may still be too conservative for many applications such that there remains a significant need for a widely available and well-documented database of ISRs, which is the impetus for the current data collection effort*."

The database supports use of the 10 percent ISR used in the GNB analysis. In addition, the use of PVMRM for atmospheric conversion of NO to NO2 is what is specified in the EPA guidance. Therefore, as long as the 10 percent assumption made by GNB is valid, the GNB analysis should yield a reasonable assessment of potential 1-hour NO2 impacts. Because the GNB FEIS indicated that none of the NAAQS would be exceeded with the four drill rig scenario, the Proposed Action would also not result in an exceedance of the NAAQS because only one drill rig will be operating at a time.

Under the Proposed Action, total emissions of NO_X and VOC ozone precursors, from both well development and well production are estimated at 6.41 tons per year for NO_X, and 17.87 tons per year for VOCs (**Table 4-3**). It should be noted that these are small amounts of ozone precursor emissions. For example, the GNB Project alone has NO_X emissions on the order of 2,000 tons per year and VOC emissions on the order of 7,000 tons per year with total emissions in the region reaching a magnitude of 12,000 tons per year for NO_X and 200,000 tons per year for VOCs. **Section 4.1.4** discusses the potential ozone formation

The primary sources of HAPs are from condensate storage tanks and dehydration units, with smaller amounts from other production equipment. Small amounts of HAPs are emitted by construction equipment. These emissions are extremely small compared to emissions from other projects in the surrounding region, especially the GNB Project. The GNB FEIS found that the GNB Project (3,675 wells) would not cause an adverse health effect as the result of HAPs emissions. Consequently, implementation of the Proposed Action would not likewise be expected to cause adverse health impacts.

Amendments to the CAA stipulate requirements to prevent significant deterioration of air quality and, in particular, to preserve air quality in national parks, national wilderness areas, national monuments and national seashores (42 U.S.C. 7470). These amendments also established Class I, II and III areas, where emissions of particulate matter and sulfur dioxide are to be restricted. The restrictions are most severe in Class I areas and are progressively more lenient in Class II and III areas. In addition to the CAA classifications, the Federal Land Managers have established sensitive Class II areas that also require additional AQRV evaluation as part of the NEPA process. The Service has determined that the Ouray NWR is a sensitive Class II area.

Because the Proposed Action would occur within a sensitive Class II area, potential impacts on visual air quality have to be analyzed near the emission source. The VISCREEN model used for visibility impact screening analyses calculates the contrast of a potential plume of pollutants against terrain and sky backgrounds. As a default criteria, a value of 2 for the color difference, Delta-E, is used as the threshold for a plume being "just noticeable".

Maximum emissions from a single drill rig were input into the VISCREEN model along with the default hypothetical worst case meteorological conditions for dispersion. For an observer standing near the drill rig emission source, the plume may be visible out to approximately 3 km. **Appendix E** contains the VISCREEN model input and output tables.

The GNB FEIS analyzed the potential impact of the GNB Project on visual air quality and acid deposition at distant Class I and sensitive Class II areas. The GNB FEIS analysis was conducted consistent with the Federal Land Managers Air Quality Related Work Group Phase I Report dated December 2000 (FLAG, 2000). Potential visual air quality impacts were analyzed with both Method 2 and Method 6 using the CALPUFF set of dispersion models and post-processors, but Method 2 is no longer used. Although Method 6 is consistent with the EPA's final regional haze rule; for purposes of evaluating impacts at Class I and sensitive Class II areas, it has recently been replaced by the Federal Land Managers with Method 8 (FLAG, 2010).

The main difference between Method 8 and Method 6 is that Method 8 treats small sulfate, nitrate, and organic carbon particles differently from larger particles. This generally results in a slightly more conservative (i.e., larger) regional haze impact. For example, at 70 percent relative humidity and a sulfate concentration of 0.4 ug/m^3, Method 8 yields a 13 percent greater sulfate light extinction than Method 6. However, the changes are not linear and are a function of both the particle concentrations and relative humidity.

The GNB FEIS compared modeled impacts to both 0.5 deciview (dV) and 1.0 dV 98th percentile change in light extinction evaluation criteria. The 0.5 dV change criteria is defined as the threshold for concern by the Federal Land Managers (FLAG, 2010) and is used by the EPA as a threshold for a source contributing to regional haze impairment, while the 1.0 dV change is used by EPA as a threshold for a source causing regional haze impairment. The FEIS found that the GNB Project alone would not cause a change greater than 0.5 dV at any of the Class I and sensitive Class II areas. The GNB FEIS also found

that the Project would not cause adverse acid deposition. However, the GNB analysis only used 1 year of meteorological data for its analysis, while FLAG 2010 recommends a minimum of 3 years and 5 years is preferred. Nevertheless, considering that emissions from implementation of the Proposed Action are so much smaller than the 3,675-well GNB Project, the Proposed Action alone is also not anticipated to cause a significant impact on visual air quality, nor acid deposition.

The assessment of greenhouse gas emissions and climate change remains in its early stages of formulation. The lack of scientific models that predict climate change on a regional or local level prohibits the project-specific quantification of potential future impacts on climate change. Potential greenhouse gas impacts are global and cumulative in nature only and are discussed in **Section 4.1.4.**

4.1.2 Alternative B – No Action Alternative

Under Alternative B – No Action Alternative, the proposed gas wells would not be drilled and there would be no incremental increase in emissions. Effects on ambient air quality would continue at present levels from existing oil and gas development in the region and other emission producing sources. Since the Proposed Action does not cause nor contribute to a significant ambient air quality impact, then Alternative B – No Action Alternative would not change the significance of potential air quality impacts either.

4.1.3 Cumulative Impacts

The CIAA for air quality resources is the Uinta Basin. The GNB FEIS summarized past, present, and reasonably foreseeable development in the Uinta Basin. While, the Ouray NWR 2-Well Development Project was not explicitly listed in the GNB FEIS as one of the anticipated future projects, emissions under the Proposed Action are included in the scaling factors used by the GNB FEIS to estimate reasonably foreseeable development in the region. **Table 4-6** shows the total emissions projected in the GNB FEIS compared to those under the Proposed Action. In **Table 4-6**, "2006 Baseline" represents existing emissions, "2018 Projected" represents the total of existing emissions plus reasonably foreseeable future development, and "2017 GNB Project" is the additional emissions as the result of the GNB Project (i.e., the GNB Proposed Action). As shown in **Table 4-6**, the Proposed Action comprises a very small percentage of the total emissions in the Uinta Basin.

Table 4-6. Uinta Basin Oil and Gas Operations Emissions Summary (2006)

Emissions Category	NO_X (tons/year)	CO (tons/year)	SO_X (tons/year)	PM_{10} (tons/year)	VOC (tons/year)
2006 Baseline	10,754	7,800	391	592	70,226
2018 Projected	10,138	9,732	30	565	184,262
2017 GNB Project	2,213	1,300	25	1,011	6,617
Uinta Basin Future Total (i.e., 2018 Projected plus GNB Project)	**12,351**	**11,032**	**55**	**1,576**	**190,879**
Ouray NWR 2-Well Development Project (Proposed Action)	6.41	5.90	0.031	19.49	17.87

The GNB FEIS explicitly analyzed cumulative impacts with respect to NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, ozone, HAPs, visual air quality, and acid deposition at sensitive Class I and II areas. The FEIS found that the cumulative impacts of NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$ emissions would not cause an exceedance of the NAAQS in the region. Therefore, it is assumed that implementation of the Proposed Action will also not contribute to an exceedance.

The GNB FEIS analyzed the potential impact of cumulative emissions of ozone precursors on regional ozone concentrations. The GNB FEIS regional ozone modeling did not show an exceedance of the ozone NAAQS caused by the cumulative emissions in the region. As discussed in Chapter 3, although the current photochemical models do show the effect of ozone precursor emissions on summer time ozone concentrations, they have not yet been developed to represent winter time ozone formation in detail. Emissions of ozone precursors from the Proposed Action are 0.01 percent of the regional total assessed in the GNB analysis (i.e., sum of the Proposed Action NO_x and VOC compared to the sum of the Uinta Basin future total NO_x and VOC).

Based on the magnitude of the projected increase in ozone precursors in the Uinta Basin, whether or not the proposed project is built, and the contribution that would be emitted from implementation of the Proposed Action, a precise numerical analysis of potential ozone impacts from the action alternatives is not feasible. Any cumulative ozone impacts from implementation of the Proposed Action would be indistinguishable from, and insignificant in comparison to, the margin of uncertainty associated with the regional cumulative VOC and NO_X emission inventory and ozone impact modeling methodology. Whether or not emissions from the Proposed Action were included in any regional ozone modeling, there would be no difference in the results.

On the other hand, photochemical models have demonstrated that reductions in NOx and VOC emissions will reduce the potential for ozone exceedances. Considering the fact that the region may be declared nonattainment, ozone exceedances have been observed, and oil and gas operations are the only major source of emissions in the region, the possible contribution of the Proposed Action to potential ozone formation cannot be ignored and a reduction in emissions will result in a reduced potential for visibility impairment, even if not detectable, quantifiable, or measureable.

The State of Utah has expressed interest in participating in the USEPA Ozone Advance Program that encourages the reduction of ozone precursor emissions and participants may receive preferred status when applying for Federal grants and/or receive a State Implementation Plan (SIP) credit for reduction measures undertaken as part of the Program. Thurston will consider participating in the Ozone Advance

Program should a reasonable plan be promulgated in the future and will also consider participating in the BLM Adaptive Management Program for ozone precursor emission reductions. In the interim, Thurston will comply with all applicable air emission regulations that are designed to ensure that ozone levels do not exceed the NAAQS.

In addition, in the future the Uinta Basin may be declared non-attainment for ozone by the USEPA. If this occurs, the State of Utah will be required to develop a SIP to achieve attainment status and the SIP may require emission reductions from existing or new sources of ozone precursor emissions. Thurston will abide by the SIP process and all emission reduction requirements that may be included in the SIP.

The GNB FEIS also modeled potential visual air quality and acid deposition impacts at distant Class I and sensitive Class II areas. The GNB FEIS found that cumulative emissions in the Uinta Basin would not have a significant impact on acid deposition. As discussed in **Section 4.1.1** of this EA, the GNB FEIS found that the 3,675-well GNB Project alone would not cause an exceedance of the 0.5 dV threshold. On the other hand, the GNB FEIS found that cumulative emissions from all current and future development could cause an exceedance of the 1.0 dV threshold on 223 to 365 days per year at several of the Class I areas. The lowest value, 223 days per year, was for Canyonlands National Park. Similar results were found for the sensitive Class II areas, with the lowest number of days (206) being at the Browns Park NWR. The GNB FEIS analysis used Method 6 to assess visual air quality impacts. Recent guidance uses Method 8, and thus the cumulative visual air quality impacts with Method 8 could be different than reported in the GNB FEIS.

However, as in the case of ozone, the emissions that could potentially affect visual air quality from implementation of the Proposed Action are less than 0.02 percent of the future total. Any cumulative visual air quality impacts from implementation of the action alternatives would be indistinguishable from, and insignificant in comparison to, the margin of uncertainty associated with the regional cumulative emissions related to potential visual air quality impacts. Whether or not emissions from the Proposed Action were included in the cumulative visual air quality impact modeling, regardless of the method used to perform the analysis (i.e., Method 2, 6, or 8), there would be no difference in the results. But as noted above, a reduction in emissions will result in a reduced potential for visibility impairment, even if not detectable, quantifiable, or measureable. Under the Proposed Action, implementation of the conservation measures (**Section 2.1.10**) would also reduce impacts to air quality by minimizing fugitive dust.

Under the No Action Alternative, there would be no contribution to cumulative emissions in the region. However, the potential impacts of the cumulative emissions would not essentially change because the Proposed Action emissions are such a small portion of the total. As a result, there would be no detectable or observable change in cumulative impacts whether or not the Proposed Action or Alternative B - No Action Alternative is implemented.

4.1.4 Mitigation

The following conservation measures would be applied to reduce impacts to air quality under the Proposed Action:

1) All internal combustion equipment would be kept in good working order;
2) To reduce potential impacts to air quality, all equipment associated with drilling and completion activities, as well as service equipment used for fracking and cementing, would be with Tier 2 or better drilling rig engines.
3) To reduce any potential impact on air quality, the Service requires that all vehicles with diesel engines be manufactured after 1996 and be kept in good working order;

4) Low bleed or no bleed pneumatics would be installed on separator pump valves and other controllers. The use of low bleed pneumatics would result in lower emission of volatile organic compounds (VOCs);

5) Thurston has agreed to use similar air pollution control technologies that are currently being applied for other oil and gas operations on Federal lands in the Uinta Basin. At a minimum, the following air pollution control practices will be used to address recognized issues with winter ozone formation:

    a. Dehydrator VOC emission controls to +95% efficiency;

    b. Tank VOC emission controls to +95% efficiency; and

    c. If and when gas-powered engines are used, they will be required to meet the following standard: Stationary internal combustion engine standard of 2g NOx/bhp-hr for engines <300HP and 1g NOx/bhp-hr for engines >300HP.

6) During completion, flaring would be limited as much as possible. Production equipment and gas gathering pipelines would be installed as soon as possible;

7) Telemetry would be installed to remotely monitor and control production. This would reduce truck traffic and decrease associated dust and tailpipe emissions;

8) During production, tighten connections and replace packing to minimize leaks and fugitive emissions;

9) During production, use and maintain proper hatches, seals, and valves to minimize air emissions;

10) During daily site visits, or as needed, inspections will be conducted using soap solutions to identify and repair fugitive gas leaks from leaking compressors, valves, connectors, seals, and open-ended lines;

11) Eliminate unnecessary vehicle idling;

12) Thurston would prohibit any open burning of garbage or refuse at well sites or other facilities.

13) Thurston will instruct its employees and contractors: (1) not to exceed 10 miles per hour on well pad access roads; and (2) not to exceed 25 miles per hour on the main Refuge road during construction, drilling/completion, production, or normal daily activities to discourage the generation of fugitive dust from traffic.

14) Dust levels on regularly traveled access routes must be kept to a minimum. During drilling and completion operations, Thurston will perform dust abatement measures on the main Refuge road and proposed access roads and/or well pads at least once a day or as needed, as determined by the Refuge Manager. Thurston must have a water truck and operator(s) readily available to perform dust abatement. Only water from an off-Refuge source will be allowed for dust suppression efforts. Magnesium water or an approved equivalent may be used as needed with prior approval from the Refuge Manager or authorized representative. Dust control measures must be implemented throughout the traveled areas of the Project Area, including construction sites and existing and proposed roads.

4.2 Soils

As described in **Section 3.2**, soils in the Project Area are generally rated low in reclamation potential. Impacts to soils are typically described in terms of short-term and long-term impacts. In disturbed areas

where interim reclamation is implemented, ground cover by herbaceous species could potentially re-establish within 5- to 7-years following seeding of native plant species and diligent weed control efforts, thereby reducing soil erosion. These reclaimed areas have often been referred to as short-term disturbance. However, it is important to note that all surface disturbances could remain as long-term (or even permanent) impacts on the landscape if reclamation efforts are not successful.

4.2.1 Alternative A – Proposed Action

Construction and operation of the proposed project would result in short- and long-term impacts to soils within the Project Area. Impacts would result from the clearing of vegetation, excavation, salvage, stockpiling, and the redistribution of soils during construction and reclamation activities that are associated with pads, access roads, and pipelines.

Implementation of the Proposed Action would result in the direct disturbance of approximately 10.5 acres of soils within the Project Area. Following construction, approximately 2.9 acres of short-term disturbance (28 percent) associated with construction of proposed pads and portions of the access roads and pipeline ROWs not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the Proposed Action to approximately 7.6 acres. **Table 4-7** provides a summary of short-term and long-term surface disturbance associated with each soil mapping unit within the Project Area.

Blading or excavation to achieve desired grades could result in slope steepening of exposed soils in cut-and-fill areas, mixing of topsoil and subsoil materials, and the breakdown of soil aggregates into loose particles. The mixing of physical characteristics of the soils, including structure, texture, and rock content could potentially lead to a loss of soil productivity and reduced reclamation potential. Topsoil and subsoil would be stockpiled separately along the sides of the pads and access roads. Soil structural aggregates would also be broken down by compaction from vehicular traffic. Removal and stockpiling of topsoil for revegetation purposes could reduce the natural fertility of the soil, and cause a loss of soil profiles by mixing soil horizons. These activities could potentially result in the subsequent breakdown of the soil structure.

Table 4-7. Soil Disturbance by Major Soil Map Units under the Proposed Action

Soil Map Unit	Acres within Project Area	Short-term Surface Disturbance (acres)	Long-term Surface Disturbance (acres)
Badland-Rock outcrop complex, 1 to 100 percent slopes (12)	324	2.2	1.5
Green River loam, 0 to 2 percent slopes, occasionally flooded (88)	187	0.0	0.0
Greybull-Utaline-Badland complex, 8 to 50 percent slopes (94)	91	0.0	0.0
Jenrid sandy loam, 0 to 2 percent slopes (120)	421	0.0	0.0
Nakoy loamy fine sand, 1 to 5 percent slopes (160)	213	2.7	2.1
Ohtog-Parohtog complex, 0 to 2 percent slopes (166)	245	2.3	1.6
Riverwash (191)	94	0.0	0.0
Shotnick loamy sand, 0 to 4 percent slopes (205)	332	3.3	2.4
Shotnick-Walkup complex, 0 to 2 percent slopes (209)	96	0.0	0.0

Soil Map Unit	Acres within Project Area	Short-term Surface Disturbance (acres)	Long-term Surface Disturbance (acres)
Stygee clay loam, 0 to 1 percent slopes (221)	38	0.0	0.0
Tipperary loamy fine sand, 1 to 8 percent slopes (229)	202	0.0	0.0
Turzo loam, 0 to 4 percent slopes (242)	285	0.0	0.0
Blackston loam, 0 to 2 percent slopes (23)	76	0.0	0.0
Utaline very gravelly sandy loam, 0 to 2 percent slopes (253)	19	0.0	0.0
Unclassified (open water, water structures)	1,142	0.0	0.0
Total	**3,767**	**10.5**	**7.6**

[1] Total acreage estimates are based on GIS-software calculations and may not equal the total summation when using mathematic equation due to rounding, removal of overlapping development and minute boundary discrepancies.

4.2.1.1 Erosion and Sedimentation

The whole soil erosion potential (K_w) for the soils that would be disturbed under the Proposed Action range from 0.24 – 0.37, indicating a moderate potential for erosion. In addition, the reclamation source materials rating for these soils are low, indicating that the presence of soil factors would inhibit the growth of vegetation. Upon completion of construction activities, re-vegetation, and 5- to 7-growing seasons, if reclamation efforts are successful, erosion rates would be expected to decrease to near baseline conditions for the reclaimed portions of the well pads, access roads, and pipeline ROW. However, erosion rates would likely remain at slightly elevated levels for the new access roads even in the absence of high traffic volumes.

Exposed soils would also be susceptible to heightened wind and soil erosion. The removal of vegetative cover, steepening of slopes, and the breakdown of aggregates would increase the potential for channelized runoff and accelerated soil erosion. Wind erosion could also increase with removal of vegetation and exposure of soils. Erosion would result in the formation of more rills and gullies and would increase sedimentation of surface water. Erosion would be particularly evident if project related activities are conducted during periods of high precipitation or during drought conditions. The increased erosion of soils could potentially lead to increased loss of vegetative cover and increased sedimentation in ephemeral drainages, the Green River, and/or other unnamed drainages within Ouray NWR. The actual amount of additional sedimentation that would reach the drainages within or downstream adjacent to the Project Area would depend of the effectiveness of reclamation and erosion control measures as well as natural factors including the water available for overland flow; the texture of the eroded material and the amount and kind of ground cover; the shape, gradient, and length of the slopes; and surface roughness (Barfield et al. 1981).

Under the Proposed Action, topsoil would be conserved. Topsoil removed during project activities would be stockpiled for interim and final reclamation. During interim reclamation, all areas not needed for production would be returned to their natural contour using stockpiled topsoil and then seeded. At the completion of the project, or if a well is not productive, the well pads would be completely reclaimed. In addition, implementation of the additional conservation measures detailed in **Section 2.1.10** would further minimize soil erosion and sedimentation impacts under the Proposed Action. Ground disturbing activities would be limited during periods of low precipitation to minimize wind erosion and fugitive dust deposition. Greater care and maintenance of topsoil would enhance reclamation success for soils with poor reclamation potential. This includes separating, stockpiling, covering, and documenting topsoil stockpiles on-site, in accordance with the Refuge's prescribed conservation measures.

4.2.1.2 Soil Contamination

Sources of potential soil contamination include leaks or spills of natural gas condensate liquids from wellheads, gas and water lines, produced water sumps, and condensate storage tanks. To reduce the potential for hydrocarbon contamination of soils, gas lines, and water lines would be designed to minimize the potential for spills and leaks. Storage tanks would be located on the upper area of the Refuge, away from Leota Bottom wetlands and the Green River, and surrounded by berms capable of holding at least 110 percent of the largest single tank volume. Leaks or spills of saline water, hydraulic fracturing chemicals, fuels, and lubricants could also result in soil contamination. Depending on the size and type of spill, the effect on soils would primarily consist of the potential loss of soil productivity. The Project would minimize the risk of such spills by providing safeguards against spills and making sure that detailed reporting and cleanup measures are performed in the event of a spill. Thus, the potential for impacts to soils from spills would be considered minor.

Implementation of conservation measures listed in **Section 2.1.10** would further minimize the direct and indirect impacts to soils assessed under the Proposed Action (see **Section 4.2.1**). Construction of containment structures and use of catch pans or other liner systems to capture any and all leaked substances from storage tanks and/or production facilities would further minimize risks to the soil resources from possible contamination. In the event of an accidental spill or discharge, Thurston would be required to remove contaminated soils for proper disposal off-site and replace them with the same soil type or one specified and approved by the Refuge Manager. To further protect soils from contamination, Thurston or a Service-approved laboratory will be required to test the soils at the Project site to determine levels of heavy metals, chemical pollutants, or other contaminants prior to rig-up operations and before completion or at abandonment. Ground disturbance activities will be limited during periods of high precipitation to minimize impacts to soils. Greater care and maintenance of topsoil would enhance reclamation success on soils having poor reclamation potential. This includes separating, stockpiling, covering, and documenting topsoil stockpiles on-site in accordance with Refuge protection measures.

4.2.2 Alternative B – No Action Alternative

Under the No Action Alternative, the applicant would be denied access to USFWS refuge lands and exploratory drilling would not occur within Ouray NWR. As such, no changes to the existing environment would occur. No impacts to soil resources are anticipated.

4.2.3 Cumulative Impacts

The CIAA for soil resources is defined as the Ouray NWR boundary and adjacent lands. Any surface disturbing activity that removes native vegetation and topsoil from land within the Refuge may cumulatively and incrementally affect soil resources by increasing erosion and sediment yield, thereby reducing soil productivity and stability as measured by the amounts and types of vegetative cover and forage. Past, present, and reasonably foreseeable actions that could result in increased erosion and sediment yield within the CIAA include: prescribed burns; habitat enhancement projects; road, trail, and various other travel-way development; and oil and gas exploration and production. Of these actions, impacts related to road construction are the highest concern. As active roadways and trails would not be reclaimed for the long term, it is assumed sediment yield from existing and proposed road and trail construction (including those roads used for oil and gas development) would continue at rates two to three times above background rates into the indefinite future, as compared to other authorized actions.

As previously shown in **Table 4-2**, surface disturbance associated with the Proposed Action, when added to past, present, and other reasonably foreseeable actions, would cumulatively and incrementally result in minor negative cumulative impacts to soil resources within the CIAA. Approximately 78.2 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities on the Refuge. Under the Proposed Action, the proposed Ouray NWR 2-Well Development Project would incrementally increase the total cumulative soil disturbance in Ouray NWR to 89.1 acres. Throughout the CIAA, disturbed soil acreage and reduced soil productivity would last for the lifetime of oil and gas development or until final reclamation is deemed successful.

The incremental increase within the CIAA would increase under the Proposed Action because the bundled surface HDPE pipeline (and embedded natural gas, oil, and water lines) and potential power line within the ROW would result in more surface disturbance. Soil compaction due to construction activities at well pads, along access roads, and in other disturbed areas would result in a small increase in surface runoff. This increased runoff could in turn cause increased sheet, rill, and gully erosion. The construction and operation of each well would also incrementally increase the potential for soil contamination within the CIAA. Spills, leaks, or discharges could increase the loss of soil productivity within the area.

Under the Proposed Action, implementation of certain design features (see **Section 2.1**) and conservation measures (see **Section 2.1.10**), including berms, proper grading of well pads and access roads, and spill prevention and containment measures, would reduce impacts to soil resources by minimizing soil erosion and reducing the potential for soil contamination.

No cumulative impacts to soil resources are expected under the No Action Alternative.

4.2.4 Mitigation

The following conservation measures would be applied to reduce impacts to soils under the Proposed Action:

1) The drill site and immediate access roads must be constructed of Refuge-approved material for all drilling locations. All existing drainage patterns within roads to be constructed must be maintained uninterrupted by the use of culverts, bridges, or other applicable techniques as specified and authorized by the Refuge Manager or the Service AO.
2) Thurston must provide a Stormwater Pollution Prevention Plan (SWPPP) that would be reviewed by the Service prior to the commencement of construction activities. This plan should be prepared according to industry guidelines and should include sufficient information and narrative descriptions regarding construction activities along the existing waterways, locations of all proposed potential discharges, identification of potential pollutant sources, maps detailing all ground-disturbing activities at sites, and details and figures for proposed BMPs for these construction activities.
3) Thurston shall implement and maintain BMPs at all oil and gas locations to control stormwater runoff in a manner that minimizes erosion, transport of sediment offsite, and site degradation. BMPs shall be maintained until the facility is abandoned and final reclamation is achieved. Operators shall employ BMPs, as necessary, to comply with this rule at all oil and gas locations, including, but not limited to, well pads, soil stockpiles, access roads, tank batteries, and pipeline ROWs. BMPs shall be selected based on site-specific conditions, such as slope, vegetation cover, and proximity to water bodies, and may include maintaining in-place some or all of the BMPs installed during the construction phase of the facility. Where applicable, based on site-specific conditions, operators shall implement BMPs in accordance with good engineering practices.

4) Stormwater drainage should be segregated from loading/unloading facilities, and operations areas from unimpacted areas.

5) No project vehicles will be operated along dirt access roads or at drilling pad sites during periods of saturated soil conditions when surface ruts greater than 4 inches would occur along straight travel routes.

6) As necessary during construction, drilling, and production operations, appropriate BMP sedimentation controls will be used in areas susceptible to erosion. The BMPs would be selected and constructed as described in "The Gold Book" (USDI - USDA 2007).

7) Sediment traps, swales, and mulching should be used during construction activities to reduce loss of sediment and contamination of runoff.

8) Straw bales and/or silt fences would be used as energy dissipaters where the possibility of erosional down-cutting exists. If straw bales are used for erosion and sediment control, the straw/hay must be certified weed-free; otherwise, only silt fencing would be allowed for this purpose. These structures would be installed prior to construction, and would be left in place and maintained for the LOP or until the adjacent disturbed slopes have revegetated and stabilized.

9) Project vehicles will be restricted to use of the project-related travel routes and surfaces, including turn-outs on approved travel routes.

10) Thurston would perform re-grading and watering of the access routes following inclement weather conditions as needed. Earthen berms and storage tank containment areas would be lined with a non-permeable liner in order to reduce the risk of groundwater and soil contamination. These liners will be maintained and replaced per manufacturer guidelines.

4.3 Water Resources Including Floodplains, Wetlands, and Waters of the U.S.

4.3.1 Alternative A – Proposed Action

Construction and operation of the proposed project could potentially result in direct and indirect impacts to water resources. The principal impacts to water resources associated with the Proposed Action include: (1) increased sediment loading to the Green River, potentially increasing salinity levels in the Colorado River system; (2) depletion of stream flows in the Green River from the removal of water for drilling activities; (3) increased runoff; (4) impacts to water quality (i.e., potential contamination of surface water resources and shallow groundwater with drilling fluids or other wastes generated by natural gas drilling and production activities); and (5) direct and indirect impacts to floodplains.

4.3.1.1 Surface Water

The magnitude of potential project-related impacts to surface water resources would depend on a number of factors, including the proximity of surface disturbances to the Green River; slope aspect and gradient; soil type; the duration and timing of the construction activity; and the success or failure of reclamation and erosion control measures. The potential for adverse impacts to surface water resources would be greatest during project construction activities and would likely decrease in time due to natural stabilization of disturbed surfaces, the reduction in the amount of surface disturbance from interim and final reclamation, and successful revegetation efforts.

Increased Sedimentation

Much of the Project Area, including land where the well pads would be constructed, is nearly flat and increased erosion from these areas would likely be negligible. The potential for increased erosion would

be greatest along access corridors and new access roads. The actual amount of sediment that would be transported to the Green River would depend on natural factors and the effectiveness of BMPs employed to control erosion, but is expected to be minimal. Potential increases in construction-related erosion and sedimentation would be minimized by implementing BMPs (e.g., silt fencing).

During construction erosion control measures would be implemented to avoid or minimize soil erosion and sedimentation. All roads would be constructed with appropriate and adequate drainage and erosion control features (e.g., cut-and fill-slope and drainage ditch stabilization, relief and drainage culverts, wing ditches, and rip-rap). The Refuge Manager will specify the erosion control methods to be used on a site-specific basis. Revegetation of road edges, drainage ditches, and cut-and-fill slopes would help stabilize exposed soil and reduce sediment loss.

Water Use

Water for use during drilling operations would be obtained from the Green River at the Green River Bridge on State Highway 88 (State Water Right No. 49-2307 and State Water Right No. 49-2367). Approximately 0.5 acre-feet (5,256 barrels, or 162,925 gallons) of water would be needed for the drilling of each well. Thus, a maximum of one acre-foot of water would be required to drill two wells. Approximately 2.3 acre-feet (24,176 barrels, or 749,458 gallons) of additional water would be used per well for completion purposes, for a total of approximately 4.6 acre-feet of water for two wells. Approximately 0.1 acre-feet (1,051 barrels, or 32,585 gallons) of water would be used on Wildlife Refuge Road for dust control. Water used for dust control purposes would be obtained from the Vernal City municipal water supply. The total amount of water required for drilling, completion, and dust control operations is anticipated to be approximately 5.7 acre-feet over the LOP. In comparison, the average annual flow in the Green River at Ouray is about 4,064,290 acre-feet (based on flow data from the USGS gauging station at Ouray). Therefore, the use of water for drilling will deplete the Green River by only 0.0001 percent.

Increased Runoff

Soils compacted on well pads and roads would contribute to slightly greater runoff than undisturbed sites. The increased erosion could subsequently lead to slightly increased turbidity in the adjacent floodplain during major storm events. However, this effect would likely be negligible due to the low amount of runoff that would potentially be generated from the proposed facilities. In addition, to some degree surface water flow within the Refuge is controlled by a series of dikes and levees that regulate the discharge of floodwaters to the surrounding floodplain and ultimately into the Green River.

Runoff from undisturbed areas around each well pad would be directed into ditches and energy dissipaters (if needed) around the site and then released to grade. Stormwater management efforts may include additional engineering measures such as the installation of culverts to divert water flow around the well pads. As a result of these measures, the increased runoff would likely have no appreciable impact on the adjacent floodplain.

Water Quality

Contamination of surface water can occur in oil and gas fields. Sources of potential contamination include leaks of fuels, petroleum products, and produced water from wellheads, conveyance pipelines, storage tanks, and tanker trucks; leaching of contaminants from impacted soils near these facilities; and accidental spills. A spill of natural gas condensate that enters the adjacent floodplain or the Green River would have the greatest potential environmental impact on surface water. Potential effects from a spill of natural gas condensate could include an increase in biological oxygen demand (BOD) that results in the depletion of oxygen in the water and sediments during the short-term. This depletion of oxygen could have deleterious effects on aquatic organisms.

Produced water would be stored in steel tanks located on the tank battery pad. The contents of the tanks would be pumped out as needed and transported by tanker truck to licensed disposal sites. A spill of produced water into the adjacent floodplain or Green River could also result in negative impacts, including an increase of sodium, chloride, and other constituents, and aquatic organism mortality. In addition, significant leaks of produced water from routine loading operations on the well pads could potentially enter and impact surface water. The potential for a release from project vehicles and tanker trucks would be greatest during the construction, well drilling, and completion phase as a larger degree of mobilization would be required. The potential for release from tanker trucks that could impact the Green River and adjacent wetlands would be much lower during the operational life of the wells as these trucks would not be using the main Refuge Road near the Green River and fewer truck trips to the tank battery site would be required.

The Proposed Action has been designed to minimize the potential for spills. Should well logs determine that a well is economically viable, steel production casing would be run from the bottom of the wellbore through to the surface casing. The steel production casing would be cemented in place. Cementing the production casing would prevent damage to the wellbore that could potentially occur from targeted formation pressure or retard corrosion, and would prohibit pressure communication or fluid migration between productive zones. This would provide protection to freshwater aquifers within the Project Area.

Prior to drilling below the surface casing, a BOP would be installed on the surface casing and a flow control manifold consisting of manual and hydraulically operated valves would be installed below the rig floor. Both the BOP and the steel casing would be pressure tested to verify well integrity and to comply with *BLM Onshore Oil and Gas Order No. 2, Drilling Operations*. Additionally, a cement bond log would be run as part of completion operations to ensure that the production casing is properly protected from non-target formations. All drilling fluids used for each well would be contained within a closed-loop drilling system and no reserve pits would be constructed or used. All condensate and water tanks would be surrounded by a dike of sufficient capacity to contain 110 percent of the storage capacity of the largest tank in the battery and sufficient freeboard to contain precipitation.

Thurston would prepare and implement a final site-specific SPCC plan within 6 months of commencing operations. The SPCC plan describes spill control, reporting, and cleanup procedures to help prevent impacts to surface and subsurface waters. Any release of oil, gas, salt water, or other such fluids would be cleaned up immediately and removed to a permitted disposal site. Thurston would develop a stormwater management plan and design well locations to divert storm water drainages around the proposed well pads to reduce the amount of on pad erosion and the potential for small quantities of hazardous material from accidental spills to be washed into the drainage.

4.3.1.2 Groundwater

Potential impacts to groundwater resources from the Proposed Action include contamination of shallow groundwater underlying the Leota Bottom with produced water, drilling fluids, and petroleum constituents. Spills of fuels or produced fluids have the potential to contaminate shallow groundwater resources, including water used by the Ouray NFH from its production well. Potential effects from contamination of groundwater with natural gas condensate or produced water are similar to the potential effect to surface water, and include an increase in BOD, depletion of dissolved oxygen, and an increase of sodium, chloride, and other constituents. In addition, cleanup of groundwater contaminated with these substances can be considerably more difficult than cleanup of surface water.

The Proposed Action has been designed to minimize the potential for contamination of shallow aquifers. The well would be lined with steel casing that would be cemented in place. The steel casing would be pressure tested to ensure that the well would not leak production fluids into non-target or water bearing formations. The steel casing would then be cemented in place down to the producing zones and a cement bond log would be run. This would prevent damage to the wellbore that could potentially occur from targeted formation pressure, retard corrosion, and prohibit pressure communication or fluid migration between productive zones. If a spill is detected, the SPCC plan would be implemented to minimize, control, and cleanup the affected area. The measures provided in the SPCC plan would minimize the chance that spilled material would enter the groundwater by providing a rapid response to any spill events.

Hydraulic fracturing would be conducted as part of the Proposed Action. Hydraulic fracturing is commonly used to enhance the recovery of natural gas from relatively impermeable "tight" sandstones. This process involves the injection of water or other fluids, which may contain some petroleum constituents, and sand or some other "proppant" into the formation. Hydraulic fracturing would occur at depths that are at least 2,500 feet or more below the surface within isolated sections of the completion casing. Therefore, because of the great depth at which hydraulic fracturing would be conducted, and other protective measures incorporated into well construction, groundwater resources would not be affected.

4.3.1.3 Floodplains and Wetlands and Waters of the U.S.

Floodplains are protected by EO 11988 which requires that all Federal agencies take action to reduce the risk of flood loss; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. Wetlands and Waters of the U.S. are protected under Section 404 of the CWA. Potential impacts to floodplains from the Proposed Action include damage to or loss of riparian vegetation from increased sedimentation; removal of vegetation for road and well pad construction; and pollution of surface water ponds or wetlands on the Leota Bottom due to accidental spills or loss of containment of petroleum products, fuels, and other chemicals. Per USACE verification, no direct impacts resulting from implementation of the Proposed Action would occur to wetlands or Waters of the U.S. See **Appendix B** for details.

The implementation of the environmental protection measures described above for surface water resources (e.g., revised location of tank battery, BMPs and SPCC) would also be protective of floodplains, waters of the U.S. and wetlands in the Project Area. Therefore, the potential for adverse direct or indirect impacts to floodplains and wetlands is expected to be minimal. Additionally, conservation measures listed in **Section 2.1.10** would further minimize potential direct and indirect impacts assessed under the Proposed Action (see **Section 4.3.1**). Implementation of secondary containment structures to capture any and all leaked substances from storage tanks, production facilities, and drilling equipment would reduce the potential for contamination of water resources due to accidental

spills. The well development timing limitations would limit construction activities during potentially wet conditions in the spring, thereby potentially reducing damage to floodplains vegetation from construction activities.

4.3.2 Alternative B – No Action Alternative

Under the No Action Alternative, the applicant would be denied access to USFWS refuge lands and exploratory drilling would not occur within the Ouray NWR. As such, no impacts to water resources would occur.

4.3.3 Cumulative Impacts

The CIAA for water resources, including floodplains, wetlands, and waters of the U.S., is defined as the Green River System. Any surface disturbing activity that removes native vegetation and topsoil from land within the Refuge may cumulatively and incrementally affect water resources by increasing erosion and sediment yield, as well as by introducing produced fluids and other physical and chemical constituents to area drainages and surface water features. Past, present, and reasonably foreseeable actions that could result in increased erosion rates, sediment yield, and contamination within the CIAA include: oil and gas development, prescribed burns, Refuge management activities, recreation, and road and trail construction. Of these actions, surface disturbing activities such as construction of oil and gas facilities and associated infrastructure would likely have the greatest potential impact on water resources due to increased erosion and sedimentation rates. However, moving the tank battery and related equipment to the upper area of the Refuge will reduce these potential impacts.

Surface disturbing activity that removes native vegetation and topsoil within the Refuge may cumulatively and incrementally impact surface water resources from increasing erosion and subsequent sedimentation. Implementation of the Proposed Action may introduce produced fluids and other physical and chemical constituents to area drainages and surface water features. Past, present, and reasonably foreseeable actions that could result in increased erosion, sediment yield, and contamination within the CIAA include: oil and gas development, prescribed burns, Refuge management activities, recreation, and road and trail construction.

As previously shown in **Table 4-2**, surface disturbance associated with the Proposed Action would cumulatively and incrementally result in minor negative cumulative impacts to water resources within the CIAA when added to past, present, and other reasonably foreseeable actions. Approximately 78.2 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities on the Refuge. The proposed project would incrementally increase the total cumulative soil disturbance in Ouray NWR to approximately 89.1 acres. Throughout the CIAA, increased erosion and sediment yield, and the risk of spills, would last for the lifetime of oil and gas development and production until final reclamation is deemed successful. Depending on reclamation requirements, drought conditions and other factors may affect reclamation success in the CIAA.

Soils compacted on existing roads, new access roads, and well pads would contribute to higher runoff than at undisturbed sites. The increased runoff could lead to higher peak flows in the CIAA drainage system, potentially increasing erosion of the channel banks. Such increased erosion, when combined with increased erosion from other authorized actions, could have negative impacts on aquatic habitat within affected drainages and on the proper functioning condition of floodplains. These impacts include increased turbidity and salinity; the covering of stream substrates with fine sediment and clogging of the interstitial pores of the substrate; increased transport of pollutants, including trace metals, herbicides, and petroleum constituents, and increased down-cutting of channel and bank destabilization. The construction

and operation of each well would also incrementally increase the potential for leaks or spills of saline water, hydraulic fracturing chemicals, fuels, and lubricants within the CIAA. Spills of this nature could contaminate surface water or shallow alluvial groundwater within the Refuge.

Under the Proposed Action, implementation of design features (see **Section 2.1**) and conservation measures listed in **Section 2.1.10** would minimize cumulative impacts to water resources within the Refuge. These measures include moving the tank battery and associated equipment away from sensitive wetland areas and the Green River, constructing secondary containment structures around the proposed facilities and limiting construction activities during wet conditions, thereby reducing impacts to floodplain vegetation.

No cumulative impacts to water resources are expected under the No Action Alternative.

4.3.4 Mitigation

The following conservation measures would be applied to reduce impacts to water resources under the Proposed Action:

1) Thurston must provide the Refuge Manager or the Service AO a copy of the wetland determination/delineation that was issued by the U.S. Army Corps of Engineers (USACE) for the Project Area showing that none of the well pad locations or roads will impact wetland areas. The USACE would also need to be contacted if any wetlands may be disturbed by the proposed exploration activities;
2) The Operator will be responsible for providing all water needed for drilling operations from outside the Refuge. No wastewater will be discharged onto Refuge lands, ditches, or water bodies. The Operator will provide a containerized or temporary septic system for domestic sewage disposal during drilling operations, which must be removed upon completion of drilling. Use of portable toilets at the drill site or the installation of a temporary septic system, or similar treatment system or tanks, will be required for any trailer onsite. No surface discharge of septic system or portable toilet water is permitted. Septic tanks must be inspected weekly during operations and pumped as necessary. Upon completion of operations, the septic tanks must be pumped out, removed, and all material hauled away.
3) Thurston shall provide a detailed map of the Project Area and the location of the well pads and associated roads with respect to wetlands and waters of the United States.
4) Thurston would sample and test any known water wells located within a 0.50 mile radius up-gradient or immediately down-gradient of the oil extraction wells. The testing protocol will be developed jointly by the Service and Thurston.
5) Thurston's proposed casing program will be designed and implemented to adequately protect usable quality groundwater such that impacts to groundwater from drilling and production are not anticipated. Risks to groundwater from unanticipated downhole failures would be considered low, correctable, and manageable (O'Dell 2014).
6) In accordance with EPA regulations (40 CFR Part 112) and UDOGM requirements, Thurston must prepare and implement a SPCC plan for each well within 6 months of beginning operations. Copies of the SPCC plans shall be provided to the Refuge Manager within 6 months of commencing production operations.
7) In accordance with EPA regulations (40 CFR Part 112) and UDOGM requirements, Thurston must prepare and implement a SPCC plan for each well within 6 months of beginning

operations. Copies of the SPCC plans shall be provided to the Refuge Manager within 6 months of commencing production operations.

8) A Draft SPCC Plan, which illustrates the types of spill prevention measures that will be developed and implemented for each well, is included in **Appendix G** of the EA/BA. This plan will be reviewed by the Service and should include a listing of secondary containment and/or diversionary structures or equipment for all oil handling containers, equipment, and transfer areas. It should also include a table identifying tanks and containers at the facility with the potential for an oil discharge, the mode of potential failure, and the likely flow direction and potential quantity of the discharge, as well as provide the secondary containment method and containment capacity. In addition, the SPCC Plan should include the physical layout of the facility and a facility diagram that marks the location and contents of each container. The facility diagram must also include all transfer stations and connecting pipes.

9) All open-top oil, condensate, or produced water tanks, dehydration unit tubs, secondary containment tubs, and any other open tub, tank, pan, or similar item will be netted or screened to prevent entrapment and mortality of migratory birds. Where there are open-top tanks that do not contain harmful substance, such as stock water tire tanks, we recommend the use of escape ramps in these tanks to minimize the potential drowning of migratory birds and possible violations of the Migratory Bird Treaty Act (MBTA).

10) Thurston will construct a secondary containment berm of sufficient capacity to contain 110 percent of the storage capacity of the largest tank in the tank battery and sufficient freeboard to contain precipitation. Thurston will install containment for the chemical injection tanks.

11) Catch pans or other secondary containment systems consistent with industry standards are required for equipment and locations such as mud pumps, bulk mud additive tanks, fuel tanks, mixing sheds, generators, accumulator and lines, and under the entire rig floor. The catch pans must cover the entire surface area under the equipment. The rig floor catch pan (collector) must be properly secured to allow for wash down and mud drainage from the drill pipe. The catch pans must be kept free of accumulated debris and spill materials must be emptied on a regular basis.

12) Earthen berms and storage tank containment areas would be lined with a non-permeable liner in order to reduce the risk of groundwater and soil contamination. These liners will be maintained and replaced per manufacturer guidelines.

13) Substitute organic additives, polymers, or biodegradable additives for oil-based mud to reduce toxicity;

14) Lubricate with mineral oil and lubra-beads instead of diesel oil;

15) All on-site personnel would be trained in the proper management of waste types encountered at the site;

16) A copy of all MSDS sheets shall be provided prior to use of any chemicals or compounds that have an MSDS data sheet;

17) Thurston shall provide Refuge staff with any needed safety equipment for periodic inspection;

18) Fuel and lubricants will be temporarily stored in transportable containment trucks and trailers to minimize potential for accidental releases;

19) No other hazardous or potentially hazardous materials will be brought into the Project Area;

20) During daily site visits, visual inspections will be conducted to assure that no leaks of oil, brine, or chemicals are occurring.

21) All spills or leaks of drilling muds, diesel fuel, hydraulic fluid, lubricating oil, and coolant, including contaminated soil material will be excavated and placed in an appropriate container and then transported to an approved off-site disposal location; and

22) The soils at the location site must be tested by a USFWS-approved laboratory using approved standards to determine levels of heavy metals, chemical pollutant, and other contaminants prior to rig-up operations. Duplicate tests must be conducted before completion or at abandonment to determine impacts from potential undiscovered spills and releases of oil or other chemical constituents. If the exit test reveals levels above the background established by the pre-drilling test, clean-up will be required. The most practical method of clean-up is soil removal. Any quantity of soil removed must be replaced with a Service-approved equal and to the original contours.

4.4 Biological Resources

4.4.1 General Vegetation

4.4.1.1 Alternative A – Proposed Action

Construction and operation under the Proposed Action would result in direct and indirect impacts to vegetation communities within the Project Area. Direct effects to vegetation (i.e., modification of structure, species composition, and extent of cover types) would occur from disturbance or removal of vegetation associated with construction of well pad sites, access roads or improvements to Wildlife Refuge Road. Indirect effects may include the short-term and long-term increased potential for noxious weed invasion, exposure of soils to accelerated erosion, soil compaction, and shifts in species composition and/or changes in plant density.

Table 4-8 shows that implementation of the Proposed Action would result in the direct disturbance of 10.5 acres of vegetation. This includes approximately 3.0 acres of scrub/shrub; 1.9 acres of grasslands/herbaceous; 1.5 acres of riparian vegetation types; 3.4 acres of barren land; and 0.7 acre of altered or disturbed vegetation cover types. Following construction, approximately 2.9 acres of short-term disturbance (28 percent) associated with construction of proposed pads, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance associated with implementation of the Proposed Action to approximately 7.6 acres.

Table 4-8. Vegetative Communities Affected by the Proposed Action

Land Cover Type	Vegetation Community	Short-Term Disturbance	Long-Term Disturbance
Scrub/Shrub	Colorado Plateau Mixed Low Sagebrush Shrubland	0.0	0.0
	Inter-Mountain Basin Mixed Salt Desert Shrubland	3.0	2.1
	Colorado Plateau Pinyon-Juniper Shrubland	0.0	0.0
	Inter-Mountain Basins Big Sagebrush Shrubland	0.0	0.0
Total		**3.0**	**2.1**
Grasslands/ Herbaceous	Inter-Mountain Basins Semi-Desert Shrub Steppe	1.9	1.5
Total		**1.9**	**1.5**
Riparian	Inter-Mountain Basins Greasewood Flat	1.5	1.1
	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	0.0	0.0
Total		**1.5**	**1.1**
Barren Lands	Colorado Plateau Mixed Bedrock Canyon and Tableland	1.3	0.9
	Inter-Mountain Basins Shale Badland	2.1	1.5
Total		**3.4**	**2.4**
Open Water	Open Water	0.0	0.0
Total		**0.0**	**0.0**
Altered or Disturbed Land	Invasive Annual Grassland	0.7	0.5
	Invasive Southwest Riparian Woodland and Shrubland	0.0	0.0
	Agricultural Lands	0.0	0.0
	Existing Development	0.0	0.0
Total		**0.7**	**0.5**
Grand Total		**10.5**	**7.6**

[1] Total acreage estimates are based on GIS-software calculations and may not equal total acreage by soil map unit due to rounding, removal of overlapping development, and minute boundary discrepancies. GIS-based calculations are considered more accurate than estimates calculated using simple addition and therefore, will be used throughout this document.

*Note: Individual acreages may not equal totals due to rounding.

*No USACE-designated wetlands are located within the proposed disturbance area.

The duration of impacts to vegetation would depend, in part, on the success of mitigation and revegetation efforts and the time needed for natural succession to return revegetated areas to pre-disturbance conditions. Following interim reclamation, ground cover would likely begin to re-establish within 2- to 3-years following seeding using native plant species. An estimated 7- to 10-years would be needed for shrub species to successfully re-vegetate the disturbed portions of the Project Area. Long-term disturbance would remain for the estimated 25- to 33-year LOP or until such time as the abandoned pads and roads would be restored to near existing conditions.

Interim reclamation for portions of the proposed pads and access roads not needed for production facilities/operations would be completed within 6 months following completion of the last well planned. Seeding of temporarily disturbed areas along roads and pipelines would be completed within 30 days following completion of construction.

Implementation of the Proposed Action also would increase the potential for the occurrence of indirect effects. Additional construction related impacts could include soil compaction, an increased potential for wind and water erosion of disturbed surfaces prior to reclamation, and the potential for shifts in species composition and/or changes in plant density.

Conservation measures would further reduce environmental impacts through greater care and maintenance of topsoil to enhance reclamation success (see **Section 2.1.10**). In addition, actions would be taken to limit the spread and introduction of noxious weeds through decontamination of vehicles and equipment entering the Refuge.

4.4.1.2 Alternative B – No Action Alternative

Under the No Action Alternative, the two proposed well pads, the tank battery pad, associated access roads, and surface pipeline would not be implemented. As such, there would be no direct or indirect impacts to vegetation or wetlands. Existing conditions for vegetation and wetlands resulting from recreation use and maintenance of Refuge resources would continue at current levels.

4.4.1.3 Cumulative Impacts

The CIAA for general vegetation is defined as the Ouray NWR boundary and adjacent lands. Any surface disturbing activity that removes native vegetation and topsoil may cumulatively and incrementally affect general vegetation by fragmenting plant communities and increasing competition from invasive and noxious weeds. Surface-disturbing activities that compact soil, increase erosion and sediment yield, and increase fugitive dust may also cumulatively and incrementally affect general vegetation. Consequently, change to the landscape may decrease plant productivity and composition in the CIAA. Past, present, and reasonably foreseeable actions that could result in adverse impacts to vegetation within the CIAA include oil and gas development; prescribed burns; habitat enhancement projects and regular Refuge management activities; invasive species control and eradication efforts; and general recreation activities.

As shown in **Table 4-2,** surface disturbance associated with the Proposed Action, when added to past, present, and other reasonably foreseeable energy development activities would cumulatively and incrementally affect vegetation communities across the CIAA. Approximately 78.2 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities on the Refuge. Implementation of the Proposed Action would incrementally increase the total cumulative disturbance in the Refuge to approximately 89.1 acres. Throughout the CIAA, disturbed vegetation communities and reduced plant productivity would last for the lifetime of oil and gas development and production, until such time that final reclamation is deemed successful. Depending on reclamation requirements, drought conditions and other factors may affect reclamation success in the CIAA.

Under the No Action Alternative, no additional surface disturbance would occur within the CIAA as a result of the proposed project.

4.4.1.4 Mitigation

The following conservation measures would be applied to reduce impacts to vegetation:

1) Thurston has developed a Reclamation & Monitoring Plan/Noxious Weed Management Plan that will be used to direct reclamation and monitoring operations and to ensure that the results meet acceptable standards (included as Appendix F of the EA/BA).

2) Thurston will develop vegetation pre-disturbance baseline documentation/data for the proposed well sites or will implement other methods to determine reclamation success, in cooperation with the Service AO.

3) Thurston will provide the Service with an annual report describing the progress of its reclamation operations.

4) Thurston will reclaim as much of a well pad as possible by leaving level ground sufficient for work over operations and re-contouring the remainder of the initial disturbance.

5) All construction of roads and pads will occur in a manner that best facilitates their subsequent complete removal and reclamation once Thurston's activities have ceased at these sites. This includes separating, stockpiling, and covering topsoil layers onsite to be replaced during reclamation. All disturbed areas must be reclaimed with Service input at the time reclamation occurs. Only endemic plants and seed mixtures are to be used in reclamation. Thurston shall separate and store the topsoil horizon or the top 6 inches, whichever is deeper, and mark or document stockpile locations to facilitate subsequent reclamation. When separating the topsoil layers, the operator shall segregate the horizon based upon noted changes in physical characteristics such as organic content, color, texture, density, or consistency. All stockpiled soils shall be protected from degradation due to contamination, compaction and, to the extent practicable, from wind and water erosion during drilling and production operations. BMPs to prevent weed establishment and to maintain soil microbial activity shall be implemented. Final reclamation of all disturbed areas shall be considered complete as follows:

    a. When all activities disturbing the ground have been completed and;

    b. When all disturbed areas have been either built upon, compacted, covered, revegetated, paved, or otherwise stabilized in such a way as to minimize erosion, or;

    c. When a uniform vegetative cover has been established that reflects pre-disturbance or;

    d. When reference area forbs, shrubs, and grasses with total percent plant cover of at least 80 percent of pre-disturbance or reference area levels (excluding noxious weeds) or equivalent permanent, physical erosion reduction methods have been employed. Re-seeding alone is not sufficient.

6) Within 120 days following completion of drilling and testing operations, the Refuge Manager or the Service AO will be advised whether the well is to be retained or plugged. If the well site is to be abandoned, the well is to be plugged to meet the standards of the State requirements, all above-ground structures must be removed, and the site and road restored to near original condition as directed by the Refuge Manager or the Service AO. Any damage to existing surface vegetation, water channels, or other physical features must be restored to original site conditions. All costs shall be borne by the Operator.

4.4.2 Invasive and Noxious Weeds

4.4.2.1 Alternative A – Proposed Action

Disturbances from construction would increase the potential for the establishment and spread of noxious weeds. Noxious weeds tend to be aggressive colonizers of disturbed areas where the native vegetation has been removed. Therefore, disturbances associated with construction of well pad sites, access roads, and other project facilities would provide opportunities for invasive and noxious weeds to become established. Once established, weeds could contribute to a reduction in the overall visual character of the

area and add to the reduction or elimination of native plant species, wildlife habitat, and/or habitat for special status plant species.

In order to minimize the potential for adverse effects from invasive and noxious weed establishment, monitoring for invasive and noxious weeds would be necessary and if found, control and eradication measures would be implemented as outlined in the COAs for the SUP for the Project. The implementation of these measures along with conservation measures listed in **Section 2.1.10** would minimize the potential for adverse impacts from noxious weeds. Under the No Action Alternative, the applicant would be required to decontaminate all construction vehicles and equipment, prior to entering the Refuge. Any materials brought into the Refuge for the construction or reclamation of the proposed pads must be authorized by the Refuge Manager, and no topsoil from outside the refuge would be allowed. In addition, Thurston will also be required to have a Reclamation Plan that includes weed management (see **Appendix F**) to monitor affected and reclaimed lands for noxious weed infestations.

4.4.2.2 Alternative B – No Action Alternative

Under the No Action Alternative, the proposed project would not be implemented. As a result, there would be no direct or indirect impacts associated with the spread of invasive species and/or noxious weeds. Existing conditions promoting the continuation and spread of noxious weeds (for example, recreation and regular Refuge maintenance activities) would continue at current levels.

4.4.2.3 Cumulative Impacts

The CIAA for invasive and noxious weeds is defined as the Ouray NWR boundary and its adjacent lands. Any surface disturbing activities that remove native vegetation and topsoil from the Refuge may cumulatively and incrementally contribute to the introduction and/or spread of invasive and noxious species. Cumulative effects to vegetation from noxious weeds are many and stem from a variety of past, present, and reasonably foreseeable land management and development activities including prescribed fire, wildfire, and habitat enhancement projects, developed and motorized recreation, invasive species control and eradication efforts, and future oil and gas development. Specific negative impacts associated with the introduction and/or spread of invasive and noxious weed species include: 1) a reduction in the overall visual character of an area; 2) competition with, or elimination of native plants; 3) a reduction or fragmentation of native vegetation for wildlife use; and 4) increased soil erosion. Weed infestations may enter previously undisturbed areas or increase the size or density of existing weed populations within the Refuge. These impacts would likely be greatest along road corridors, which often provide a major conduit for the spread of weeds into natural areas.

Surface disturbance associated with the Proposed Action would cumulatively and incrementally affect vegetation communities across the CIAA when added to past, present, and reasonably foreseeable actions. Approximately 78.2 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities. Implementation of the Proposed Action would incrementally increase the total cumulative disturbance on the Refuge to approximately 89.1 acres (see **Table 4-2**). Under the Proposed Action, interim and final reclamation, in combination with conservation measures (see **Section 2.1.10**) would reduce the potential for introduction or spread of invasive and noxious species into native vegetation communities within the Refuge. Throughout the CIAA, disturbed areas associated with the construction of well pads and access roads would last for the lifetime of oil and gas development and production until final reclamation is deemed successful. Depending on reclamation requirements, drought conditions and other factors may affect reclamation success and timelines within the CIAA.

Under the No Action Alternative, the potential for the spread and/or introduction of invasive and noxious weeds resulting from Refuge management activities and recreational use would continue at current levels and incrementally add to the cumulative impacts within the Refuge.

4.4.2.4 Mitigation

The following conservation measures would be applied to reduce impacts related to noxious and invasive weeds:

1) All vehicles and equipment originating from outside the Refuge must be decontaminated prior to arriving at the Refuge per Service procedures to prevent the introduction of noxious weeds to the Refuge. Decontamination would include removal of skid plates for inspection and cleaning if necessary. It is recommended that the operator consult with the local weed control agency or other weed control authority if weed infestation occurs. It is the responsibility of the operator to monitor affected and reclaimed lands for noxious weed infestations. The Refuge will require a weed control plan.
2) Any materials brought into the Refuge as fill material for construction must be certified weed-free or authorized by the Refuge Manager or the Service AO. To minimize the spread of invasive species, no top soils will be brought in from outside the Refuge.
3) To reduce the likelihood of introducing noxious and invasive weed species as a result of project-related vehicles and equipment entering the Project Area, Thurston and its contractors will remove weed seed and soil from all construction equipment and vehicles prior to the start of construction;
4) Any weed infestations noted at drilling sites and along project-constructed access roads would be treated as necessary and as approved by the Service to prevent additional spread; and
5) Thurston would implement an intensive weed control program at the beginning of the first growing season after construction in accordance with the site-specific reclamation and weed management plan.

4.4.3 Wildlife and Wildlife Habitats

4.4.3.1 Alternative A – Proposed Action

Under the Proposed Action, construction and operation of the proposed project would result in direct and indirect impacts to wildlife and wildlife habitat. The principal impacts to terrestrial wildlife associated with implementation of the Proposed Action would likely include: (1) the loss of certain wildlife habitats due to construction activities such as earth-moving associated with proposed pads, access roads, and the bundled HDPE pipeline; (2) habitat fragmentation; (3) vehicle-related mortality; (4) displacement of some wildlife species; and (5) an increased potential for illegal take and harassment of wildlife. The magnitude of impacts to wildlife and wildlife habitats would depend on a number of factors including the type and duration of disturbance, the species of wildlife present, time of year, and implementation of recommended and required conservation measures.

Table 4-8 shows that implementation of the Proposed Action would result in the direct disturbance of 10.5 acres of vegetation. This includes approximately 3.0 acres of scrub/shrub; 1.9 acres of grasslands/herbaceous; 1.5 acres of riparian vegetation types; 3.4 acres of barren land; and 0.7 acre of altered or disturbed vegetation cover types. Direct disturbance to wildlife habitat includes activities such as ground surface grading and excavation, tree and shrub removal, and/or scraping of road surfaces that

disturbs surface and subsurface soils. Each of these activities could effectively remove and/or degrade existing habitat, thereby reducing its availability to local wildlife populations.

Following construction, approximately 2.9 acres of short-term disturbance (30 percent) associated with construction of the two proposed well pads, the tank battery pad, portions of the access road, and pipeline ROW not needed for operational purposes would be reclaimed. These areas would be revegetated with native seed mixes approved by the Refuge Manager, most of which are specifically oriented to enhance wildlife use. The duration of impacts to vegetation would depend, in part, on the success of mitigation and reclamation efforts and the time needed for natural succession to return revegetated areas to pre-disturbance conditions. Grasses and forbs are expected to become established within the first several years following reclamation; however, an estimated 7 to 10 years would be required for shrub establishment and production of useable forage. Thus, under the Proposed Action, total habitat disturbance to vegetation would be reduced from approximately 10.5 acres to 7.6 acres.

Permanent and temporary loss of habitat as a result of construction activities could affect some small mammal, bird, reptile, and/or amphibian species with very limited home ranges and mobility. Although there is no way to accurately quantify these effects, the impact is likely to be moderate in the short term and be reduced over time as reclaimed areas produce suitable habitats. Since most of these wildlife species are common and widely distributed throughout the Project Area, the loss of some individuals as a result of habitat removal would have a negligible impact on populations of these species throughout the region.

Indirect effects due to displacement of wildlife also would occur as a result of construction activities associated with the proposed project. In response to the increase in human activity (e.g., equipment operation, vehicular traffic, noise, and lighting), wildlife may avoid or move away from the sources of disturbance to other habitats. This avoidance or displacement could result in underutilization of the physically unaltered habitats adjoining the disturbances. The net result would be that the value of habitats near the disturbances would be decreased and previous distributional patterns would be altered. The habitats would not support the same level of use by wildlife as before the onset of the disturbance. Additionally, some wildlife would be displaced to other habitats leading to some degree of overuse and degradation to those habitats.

Public vehicle use of roads can have an additive, or possibly a synergistic influence on reducing wildlife use of adjacent habitats, as well as causing additional impacts. Public access and increased truck traffic associated with construction, drilling, and production operations in the Project Area would increase the potential for mortality and general harassment of wildlife.

Big Game

Surface disturbances associated with the Proposed Action would result in the direct short-term loss of approximately 7.2 acres of crucial, year-long habitat for mule deer. Following construction, approximately 2.1 acres of short-term disturbance (29 percent) associated with construction of proposed pads, pipeline ROW, and access road ROWs not needed for operational purposes would be reclaimed. This would reduce the long-term disturbance of substantial, year-long habitat for mule deer associated with the Proposed Action to approximately 5.1 acres.

Additionally, approximately 2.9 acres of pronghorn habitat would initially be disturbed during the construction of the Proposed Action. Following the well drilling and completion phase, 0.7 acres would be subject to interim reclamation and would be returned to their natural contour and reseeded. The remaining 2.2 acres would be disturbed for the LOP and until final reclamation has successfully revegetated the project footprint.

No surface disturbance to elk seasonal ranges would occur under the Proposed Action because these areas do not occur in close proximity to the disturbance footprint. No adverse impacts to elk are expected as a result of direct habitat disturbance under the Proposed Action because no designated crucial habitats will be affected and a relatively small total area is involved, and habitats similar to those impacted are readily available in surrounding areas.

Activities associated with the construction phase of the project are likely to temporarily displace pronghorn, mule deer, or elk from adjacent habitats, lowering the overall habitat effectiveness within the Project Area (D'Eon and Serrouya 2005; Sawyer et al. 2006). This could be caused by noise effects related to drilling equipment or through increased human presence. These zones are not likely to be completely abandoned by these species, but the effective use of these areas could be reduced depending on a number of factors such as time of year, social structure of individual herds, and whether populations are resident or migratory. However, once construction is complete, facilities are put into operation, and subsequent human activities are reduced, big game are likely to return to pre-disturbance activity patterns because most resident animals would have already been acclimated to the relatively high level of human activity. The displacement of a few individual big game species from their summer range is considered a short-term, non-adverse impact because of the temporary nature of the displacement and the availability of comparable habitats in adjacent areas.

The potential for vehicle collisions with big game during the spring, summer, and fall months would be increased by a commensurate increase in vehicle traffic during construction and would continue (although at a much reduced rate) throughout all phases of the well operations. In addition, the short-term influx of temporary construction workers and the long-term use of the area by oil and gas field employees would increase the potential for poaching and general harassment of big game. Although such activities are not likely to reach significant proportions, conservation measures listed in **Section 2.1.10** would reduce potential adverse impacts from big game poaching and/or harassment.

Upland Game

Permanent and temporary loss of habitat as a result of construction activities could affect some upland game bird and mammal species within the Project Area. Approximately 4.7 acres of crucial year-long wild turkey habitat would be disturbed under the Proposed Action. Additionally, 10.5 acres of proposed disturbance would occur within year-long crucial habitat for ring-necked pheasant. Interim reclamation would reduce the long-term disturbance to these areas down to approximately 3.4 and 7.6 acres respectively. Although there is no way to accurately quantify impacts for other upland game species, the impact is likely to be moderate in the short-term and be reduced over time as reclaimed areas produce suitable habitats. Most of these game species would be common and widely distributed throughout the Project Area and surrounding region. The displacement of some individuals as a result of habitat removal would have a negligible impact on populations of these species throughout the region.

Waterfowl and Migratory Birds

The intensity of impacts from the Proposed Action on waterfowl and migratory birds that use the Ouray NWR and the surrounding region would be dependent upon the seasons of construction and the drilling of each well. If construction and drilling are completed in the late summer or early fall months (i.e., August to October), some of the migratory bird species would have left the immediate Project Area, or at least will have fledged and left their nests. Disturbance during this time would be temporary, and project-related impacts would not likely have an appreciable impact on migratory bird populations as a whole or individual species in general. However, if the proposed well construction and drilling were to occur during the peak nesting months in spring/summer, the Proposed Action could increase the potential for nest abandonment, reduce fecundity, displacement of birds in habitats adjacent to the proposed

disturbance areas. These impacts would vary depending on species specific sensitivity to human activity, increased noise and light, and habitat fragmentation.

Construction, drilling, and completion activities, as well as production and maintenance activities would result in the fragmentation of habitat and associated edge avoidance by migratory birds, which have been documented as leading to lower levels in productivity (Renfrew et al. 2005). Associated noise, lighting, and increased human presence could cause displacement from foraging and nesting habitats. If displaced, birds could move to less suitable habitats that could cause an increase in competition and deteriorated physical condition. Increased vehicle traffic levels could also lead to the increased potential for collisions between migratory birds and vehicles. Thurston has committed to conducting drilling and completion activities outside the nesting season for yellow-billed cuckoo (June 15th to August 31st). This would reduce construction, drilling, and completion related impacts to migratory birds that may utilize of nest in the Project Area during this period. Given the relatively short period of time in which construction, drilling, and completion activities would occur, impacts related to noise, light, and increased human presence would be minor. The implementation of design features such as electrification of production facilities, along with conservation measures listed in **Section 2.1.10** would reduce the long term impacts to migratory birds resulting from noise, lighting, electrification risk, and human activity.

Raptors

The principal impacts of the Proposed Action on raptors are: (1) nest desertions and/or reproductive failure caused by project-related disturbances, (2) increased public access and subsequent human disturbance resulting from new road and well pad construction, (3) increased risk of electrocution from installation of power lines and (4) temporary reductions in prey populations. Based on Refuge data, 12 raptor species are known to nest within the Refuge. Most of these nest sites are located in trees along the riparian corridor and in the Green River floodplain. In addition, there are three known bald eagle roosting sites located within the Project Area and eight located adjacent to the Project Area along the Green River.

Direct impacts to raptors could result from surface-disturbing activities or areas with concentrated human activity that is in close proximity to an active raptor nest. This could lead to temporary displacement from nesting sites, avoidance of affected areas, and deterrence from establishing other nesting sites. Steidl and Anthony (2000) suggest that the greatest energetic costs from disturbance occur in nestlings, potentially decreasing overall reproductive success. Displacement could also lead to increased use of adjacent habitats, which could lead to increased inter- and intra-specific competition for resources. Because increased noise levels and visual disturbances associated with construction and drilling activities would be localized and short-term, displacement to adjacent habitats would likely be temporary in nature and would not likely alter the productivity of current raptor populations within the Project Area.

The newly constructed access roads under the Proposed Action may increase public access to areas within the Project Area and Leota Bottom. As workers and recreationists increase use of or activities in the Project Area, the potential for encounters between raptors and humans would also increase and could result in increased disturbance to nests and foraging areas, vehicle collisions, and incidences of general harassment.

New power lines used to serve wells under the Proposed Action would pose an increased risk of electrocution and collision hazard to raptors. Electrocution is a well-documented source of mortality for raptors and the vast majority of electrocutions involve electric distribution lines rather than high voltage transmission lines (APLIC 2006). Potential impacts to raptors would be mitigated by designing poles according to criteria presented in *Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 2006* (APLIC 2006). In addition, strategies for minimizing collision risk with power lines

would follow criteria presented in *Reducing Avian Collisions with Powerlines: the State of the Art in 2012* (APLIC 2012).

The development of proposed well pads and associated roads and pipelines would initially disturb an estimated 10.5 acres of potential habitat for several species of small mammals that serve as prey items for raptors. It is not likely to be the determining factor in the level of use by raptors within the Project Area because the small amount of short-term change in prey base populations created by the construction associated with the Proposed Action is minimal in comparison to the overall status of the rodent and lagomorph cycles, which is controlled over the region and State by natural forces. While prey populations on the Project Area would likely sustain some stress during the initial phase of the project, prey numbers would be expected to soon rebound to pre-disturbance levels following reclamation of approximately 31 percent of the short-term disturbance area involving unused portions of pads and roads. Once reclaimed, these areas will likely promote an increased density and biomass of small mammals that is comparable to those of undisturbed areas (Hingtgen and Clark 1984). For these reasons, implementation of the Proposed Action is not expected to produce any appreciable long-term negative changes to the raptor prey base within the Project Area.

Both successful interim reclamation of areas not used for production activities and final reclamation efforts could re-establish some raptor and prey habitat over time. Measures to reduce speeding and remove carrion on area roads could reduce direct impacts associated with the Proposed Action.

Fisheries
Under the Proposed Action, habitat for native and/or recreational fish species inhabiting the Green River within and adjacent to the Project Area may be degraded by increased erosion, sediment yield, and the potential for exposure to hazardous substances in the case of an accidental spill that would result in condensate and hydrocarbon material entering the Green River. However, degradation of habitat related to increased erosion and sedimentation would be minimized through design features (see **Section 2.1**) and conservation measures listed in **Section 2.1.10** that include provisions to implement and monitor reclamation procedures, adhere to a SWPPP, and use BMPs to reduce or minimize the potential for erosion and sedimentation within the Project Area. In addition, well construction standards described in the "Gold Book" as well as implementation of and adherence to action items specified in the SPCC plan would minimize impacts related to potential exposure of hazardous substances. Water depletions associated with implementation of the Proposed Action may reduce the ability of the Green River and its tributaries to create and maintain the physical habitat required by fish species and the supporting biological environment; however, water depletions under the Proposed Action would be minor and would not likely contribute to long-term impacts. While individual common native and/or recreational fish may be affected by the Proposed Action, population or species-level impacts are not anticipated.

4.4.3.2 Alternative B – No Action Alternative

Under the No Action Alternative, the proposed surface disturbing activities would not occur. Future mineral development in the Project Area would be considered on a case-by-case basis and would be subject to separate NEPA analysis. As a result, the No Action Alternative would not have an adverse or beneficial effect on fish and wildlife.

4.4.3.3 Cumulative Impacts

The CIAA for fish and wildlife and their associated habitat is defined as the Ouray NWR boundary and its adjacent lands. This analysis assumes that: (1) human use of the CIAA would increase with implementation of the Proposed Action; and (2) the overall region has been previously affected by past and present (existing and ongoing) oil and gas development.

Past, present, and reasonably foreseeable surface disturbance from oil and gas activities within the CIAA has and will continue to reduce wildlife habitat, contribute to habitat fragmentation, disrupt seasonal patterns or migration routes, displace individual wildlife species, result in collisions between wildlife and vehicles, and potentially contribute to poaching and harassment of animals. Other permitted activities, such as recreation, refuge management operations, and prescribed burns have and will also continue to contribute to cumulative impacts to fish and wildlife, but the incremental contribution of these activities is difficult to quantify. As such, this analysis assumes future disturbance in the CIAA would primarily result from oil and gas development; however, it is understood that recreation, development of dedicated recreational and educational facilities, and ongoing Refuge management activities may also contribute to the disturbance of wildlife species and their habitat.

As shown in **Table 4-2,** approximately 78.2 acres have been or will be disturbed in the past, present, and reasonably foreseeable future from oil and gas activities within the Refuge. Implementation of the Proposed Action would incrementally increase the total cumulative disturbance on the Refuge to approximately 89.1 acres. While surface disturbance does correspond to associated wildlife impacts, accurate calculations of cumulative wildlife habitat loss are not determinable because the direct impacts are species-specific and depend on the following: status and condition of the population(s) or individual animals being affected; seasonal timing of the disturbances; value or quality of the Project Area habitats as well as adjacent habitats; physical parameters of the affected and nearby habitats (e.g., extent of topographical relief and vegetative cover); and type of surface disturbance.

Surface disturbance associated with the Proposed Action would have minimal impacts on wildlife habitat across the CIAA (0.8 percent) when added to past, present, and reasonably foreseeable actions; however, this amount of disturbance could have substantial impacts, as described below. In the context of cumulative impact analysis, each acre of vegetation and wildlife habitat disturbance in the Refuge would be additive to other losses of habitat, foraging areas, breeding areas, ground cover, and increased habitat fragmentation within the Uinta Basin. Additional development activities could temporarily displace wildlife or preclude wildlife species from using areas of more intense human activity. Other impacts could increase disruption of migratory routes and seasonal ranges, general distress, or deteriorated physical condition, decreased reproductive success, and nutritional condition due to increased energy expenditure.

Under the Proposed Action, implementation of design features (see **Section 2.1**) and conservation measures listed in **Section 2.1.10** would reduce impacts to wildlife and wildlife habitat, thus reducing long-term cumulative impacts within the Refuge. These measures include avoidance of sensitive wildlife habitat (i.e., floodplains/riparian area), preconstruction surveys, adherence to speed limits, implementation of a SPCC plan, and minimizing noise during construction, drilling and completion activities.

No cumulative impacts are anticipated under the No Action Alternative as no project activity would occur within the Ouray NWR.

4.4.3.4 Mitigation

The following conservation measures would be applied to reduce impacts to wildlife species and wildlife habitat:

1) Project personnel would be subject to the following requirements: (1) no harming, harassing, or shooting of wildlife or horses, (2) no dogs or other pets admissible in the Project Area, (3) no

firearms permitted, and (4) no littering. Workers will be required to check under their vehicles prior to departing the project site;

2) Thurston will conduct preconstruction surveys, as needed.

3) Thurston will install electricity (if feasible) to provide power for separators and pumpjacks on the two proposed well pads to reduce the level of noise for both wildlife and visitors. Should electrified systems be used, an aboveground distribution line would be built on single wood utility poles located within the proposed road ROW. If feasible, the proposed distribution line would tie into an existing power source at the Ouray National Fish Hatchery (NFH). If and when gas-powered engines are used, noise abatement methods (e.g., acoustic barriers and mufflers) will be implemented to reduce noise impacts to levels at or below noise levels of an electrified system. Thurston will communicate its intentions for power supply and noise mitigation methods to the Service as determinations are made.

4) Construction and drilling operations conducted during the Refuge's sensitive wildlife period (May 1st through August 31st) must be coordinated with and authorized by the Refuge Manager or the Service AO to avoid conflicts with wildlife. At the discretion of the Refuge Manager or the Service AO, additional wildlife monitoring or mitigation may be required during this sensitive period based on site-specific conditions.

5) Should the project schedule construction activities between March 1st and August 31st, all areas within 0.5 miles of the proposed project would be surveyed for the presence of raptor nests by a Service-approved biologist. If occupied raptor nests are found within the recommended spatial buffers, the Utah ESO would be consulted to determine if the recommended spatial buffers can be modified on a nest-by-nest basis by considering the species, timing, nest status, disturbance type and duration, vegetation, and topography.

6) Burrowing owl surveys would be conducted concurrently with the raptor surveys within 0.25 miles of the proposed project if the project schedule occurs between March 1st and August 31st. If occupied burrowing owl nests are found within the recommended spatial buffers, the Utah ESO would be consulted to determine if the recommended spatial buffers can be modified on a nest-by-nest basis by considering the species, timing, nest status, disturbance type and duration, vegetation, and topography.

7) Project activities would comply with applicable requirements of the MBTA, Bald and Golden Eagle Protection Act (BGEPA), and ESA, as amended;

8) Potential impacts to raptors from increased risk of electrocution would be mitigated by designing poles for the new power lines according to criteria presented in *Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 2006* (APLIC 2006). In addition, strategies for minimizing collision risk with power lines would follow criteria presented in *Reducing Avian Collisions with Powerlines: the State of the Art in 2012* (APLIC 2012). Depending on the alternative selected, specific standards to be followed will be identified in the Decision Record for the EA.

9) To avoid and minimize impacts to birds during construction and operations and to ensure ground-disturbing activities do not result in the "take" of an active nest or migratory bird protected under the MBTA, the Service requires the following of Thurston:

    a. Any groundbreaking activities or vegetation treatments should be performed before migratory birds begin nesting or after all young have fledged to avoid take;

b. Time tree and shrub removal and ground disturbing activities should occur during the non-nesting season (approximately September 1st to February 28th). If this is not possible, surveys should be conducted prior to disturbance to determine whether active nests are present; active nests found in the area should be left untouched until the young have fledged;

c. If activities must be scheduled to start during the migratory bird breeding season, appropriate steps to prevent migratory birds from establishing nests in the potential impact area should be taken. These steps could include covering equipment and structures and use of various excluders (e.g., noise). Birds can be harassed to prevent them from nesting on the site;

d. If activities must be scheduled during the migratory bird breeding season, a site-specific survey for nesting birds should be performed starting at least 2 weeks prior to vegetation treatments. Established nests with eggs or young cannot be moved, and the birds cannot be harassed (see item b above), until all young have fledged and are capable of leaving the nest site; and

e. If nesting birds are found during the survey, appropriate spatial buffers should be established around nests. Vegetation treatments within the buffer areas should be postponed until the birds have left the nest. Confirmation that all young have fledged should be made by a qualified biologist.

10) The Refuge Manager or the Service AO may require drill pads to be fenced and signed, if necessary, to prevent both wildlife and Refuge visitors from gaining access to the sites. All appropriate warning signs should be placed along all sides of the fence.

11) As necessary, Thurston will notify the appropriate authorities (Utah Department of Transportation [UDOT] on highways and Utah Division of Wildlife Resources [UDWR] or USFWS on County and Refuge roads) of the presence of roadside carrion and ask that they remove the carrion as soon as possible. Carcasses may be covered in the interim to discourage scavenging by bald eagles and other raptors. However, only authorized personnel may touch or remove the carcasses.

4.4.4 Special Status Plant and Animal Species

In general, construction and operational impacts on special status fish and wildlife species and their habitats would be similar to those discussed in the preceding sections for vegetation communities (**Section 4.4.1**) and wildlife (**Section 4.4.3**). However, these impacts can be more severe for special status plant, fish, and wildlife species, if present, since the distribution and abundance of many of these species are limited in the Project Area and surrounding region. An adverse impact to special status species will have occurred if construction and/or operation of any component of the proposed project would cause significant changes to the existing abundance, distribution, or habitat value for a special status fish and wildlife species.

4.4.4.1 Alternative A – Proposed Action

Species Listed as Federally Threatened, Endangered, or Proposed

The following section describes the anticipated effects of various project components and activities associated with the Proposed Action on federally listed, proposed, and candidate species carried forward for evaluation. The magnitude and nature of effects of the Proposed Action are assessed for the species relative to existing conditions in terms of whether these effects are adverse. Conclusions regarding the

effects of the Proposed Action on the species, as well as a determination of effect (***no effect; may affect, not likely to adversely affect; may affect, likely to adversely affect; is likely to jeopardize proposed species or adversely modify proposed critical habitat;*** and ***is not likely to result in a trend towards Federal listing of the species***) are presented in the conclusions and determination section at the end of the analysis for the species.

Although not specifically required by the ESA, the USFWS encourages the formation of partnerships to conserve candidate species because these species by definition may warrant future protection under the ESA. Under Intra-Service Section 7 consultations, candidate species are treated as if they are proposed for listing for purposes of conducting internal FWS conference. FWS units consult or confer with the appropriate FWS Ecological Services field office on actions they authorize, fund, or carry out that may affect listed, proposed, or candidate species or designated or proposed critical habitat.

Yellow-Billed Cuckoo

The yellow-billed cuckoo is known to use riparian habitat that occurs north, east, and south, but outside, of the disturbance footprint for the Project along the Green River. Therefore, the Proposed Action would not have direct impacts to this habitat. Potential effects of the Proposed Action on the western yellow-billed cuckoo would likely be in the form of direct noise disturbance or lighting. Noise and/or lighting may arise from construction, drilling, and production activities, as well as traffic associated with the proposed project, which could affect cuckoos, if present in the immediate vicinity of these activities. This could lead to avoidance of affected areas (Goodwin and Shriver 2011). Displacement could also lead to increased use of adjacent habitats, which could lead to increased inter- and intra-specific competition for resources.

Existing studies on noise indicate that the response of wildlife to noise disturbance is complex; that is, it is neither uniform nor consistent. Delaney et al. (1997) reviewed literature on the response of raptors and other birds to noise and concluded the following: (1) birds are more susceptible to disturbance-caused nest abandonment early in the nesting season, (2) birds generally flush in response to disturbance when distances to the source are less than approximately 200 feet and when sound levels are in excess of 95 dB(A), and (3) the tendency to flush from a nest declines with experience or habituation to the noise, although the alert response (i.e., head movements or agitated behavior) cannot be completely eliminated by habituation.

Results of a study suggest that the effects of traffic noise may be especially pronounced for species that vocalize at low frequencies, including the yellow-billed cuckoo. On the basis of these results for yellow-billed cuckoos and white-breasted nuthatches, birds that sing at the frequencies of traffic noise may be strongly affected by the noise of urbanization and infrastructure development beyond urbanized areas (Goodwin and Shriver 2011).

Another recent study involving a “phantom” road documented over a one-quarter decline in bird abundance and almost complete avoidance by some species between noise-on and noise-off periods along the phantom road and no such effects at control sites. This suggests that traffic noise is a major driver of effects of roads on populations of animals (McClure et al. 2013).

Elevated ambient daytime noise from the proposed project during the western yellow-billed cuckoo breeding season could result in decreased utilization within an indeterminate number of acres north, east, and south of the current Wildlife Refuge Road along the floodplain. The magnitude of impacts would depend on the specific type of activity, the noise level generated by various types of equipment, noise mitigation systems, the distance between the activity and individual cuckoos, and whether local barriers and topography provide shielding effects.

Noise analysis completed for the Montebello Hills Specific Plan Environmental Impact Report revealed that use of electric pumpjack equipment and transformers similar in size to what may eventually be installed on the Refuge would generate noise levels at distances greater than 150 feet that are considered ambient conditions in a rural residential area (i.e., noise levels near or below 40 dB[A]) (BridgeNet International 2009). Topographic screening (if present) between the area of disturbance and the birds' location creates a noise buffer and could assist in the reduction of noise disturbance (Knight and Cole 1995). If gas-powered pumpjacks are used during the production phase, drilling noise levels can be reduced through the use of noise mitigation systems. For example, installation of acoustic blankets on drilling equipment can reduce noise levels by 8 to 10 dB(A) at distances of 300 feet. In addition, sound walls or artificial acoustic barriers placed around production facilities can reduce drilling sound levels by up to 20 dB(A) (Behrens and Associates, Inc. 2006).

Table 4-9 lists noise levels associated with common activities and events.

Table 4-9. Common Noise Levels Associated with Activities and Natural Events

Source	Sound Level
Threshold of Hearing	0 dB(A)
Wind in Deciduous Trees (2-14 mph)	36-61 dB(A)
Falling Rain (Variable Rainfall Rates)	41-63 dB(A)
Light Traffic (at 100 feet)	50 dB(A)
Average Residence	50 dB(A)
Loud Automobile Horn (at 1 meter)	115 dB(A)
Oil Drilling Rig (at 50 feet)	90-115 dB(A)

Source: EPA 1974

The influences of vegetation, topography, and atmospheric conditions on noise reduction factors can vary greatly and are often impossible to quantify. Therefore, these factors are generally not taken into account in environmental noise analysis, which generally results in predicted noise levels that are higher than actual noise levels. For example, a break in the line of sight between a noise source and receptor can result in a 5 dB(A) reduction. Dense vegetation can reduce noise levels by 5 dB(A) for every 100 feet of vegetation, up to a maximum reduction of 10 dB(A) (USDOT 1995). Wind can reduce noise levels by as much as 20 dB(A) to 30 dB(A) at long distances (USDOT 1995).

Table 4-10 shows the attenuation of noise levels in association with distance from the receptor.

Table 4-10. Estimated Noise Attenuation Associated with an Increase in Distance

Distance to Receptor (Feet)	Sound Level at Receptor (Decibels)
50	92
100	86
200	80
400	73
600	69
800	67
1,000	64
1,500	60

Distance to Receptor (Feet)	Sound Level at Receptor (Decibels)
2,000	57
2,500	54
3,000	51
4,000	47

Source: California State Water Resources Control Board (2002).

Thurston would not conduct construction, drilling, and completion activities during the yellow-billed cuckoo nesting season (June 15th to August 31st); therefore, intensive noise, light, traffic, and human related impacts to nesting cuckoos during these project phases are not anticipated. Due to the distance the proposed well pads would be from the nearest area that contains riparian vegetation and the potential use of electrified pump-jacks or acoustic barriers the magnitude of project-related noise impacts on the yellow-billed cuckoo are not expected to reach adverse levels. Thurston would use electrified pumpjacks (if feasible) during the production phase to reduce ambient noise within the Project Area. During initial drilling activities, gas-powered engines would be needed. When gas-powered engines are used, then noise abatement methods (i.e. acoustic barriers and mufflers) will be implemented to reduce noise impacts are at or below noise levels of an electrified system. Because the tank battery and associated equipment would be located on the upper area of the Refuge and would be accessed from a separate road system, the production phase would involve minimal traffic (about one pickup truck per day) near the riparian areas where yellow-billed cuckoos are known to occur.

Potential indirect impacts to yellow-billed cuckoo habitat could result under the Proposed Action from increased soil erosion and potential for spills and leaks. These impacts would be reduced with interim reclamation, conservation measures for erosion control to avoid or minimize soil erosion and off-site deposition, and spill containment measures. Further, while the yellow-billed cuckoo is known to occur and nest within the Ouray NWR, they are considered as uncommon summer residents within the Refuge. Given the potential project footprint and conservation measures, the Service has determined that the Proposed Action ***may affect, but is not likely to adversely affect*** the yellow-billed cuckoo**.**

Colorado River Fish Species

Based on the similarity of their affected habitats within the Green River and potential impacts associated with the proposed alternatives, impact analyses for the bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker (collectively known as the Colorado River fish) are discussed together within this EA.

Total water needed for the proposed project would be approximately 5.7 acre-feet (see **Section 2.1.7**). The estimated total freshwater needed for the proposed project (5.7 acre-feet) could result in depletion to the Green River, thus directly affecting the Colorado River fish and their habitat. Water depletions can reduce the ability of the Green River and its tributaries to create and maintain the physical habitat required by these fish and the supporting biological environment. Water depletions can also contribute to alterations in flow regimes that favor increased forage and habitat competition for, and predation on, the Colorado River fish from non-native fish species.

In order to address depletion and other direct and indirect impacts on the Colorado River fish, a Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (Recovery Program) was initiated in January 22, 1988. Under the Recovery Program, any water depletions from tributary waters within the Colorado River drainage are considered to "jeopardize the continued existence" of these fish. To further define and clarify the recovery processes in the Recovery Program, a Section 7 agreement was implemented on October 15, 1993, by the recovery program participants.

Incorporated into this agreement is a Recovery Implementation Program Recovery Action Plan (RIPRAP). The RIPRAP identifies actions currently required to recover the endangered fish species in the most expeditious manner. Included in the RIPRAP was the requirement that a one-time depletion fee would be paid to help support the recovery program for all non-historic water depletions (i.e., occurring after January 1988) from the Upper Colorado River Basin. The depletion fee ($19.82 per acre-foot as of October 1, 2012, and updated annually) was intended to be the reasonable and prudent alternative to avoid jeopardy to the endangered fishes by depletions to the Upper Colorado River Basin (USFWS 2013a). In 1995, the USFWS eliminated these fees for non-historical water depletions (permitted after January 1988) from the Upper Colorado River Basin of 100 acre-feet or less (USFWS 1994). For this EA, it is assumed that all water depletions from fresh water sources would be considered non-historical.

Local floodplain areas to the project (i.e., Leota Bottom) are important nursery habitats for razorback sucker. As part of the newly implemented *Study Plan to Examine the Effects of Using Larval Razorback Sucker Occurrence in the Green River as a Trigger for Flaming Gorge Dam Peak Releases* (LTSP) (Larval Trigger Study Plan ad hoc committee 2012), the Recovery Program plans to use floodplains in the Leota Bottom area as nursery habitat under various hydrologic conditions. Specifically, Leota 7 would be targeted for larval razorback in all average and wetter years, and Leota 7a and 4 would be targeted in moderately wet and wet years. These floodplain units located within the Project Area lie directly east of Wildlife Refuge Road and the proposed disturbance. More specifically, units 4, 7 and 9 are those most likely to suffer from indirect impacts associated with project activities. Potential indirect effects to the floodplains in the Leota Bottom and their associated fish habitat are described below.

Implementation of the Proposed Action could also degrade USFWS-designated critical habitat for the Colorado River fish species in major tributaries and floodplains of Green River by increasing erosion, sediment yield, and the potential for exposure to hazardous substances in the case of an accidental spill that would result in condensate and hydrocarbon material to enter the Green River. Should a release of project related hazardous material occur, potentially hazardous materials could enter the Green River via stormwater runoff. However, the modified project design involves moving the tank battery and associated equipment to the upper area of the Refuge on lands leased from the State, which are over 1 mile from Leota Bottom and the Green River. Tanker truck traffic would access this upper area from a separate road system. Therefore, the lack of storage tanks near Leota Bottom and the Green River, and the lack of tanker trucks on the main Refuge road, will greatly reduce the likelihood of a spill. In addition, degradation of habitat related to increased erosion and sedimentation would be minimized through design features (see **Section 2.1**) and conservation measures listed in **Section 2.1.10** that include provisions to implement and monitor reclamation procedures, adhere to a SWPPP, and use BMPs to reduce or minimize erosion from the Project Area. Furthermore, impacts related to the increased potential for exposure to hazardous substances would be minimized by implementation of and adherence to the specific action items of a SPCC plan that would contain and/or control contaminated water. A SWPPP would also help to prevent any materials that may be potential releases on a well pad from migrating down gradient into the sensitive river and floodplain habitats within the Green River system. The project does include bundled oil, gas, and water pipelines, but they would contain relatively small volumes (approximately16,435 gallons) of fluid given the diameter of each individual pipeline, and their above-ground placement would facilitate maintenance, all of which would minimize the chance of a significant spill.

The Proposed Action would not result in any direct impacts to the Ouray NFH. The proposed well pads, access road, and pipeline corridor would occur approximately 7,571.5 feet southeast of the hatchery. The hatchery could be indirectly impacted by the construction of the proposed above ground power line running from the hatchery to the proposed well sites. These impacts could include increased noise and

human presence within the vicinity of the facility. However, these impacts are considered negligible as they would be short in duration and minor in scope.

As discussed in **Section 4.3.1.1**, the use of water for drilling under the Proposed Action will result in a small depletion to the Green River, 0.0001 percent. While this amount may be minor to the flow of the Green River, any loss of water from the Upper Colorado River Basin represents a measurable loss of habitat for fish species; therefore, implementation of the Proposed Action ***may affect, is likely to adversely affect*** the Colorado River fish and their designated critical habitats in the Green River. This determination can be attributed to the anticipated 5.7 acre-feet depletion of water from the Green River Basin. The potential for the Colorado River fish and their designated critical habitat to be exposed to hazardous substances originating from an accidental spill has been greatly reduced through multiple conservation measures. Therefore, there is an extremely low likelihood of a release or discharge of condensate or hydrocarbon materials into the Green River and its associated 100-year floodplain, As a result, the Service has determined that no other aspects of the Proposed Action (beside the water depletion) are likely to result in adverse effects to the Colorado River fish species.

Uinta Basin Hookless Cactus

Implementation of the Proposed Action would directly result in the disturbance of approximately 10.9 acres of potential habitat for Uinta Basin hookless cactus within the Project Area, which represents approximately 0.002 percent of the total potential habitat for Uinta Basin hookless cactus across their entire range. Following construction, approximately 3.4 acres (31 percent) of land associated with the construction of the pads, access roads, and pipeline ROWs not needed for operation purposes would be reclaimed. This would reduce the long-term disturbance to Uinta Basin hookless cactus habitat associated with the Proposed Action to approximately 7.5 acres. None of the proposed pads or their associated project infrastructure would be constructed within Level 1 and 2 Core Conservation Areas for the Uinta Basin hookless cactus.

Figure 4-1 shows the results of cactus areas surveyed in June 2012, April 2003, November 2013, and August 2014. No cactus were identified within the survey buffer for the proposed pads, access roads and surface pipelines. The majority of the relocated pipeline route passes through unsuitable habitat for this cactus. One potentially suitable habitat area was surveyed in August 2014, but no cactus were found.

Implementation of the Proposed Action would increase the potential for occurrence of indirect and direct effects to the Uinta Basin hookless cactus, if present. Disturbances from construction could increase the potential for the invasion and establishment of noxious weed species. Invasion by non-native species is particularly problematic because they are capable of effective competition with native species for space, water, light, nutrients, and subsequent survival. Over time, the successful establishment of non-native species can out-compete native vegetation and eventually dominate large areas. An increase in weedy annual grasses also increases the potential for fire by increasing the density and flammability of available fuels. Grasses are more flammable and establish in denser populations than woody and non-woody native vegetation.

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INSERT Figure 4-1. 2012-2013 Cactus Survey Results

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Additional indirect construction-related impacts could include an increased potential for wind erosion of disturbed areas creating airborne dust that could be transported into suitable habitat for these species. Airborne dust generated by vehicles could inhibit photosynthesis and transpiration in the Uinta Basin hookless cactus. Inhibited and reduced rates of photosynthesis could affect the rate of growth, the reproductive capacity of individual plants, and ultimately the ability of these individuals to persist in adjacent areas. Thompson et al. (1984) and Farmer (1993) have indicated that varying amounts of dust settling on vegetation can block stomata, increase leaf temperature, and reduce photosynthesis.

Other indirect impacts to Uinta Basin hookless cactus in the Project Area would include an increased risk of crushing by off-road vehicles due to an expanded road network, impacts from herbicides used to control invasive plants, and possible reductions in pollination or seed dispersal due to a larger road network and resulting habitat fragmentation and dust. Because the Uinta Basin hookless cactus requires insect pollinators for successful reproduction (Tepedino et al. 2010), impacts to pollinator nesting and foraging habitats can negatively affect the cactus by reducing the diversity and abundance of pollinators and, thereby, the plant's ability to successfully reproduce. The expanded road network also will increase the risk of illegal collecting of cacti.

Design features outlined under the Proposed Action (see **Section 2.1**) would reduce the impacts to *Sclerocactus spp.* Actions include: monitoring noxious weed and invasive species; using existing roads where possible; minimizing new surface disturbance; applying dust abatement techniques; conducting preconstruction surveys in potential habitat; and adhering to conservation measures. In addition, species-specific conservation measures for the Uinta Basin hookless cactus include provisions to avoid occupied habitat, employ the use of spatial buffers between surface activities and known populations of plants, limit off-road travel, and monitor the effectiveness of these measures.

Although larger landscape-level changes such as increased habitat fragmentation and habitat loss, pollinator disturbance, changes in erosion and water runoff, and increased weed invasion cannot be entirely negated, the measures described above will minimize the impacts of the action to *Sclerocactus spp.*. In addition, much of the area in and around the vicinity of the proposed project is considered unsuitable habitat for Uintah Basin hookless cactus. In areas of potentially suitable habitat, surveys were conducted and no cactus were found. Therefore, the Proposed Action ***may affect, is not likely to adversely affect*** the Uinta Basin hookless cactus.

Ute ladies'-tresses

No disturbance to wetlands, riparian areas, or floodplains would likely occur under implementation of the Proposed Action. Therefore, no loss of Ute ladies'-tresses is anticipated as a result of the proposed project. Additionally, no Ute ladies'-tresses have been observed south of Highway 40 (Fertig et al. 2005). For the same reasons, the potential for occurrence of indirect and direct effects to this species from the Proposed Action would be unlikely to occur. Therefore, the Proposed Action ***may affect, is not likely to adversely affect*** the Ute ladies'-tresses.

Utah Natural Heritage Program Species of Concern

The following section describes the anticipated effects of project components and activities associated with the Proposed Action on UNHP species of concern identified as potentially occurring within the Project Area. The magnitude and nature of effects resulting from implementation of the Proposed Action is assessed for the species relative to existing conditions in terms of whether these effects are expected to appreciably impact species population viability and/or result in a trend towards Federal listing.

Bald and Golden Eagle

Although no bald or golden eagle nesting has been reported to occur within the Project Area, bald eagles have been documented to nest within about 5 miles of the Refuge and there are several bald eagle roosting sites within the Project Area and adjacent lands. Impacts associated with the implementation of the Proposed Action on roosting bald and golden eagles would be similar to those discussed in **Section 4.4.3.1.4** for raptors. These impacts include temporary displacement caused by elevated human activity, increased public access and subsequent human disturbance as a result of construction of new access roads and reduction in prey population due to habitat fragmentation and alteration.

Increased noise levels, lighting, and visual disturbances associated with construction and drilling activities would be localized and short-term, and would not be likely alter the current use of cottonwood trees and elevated areas along the Green River as roosting sites for eagles. In addition, the cliffs and trees that occur along the Green River would provide a moderate level of topographic screening and increased insulation from facilities, human activity, and altered habitat throughout the Project Area.

In addition to fish taken along the Green River, bald eagles would likely feed on carrion during the winter, including mule deer and pronghorn that use winter range within portions of the Project Area. The potential for vehicle collisions with big game could increase as a result of increased vehicular traffic associated with the presence of construction crews and operation under the Proposed Action. Measures to control speed limits and the removal of big game carcasses from roadways would be implemented to reduce the potential for vehicle-related collisions with bald eagles.

New power lines used to serve facilities and wells under the Proposed Action would pose an increased risk of electrocution and collision hazard to bald and golden eagles. Electrocution is a well-documented source of mortality for eagles and other raptor species and the vast majority of electrocutions involve electric distribution lines rather than high voltage transmission lines (APLIC 2006). Potential impacts to raptors would be mitigated by designing poles according to criteria presented in *Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 2006* (APLIC 2006). Furthermore, strategies for minimizing collision risk with power lines would follow criteria presented in *Reducing Avian Collisions with Powerlines: the State of the Art in 2012* (APLIC 2012).

Should the project timeline include construction during the raptor nesting season (March 1st to August 31st), all areas within 0.5 miles of the proposed project would be surveyed for the presence of eagle nests by a Service-approved biologist. If an occupied nest is identified, all construction activities would be postponed until the young have fledged and left the nest (see conservation measures listed in **Section 2.1.10**) (Romin and Muck 2002). Other measures pertaining to bald and golden eagle protection and mitigation include interim and final reclamation, adherence to speed limits, and procedures to contact the county for carrion removal. Based on adherence to these measures, the Proposed Action would not likely result in a trend toward re-listing of this species, nor would it result in an appreciable loss of bald eagle or golden eagle populations or density within the Project Area.

Ferruginous Hawk

Implementation of the Proposed Action could result in both direct and indirect impacts to the ferruginous hawk and would resemble the impacts identified in **Section 4.4.3.1.4** for raptors in general. These impacts include temporary displacement caused by elevated human activity, increased public access and subsequent human disturbance as a result of construction of new access roads, and reduction in prey population due to habitat fragmentation and alteration.

Ferruginous hawks are particularly susceptible to human-caused disturbances during courtship and incubation periods, and the species will abandon nests if disturbed prior to the eggs hatching (Wheeler 2003). Construction, drilling, or completion activities plus increased traffic could potentially disrupt breeding and nesting activities in the Project Area. Such disturbance could result in displacement from nesting sites and reduce nesting success. A reduction in reproductive success could continue throughout the LOP, particularly near heavy traffic roads or areas with intense human activity. Displacement could lead to increased use of adjacent habitats, which could cause increased inter- and intra-specific competition for resources.

Surface disturbances associated with the Proposed Action would result in the short-term direct loss of and fragmentation of approximately 10.9 acres of prey species habitat such as ground squirrels, prairie dogs, jackrabbits, rabbits, small rodents, and birds. The direct habitat loss and reduced habitat values in foraging areas, loss of prey and prey habitat, and increased potential for collisions with vehicles traveling in the Project Area may limit foraging opportunities for individual ferruginous hawks.

New power lines used to serve facilities and wells under the Proposed Action would pose an increased risk of electrocution and collision hazard to ferruginous hawks. Electrocution is a well-documented source of mortality for raptors and the vast majority of electrocutions involve electric distribution lines rather than high voltage transmission lines (APLIC 2006). Potential impacts to raptors would be mitigated by designing poles according to criteria presented in *Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 2006* (APLIC 2006). Furthermore, strategies for minimizing collision risk with power lines would follow criteria presented in *Reducing Avian Collisions with Powerlines: the State of the Art in 2012* (APLIC 2012).

Should the project timeline include construction during the ferruginous hawk nesting season (March 1st to August 1st), all areas within 0.5 miles of the proposed project would be surveyed for the presence of raptor nests by a Service-approved biologist. If an occupied nest is identified, all construction activities would be postponed until the young have fledged and left the nest (see conservation measures listed in **Section 2.1.10**) (Romin and Muck 2002). Other measures pertaining to ferruginous hawk protection and mitigation include interim and final reclamation, adherence to speed limits, and procedures to contact the county for carrion removal. Based on adherence to these measures, the Proposed Action would not likely result in an appreciable loss of ferruginous hawk populations or density within the Project Area.

Northern Goshawk

Implementation of the Proposed Action could result in both direct and indirect impacts to the northern goshawk and would resemble the impacts identified in **Section 4.4.3.1.4** for raptors in general. These impacts include temporary displacement caused by elevated human activity, increased public access and subsequent human disturbance as a result of construction of new access roads, and reduction in prey population due to habitat fragmentation and alteration.

New power lines used to serve facilities and wells under the Proposed Action would pose an increased risk of electrocution and collision hazard to northern goshawks. Electrocution is a well-documented source of mortality for raptors and the vast majority of electrocutions involve electric distribution lines rather than high voltage transmission lines (APLIC 2006). Potential impacts from increased risk of electrocution would be mitigated by designing poles according to criteria presented in *Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 2006* (APLIC 2006). Furthermore, strategies for minimizing collision risk with power lines would follow criteria presented in *Reducing Avian Collisions with Powerlines: the State of the Art in 2012* (APLIC 2012).

No northern goshawk nests or roosting sites exist within or around the Project Area, and the northern goshawk is listed as an uncommon species within the Ouray NWR. Therefore, implementation of the proposed action would likely have minimal effects on the northern goshawk.

Should the project timeline be delayed to include construction within the March 1st to August 31st window, all areas within 0.5 miles of the proposed project would be resurveyed for the presence of raptor nests by a Service-approved biologist. If an occupied nest is identified, all construction activities would be postponed until the young have fledged and left the nest (see conservation measures listed in **Section 2.1.10**) (Romin and Muck 2002). Other measures pertaining to northern goshawk protection and mitigation include interim and final reclamation, adherence to speed limits, and procedures to contact the county for carrion removal. Based on adherence to these measures, the Proposed Action would not likely result in a trend toward an appreciable loss of northern goshawk populations or density within the Project Area.

Burrowing Owl

The primary effect of the Proposed Action on burrowing owls would be the direct loss and fragmentation of potential foraging habitat. While no prairie dog colonies would be directly disturbed, increased human activity and development in close proximity to nesting sites in the Project Area could lead to nest abandonment, which would lower the annual productivity of breeding pairs. Since burrowing owls alternate between nesting sites within their breeding boundary, any surface facilities that have ongoing traffic and human presence in or near prairie dog colonies could prevent burrows from being used as nest sites in the future.

Construction, drilling, and completion activities would also result in visual disturbances (lighting) on the landscape, increased noise from equipment use, and increased vehicle traffic, all of which could cause burrowing owls to avoid disturbed areas. Such displacement and avoidance could lead to an increased use of adjacent habitat, which could cause increased inter-specific and intra-specific competition for resources in these areas.

Based on Service biologists' determination, any prairie dog towns located within 0.25 miles of the proposed construction would be surveyed for the presence of ground-nesting burrowing owls. If an occupied nest is identified, all construction activities would cease between March 1st and August 31st (see conservation measures listed in **Section 2.1.10**) (Romin and Muck 2002). Other measures pertaining to burrowing owl protection and mitigation include interim and final reclamation, adherence to speed limits, and procedures to contact the county for carrion removal. In addition, implementation of recommended conservation measures that include provisions to avoid active white-tailed prairie dog colonies during construction could further reduce impacts related to the loss of potential nesting habitat in the Project Area.

Short-eared Owl

Implementation of the Proposed Action could directly impact short-eared owls through loss and fragmentation of foraging and nesting habitat. Indirect effects on short-eared owls include displacement from foraging areas and loss of prey species' habitat as a result of habitat fragmentation and alteration.

Temporary displacement or avoidance of habitats could affect short-eared owls potentially nesting on the ground in the vicinity of construction activities. As established in the Vernal RMP and included in **Section 2.1.10**, surface disturbing activities are not to occur within 0.25 miles of identified short-eared owl nests from March 1st through August 1st (BLM 2008). However, short-eared owl nests are often located on the ground and are difficult to see in areas of dense vegetation. Active nests could potentially be missed during aerial or ground surveys that could result in impacts on breeding, nesting, and fledgling

success and may also be subject to mortality from collisions with construction vehicles or equipment. Other conservation measures pertaining to short-eared owl protection and mitigation include interim and final reclamation, adherence to speed limits, and procedures to contact the county for carrion removal. Based on adherence to these measures, the Proposed Action would not likely result in a trend toward an appreciable loss of short-eared owl populations or density within the Project Area.

American White Pelican

The American white pelican may use riparian habitat that is found along the eastern border of the Project Area. This habitat within the Project Area is away from the footprint of the development and would not be subject to direct impacts from the implementation of the Proposed Action. However, indirect impacts to the American white pelican could result from increased levels of human activity and noise within the Project Area. These disturbances could cause displacement of individuals from the riparian corridor adjacent east of the proposed development and deter the American white pelican from establishing nesting sites within the Project Area in the future. Indirect impacts to potential American white pelican habitat could result under the Proposed Action from increased soil erosion and potential for spills and leaks. These impacts would be reduced with interim reclamation, recommended conservation measures for erosion control to avoid or minimize soil erosion and off-site deposition, and spill containment measures. Based on adherence to these measures, the Proposed Action would not likely result in a trend toward an appreciable loss of American white pelican populations or density within the Project Area.

Long-billed Curlew

Potential direct effects to the long-billed curlew are loss of potential nesting habitat and foraging habitat. Since this species is a known nester on the Refuge and requires dry grassland as nesting habitat, it is likely that surface disturbance as a result of the Proposed Action will reduce the total available nesting habitat for the long-billed curlew within the Ouray NWR. Additionally, the long-billed curlew may use riparian habitat as foraging habitat, which is found along the eastern border of the Project Area. Indirect impacts such as increase sediment loads and potential spills and leaks could affect habitat for invertebrate riparian species. These impacts would be reduced with interim reclamation, recommended conservation measures for erosion control to avoid or minimize soil erosion and off-site deposition, and spill containment measures. Based on adherence to these measures and given that the long-billed curlew is not a common species to this area, the Proposed Action would not likely result in a trend toward an appreciable loss of long-billed curlew populations or density within the Project Area.

Lewis's Woodpecker

While no habitat for the Lewis's woodpecker would be directly disturbed by the Proposed Action, direct impacts may stem from the timing of surface disturbing actions and increased human presence during sensitive breeding and nesting periods. These impacts could cause individual breeding pairs to abandon the area and/or abandon nest and young, choosing other areas. Indirect impacts extend these direct impacts to include increased inter- and intra-species competition for suitable breeding and foraging sites elsewhere along the riparian corridors. Displacement to other, possibly less suitable habitat areas could result in lowered overall physical conditioning of the birds, which could affect breeding success and survivability of young. Suitable reproduction and foraging habitat for the Lewis's woodpecker occurs along the Green River on the eastern border of the Project Area, but no Lewis' woodpeckers have been documented on the Refuge for more than 10 years. The Proposed Action would not likely affect the species at the population level or lead in a trend towards Federal listing of this species.

White-tailed Prairie Dog

No surface disturbance would occur on habitat occupied by white-tailed prairie dog colonies under the Proposed Action. Potential impacts to the white-tailed prairie dog may include direct mortalities of

individuals as a result of crushing from construction activities, vehicles, and equipment. Additional impacts may result from increased habitat fragmentation, human presence, and noise which may cause prairie dogs to underutilize habitat adjacent to disturbance. Disturbance in areas adjacent to white-tailed prairie dog colonies would not likely result in significant impacts to the populations present. Given the colony's behavior, which is characteristic of habituation to human activity, despite current disturbance from the existing road and the Ouray NFH, additional disturbance in the vicinity of these areas is not expected to result in underutilization of adjacent habitats. Habitat disturbance in surrounding areas may encourage future colonization in the short-term, based on the availability of disturbed soils that would occur within the Project Area subsequent to the Project-related construction. Weed control would reduce habitat degradation. Overall, the Proposed Action may indirectly impact the white-tailed prairie dog, but would not likely result in a trend towards Federal listing of this species.

Bluehead Sucker, Flannelmouth Sucker, and Roundtail Chub

Based on the similarity of affected habitat within the Green River and potential impacts associated with the alternatives, impact analyses for the bluehead sucker, flannelmouth sucker, and roundtail chub (collectively known as Utah State Sensitive Fish Species) are discussed together within this EA. Impacts to the Utah State sensitive fish species would be similar in nature to those previously discussed for the Colorado River fish species including potential water depletion to the Green River, which would directly affect the Utah State sensitive fish and their habitat. Implementation of the Proposed Action may also result in increased erosion, sediment yield, and the potential for exposure to hazardous substances due to an accidental discharge or release of condensate or hydrocarbon material into the Green River. Conservation measures identified under the Proposed Action would minimize habitat degradation resulting from increased sedimentation or erosion to the Green River through the implementation of a SWPPP and interim reclamation. In addition, impacts associated with the increased potential for exposure to hazardous substances would be minimized through implementation of and adherence to the specific guidelines of a SPCC plan. Implementation of the Proposed Action may directly affect the habitat of the Utah State sensitive fish species, but would not likely result in a trend towards Federal listing of the species.

Smooth Green Snake

While the smooth green snake is generally uncommon in the Uinta Basin, it is possible that the species has been observed within the Refuge's boundary. Implementation of the Proposed Action may result in permanent and temporary loss of smooth green snake habitat as a result of construction activities, although the impact is likely to be moderate in the short term and be reduced over time as the Project Area is returned to its preexisting condition. Increased human activity (e.g., equipment operations, vehicular traffic, and noise), can cause temporary displacement or avoidance of affected areas. Conservation measures identified under the Proposed Action, including interim and final reclamation and management of noxious weeds, would reduce impacts to potential smooth green snake habitat. Based on this information and the fact that the smooth green snake is generally uncommon within the Project Area, implementation of the Proposed Action would not likely result in a trend toward Federal listing of the species.

4.4.4.2 Alternative B – No Action Alternative

Under the No Action Alternative, Thurston would be denied access to Service refuge lands and the proposed well pads, tank battery pad, associated access roads, and pipeline would not occur within Ouray NWR. Future mineral development in the Project Area would be considered on a case-by-case basis and would be subject to separate NEPA analysis. As a result, the No Action Alternative would have no adverse or beneficial effects on special status species.

4.4.4.3 Cumulative Impacts

The CIAA for special status plant and animal species and their associated habitat is defined as the Ouray NWR boundary and adjacent lands. It is assumed that cumulative impacts to special status plant and wildlife species would be similar to those discussed for general vegetation and wildlife (see **Sections 4.4.1.4** and **4.4.3.4**, respectively). However, given ongoing habitat losses, sensitivity to disturbance, and declining overall population numbers, special status plant and wildlife species would likely be more sensitive to impacts related to development within the Refuge than other more common species. Based on these sensitivities, existing and reasonably foreseeable development land uses have reduced and would likely continue to reduce the quality and quantity of habitats within the CIAA for special status species.

On federally administered lands, surveys are required in potential or known habitats of threatened, endangered or otherwise special status species prior to project implementation. These surveys help determine the presence of any special status plant and wildlife species or extent of their habitat. Furthermore, protective measures such as seasonal and/or spatial and temporal buffers would generally be implemented to avoid or minimize direct disturbance or impacts. As such, the additive impacts of the Proposed Action to past, present, and reasonably foreseeable actions could affect but would not likely adversely affect special status species populations within the Refuge. Given the status of the Uinta Basin hookless cactus and the Colorado River endangered fish, cumulative impacts may be more pronounced than other special status species and they are discussed in more detail below.

Yellow-Billed Cuckoo

Because the Proposed Action does not result in the loss of any riparian woodlands or other vegetation communities that may provide habitat for the yellow-billed cuckoo, the proposed project would not provide an incremental contribution to the loss of nesting habitat within the CIAA. Implementation of the Proposed Action along with past, present, and reasonably foreseeable development within the CIAA could degrade available riparian woodland habitat through indirect impacts such increased erosion and ambient noise levels. Adherence to project design features (see **Section 2.1**) and conservation measures listed in **Section 2.1.10** would further reduce the cumulative impacts of the proposed project on yellow-billed cuckoo within the CIAA.

Colorado River Endangered Fish

Water depletions associated with the Proposed Action in combination with depletions from past, present, and reasonably foreseeable activities in the CIAA would result in small but incremental impacts to the Upper Colorado River Basin and the biological environment for the Colorado River Endangered Fish species. Implementation of the Proposed Action in combination with other activities in the CIAA could degrade USFWS-designated critical habitat for the Colorado River Endangered Fish Species using the Green River by increasing erosion, sediment yield, and the potential for leaks or spills. Implementation of certain design features (see **Section 2.1**) and conservation measures listed in **Section 2.1.10** would reduce impacts to the Colorado River endangered fish species. These measures include appropriate erosion control measures and use of closed-loop drilling techniques. Many of the aforementioned impacts would be minimized and/or monitored. While the Proposed Action would result in a depletion of 5.7 acre-feet of water from the Green River, this would represent less than 0.000001 percent of the 2.8 million acre-feet of water withdrawn by the 2,025 projects managed under the Recovery Program (USFWS 2013a).

Uinta Basin Hookless Cactus

Cumulative effects to the Uinta Basin hookless cactus would be similar to those discussed for general vegetation within the Ouray NWR (see **Section 4.4.3.1**). Direct cumulative impacts would result from potential crushing of individual cactus, the temporary or permanent loss of suitable habitat, soil

compaction (as the result of construction), Refuge management activities, past, present, and reasonably foreseeable activities, and recreational use. Indirect cumulative impacts include habitat fragmentation; increased dust effects; introduction and spread of invasive species; temporary or permanent loss of suitable habitat; and changes to the composition of the native vegetative community from surface disturbance activities such as oil and gas development, road construction, and other human activities. Changes in land use patterns or increased human encroachment also would adversely impact occupied and suitable habitats. Recovery and reclamation of suitable habitats could be compounded by limiting reclamation conditions (e.g., drought). While the Proposed Action would provide an incremental reduction of habitat for the Uinta Basin hookless cactus within the CIAA by 10.9 acres, this incremental increase would be minor in comparison to larger oil and gas development within the Uinta Basin as a whole. For instance, when comparing the proposed project to the Gasco Energy Uinta Basin Natural Gas Development Project, which proposed 4,809 acres of surface disturbance within Uinta Basin hookless cactus habitat, the Proposed Action would only represent a minor loss of habitat for this species (BLM 2012a).

Surveys for Uinta Basin hookless cactus were conducted during June 11-14, 2012; April 1-3, 2013; November 4, 2013; and August 12, 2014 in accordance with USFWS and BLM survey requirements for *Sclerocactus spp.* (USFWS 2012c, 2013c). Surveys were conducted in areas proposed for well pad, access road, original pipeline alignment, and revised pipeline alignment development under the Proposed Action as well as areas proposed for alternative pipeline routes. Results of the survey effort identified two populations of Uinta Basin hookless cactus, which were located along the ridgeline of the bluffs south of the proposed tank storage facility. As a result of project modifications, these populations would be avoided. All populations were located outside of Level 1 and 2 Core Conservation Areas. No cactus were identified within the USFWS setback buffers for *Sclerocactus spp.*

Cumulative impacts to the Uinta Basin hookless cactus resulting from the Proposed Action would be minimized through implementation of conservation measures listed in **Section 2.1.10**. In addition, implementation of conservation measures would further reduce impacts related to the loss of potential habitat and accidental loss of individual species resulting from construction and/or operation activities.

Ute Ladies'-Tresses

Because no habitat for the Ute ladies'-tresses would be disturbed by the proposed project, no incremental increase in direct cumulative impacts to the CIAA resulting from the Proposed Action is anticipated. Indirect cumulative impacts such as increased erosion and subsequent sedimentation into wetland, floodplain, river terrace, and shoreline habitats, along with the increased potential for the introduction of hazardous substances through accidental release could occur. These impacts could further reduce the quality and overall available habitat for Ute ladies'-tresses within the CIAA. Cumulative impacts to Ute ladies'-tresses resulting from the Proposed Action would be minimized through implementation of conservation measures described in **Section 2.1.10**.

4.4.4.4 Mitigation

The following conservation measures would be applied to reduce impacts to special status plant and animal species under the Proposed Action:

Yellow-billed Cuckoo

1) Thurston would not commence or conduct construction, drilling, or completion activities during the yellow-billed cuckoo nesting season (June 15th to August 31st).

2) Noise mitigation measures listed under "Wildlife" apply to the yellow-billed cuckoo, and will reduce noise disturbance to this species.

Colorado River Endangered Fish

1) Conservation measures listed under "Erosion and Sedimentation Control," " Spill Procedures," " Water Resources, Including Wetlands and Floodplains," and "Hazardous Materials and Solid Waste" apply to the Colorado River endangered fish and will reduce the potential for an accidental spill that could contaminate the Green River and associated wetlands, thus greatly reducing the likelihood that these species could be adversely affected.

Uintah Basin Hookless Cactus

1) Pre-project habitat assessments were completed across 100 percent of the project disturbance area within potential habitat prior to any ground-disturbing activities to determine if suitable Uinta Basin hookless cactus habitat was present. Within suitable habitat, site inventories were conducted to determine occupancy. No cactus were found within the project disturbance area or associated buffers. In addition, the following conservation measures that are part of the project design will reduce the likelihood that cactus could be affected:

    a. Limit new access routes created by the project;
    b. Roads and utilities should share common ROWs where possible;
    c. Vehicles will stay on designated routes and other cleared/approved areas; and
    d. All disturbed areas will be re-vegetated with native species comprised of species indigenous to the area and non-native species that are not likely to invade other areas.

4.5 Paleontological Resources

Direct adverse impacts to paleontological resources in the Project Area include physically altering, damaging, or destroying all or a part of the paleontological resource; altering characteristics of the surrounding environment that contribute to the paleontological resource's significance; and, neglecting the paleontological resource to the extent that it deteriorates or is destroyed. Direct impacts can be assessed by identifying the types and locations of proposed activities and determining the location of resources that could be affected.

4.5.1 Alternative A – Proposed Action

Under the Proposed Action, known (surface) or potentially unknown (buried) paleontological resources could be directly affected and irreversibly damaged or destroyed by surface-disturbing activities related to pad and road construction activities. The opportunity for increased human presence in the area could result in increased incidences of vandalism and/or theft of such resources. All of these impacts could contribute to the alteration of the Project Area as well as the possible loss of interpretation possibilities and research potential.

Based on current paleontological records search and survey, one previously known paleontological locality occurs near the existing access road and two new fossil localities were discovered in the same

general location. Additionally, a recent survey of the pipeline route has identified one new locality that has the potential to contain significant fossils. Thurston has committed to suspend all operations that would further disturb paleontological material if such resources are uncovered during ground-disturbing activities (refer to **Section 2.1.10**). Such a commitment would mitigate impacts to paleontological resources in the Project Area. As the HDPE pipeline would be laid across the surface, impacts to fossils and formations potentially containing significant fossils are not anticipated from the pipeline due to the lack of surface disturbing activity.

4.5.2 Alternative B – No Action Alternative

Under the No Action Alternative, the proposed surface disturbing activities would not occur. Future mineral development in the Project Area would be considered on a case-by-case basis and would be subject to separate NEPA analysis. As a result, the No Action Alternative would have no adverse or beneficial effects on paleontological resources.

4.5.3 Cumulative Impacts

The CIAA for paleontological resources is defined as the Project Area boundary. Cumulative impacts to paleontological resources are defined as any damage to, or destruction of, paleontological resources which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions (40 CFR 1508.7). The magnitude of impacts may be greater or lesser depending on 1) the paleontological resource site densities present in the areas of project-related activity; 2) the importance of the paleontological resources present; and 3) the final magnitude and scope of reasonably foreseeable actions over the next 20 years. However, it is important to remember that destruction to, or damage of, paleontological resources is often site-specific and not additive in nature.

Impacts to paleontological resources in the CIAA would primarily result from past, present, and reasonably foreseeable activities associated with surface and subsurface disturbance of fossiliferous rocks for oil and gas development. These activities could damage or destroy fossils. Destruction of scientifically-important fossils would irreversibly and irretrievably damage the paleontological information base, and destroyed fossils would not be available for future analysis. In addition, increased vandalism and theft of fossils could result from improved vehicle and pedestrian access to fossil localities and increased visitation to the area.

Specific direct impacts to presently unknown paleontological resources in the CIAA would not be known until surveys are completed for all areas proposed for surface disturbance. While the potential for direct impacts to fossils is likely to increase with increased surface disturbance in the CIAA, these impacts would be mitigated by preparation and execution of appropriate conservation measures that have been approved by the Refuge Manager or appropriate Service AO. Surface-disturbing activities could also have a beneficial effect on paleontological resources by drawing the attention of a qualified paleontologist to areas that are not currently being researched, and may result in the collection of specimens and data that would not be recovered otherwise. Therefore, neither the Proposed Action nor the No Action Alternative would incrementally contribute to cumulative impacts to paleontological resources from oil and gas exploration and development in the Project Area.

4.5.4 Mitigation

The following conservation measures would be applied to reduce impacts to paleontological resources under the Proposed Action:

1) Thurston has conducted paleontological surveys on lands that would be affected by surface-disturbing activities. Recommendations to minimize potential damage to paleontological resources (e.g., a permitted paleontologist will be present to monitor construction in certain circumstances) will be followed. The results of the survey were submitted to the Service with the APD for each well.
2) Thurston will educate its contractors and employees about the relevant Federal regulations intended to protect paleontological resources. All vehicular traffic, personnel movement, construction, and restoration activities will be confined to existing roads and to areas cleared by the site inventory unless mitigation measures are undertaken. If any potential paleontological resources are uncovered during construction, work will stop immediately in the area and the AO will be notified.
3) Per consultation with the Utah SHPO, a contracted paleontologist will be onsite when construction occurs.
4) If paleontological resources are uncovered during ground disturbing activities, Thurston would suspend all operations that would further disturb such materials and immediately contact the Authorized Officer, who will arrange for a determination of significance, and, if necessary, recommend a recovery or avoidance plan.

4.6 Cultural Resources

4.6.1 Alternative A – Proposed Action

During the cultural resource inventory that was conducted for the Project, only two sites were identified. Though site 42UN7913 has been recommended eligible to the NRHP as a whole, the portion of this site within the APE has lost integrity and is not eligible to the NRHP. Additionally, the portion of 42UN8480 within the Project Area has lost its integrity at the location of the proposed pipeline crossing. Therefore, the Project is unlikely to have an adverse or beneficial effect on the site.

Indirect impacts to cultural resources in the Project Area from implementation of the Proposed Action could result from atmospheric, visual, and auditory intrusions; increased visitation and traffic during construction, drilling and completion operations; vandalism; erosion; and unknown impacts to unidentified cultural landscapes, all of which may contribute to an alteration of the overall setting and feeling of the Project Area. Such changes could lead to the damage, destruction, or removal of scientific information, the loss of research potential, the loss of interpretation possibilities, and the destruction of the character or setting of a site.

The conservation measures identified in **Section 2.1.10** of this EA will also further minimize effects to sites 42UN7913 and 42UN8480. Therefore, the Proposed Action would not have an adverse or beneficial effect on historic properties. Should any cultural resources be discovered during construction, a report should be made immediately to the Refuge Manager.

4.6.2 Alternative B – No Action Alternative

Under the No Action Alternative, the proposed surface disturbing activities would not occur. Future mineral development in the Project Area would be considered on a case-by-case basis and would be subject to separate NEPA analysis. As a result, the No Action Alternative would not have an adverse or beneficial effect on historic properties.

4.6.3 Cumulative Impacts

The CIAA for cultural resources is defined as the Project Area boundary because impacts are not additive across a landscape. Impacts to the cultural resources in the CIAA would primarily result from past, present, and reasonably foreseeable activities associated with surface and subsurface disturbance. Impacts to cultural resources in the CIAA may also result from specific cultural resource management decisions and from non-surface-disturbing activities that create atmospheric changes, visual obstructions, noise levels, and/or lighting impingement effects. These latter impacts would apply to sites or locations that together comprise the overall cultural experience for all visitors to the area, especially those areas deemed sacred or traditionally important by Native American Tribes and used by these groups. These types of impacts cumulatively affect not only the historic setting, visitor experience, and viewshed of cultural properties, but also their eligibility potential for nomination to the NRHP.

As previously stated, no potential impacts to eligible cultural resource sites were identified during the cultural resource inventory for the proposed project. Specific direct impacts to presently unknown cultural resources as a result of reasonably foreseeable actions in the CIAA would not be known until surveys are completed for any areas proposed for surface disturbance and cultural resource properties are evaluated for their eligibility for listing on the NRHP. While the potential for direct impacts to eligible cultural resources is likely to increase with increased surface disturbance, these impacts can be mitigated by preparation and execution of appropriate conservation measures that have been approved by the Refuge Manager or appropriate Service AO. As cultural resource surveys would occur prior to any surface-disturbing activities in the Project Area, and as all NRHP eligible cultural resources would be avoided or appropriately mitigated, direct cumulative impacts to these resources are expected to be minimal.

Although archaeological sites located within disturbance areas would be avoided or mitigated, sites located outside of and adjacent to disturbance areas would be vulnerable to indirect impacts. When considered in addition to other past, present, and reasonably foreseeable actions, implementation of the Proposed Action could cumulatively affect unknown cultural resources in the Project Area by introducing atmospheric, visual, and auditory intrusions; increased visitation and pedestrian traffic during well development and operation; and unknown impacts to unidentified cultural resources and cultural landscapes. It is anticipated that there would be a cumulative increase in vandalism, illegal collection, and dust due to the increase in roads throughout the CIAA, and increased erosion at sites located in the vicinity of pads, roads, and pipelines where vegetation cover has been reduced or eliminated. All of these impacts may contribute to an alteration of the overall historic setting and visitor experience of the CIAA. Beneficial cumulative impacts would also likely occur as undocumented cultural resources could be discovered and preserved.

No cumulative impacts to cultural resources are expected under the No Action Alternative.

4.6.4 Mitigation

The following conservation measures would be applied to reduce impacts to cultural resources under the Proposed Action:

1) Thurston has conducted a Class III cultural resource survey on lands that would be affected by surface-disturbing activities and will avoid all sites determined to be eligible to the NRHP or will perform mitigation as recommended by the cultural resource consultant and directed by the AO. The results of the survey were submitted to the Service.

2) In the event that unanticipated cultural resources are uncovered during surface-disturbing activities, procedures outlined in the Service's 614 FW 2, Survey and Identification Manual

(USFWS 1992) and other applicable regulations would be followed. Thurston would suspend operations at the site and immediately contact the Service, who will arrange for a determination of eligibility in consultation with the State Historic Preservation Office (SHPO) and if necessary, will recommend a recovery or avoidance plan.

3) If the proposed surface disturbance will affect an NRHP-eligible site, data recovery will be performed. Data recovery will include detailed recordation and archival research. The gathered information will be analyzed and described in a report that details the results of the investigation. The report will be submitted to the Service and the SHPO in Salt Lake City.

4) Thurston is responsible for informing all persons in the area who are associated with this project that they may be subject to prosecution for knowingly disturbing historic or archaeological sites or for collecting artifacts. All vehicular traffic, personnel movement, and construction and restoration activities would be confined to the areas evaluated in the pre-disturbance survey.

5) Thurston will educate its contractors and employees about the relevant Federal regulations intended to protect cultural resources. Furthermore, Thurston will educate staff and contractors regarding illegal collection or destruction of cultural resources. All vehicular traffic, personnel movement, construction, and restoration activities will be confined to existing roads and to areas cleared by the site inventory unless mitigation measures are undertaken. In the event historic or archeological resources are uncovered during construction, work will stop immediately and the Service AO will be notified.

4.7 Transportation

4.7.1 Alternative A – Proposed Action

Under the Proposed Action, short-term increases in the volume of both heavy and light traffic would occur on US 40, SH 88, and along Wildlife Refuge Road. Traffic operations may be affected by additional traffic volumes including heavy trucks, tractor trailers, and passenger transport vehicles and may result in temporary traffic delays. Unpaved road surfaces may be degraded due to heavy equipment traffic during the construction and drilling phases of the project, and fugitive dust would be generated in association with travel along these roads.

The largest increase in traffic would occur during the construction, drilling, and completion phases of the project. Construction of the well pads and associated access roads would require three light trucks to transport construction crews for duration of up to 7 days. Two to three pieces of heavy equipment, such as bull dozers and motor graders, would also be used to perform earth moving operations. Drilling operations would generate approximately 225 truck trips, and completion operations for the two proposed wells would require approximately 360 vehicle trips. In total, traffic generated during the construction, drilling, and completion phase (38 days per well) would be an average of from 8 to 9 vehicles per day, although some days would experience higher than average traffic volumes depending on the specific work activity conducted.

Once the wells are complete, the volume of traffic would decrease substantially and would be limited to routine production and maintenance operations. At the tank battery location on the north side of the upper Refuge road, tanker trucks would remove condensate from onsite storage tanks on the well pads at rates ranging from twice per day to once per week. The wells may be recompleted once per year (after about 5 years of production) that would require approximately 3 to 5 truck trips per day for approximately 7 days.

A Special Use Permit will be issued by the Refuge for road improvements and access road construction, prior to beginning work on any USFWS managed roads. The SUP covers a 5-year period. A ROW permit will be required and obtained from the USFWS Realty Division for long-term access if it is determined that the wells are productive.

Per the conservation measures listed in **Section 2.1.10**, the Operator would be required to upgrade and maintain all access routes and roads within the Refuge and must have road maintenance equipment and Operator(s) readily available to perform road repairs and maintenance (including dust abatement), as needed, or as directed by the Refuge Manager. Vehicles speed limits within the Refuge area boundary would also be set at the discretion of the Refuge Manager and will be strictly adhered to.

4.7.2 Alternative B – No Action Alternative

Under the No Action Alternative, no improvements to the existing transportation infrastructure would occur. Traffic volumes on US 40 and SH 88 would continue to reflect background levels and trends resulting from regional land use, recreational use, other approved energy development projects, and related traffic. No impacts to traffic patterns or volumes would result from the No Action Alternative.

4.7.3 Cumulative Impacts

The analysis area for cumulative effects to transportation includes the US 40 corridor between Vernal and Roosevelt, SH 88 between US 40 and the Town of Ouray, and the existing transportation infrastructure within the Project Area. Past, present, and reasonably foreseeable development activities that contribute to transportation-related impacts include oil and gas development, agriculture, recreation, and upgrades to the existing transportation infrastructure within the region.

Implementation of the Proposed Action would result in minor cumulative impacts to the transportation analysis area. Adverse cumulative impacts primarily would consist of small incremental increases in traffic delays, increased traffic volumes, potential road closures, and road damage associated with construction, drilling, and production of the proposed wells. Traffic volumes generated by the project would incrementally add to existing and future background traffic volumes from residential, recreation, and industrial uses. On roadways where adequate capacity exists and traffic volumes are low, the addition of project-related traffic would not substantially affect traffic operations or safety. On roadways such as US 40 where traffic volumes are high, the cumulative effect of project-related traffic may be noticeable during periods of increased use such as during worker commuting hours or during wet conditions. A potential benefit associated with implementation of the Proposal Action would include a better maintained road network in the southern portion of the Refuge that could cater to recreational use and Refuge management activities.

No cumulative impacts to transportation are expected under the No Action Alternative.

4.7.4 Mitigation

The following conservation measures would be applied to reduce impacts to transportation under the Proposed Action:

1) The Operator must provide detailed maps or plats of the proposed project layout (as required by the Refuge Manager or the Service AO) that shows routes, staging areas, construction areas, and work locations. The map should include the following minimum information:

    a. Dimensions on adjacent exterior section lines sufficient to completely describe the quarter section that contains the proposed well shall be indicated. If dimensions are not field measured, state how the dimensions were determined.

    b. The latitude and longitude of the proposed well location shall be provided on the drawing with a minimum of five (5) decimal places of accuracy and precision using the North American Datum (NAD) of 1983 (e.g.; latitude 37.12345 N, longitude 104.45632 W).

    c. For irregular, partial or truncated sections, dimensions will be furnished to completely describe the entire section containing the proposed well.

    d. The field-measured distances from the nearer north/south and nearer east/west section lines shall be measured at ninety (90) degrees from said section lines to the well location and referenced on the plat.

    e. A map legend.

    f. A north arrow.

    g. A scale expressed as an equivalent (e.g. - 1" = 1000').

    h. A bar scale.

    i. The ground elevation.

    j. The basis of the elevation (how it was calculated or its source).

    k. The basis of bearing or interior angles used.

    l. Complete description of monuments and/or collateral evidence found; all aliquot corners used shall be described.

    m. The legal land description by section, township, range, principal meridian, baseline and county.

    n. Operator name.

    o. Well name and well number.

    p. Date of completion of scaled drawing.

    q. A line designating the 100-year floodplain for the Green River relative to pad and well placement.

2) Refuge officials will conduct an onsite meeting before rig-up with representatives of Thurston. The purpose of the meeting is to review and reiterate regulations and conditions that apply to work crew conduct on the Refuge. Thurston will be responsible for ensuring that employees, representatives, consultants, contractors, and subconsultants adhere to the COAs and BMPs identified in the SUP and DR for this EA.

3) The Operator must upgrade and maintain all access routes, roads, and bridges designated for its use across the Refuge in accordance with acceptable specifications and standards as described by the "Gold Book" (USDI-USDA 2007 as revised). The Operator must have road maintenance equipment and operator(s) readily available to perform road repairs and maintenance as needed, or as directed by the Refuge Manager or the Service AO.

4) The drill site and immediate access roads must be constructed of Refuge-approved material for all drilling locations. All existing drainage patterns within roads to be constructed must be maintained uninterrupted by the use of culverts, bridges, or other applicable techniques as specified and authorized by the Refuge Manager or the Service AO.

5) Within 120 days following completion of drilling and testing operations, the Refuge Manager or the Service AO will be advised whether the well is to be retained or plugged. If the well site is to be abandoned, the well is to be plugged to meet the standards of the State requirements, all above-ground structures must be removed, and the site and road restored to near original condition as directed by the Refuge Manager or the Service AO. Any damage to existing surface vegetation, water channels, or other physical features must be restored to original site conditions. All costs shall be borne by the Operator.

6) Impacts on sensitive habitat (e.g., wetlands, riparian areas), wildlife, plants, and other sensitive natural or historical resources must be avoided to the extent possible while constructing the access road and well pads. Existing roads shall be used to the greatest extent practicable to avoid erosion and minimize the footprint devoted to oil and gas operations. Roadbeds shall be engineered to avoid or minimize impacts to riparian areas or wetlands to the extent practicable. Unavoidable impacts shall be mitigated.

7) Any necessary personnel, vehicles, materials, and/or equipment shall be transported to the project site before sunset each day, and shall not depart the project site until after sunrise, except for materials/equipment transport needed for emergencies (e.g., rig repairs, spill response).

8) All vehicle access will be restricted to developed roads. All-terrain vehicle (ATV) use and deviations to vehicle use must be pre-approved by the Refuge Manager in writing prior to any action taken (50 CFR 27.31).

9) Vehicle speed limits are not to exceed 10 miles per hour traveling on access roads from the main Refuge road to the well pad; and not to exceed 25 miles per hour on the main Refuge road during construction, drilling/completion, production, or normal daily activities to discourage the generation of fugitive dust. These speed limits are set at the discretion of Refuge Manager and limits will be strictly adhered to (50 CFR 27.31).

10) All personnel and activities shall be restricted to the immediate drilling area and the direct access road to the drill site (50 CFR 26.22).

11) No project vehicles will be operated along dirt access roads or at drilling pad sites during periods of saturated soil conditions when surface ruts greater than 4 inches would occur along straight travel routes.

4.8 Recreation

4.8.1 Alternative A – Proposed Action

The Proposed Action is not likely to appreciably impact recreation activities within or adjacent to the Project Area. Except for short periods of time associated with the construction of the proposed pads, access roads, and/or pipeline installation, most recreational activities on the Refuge would continue uninhibited in the Project Area. Increased traffic, fugitive dust, and noise during construction, drilling, and completion activities would likely discourage hunting and wildlife viewing within the vicinity (i.e., approximately 0.5 miles) of the proposed pads, and likely will diminish the quality of the recreation experience. However, activities associated with pad and road construction and drilling and completion are only expected to take approximately 5 to 6 weeks per pad. Depending on timing, these activities may interfere with hunting season.

If the proposed well are not productive and the disturbed areas are reclaimed, no impacts to recreation will occur in the long-term. If the wells are productive over the operational life of the project, the presence of the pads, access roads, and surface pipeline likely will diminish the quality of the experience of recreational users. These potential impacts would occur because the relatively undisturbed character of the area would be altered by the presence of industrial facilities. Since most recreational users generally prefer a natural unaltered setting, the attractiveness of the area and its surroundings would be reduced as a recreational resource. As a result, recreational users who use the Project Area, particularly for wildlife viewing and/or hunting where the proposed pads, pipeline, and access roads would be located could be displaced to other undisturbed settings within the Refuge or elsewhere, where the quality of wildlife viewing and/or hunting may be reduced.

Per the conservation measures listed in **Section 2.1.10**, the Operator would be required to do the following: 1) fence and provide appropriate signage on all pads to prevent Refuge visitors from gaining access; and 2) modify drilling operations, as necessary, to reduce conflicts with regular Refuge management and public use activities.

4.8.2 Alternative B – No Action Alternative

Under the No Action Alternative, development of the Project Area would not occur and recreational opportunities and resources would remain in their present condition.

4.8.3 Cumulative Impacts

The analysis area for cumulative effects to recreation is the entire Ouray NWR boundary and adjacent, lands. Under both Proposed Action, the short-term disruption of recreational opportunities and access to the Leota Bottom resulting from the construction of the pads and associated access roads would contribute to adverse cumulative impacts. In addition, the proposed development may also decrease opportunities for recreationists seeking a more primitive setting or experience. No cumulative impacts are anticipated under the No Action Alternative.

4.8.4 Mitigation

The following conservation measures would be applied to reduce impacts to recreation under the Proposed Action:

1) Thurston will install electricity (if feasible) to provide power for separators and pumpjacks on the two proposed well pads to reduce the level of noise for both wildlife and visitors. Should electrified systems be used, an aboveground distribution line would be built on single wood utility poles located within the proposed road ROW. If feasible, the proposed distribution line would tie into an existing power source at the Ouray National Fish Hatchery (NFH). If and when gas-powered engines are used, noise abatement methods (e.g., acoustic barriers and mufflers) will be implemented to reduce noise impacts to levels at or below noise levels of an electrified system. Thurston will communicate its intentions for power supply and noise mitigation methods to the Service as determinations are made.
2) The Refuge Manager or the Service AO may require drill pads to be fenced and signed, if necessary, to prevent both wildlife and Refuge visitors from gaining access to the sites. All appropriate warning signs should be placed along all sides of the fence.
3) Refuge officials will conduct an onsite meeting before rig-up with representatives of Thurston. The purpose of the meeting is to review and reiterate regulations and conditions that apply to work crew conduct on the Refuge. Thurston will be responsible for ensuring that employees,

representatives, consultants, contractors, and subconsultants adhere to the COAs and BMPs identified in the SUP and DR for this EA.

4) During all phases of this project, noise levels must be kept to a minimum and should not exceed the established industry standard above ambient day and nighttime noise levels. Thurston should make every effort to utilize electric pumping equipment (most quiet) during the production phase of this operation.

4.9 Visual Resources

4.9.1 Alternative A – Proposed Action

The potential direct impacts to visual resources would include the visual contrasts created by construction equipment, pipelines, well pads, the tank battery pad, temporary and permanent access roads, and other forms of infrastructure associated with oil and gas exploration and development within Ouray NWR. In general, drilling rigs and equipment, construction and maintenance vehicles, development infrastructure, and surface disturbance, including roads, would impact an area's scenic quality and appearance of naturalness with human-made color, form, and linear contrasts. The visual impacts from producing wells (including permanent access roads, well pads, pipelines, maintenance vehicles, and related infrastructure, such as generators and storage tanks) would have similar visual contrasts with the natural landscape and would persist throughout the LOP.

Long-term fugitive dust that would be generated by production well maintenance vehicles and short-term well-drilling activities could impact long-distance scenic quality because these fugitive dust-producing activities would continue throughout the LOP. However, conservation measures for dust abatement along access roads would reduce the effects of long-term dust-related haze to long-distance scenic quality (see **Section 2.1.10**).

Additional impacts may include artificial light and associated sky flow from night lighting required for night-time drilling. Night lighting could degrade scenic quality in relatively undeveloped areas by introducing intrusive artificial lighting into an otherwise unlit natural landscape. This could have detrimental impacts on nocturnal species such as bats and insects and how they use the surrounding landscape. Short-term visual impacts from horizontal and vertical lighting at the well-pad locations would occur during the drilling period of 10 days per well. The locations of these temporary impacts would move across the Project Area as each individual well is drilled and completed. Short-term impacts would also include drilling rig visibility at site-specific drilling locations during the day and night because the rigs would be moved weekly or monthly, depending on amount of time needed to drill each well. Long-term impacts (for the LOP) would include pipeline, infrastructure, well-pad visibility, and surface disturbances from the well-pad and access road construction.

Thurston would minimize impacts resulting from artificial light by shielding lighting and using switches, timers or motion sensors. In addition, artificial lighting needed for night operations would be kept to a minimum and shielded to the extent practicable. All lights must be less than 3500° Kelvin color temperature to reduce blue-rich light, which increases sky glow and can be a wildlife attractant (see **Section 2.1.10**). All production equipment and associated infrastructure will be painted a standard environmental color to blend with the natural landscape background, thus further reducing long-term visual impacts.

4.9.2 Alternative B – No Action Alternative

Under the No Action Alternative, the proposed oil and gas exploration project would not occur. As such, the No Action Alternative would have no adverse or beneficial effects on visual resources.

4.9.3 Cumulative Impacts

The CIAA for visual resources is defined as the Ouray NWR boundary and adjacent lands. This CIAA accounts for impacts to visual resources that are collectively affected by ongoing Refuge management activities and energy extraction, given that this land is commonly managed by the Service under the Refuge's CCP. The most visible effects from past activities within the Refuge have generally been caused by the removal of tamarisk and other vegetation in patterns that contrast with the natural forms, lines, colors, and textures of the natural landscape and the alteration of waterflow within the bottomlands along the Green River caused by construction of dikes and levees. Further, development of oil and gas including the construction of roads, well pads, pipelines, and power lines has transformed the landscape on the periphery of the Refuge and in the Uintah Basin.

Past, present, and reasonably foreseeable future oil and gas development has disturbed approximately 78.2 acres within the Ouray NWR (**see Table 4-2**). Other public land use and Refuge management activities have resulted in unknown disturbance acreages within the Refuge and have also affected the character of the landscape. Implementation of the Proposed Action would incrementally increase the total cumulative surface disturbance resulting from energy development in the Ouray NWR to approximately 89.1 acres and would result in cumulative impacts to visual resources. Cumulative impacts would consist of incremental modifications to the natural landscape resulting from the removal of vegetation and the degree of deviation from the landscape's natural condition. Impacts to visual resources would be minimized under the Proposed Action by implementation of conservation measures.

No cumulative impacts to visual resources are expected under the No Action Alternative.

4.9.4 Mitigation

The following conservation measures would be applied to reduce impacts to visual resources under the Proposed Action:

1) Thurston must implement the following measures and/or conditions to reduce the impacts on daytime and nighttime visual resources:
    a. All permanent (onsite 6 months or longer) structures either constructed or installed infrastructure must be painted a flat, non-reflective, earth-tone color (Covert Green), as determined by the Service AO, to blend with the natural landscape background.
    b. During pad construction, when erecting or disassembling the drilling rig, and during production, outdoor lighting should be kept to a minimum and turned off when not needed.
    c. Whenever possible, each series of lights must be either on a separate switch, timer, or motion sensor to allow the operator to tailor their use to activity in a specific area of the drill pad.
    d. All area lights must be downward pointing and fully shielded, with the exception that upward angled lighting would be used during the operation of the drilling rig in order to

provide a safe working environment for drilling personnel. All lighting focused on a particular apparatus must be laterally shielded so that all light falls upon the intended work area and a minimum amount of light is emitted sideways or upward.

e. Lights that are required by OSHA for emergencies must be linked to alarms so that they are only operational when an emergency situation arises.

f. No light shall exceed 400 watts.

g. All lamps must be ≤ 3500 ° Kelvin color temperature to reduce blue-rich light, which causes greater sky glow and is typically more attractive to wildlife.

h. A Service designee will observe the facility from critical angles and distances. Excessively glaring lights must be shielded, re-aimed, or otherwise mitigated with an adaptive approach without compromising worker safety requirements.

i. Following well completion, lights at the pumpjack area and tank battery area will be kept off except when needed for emergency maintenance.

j. Lighting will be minimized where applicable unless safety is an issue.

2) Cuts and fills would be kept at a minimum and blended with the natural environment to minimize disturbance to visual resources;

3) During all phases of this project, noise levels must be kept to a minimum and should not exceed the established industry standard above ambient day and nighttime noise levels. Thurston should make every effort to use electric pumping equipment (most quiet) during the production phase of this operation.

5.0 CONSULTATION AND COORDINATION

5.1 Introduction

The beginning of **Chapter 3** identifies issues/resources that the Service and/or the public during the public scoping process decided to bring forward to analyze in detail in **Chapter 4** and provides rationale for issues that were considered but not analyzed further in the EA. CEQ regulations under NEPA require an "early and open process for determining the scope of issue to be addressed and for identifying significant issues related to a Proposed Action" (40 CFR 1501.7). In order to satisfy this CEQ requirement, announcement of the Proposed Action was posted on the Refuge website (www.ouray.fws.gov), posted on the Refuge's information kiosk, and published weekly in the *Vernal Express* from October 31st through November 21st. The Service resource specialists reviewed Thurston's proposed POD and coordinated with the USFWS-ESO and Refuge personnel to assess the type and magnitude of potential impacts to the natural and human environment from implementation of the proposed project. A 30-day public comment period was established for the EA to allow for public participation and input.

5.2 Persons, Groups, and Agencies Consulted

Table 5-1 lists those persons, groups, and agencies that participated and/or provided input during the internal scoping meeting.

Table 5-1. Persons, Groups, and Agencies Consulted

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
U.S. Fish & Wildlife Service (USFWS) – Ecological Services Office	Information on Consultation, under Section 7 of the ESA (16 USC 1531)	Consultation with the U.S. Fish and Wildlife Service will be completed prior to the issuance of a Decision Record for this project.
U.S. Fish & Wildlife Service (USFWS) – Air Quality Branch	Coordination on methodology for analyzing and mitigating air quality impacts.	Emissions inventory and draft air quality sections of the EA were provided for review prior to the public comment period. Comments were addressed.
U.S. Fish & Wildlife Service (USFWS) – Ouray National Wildlife Refuge	Coordination with Ouray NWR on wildlife use, water quality, and historical public use data for the Refuge.	Data and analysis regarding biological resources, water quality and recreation incorporated in **Chapters 3** and **4** of the EA.
Utah State Historic Preservation Office (SHPO)	Consultation for undertakings, as required by the National Historic Preservation Act (NHPA) (16 USC 470)	Final Consultation with Utah SHPO will be initiated and completed prior to the issuance of a Decision Record for this EA. Preliminary consultation with the Utah SHPO concurred with Service determinations of eligibility and effects regarding Thurston Energy, LLC's Proposed Ouray NWR 2-Well Development Program. See **Appendix I** and **Appendix J** for details.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
U.S. Army Corps of Engineers (USACE), Utah Regulatory Office	Coordination on impacts to wetlands and waters of the U.S.	USACE, Utah Regulatory Office verified on a site visit dated February 27, 2012, and in an email dated May 07, 2012, that none of the project facilities would directly impact waters of the U.S., including wetlands. See **Appendix B**.

5.3 List of Preparers

Tables 5-2 and **5-3** lists the people who participated in initial scoping, offered technical review, and/or provided data, direction, or assistance during the preparation of this EA.

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Matthew Fry	Ouray National Fish Hatchery – Fish Biologist	Water Quality
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Tina Dobrinsky	Refuge Public Use Specialist	Recreation, Visual Resources
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Sandy Chynoweth Pagano	Sagebrush Consultants, L.L.C.	Archaeologist	Cultural resource inventory/report for proposed pipeline and access road widening
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