APPENDIX A

PUBLIC SCOPING

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NOTICE OF SCOPING

The U.S. Department of Energy (DOE) is preparing a draft Environmental Assessment to analyze and describe the potential environmental impacts associated with proposed actions at the:

National Wind Technology Center (DOE/EA-1914)
Jefferson County, Colorado

The DOE is proposing to analyze future improvements to the existing National Renewable Energy Laboratory's (NREL) National Wind Technology Center (NWTC). DOE's Golden Field Office is preparing a draft Environmental Assessment in accordance with the National Environmental Policy Act (NEPA). The complete scoping letter with attachments is available for review at the Standley Lake Public Library and on the DOE Golden Field Office and NREL websites:

http://www.eere.energy.gov/golden/Reading_Room.aspx

http://www.nrel.gov/ehsq/environmental_protection.html

Public comments on any potential issues and/or environmental impacts of implementing the proposed actions will be accepted until **November 30, 2012.** Please direct any written questions or comments to:

NREL NEPA Comments, National Renewable Energy Laboratory, EHS Office (M.S. RSF 103), 15013 Denver West Parkway, Golden, Colorado 80401 or by email to NREL.NEPA.Comments@nrel.gov or by fax to 303-275-4002.

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National Renewable Energy Laboratory
15013 Denver West Parkway - MS RSF 103
Golden, Colorado 80401-3305

PRSRT STD
US POSTAGE
PAID
GOLDEN, CO
Permit No. 258

ECRWSS
POSTAL CUSTOMER

National Renewable Energy Laboratory
15013 Denver West Parkway - MS RSF 103
Golden, Colorado 80401-3305

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National Renewable Energy Laboratory
15013 Denver West Parkway - MS RSF 103
Golden, Colorado 80401-3305

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POSTAL CUSTOMER

National Renewable Energy Laboratory
15013 Denver West Parkway - MS RSF 103
Golden, Colorado 80401-3305

PRSRT STD
US POSTAGE
PAID
GOLDEN, CO
Permit No. 258

ECRWSS
POSTAL CUSTOMER

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

October 31, 2012

TO: DISTRIBUTION LIST

SUBJECT: NOTICE OF PUBLIC SCOPING – SITE-WIDE ENVIRONMENTAL ASSESSMENT OF THE NATIONAL RENEWABLE ENERGY LABORATORY'S NATIONAL WIND TECHNOLOGY CENTER, GOLDEN, CO (DOE/EA-1914)

The U.S. Department of Energy (DOE) is proposing to complete a Site-Wide Environmental Assessment (EA) of the National Wind Technology Center (NWTC) to include analysis of potential environmental impacts due to proposed site activities and operations. Details of the proposed project and its location are contained below.

Pursuant to the requirements of the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations for implementing the procedural provisions of NEPA (40 CFR Parts 1500-1508), and DOE's implementing procedures for compliance with NEPA (10 CFR Part 1021), DOE is preparing an Environmental Assessment (EA) to:

- Identify potential adverse environmental effects as well as ways to avoid, minimize or mitigate such effects should these proposed site activities and operations be implemented;
- Evaluate viable alternatives to the proposed action, including a no action alternative;
- Describe the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and,
- Characterize any irreversible and irretrievable commitments of resources that would be involved should these proposed site activities and operations be implemented.

PROBABLE ENVIRONMENTAL EFFECTS/ISSUES SCOPED FOR THE ENVIRONMENTAL ASSESSMENT

The Site-Wide EA will describe and analyze any primary, direct, induced, indirect and cumulative impacts of the Proposed Action and alternatives, and will identify possible mitigation measures to reduce or eliminate those impacts. Beneficial and adverse, on-site and off-site, construction, operation, and maintenance impacts will be discussed, as appropriate. The Site-Wide EA will discuss impacts that may result to:

- Land Use
- Traffic and Transportation
- Noise (Acoustics)
- Visual Quality/Aesthetics
- Historic and Cultural Resources
- Water Resources
- Geology and Soils
- Air Quality, Greenhouse Gases and Climate Change

- Biological Resources
- Hazardous Materials and Waste Management
- Utilities, Infrastructure and Energy
- Energy Efficiency, Renewable Energy and Sustainability
- Human Health and Safety
- Socioeconomics and Environmental Justice
- Intentional Destructive Acts

PROPOSED ACTION AND ALTERNATIVES

The following presents a summary of the Proposed Action and No Action alternative descriptions.

Proposed Action

Proposed new construction projects include additional wind turbine test sites as well as permanent physical improvements to the site, such as buildings, equipment, utilities and other infrastructure. Other activities not requiring permanent facilities or infrastructure include facility operations, management practices and maintenance activities. Specifics of the proposed actions are provided in **Attachment I**.

Development of a Reasonable Range Of Alternatives

DOE is required to consider a reasonable range of alternatives to the proposed action during an environmental review. The definition of alternatives is governed by the "rule of reason". Reasonable alternatives are those that may be feasibly carried out based on environmental, technical, and economic factors.

Under the No Action Alternative, NREL would continue current activities and operations at NWTC.

PUBLIC SCOPING

The DOE Golden Field Office will make this letter available to all interested federal, state, and local agencies to provide input on issues to be addressed in the Site-Wide EA. Agencies are invited to identify the issues, within their statutory responsibilities that should be considered in the Site-Wide EA. The general public is also invited to submit comments on the scope of the Site-Wide EA.

This letter will be available at Standley Lake Public Library and posted in the DOE Golden Field Office online public reading room and the NREL website:

http://www.eere.energy.gov/golden/Reading_Room.aspx, and;
http://www.nrel.gov/ehsq/environmental_protection.html

Please submit your written comments regarding this scoping document on or before November 30, 2012 to:

NREL NEPA Comments
National Renewable Energy Laboratory
EHS Office, M.S. RSF 103
15013 Denver West Parkway
Golden, CO 80401
(303) 275-4002 (fax)
email: NREL.NEPA.Comments@nrel.gov

The DOE Golden Field Office welcomes your input throughout our NEPA Process.

Sincerely,

Lori Gray

Lori Gray, NEPA Compliance Officer
U.S. Department of Energy, Golden Field Office

Attachment I: Project Description
Attachment II: Figures
Figure 1-1. NWTC Regional Map
Figure 2-1. Proposed Project Locations at the NWTC

Attachment 1: Project Description

SITE BACKGROUND AND DESCRIPTION

The National Renewable Energy Laboratory (NREL) is the premier DOE national laboratory dedicated to the research, development, and deployment of renewable energy and energy efficiency technologies. As depicted in **Attachment II**, **Figure 1-1**, NREL is comprised of two main sites: South Table Mountain (STM) and the National Wind Technology Center (NWTC). Details regarding NREL's mission and research programs are available on the NREL website at: http://www.nrel.gov.

The 305-acre NWTC is located in northwest Jefferson County, Colorado, approximately 16 miles northwest of Denver. The site is south of Colorado State Highway 128 and directly east of aggregate mining and processing facilities on the east side of Colorado State Highway 93 between Golden and Boulder, Colorado.

There are currently seven major buildings located on the NWTC site that house research and administrative functions including:

- Administration Building, Building 251;
- Structural Testing Laboratory (STL), Building 254;
- Test Preparation Building (Quonset Hut), Building 260;
- 2.5 MW Dynamometer Test Facility, Building 255;
- 5.0 MW Dynamometer Test Facility and Controllable Grid Interface, Building 258;
- Distributed Energy Resources Test Facility (DERTF), Building H-1; and,
- Blade Test Facility, Building 252.

All seven major buildings are located in the Research and Support Facilities area on the northern portion of the site along the main east-west road (West 119th Ave).

Several smaller access control, support, and testing facilities are also located on the NWTC site. These include the Site Entrance Building (SEB) or Guard Post, the electrical switchgear buildings, several trailers, and several data sheds. Currently, the total area of all buildings at the NWTC is approximately 1.3 acres.

The NWTC's existing turbine test sites currently support four megawatt (MW)-scale turbines ranging in output from 1.5 to 3 MW, three mid-scale turbines, ranging from 100 kilowatt (kW) to 600 kW, and nine small wind turbines ranging in size from 1 kW to 8 kW.

In 2002, DOE released a final Site-Wide EA for the NWTC (DOE/EA-1378) evaluating the potential impacts of site operations and short-term and long-term improvements. A Finding of No Significant Impact (FONSI) was signed by DOE on May 31, 2002.

The subject of this Site-Wide EA includes the proposed action discussed below which would support DOE's mission in the R&D of energy efficiency and renewable energy technologies by providing enhanced research and support capabilities to adequately continue state-of-the-art wind energy research.

PROPOSED ACTION AND ALTERNATIVES

The following presents a summary of the Proposed Action and No Action alternative descriptions.

Proposed Action

Under the Proposed Action, DOE proposes to expand operations within the current 305-acre NWTC site. Several new buildings and additions to existing buildings are proposed at the NWTC site, as well as infrastructure upgrades to roads, electrical power, water supply, and sewer lines (NREL 2011c). This would include adding multiple turbines with associated meteorological towers, access roads, data sheds, and infrastructure. New wind turbines would vary in size from small generating capacity (up to 100 kW), to mid-range (up to 1 MW), to large MW-scale turbine installations. Future facility construction, research, development and testing proposed for the NWTC is dependent on changing federal budgets and priorities. The details provided in this assessment are the best estimates that can be made at this time. **Attachment II, Figure 2-1** presents proposed improvements at the site.

Increasing and Enhancing Research and Support Capabilities

The Proposed Action for new construction would provide for additional facilities at the NWTC, as described below.

Wind Turbine Component Research and Testing Facility. DOE would construct a 40,000 square foot facility that would be located west of Building 251. The facility is envisioned as a comprehensive R&D laboratory that would address advanced capabilities in the wind industry.

Energy Storage Test Facilities. DOE would construct one or two MW-Scale Energy Storage Test Platform areas, each approximately 200 feet x 220 feet, either south of 119th Avenue and at the north end of Row 3, or on the south end of the site between Rows 2 and 3. Both mobile and permanent energy storage test facilities would be developed to house and test innovative energy storage devices interconnected to variable renewable energy generation sources.

Staging and Maintenance Warehouse. DOE would construct a warehouse up to 40,000 square feet, west of the DERTF (Building H-1) in the northwest corner of the site. This facility would be used to support indoor staging of test projects and maintenance of equipment.

Conference and Learning Facility. DOE would also build a new Conference and Learning Facility up to 25,000 square feet, located near the NWTC site entrance.

Modifications of Existing Buildings. Modification of existing infrastructure includes upgrades to the Administration Building 251, STL Building 254, DERTF Building H-1, and 2.5 MW Dynamometer Building 255. Other modifications such as adding a cool roof to an existing building and expansion of buildings to accommodate new research and operations may be required.

The Proposed Action for infrastructure upgrades would provide for additional capabilities at the NWTC, as described below.

Other Infrastructure Upgrades. Other upgrades to the facility would include drinking water system upgrades, fire suppression system upgrades, sanitary waste upgrades, road improvements, data/telecommunications improvements.

Routine Technical Tasks for Research and Site Maintenance Activities. These tasks include loading equipment, preparing for tests, moving parts, installing and removing turbines, monitoring, cleaning facilities and equipment, maintaining landscape features, snowplowing, performing pest management, and maintaining buildings and infrastructure.

Increasing Site Use and Density

The Proposed Action provides for additional wind turbines and expansion of the number of field test sites and associated infrastructure to potentially include any combination of up to 10 large MW-scale wind turbines (each rated between 1 MW to 7 MW), up to 10 mid-scale turbines (each rated between 100 kW to 1 MW), and up to 40 small wind turbines (each rated between 300 W to 100 kW). Up to 30 meteorological towers would be installed for testing turbine operations and wind conditions. Some of the meteorological towers would be erected to support upwind and downwind turbulence inflow R&D studies, plus associated infrastructure. These numbers would be considered totals, which include the existing turbines and meteorological towers.

Expanding Power Capacity

The Proposed Action would provide for additional power capacity at the NWTC, as described below.

The current NWTC electrical generation capacity is 11.2 MW. Turbine operations are being curtailed to stay below an existing 10 MW limit in accordance with Xcel Energy requirements. The maximum combined rated electrical generation capacity for the NWTC site over the next 5 years is estimated to be up to 30 MW. Assuming wind technology development continues its current trend toward larger turbines, the projected maximum NWTC electrical generation capacity for the 5- to 10-year timeframe is estimated to increase up to a site total of 50 MW as additional turbines are added and smaller MW-scale turbines are replaced with larger units.

To accommodate an increase to 50 MW, the existing site electrical infrastructure would need to be upgraded to add an additional 40 MW of generation capacity. DOE and NREL would work with a transmission provider for the design and installation of an on-site substation to increase the site-generated power from distribution voltage (13.2kV) to transmission voltage (115kV) along with a short run of transmission line to interconnect with the transmission provider.

Development of a Reasonable Range Of Alternatives

Under the No Action Alternative, current activities and operations would continue at NWTC.

Attachment II: Figures

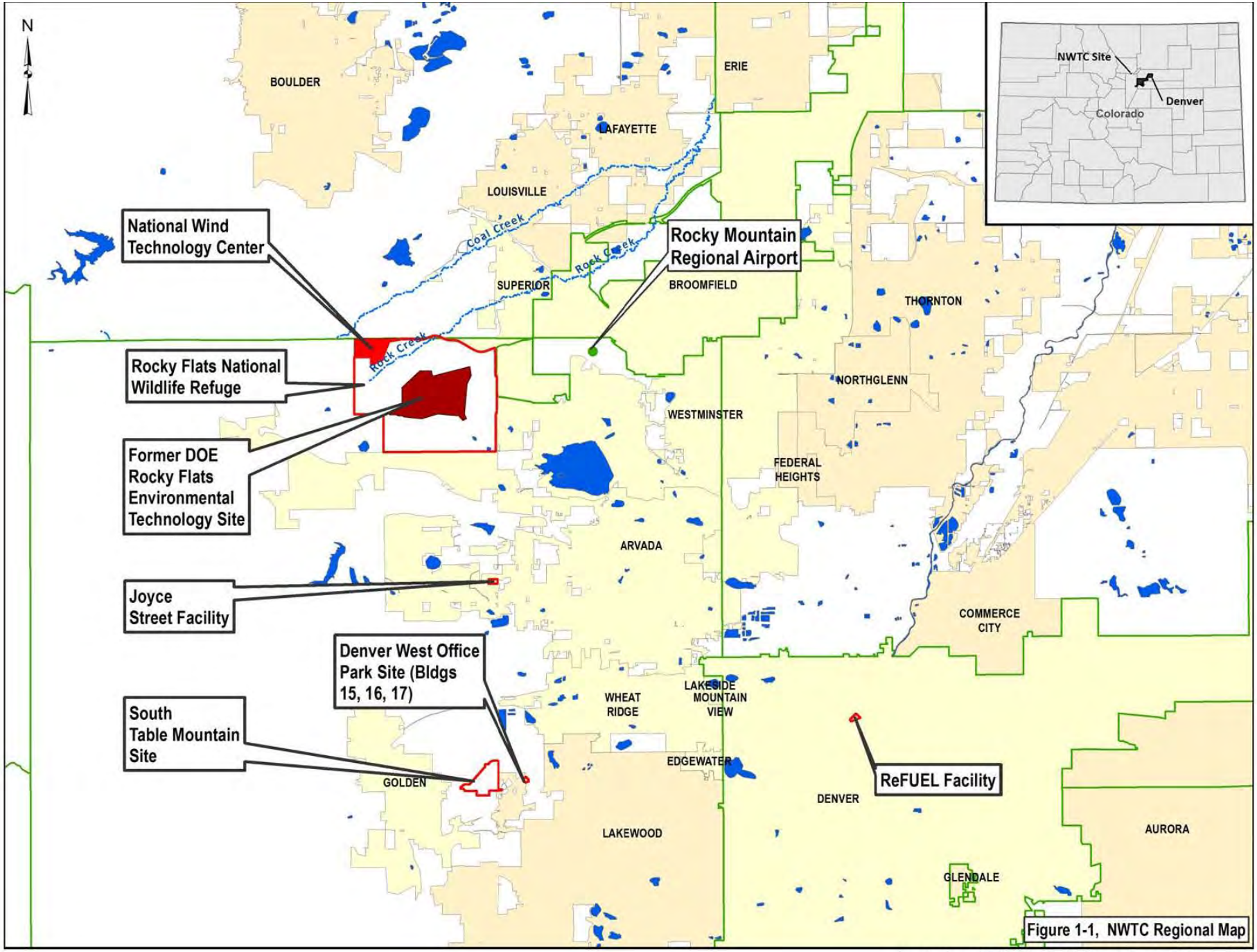
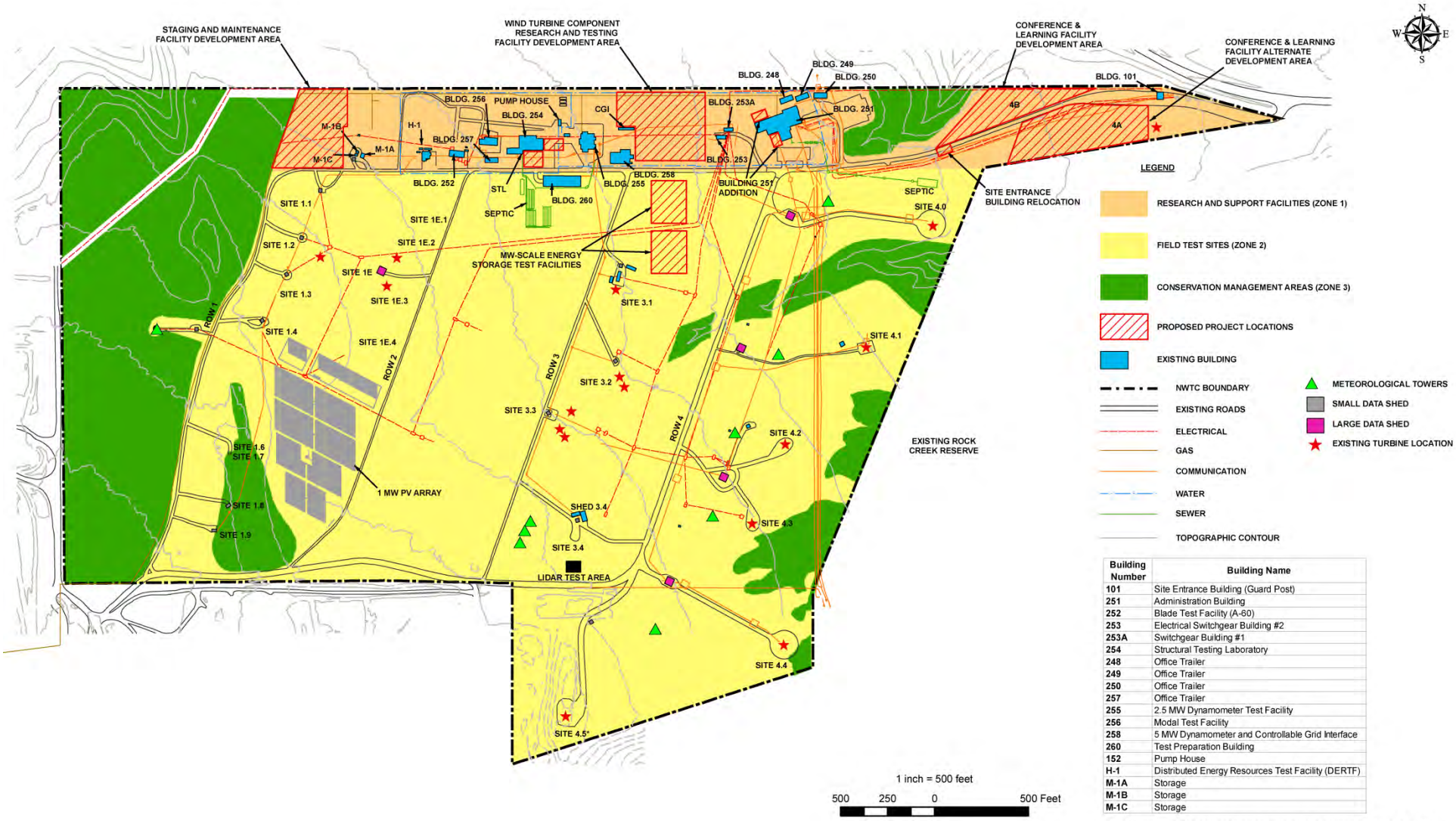


Figure 1-1, NWTC Regional Map



Building Number	Building Name
101	Site Entrance Building (Guard Post)
251	Administration Building
252	Blade Test Facility (A-60)
253	Electrical Switchgear Building #2
253A	Switchgear Building #1
254	Structural Testing Laboratory
248	Office Trailer
249	Office Trailer
250	Office Trailer
257	Office Trailer
255	2.5 MW Dynamometer Test Facility
256	Modal Test Facility
258	5 MW Dynamometer and Controllable Grid Interface
260	Test Preparation Building
152	Pump House
H-1	Distributed Energy Resources Test Facility (DERTF)
M-1A	Storage
M-1B	Storage
M-1C	Storage

*TO DATE NWTC HAS NOT CONDUCTED A SURVEY TO DEFINITELY LOCATE SITE 4.5.

Figure 2-1.
Proposed Project Locations at the National Wind Technology Center

Public Reading Room - NREL DRAFT Environmental Assessments (EAs) and Notice of Scoping/Availability

Below are electronic versions of Golden Field Office Reading Room documents that were created after November 1, 1996, per the requirements of the Electronic Freedom of Information Act Amendment of 1996. Most documents are available in Adobe Acrobat Portable Document Format (PDF). Download Acrobat Reader.

Draft Site-Wide Environmental Assessment of National Renewable Energy Laboratory's National Wind Technology Center, Jefferson County, CO (DOE/EA-1914)

- Notice of Scoping (PDF 1.6 MB)

Printable Version

Environmental Protection

Protecting the environment is at the heart of NREL's mission to develop new renewable energy technologies. Workers have a responsibility to incorporate the principles of environmental stewardship and sustainability in their work activities. When planning activities and performing daily tasks, our staff considers the potential impacts to the environment:

- The amount and type of wastes generated and reduced,
- The potential release of contaminants to air, land, or water, and
- The effect activities might have on NREL's wildlife, vegetation, and other natural resources. Links to our most recent wildlife and vegetation surveys are below.


Credit: Steve Wilcox

NREL's Environmental Management System integrates the components of environmental protection into the laboratory's management processes and activities. The laboratory's Sustainable NREL program works wth NREL's Environment, Safety, Health, and Quality Office to address NREL's environmental footprint — all areas of potential environmental impact.

South Table Mountain and National Wind Technology Center Sites Support Native Plants and Animals

NREL's two major sites, South Table Mountain and the National Wind Technology Center, are largely undeveloped, allowing for the preservation of habitats that support numerous species of native plants and animals. Our policy is to foster and maintain healthy and vigorous natural ecosystems in the undeveloped areas, as well as in areas adjacent to research facilities and activities.

Workers are encouraged to enjoy NREL's natural resources, but to do so with respect, minimizing impacts on soils and vegetation, and ensuring that wildlife is not harassed or harmed.

Environmental Reports

Annual Environmental Performance

Each year NREL reports on environmental compliance and performance through its Annual Environmental Performance Report. These reports contain detailed information about NREL's compliance programs, programs that support vegetation and wildlife enhancement, and a forward look to upcoming improvements.

- 2011 NREL Annual Environmental Performance Report
- 2010 NREL Annual Environmental Performance Report
- 2009 NREL Annual Environmental Performance Report
- 2008 NREL Annual Environmental Performance Report
- 2007 NREL Annual Environmental Performance Report

Environmental Assessment and Surveys

NREL conducts environmental assessments as required by the National Environmental Policy Act(NEPA) and periodically surveys vegetation and wildlife habitat. Below you will find recent environmental assessments, supplements, and vegetation and wildlife surveys for NREL's South Table Mountain campus in Golden and the National Wind Technology Center south of Boulder.

South Table Mountain

NEPA

- South Table Mountain Environmental Assessment 2003
  - Supplement analysis to the final supplement-II to the Final Site-Wide Environmental Assessment of the National Renewable Energy Laboratory's South Table Mountain complex, July 2011.
  - Final Supplement-II to the Final Site-Wide Environmental Assessment of the National Renewable Energy Laboratory's South Table Mountain Complex (DOE/EA 1440-S-II) and Finding of No Significant Impact 2009
  - South Table Mountain Supplemental Environmental Assessment 2008
  - South Table Mountain Three Site Development Projects Environmental Assessment 2007

Vegetation & Wildlife

- South Table Mountain Vegetation and Wildlife Survey 2011
- South Table Mountain Wildlife Survey 2005
- South Table Mountain Vegetation Survey 2002

National Wind Technology Center

NEPA

- National Wind Technology Center Environmental Assessment 2012 – Scoping Letter for Public Review
- National Wind Technology Center Environmental Assessment 2002

Vegetation & Wildlife

- National Wind Technology Center Vegetation and Wildlife Survey 2011
- National Wind Technology Center Bird & Bat Report 2003

- National Wind Technology Center Vegetation Survey 2000

Printable Version

AFFIDAVIT OF PUBLICATION

CAMERA

State of Colorado
County of Boulder

I, the undersigned agent, do solemnly swear that the CAMERA is a daily newspaper printed, in whole or in part, and published in the City of Boulder, County of Boulder, State of Colorado, and which has general circulation therein and in parts of Boulder and Broomfield counties; that said newspaper has been continuously and uninterruptedly published for a period of more than six months next prior to the first publication of the annexed legal notice of advertisement, that said newspaper has been admitted to the United States mails as second-class matter under the provisions of the Act of March 3, 1879, or any, amendments thereof, and that said newspaper is a daily newspaper duly qualified for publishing legal notices and advertisements within the meaning of the laws of the State of Colorado; that a copy of each number of said newspaper, in which said notice of advertisement was published, was transmitted by mail or carrier to each of the subscribers of said newspaper, according to the accustomed mode of business in this office.

The annexed legal notice or advertisement was published in the regular and entire edition of said daily newspaper once; and that one publication of said notice was in the issue of said newspaper dated **November 1, 2012**.

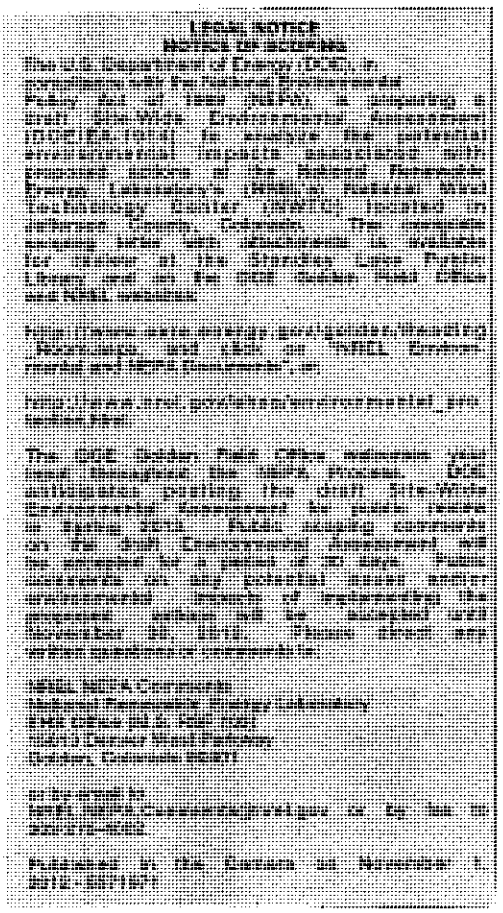
Agent

Subscribed and sworn to before me this **1st** day of **November, 2012** in the County of Boulder, State of Colorado.

Notary Public
My commission expires 12/11/2014

FEE $228.50
ACCOUNT #: 5073406
AD #5571971

MELISSA L. NAJERA NOTARY PUBLIC STATE OF COLORADO



AFFIDAVIT OF PUBLICATION

Colorado Hometown Weekly

State of Colorado
County of Boulder, County of Weld

I, the undersigned agent, do solemnly swear that the Colorado Hometown Weekly; is a weekly newspaper published in the County of Boulder and County of Weld, State of Colorado, and has general circulation therein; that said newspaper has been published continuously and uninterrupted in said County of Boulder and County of Weld for a period of more than fifty-two consecutive weeks next prior to the first publication of the annexed legal notice or advertisement' that said newspaper has been admitted to the United States mails as second-class matter under provisions of the Act of March 3, 1879, and amendments thereto; and that said newspaper is duly qualified for publishing legal notices and advertisements within the meaning of the laws of the State of Colorado;

The attached legal notice or advertisement was published in the regular and entire issue of the Colorado Home Weekly for a period of one advertisement in said issue dated **October 31, 2012**

Lillian Smith

Agent

Subscribed and sworn to before me, this **31st** day of **October, 2012** in the County of Boulder, State of Colorado.

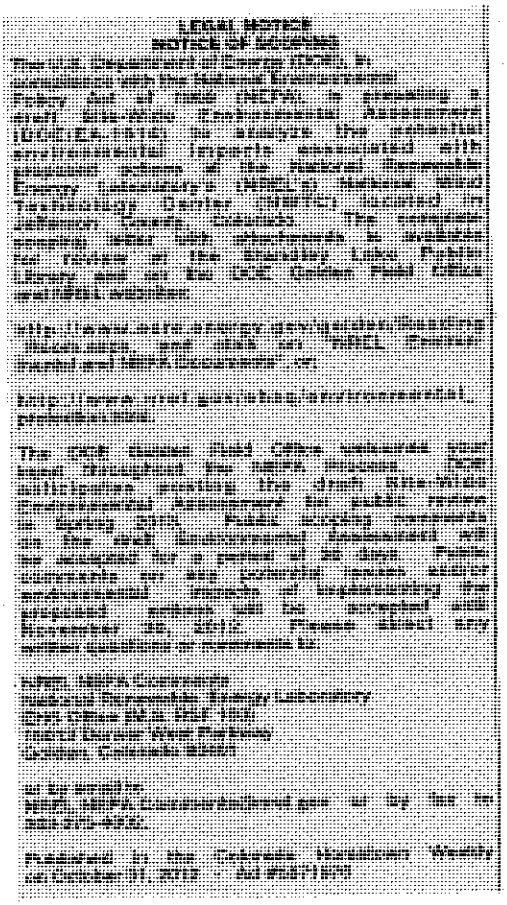
Debra K. Rysavy

Notary Public

Fee $68.20
Account #5073406
Ad #5571976

DEBRA K. RYSAVY NOTARY PUBLIC STATE OF COLORADO

MY COMMISSION EXPIRES APRIL 30, 2013



The Denver Newspaper Agency

PUBLISHER'S AFFIDAVIT

City and County of Denver)
State of Colorado)
)

The undersigned ___Jean Birch___ being first duly sworn under oath, states and affirms as follows:

1. **He/she is the legal Advertising Reviewer of the Denver Newspaper Agency, publisher of *The Denver Post* and *Your Hub*.**
2. ***The Denver Post* and Your *Hub* are newspapers of general circulation that have been published continuously and without interruption for at least fifty-two weeks in Denver County and meet the legal requisites for a legal newspaper under Colo. Rev. Stat. 24-70-103.**
3. **The notice that is attached hereto is a true copy, published in *The Denver Post* on the following date(s):**

November 1, 2012

Jean Birch

Signature

Subscribed and sworn to before me this ___1___ day of ___November___, 2012.

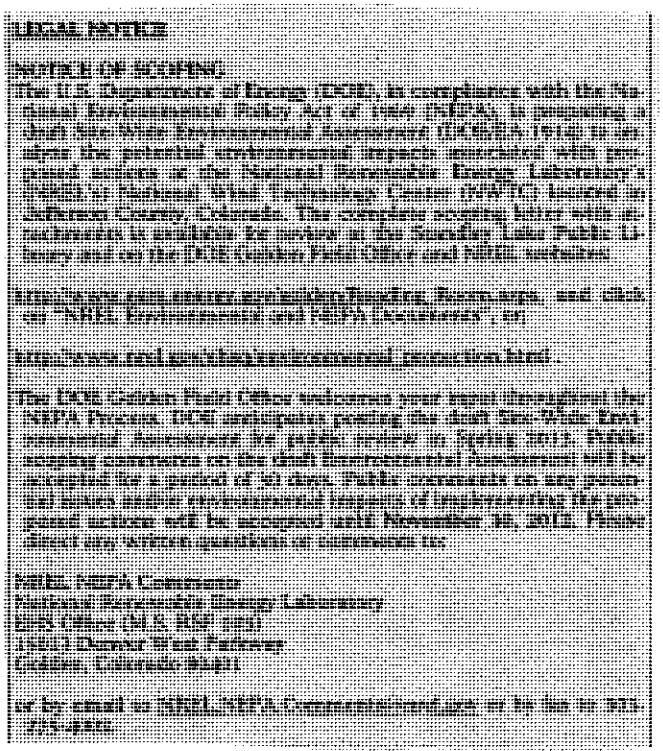
Cheryl L Schmid

Notary Public

My commission expires __ September 14, 2013 _____

(SEAL)

NOTARY PUBLIC
CHERYL L SCHMID
STATE OF COLORADO



Proof of Publication
THE GOLDEN TRANSCRIPT

110 N. Rubey Drive Suite 120 Golden, CO 80401

1. I, C Stauffer, am the agent of The Golden Transcript, newspaper printed and published in the city of Golden, County of Jefferson and State of Colorado, and has personal knowledge of all the facts set forth in this affidavit;

2. That the said newspaper is printed and published once each week on Thursday, and that it has a general circulation in the City of Golden and in the County of Jefferson and elsewhere, delivered by carriers or transmitted by mail to each of the subscribers of said paper, according to the accustomed mode of business in this office;

3. That the said newspaper was established and has heen printed and puhlished in the said City of Golden and the County of Jefferson uninterrupted and continuously during a period of at least 52 consecutive weeks next prior to the first Issue there-of containing said publication, a copy of which is hereto attached;

4. That the said newspaper is a weekly newspaper of general circulation, and is printed and published in whole or in part in the City of Golden and the said County of Jefferson in which said publication is required by law to be published, a copy of which is hereunto attached;

5. That the said newspaper is a weekly newspaper qualified to publish legal notices, as defined by the Statutes of the State of Colorado;

6. That said newspaper had, prior to January 1, 1936, and has ever since that date, been admitted to the United States mail as second class matter under the provisions of the Act of March 3, 1979, or any amendments thereto;

7. That the said annexed publication was published in the regular and entire edition of the Golden Transcript, a duly qualified weekly newspaper for that purpose, within the terms and means of the Statutes of the State of Colorado;

8. That the said annexed publication is a full, true, and correct copy of the original which was regularly published in each of the regular and entire issues of the Golden Transcript, a legally qualified paper for that purpose, once each week, on the same day of each week, for 1 succcessive weeks, by 1 Insertions, and that the first publication thereof was in the November 1, 2012;

and that the last publication was in the November 1, 2012.

Subscribed and sworn to before me this 1st day of November 2012.

By: C Stauffer

STATE OF COLORADO SS
County of Jefferson

Witness my hand and official seal

Hillary S. Sullivan

HILLARY S. SULLIVAN
NOTARY PUBLIC
STATE OF COLORADO

My Commission Expires April 15, 2014

LEGAL NOTICE
NOTICE OF SCOPING

The U.S. Department of Energy (DOE), in compliance with the National Environmental Policy Act of 1969 (NEPA), is preparing a draft Site-Wide Environmental Assessment (DOE/EA-1914) to analyze the potential environmental impacts associated with proposed actions at the National Renewable Energy Laboratory's (NREL's) National Wind Technology Center (NWTC) located in Jefferson County, Colorado. The complete scoping letter with attachments is available for review at the Standley Lake Public Library and on the DOE Golden Field Office and NREL websites:
http://www.eere.energy.gov/golden/Reading_Room.aspx, and click on "NREL Environmental and NEPA Documents", or;
http://www.nrel.gov/ehsq/environmental_protection.html.
The DOE Golden Field Office welcomes your input throughout the NEPA Process. DOE anticipates posting the draft Site-Wide Environmental Assessment for public review in Spring 2013. Public scoping comments on the draft Environmental Assessment will be accepted for a period of 30 days. Public comments on any potential issues and/or environmental impacts of implementing the proposed actions will be accepted until November 30, 2012. Please direct any written questions or comments to:
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National Renewable Energy Laboratory
EHS Office (M.S. RSF 103)
15013 Denver West Parkway
Golden, Colorado 80401
or by email to
NREL.NEPA.Comments@nrel.gov or by fax to 303-275-4002.
Published November 1, 2012
Golden Transcript

		2012 NWTC Mailing List --FINAL					
	Organization	**Name**	**Address 1**	**Address 2**	**City**	**State**	**Zip**
Boulder County	Ms. Cindy Domenico	Boulder County Commissioner		PO Box 471	Boulder	CO	80306
Boulder County	Mr. Ben Pearlman	Boulder County Commissioner		PO Box 471	Boulder	CO	80306
Boulder County	Mr. Will Toor	Boulder County Commissioner		PO Box 471	Boulder	CO	80306
Boulder County		Boulder County Parks and Open Space		5201 St. Vrain Rd.	Longmont	CO	80503
Boulder County		Boulder County Planning		PO Box 471	Boulder	CO	80306
Boulder County		Boulder County Sheriff's Office		5600 Flatiron Pkwy	Boulder	CO	80301
Broomfield		Broomfield City and County Manager		One DesCombes Drive	Broomfield	CO	80020
Broomfield		Broomfield Open Space & Trails		One DesCombes Drive	Broomfield	CO	80020
Broomfield		Broomfield Planning Department		One DesCombes Drive	Broomfield	CO	80020
Broomfield	Mayor	City and County of Broomfield		One DesCombes Drive	Broomfield	CO	80020
City of Boulder		Boulder City Manager	Municipal Building	1777 Broadway, 2nd Floor	Boulder	CO	80306
City of Boulder	Mayor	City of Boulder	City Council Office	PO Box 791	Boulder	CO	80306
City of Boulder		Open Space & Mountain Parks		66 South Cherryvale Rd.	Boulder	CO	80303
City of Superior	Town Manager	Town of Superior	Town Hall	124 E. Coal Creek Dr.	Superior	CO	80027
District		Rocky Mountain Fire District	Chief	1803 S. Foothills Hwy., Ste. 120	Boulder	CO	80303
Boulder County		Boulder Valley Conservation District		9595 Nelson Road, Box D	Longmont	CO	80501
Federal		Bureau of Land Management	Colorado State Office	2850 Younfield Street	Lakewood	CO	80215
Federal		FAA, Northwest Mountain Region	Airports Division, ANM-600	1601 Lind Avenue, SW, Suite 315	Renton	WA	98057-3356
Federal		FAA, Northwest Mountain Region	Denver Airports District Office	26805 E. 68th Avenue, Suite 224	Denver	CO	80249-6361
Federal		Fish & Wildlife Service	Susan Linner, Colorado Field Supervisor	PO Box 25486-DFC (65412)	Denver	CO	80225
Federal		Fish & Wildlife Service	Sandy Vana-Miller				
Federal		Fish & Wildlife Service	Kevin Kritz, Migratory Birds and State Programs	PO Box 25486, Denver Federal Center	Denver	CO	80225-0486
		Fish & Wildlife Service	Peter Plage	PO Box 25486, Denver Federal Center	Denver	CO	80225-0486
Federal		Jefferson Conservation District	c/o USDA-NRCS Metro Offi	PO Box 25426, Denver Federal Center	Denver	CO	80225-0426
Federal		NEPA Compliance, 8WMEA	EPA Region VIII	999 18th Street	Denver	CO	80202-2466
Federal		Office of Congressman Ed Perlmutter		12600 W. Colfax Ave., Ste. B400	Lakewood	CO	80215
Federal		Office of Congressman Jared Polis		4770 Baseline Rd, #220	Boulder	CO	80303
Federal		Office of Senator Mark Udall		999 18th St., North Tower, Suite 1525	Denver	CO	80202
Federal		Office of Senator Michael Bennet		2300 15th St., Suite 450	Denver	CO	80202
Federal	Mr. John Page	U.S. Wind Turbine Evaluations	Federal Aviation Administration	800 Independence Ave, SW, Room 400 East	Washington	DC	20591
Federal	Mr. Terry McKee	US Army Corps of Engineers,	Omaha District	9307 S. Wadsworth Blvd.	Littleton	CO	80128-6901
Federal	Mr. Gregory Davis	US EPA - Region VIII	Stormwater Coordinator; EPR-EP	1595 Wynkoop St.	Denver	CO	80202-1129
Federal		US EPA - Region VIII	Ecosystem Protection	1595 Wynkoop St.	Denver	CO	80202-2405
Federal		US EPA - Region VIII	NEPA Compliance, 8EPR-N	1595 Wynkoop St.	Denver	CO	80202-1129
Jefferson County		Jefferson County	Div. of Highways and Transportation	100 Jefferson County Pkwy, Ste. 3500	Golden	CO	80419-3500

		2012 NWTC Mailing List --FINAL					
	Organization	**Name**	**Address 1**	**Address 2**	**City**	**State**	**Zip**
Jefferson County	Mr. John Odom	Jefferson County Commissioner		100 Jefferson County Parkway	Golden	CO	80419
Jefferson County	Mr. Donald Rosier	Jefferson County Commissioner		100 Jefferson County Parkway	Golden	CO	80419
Jefferson County	Ms. Faye Griffin	Jefferson County Commissioner		100 Jefferson County Parkway	Golden	CO	80419
Jefferson County		Jefferson County Department of Health	Environmental Health Division	1801 19th St.	Golden	CO	80401
Jefferson County		Jefferson County Development & Transportation	Director	100 Jefferson County Parkway	Golden	CO	80419
Jefferson County		Jefferson County Emergency Management		800 Jefferson County Pkwy	Golden	CO	80419
Jefferson County		Jefferson County Open Space	Director	700 Jefferson County Pkwy., Ste. 100	Golden	CO	80419-5540
Jefferson County		Jefferson County Planning & Zoning	Planning and Engineering Mgr.	100 Jefferson County Pkwy, Suite. 3550	Golden	CO	80419-3500
Jefferson County		Jefferson County Road & Bridge	Director	21401 Golden Gate Canyon Rd.	Golden	CO	80403
Jefferson County		Jefferson County Transportation and Engineering	Director	100 Jefferson County Parkway	Golden	CO	80419
Jefferson County		Jefferson County Sherriff's Office		200 Jefferson County Parkway	Golden	CO	80401
Jefferson County	Mr. Kevin McCaskey	Jefferson Economic Council	President & CEO	1667 Cole Blvd., Suite 400	Golden	CO	80401
State		Air Pollution Control Division	Division Director	4300 Cherry Creek Drive South	Denver	CO	80246-1530
State		Colo. Coop. Fish & Wildlife Research Unit	Director	201 JVK Wagar Building, 1484	Fort Collins	CO	80523-1484
State		Colorado Coop Fish & Wildlife Unit	Dept. Fishery and Wildlife Biology	201 Wagner Building, CSU	Fort Collins	CO	80523-1484
State		Colorado Dept. of Agriculture	Conservation Services Division	700 Kiping Street, Suite 4000	Lakewood	CO	80215
State		Colorado Dept. of Natural Resources	Executive Director's Office	1313 Sherman Street, Room 718	Denver	CO	80203
State		Colorado Division of Wildlife	State Raptor Biologist	6060 Broadway	Denver	CO	80216
State		Colorado Division of Wildlife	Director	6060 Broadway	Denver	CO	80216
State		Colorado Geological Survey		1313 Sherman Street, Rm 715	Denver	CO	80203
State		Colorado State Forest Service	Boulder County Office	936 Lefthand Canyon Drive	Boulder	CO	80302-9341
State		Colorado State Forest Service	Golden District Office	1504 Quaker Street	Golden	CO	80401-2956
State		Colorado State Land Board		1313 Sherman Street, Rm 621	Denver	CO	80203
State		Colorado State Patrol	District 6 Commander	1096 McIntyre Street	Golden	CO	80401
State		Division of Water Resources	State Engineer	1313 Sherman St., Rm 818	Denver	CO	80203
State		Governor's Energy Office	T.J. Deora, Director	1580 Logan Street, Suite 100	Denver	CO	80203
State		Haz. Materials & Waste Mgm't Div.	Division Director	4300 Cherry Creek Drive South	Denver	CO	80246-1530
State		Office of State Representative Max Tyler	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Representative Cheri Gerou	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Representative Claire Levy	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Representative Debbie Benefield	Colorado State Capitol	200 East Colfax	Denver	CO	80203

		2012 NWTC Mailing List --FINAL					
	Organization	**Name**	**Address 1**	**Address 2**	**City**	**State**	**Zip**
State		Office of State Representative Dianne Primavera	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Senator Dan Gibbs	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Senator Evie Hudak	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Senator Shawn Mitchell	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		State Historic Preservation Office		1300 Broadway	Denver	CO	80203
State		State of Colorado	Governor John Hickenlooper	136 State Capitol	Denver	CO	80203-1792
State		Water Quality Control Division	Division Director	4300 Cherry Creek Drive South	Denver	CO	80246-1530
State		Wildfire Mitigation Coordinator/Special Project Forester	Colorado State Forest Service, Wildfire Mitigation	9769 West 119th Drive	Broomfield	CO	80221
Tribal		Oglala Sioux Tribe		PO Box 2070	Pine Ridge	SD	57770
Tribal		Southern Ute Tribe		P.O. Box 737	Ingacio	CO	81137
Tribal		Ute Indian Tribe		P.O. Box 190	Ft. Duchesne	UT	84026
Tribal		Ute Mountain Ute Tribal Council		PO Box JJ	Towaoc	CO	81334
State		Colo Dept of Transportation	Environmental Programs Branch, NEPA Mgr.	4201 East Arkansas Ave	Denver	CO	80222
Special District		Regional Transportation District	Senior Service Planner/Scheduler, North Team	1600 Blake St.	Denver	CO	80202
Special District		Regional Transportation District	Senior Service Planner/Scheduler, West Team	1600 Blake St.	Denver	CO	80202
Boulder County		Boulder County Transportation Department		P.O. Box 471	Boulder	CO	80306
Other	Art Kwerneland	Xcel Energy		1800 Larimer St, Suite 1000	Denver	CO	80202
other	Howard Kiyota	Xcel Energy		1800 Larimer St, Suite 1400	Denver	CO	80202
Other	Marty Martinez	Xcel Energy		18201 West 10th Ave	Golden	CO	80401
Other	Steven T. Brown	Director of Land Management		10170 Church Ranch Way, Suite 200	Westminster	CO	80021
Other	David Bird	Colorado Division of Reclamation, Mining, and Safety	Department of Natural Resources	1313 Sherman St., Room 215	Denver	CO	80203
Other	Mike Dixon, Ph.D.	Division of Refuge Planning	U.S. Fish and Wildlife Service	P.O. Box 25486, DFC	Denver	CO	80225
DOE	Simon Lipstein, Attorney	DOE, Office of Legal Services	Denver Federal Center, Bldg 55	P.O. Box 25547	Denver	CO	80225-0547
City of Arvada		City of Arvada	Water Transmission and	6701 Indiana Street	Arvada	CO	80007
Jefferson County	Kenneth Maenpa	Airport Manager	Rocky Mountain Metrop	11755 Airport Way	Broomfield	CO	80021

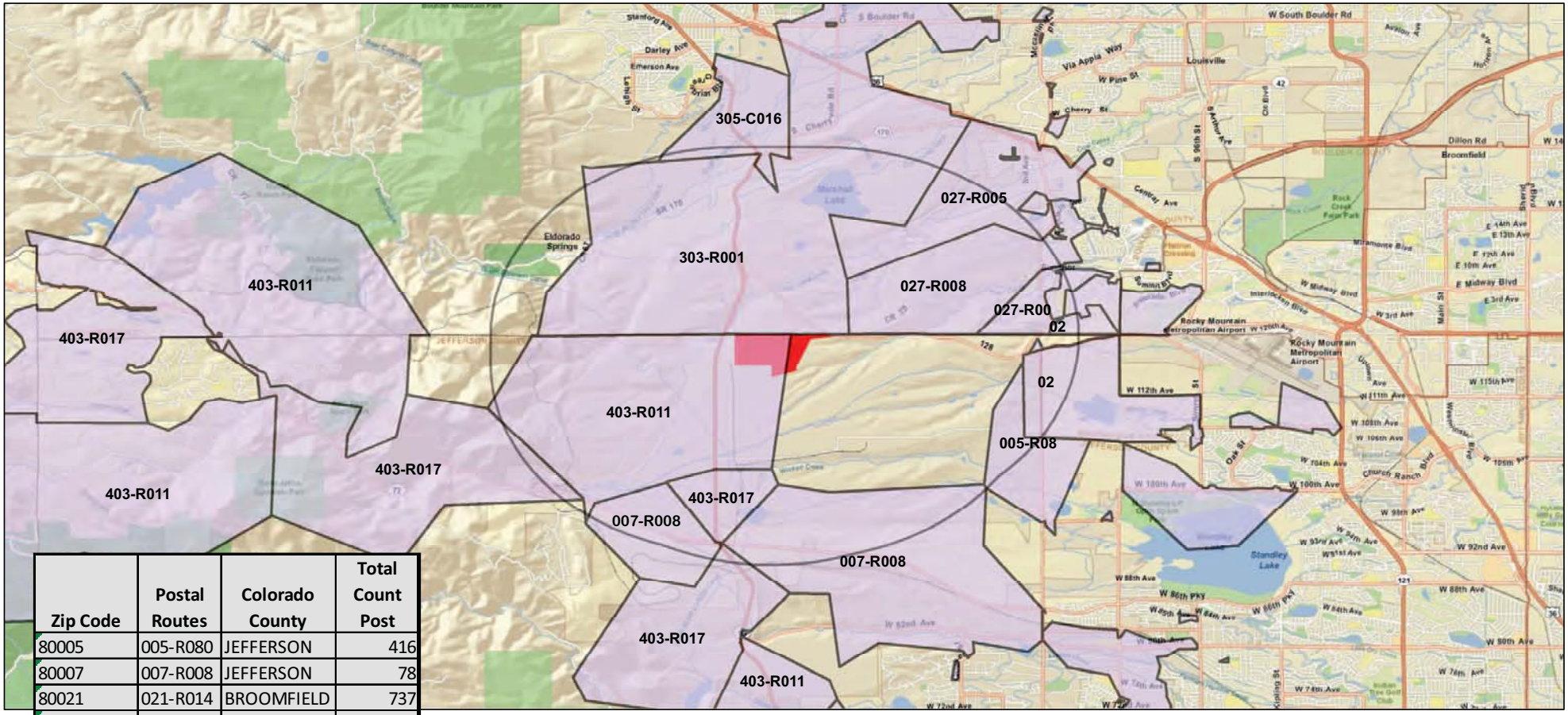
Organization	Name	Address 1	Address 2	City	State	Zip
Mr. Michael Fry	Director of Conservation Advocacy	American Bird Conservancy	1731 Connecticut Avenue, NW	Washington	DC	20009
	Nature Conservancy	Colorado Field Office	2424 Spruce Street	Boulder	CO	80302
Ms. Vickie Patton	General Counsel	Environmental Defense Fund	2060 Broadway, Suite 300	Boulder	CO	80302
Mr. Erich Pica	President	Friends of the Earth	1100 15th Street, NW, 11th Floor	Washington	DC	20005
Mr. Terry Rich	Partners In Flight	National Coordinator	1387 S. Vinnell Way	Boise	ID	83709
Mr. Jerry R. Pardilla	Executive Director	National Tribal Environmental Council	4520 Montgomery Boulevard, NE, Ste. 3	Albuquerque	NM	87109
Mr. David Goldstein	Energy Program Director	Natural Resources Defense Council	111 Sutter Street, 20th Floor	San Francisco	CA	94104
	Friends of the Foothills	P.O. Box 17164 Golden, CO 80402.	PO Box 17164	Golden	CO	80402
Mr. Douglas Larson	Executive Director	Western Interstate Energy Board	1600 Broadway, Suite 1700	Denver	CO	80202
Ms. Penny Anderson	Energy Program	Western Resource Advocates	2260 Baseline Road, Suite 200	Boulder	CO	80302-7740
	Audubon Colorado		1536 Wynkoop St., Ste. 302	Denver	CO	80202
Mr. Joshua Ruschhaupt	Sierra Club Rocky Mountain Chapter		1536 Wynkoop St. 4th Floor	Denver	CO	80202
	Colorado Wildlife Federation		1410 Grant Street, Ste. C-313	Denver	CO	80203
David Anderson	Director and Chief Scientist	Colorado Natural Heritage Program	Colorado State University, 1475 Campus Delivery	Ft. Collins	CO	80523-1475
Bethany Gravell	Executive Director	Center for Native Ecosystems	1536 Wynkoop St.	Denver	CO	80202
	National Wildlife Federation	Rocky Mountain Regional Center	2995 Baseline Rd., Suite 300	Boulder	CO	80303
	colorado environmental coalition	Denver Office	1536 Wynkoop St., #5C	Denver	CO	80202
	Jeffco Open Space Foundation, Inc.	5855 Wadsworth Bypass	Building A, Suite 100	Arvada	CO	80003

2012 Rocky Flats Trustee Council							
Name	Organization	Address 1	Address 2	City	State	Zip	
Gary Baughman	Rocky Flats Natural Resource Trustee Council	Colorado Department of Public Health and Environment	HMWMD-B2,4300 Cherry Creek Drive South	Denver	CO	80246-1530	
Scott Surovchak	Rocky Flats Natural Resource Trustee Council	DOE-LM	11025 Dover St., Suite 1000	Westminster	CO	80021-5573	
David Lucus (formerly Steve B.)	Rocky Flats Natural Resource Trustee Council	USFWS	Building 121	Commerce City	CO	80022-1748	david_c_lucas@fws.gov
Daniel S. Miller	Rocky Flats Natural Resource Trustee Council	Colorado Dept. of Law, Natural Resources and Environment Section	1525 Sherman St., 7th floor	Denver	CO	80203	dan.miller@state.co.us
Doug Robotham	Rocky Flats Natural Resource Trustee Council	Colorado Dept. of Natural Resources, Executive Director's Office	1313 Sherman Street, Room 718	Denver	CO	80203	Doug.Robotham@state.co.us

	Zip Code	Postal Route	County	Count	
	80005	R080	Jefferson	416	
	80007	R008	Jefferson	78	
	80021	R014	Broomfield	737	
	80027	R005	Boulder	509	
	80027	R008	Boulder	474	
	80027	R011	Boulder	487	
	80027	R012	Boulder	570	
	80303	R001	Boulder	400	
	80305	CO16	Boulder	463	
	80403	RO11	Jefferson	413	
	80403	R017	Jefferson	522	
				5069	Total

Newpapers						
Boulder Daily Camera	P.O. Box 591	Boulder	CO	80306	http://www.dailycamera.com/	Boulder Cty & surrounding area
Colorado Hometown Weekly	3400 Industrial Lane, Suite 2	Broomfield	CO	80020	http://www.coloradohometownweekly.com/	Erie, Lafayette, Louisville
The Denver Post	101 W. Colfax Ave.	Denver	CO	80202-51	http://www.denverpost.com/	Denver metro
Golden Transcript	110 N. Rubey Dr., Suite 120	Golden	CO	80403	http://www.newsroom@milehighnews.com	Golden area

Postal Routes for NWTC EA



Zip Code	Postal Routes	Colorado County	Total Count Post
80005	005-R080	JEFFERSON	416
80007	007-R008	JEFFERSON	78
80021	021-R014	BROOMFIELD	737
80027	027-R005	BOULDER	509
80027	027-R008	BOULDER	474
80027	027-R011	BOULDER	487
80027	027-R012	BOULDER	570
80303	303-R001	BOULDER	400
80305	305-C016	BOULDER	463
80403	403-R011	JEFFERSON	413
80403	403-R017	JEFFERSON	522
		Grand Total	**5069**

Legend

- NWTC Boundary
- ThreeMile Rad ius
- Selected Postal Routes

Notes: Map Backg
Postal
Postal

From: Van Dercook, Amy
To: Bray, Rachael - DIA
Subject: RE: Scoping Letter for NWTC in Jefferson County, CO
Date: Tuesday, October 30, 2012 8:41:00 AM

The scoping period is from November 1, 2012 to November 30, 2012. The scoping letter will be posted by November 1, 2012.

Thank you for your inquiry,

Amy Van Dercook, P.G.
U.S. Department of Energy | Golden Field Office
1617 Cole Blvd., Golden, CO 80401-3393
Phone: 720.356.1666 | Mobile: 720.233.5392
Email: amy.vandercook@go.doe.gov

From: Bray, Rachael - DIA [mailto:Rachael.Bray@flydenver.com]
Sent: Monday, October 29, 2012 1:04 PM
To: 'nrel.nepa.comments@nrel.gov'
Subject: Scoping Letter for NWTC in Jefferson County, CO

To Whom it May Concern,

I have looked on the websites as indicated per the notice received in the mail this weekend and cannot find the Scoping Letter with attachments at either location. Can you please provide a better link or check the one's provided:

http://www.eere.energy.gov/golden/Reading_Room.aspx
http://www.nrel.gov/ehsq/environmental_protection.html

Thanks for your assistance on this matter.

Sincerely,

Rachael Bray
Project Inspector, AECOM
Denver International Airport
8500 Pena Blvd.
AOB 7th FLoor
Denver, CO 80249-6340
(303) 342-4540
FAX (303) 342-2635

Van Dercook, Amy

From: Bruce Lonnecker <thatgeezer@live.com>
Sent: Sunday, October 28, 2012 1:26 PM
To: nrel.nepa.comments@nrel.gov
Subject: Notice of Scoping - Comments

Please translate this notice into English. When we see obfuscating language like this, we assume that the Government is planning actions to hurt us. We expect that these types of requests for comments are only intended to meet the public notice requirements and not really to get comments.

From: Bobbie
To: NREL.NEPA.Comments@nrel.gov
Subject: Public Comment - Scoping
Date: Saturday, November 03, 2012 4:58:13 AM

U.S. Department of Energy/NREL NWTC,

I am delighted to support the proposed expansion of the National Wind Technology Center.

Please peruse these links regarding the relation of color of wind turbines to bird/bat deaths and build your new windmills using the color Purple rather than White or Gray. There is a mention in the BBC article about temperature also having a possible effect.

<http://news.bbc.co.uk/earth/hi/earth_news/newsid_9067000/9067721.stm>

<http://www.springerlink.com/content/p4565vx242651518/>

<http://www.springerlink.com/content/88vm0214083u2r21/>

The gist of the BBC article is that insects are attracted to White and Gray uppermost, surpassed only by the color Yellow. Purple is least attractive to insects; if swarms of insects surround windmills, birds and bats will follow and the increase in deaths is significant. Our worldwide songbird and bat populations are crashing. Bats are important pollinators, and with the bee population crashing, this could impact crop production significantly worldwide. We already are having crop impacts due to severe droughts. We need songbirds to stay happy, not to mention the biodiversity impact on the web of life on Earth.

Thank you very much for this opportunity to comment,

Roberta E. Richardson
11647 Brook Road
Golden, Colorado 80403-8585

Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has.
~Margaret Mead
US anthropologist & popularizer of anthropology (1901 - 1978)

The temple bell stops
But the sound keeps coming
Out of the flowers
~ Basho

From:	cosmos eric
To:	NREL.NEPA.Comments@nrel.gov
Subject:	NWTC Notice of Scoping - Resident Comment
Date:	Tuesday, November 27, 2012 9:45:17 AM

Hi,
I have reviewed the proposed plan for the "improvements" to the NWTC.

As a resident of Superior, I am very concerned about the environmental, and asthetic impacts this may have on the area. One of the joys of living in this region is the proximity to various open outdoor areas, as well as an unspoiled view of the Flatirons and Front Range.

If I am reading the plan correctly, today there are currently 16 wind towers of various height, with a proposition of growing to 60 wind towers AND 30 meteorological towers. That is quite large jump.

I understand the benefits of alternative energy research, but this plan seems to reach a bit too far.

Please, I would like to be included in all public discussions related to this going forward.

Eric Cosmos
3624 Huron Peak Ave
Superior, CO 80027

From: Gray, Lori
To: "Mike Chiropolos"
Subject: RE: NREL Wind Technology Center, take 2
Date: Monday, December 02, 2013 3:47:36 PM

Dear Mike,

Thank you for your interest in the NWTC Sitewide EA. DOE considers your email "a comment" that will be considered in the development of the draft EA. In response to your questions:

1. The NWTC Sitewide Environmental Assessment (EA) is being drafted. DOE anticipates posting the draft EA in January 2014 for a public comment period. We are also planning on conducting a public information meeting in January 2014. We will add you to the distribution list to be notified of both these actions.
2. Until the NEPA process is completed and a decision document issued there are no agency plans or ongoing budgeting occurring for the components of the proposed action.
3. Thanks for your offer on furthering the project but DOE must complete the NEPA process before any decisions are made towards funding actions.

Thanks again,
Lori

Lori A. Gray, M.S., CSP
Environmental Stewardship Division Director
Acting NEPA Division Director
Environmental Oversight Office
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
15013 Denver West Parkway, Golden, CO 80401
Phone: 720.356.1568 Cell: 720-233.8236
Email: lori.gray@go.doe.gov

From: Mike Chiropolos [mailto:mikechiropolos@gmail.com]
Sent: Wednesday, November 13, 2013 11:51 AM
To: Gray, Lori
Subject: NREL Wind Technology Center, take 2

Lori,

A few questions regarding the proposed expansion of the NREL Wind Technology Center between Boulder and Golden:

- What is the current status of the project, under 1) NEPA, and 2) agency plans and budgetting
- Who are primary DOE/NREL contacts to discuss furthering the project and making it a reality

I am exploring options to unite public and private stakeholders behind the project. I'm an

attorney with much experience in the advocacy field, including energy and natural resources.

Thanks for any help and leads you can provide.

Sincerely,

Mike Chiropolos

303-956-0595

City of Boulder
Open Space & Mountain Parks Department
P.O. Box 791, Boulder, CO 80306; 303-441-3440

MEMORANDUM

To: NREL NEPA Comments

From: Kacey French, Open Space Planner
Will Keeley, Wildlife Ecologist

Date: 11/30/12

Re: National Wind Technology Center

Thank you for informing us of the upcoming Environmental Assessment (EA) to analyze and describe the potential environmental impacts associated with the proposed expansion of the National Wind Technology Center (NWTC). The NWTC, along with adjacent City of Boulder Open Space and Mountain Parks (OSMP) properties, Boulder County Open Space properties and the Rocky Flats National Wildlife Refuge comprise approximately 17,000 acres of native grasslands. This large and relatively undeveloped habitat block is ecologically important and supports a variety of wildlife. City of Boulder, Open Space and Mountain Parks (OSMP) staff has identified several issues we suggest be addressed in the EA. Please consider the following comments:

The OSMP property to the north receives considerable use by foraging raptors because of the abundant prey resources in the area. The area has supported nesting Bald and Golden Eagles for at least the previous 5 years. An occupied Bald Eagle nest is located approximately 2.7 km from the proposed "Wind Turbine Development Area" and an occupied Golden Eagle nest is approximately 5 km from the Area. OSMP monitoring indicates that these grasslands also support a rich grassland bird community during the nesting season. Additionally, the two reservoirs north of the NWTC provide crucial stopover habitat for migrating waterfowl. Increasing the number of turbines at NWTC may impact avian communities on OSMP. Recent research has indicated that wind turbines are substantial cause of mortality for birds, particularly raptors and nocturnal migrators (Kunz et al. 2007, Garvin et al. 2011). We suggest the EA assess the impact to avian communities, including the ability to remain in compliance with the Bald and Golden Eagle Protection Act as well as the Migratory Bird Treaty Act.

Hoary bats have been observed foraging above tree-tops in the forested areas on OSMP property approximately 3 km from the NWTC, and a water source, which could be used by bats, is 300m from the proposed site. Recent evidence suggests that bats, particularly tree bats like Hoary bats, are severely affected by the presence of wind turbines (Arnett et al. 2008, Ellison et al. 2012). Some researchers believe these species may actually be attracted to wind turbines, especially

when migrating or mating, and conclude that wind turbines are a substantial cause of mortality. We suggest the EA assess impacts to these nearby bat communities.

We suggest alternatives that incorporate daily or seasonal use cycles of the turbines to minimize impact to birds and bats be analyzed.

A pond nearby on OSMP property (approximately 150m from the proposed 4A and 4B buildings) has supported Northern Leopard Frogs in recent years. This pond is spring fed and may act as a critical over-wintering site for leopard frogs breeding in the ephemeral ponds to the north. This site also has habitat characteristics similar to leopard frog breeding sites on OSMP. Northern leopard frogs are considered sensitive in Colorado and other western states, and populations of this once common amphibian are declining (Smith and Keinath 2007). Semlitsch and Bodie (2003) recommended protecting a buffer zone of 290m around wetlands in order to avoid deleterious effects of human activities on ranid populations. We suggest the EA assess potential impacts to the Northern Leopard frogs, the nearby pond, and the ability to mitigate impacts of construction, maintenance, and everyday use of building 4A and 4B to the pond described above. We recommend this analysis include the ability to minimize runoff containing vehicular fluids (i.e., oil, coolant), materials used to improve traction (i.e., sand, gravel), and eliminate ice (i.e. salt) from associated parking lots into this pond.

This important grassland habitat block supports a resident elk herd of about 30 animals in addition to the previously described avian populations. We suggest the EA address the impacts of additional wind turbines to the habitat effectiveness of this grassland habitat block, including effects of this project on the movement of elk within the block.

Please contact us if you have any questions.

Kacey French
Open Space Planner
720-564-2081
frenchk@bouldercolorado.gov

Will Keeley
Wildlife Ecologist
720-564-2085
keeleyw@bouldercolorado.gov

Literature Cited

Arnett, E.B. et al. 2008.Patterns of bat fatalities at wind energy facilities in North America. Journal of Wildlife Management 72: 61-78.

Ellison, L.E., 2012, Bats and wind energy—A literature synthesis and annotated bibliography: U.S. Geological Survey Open-File Report 2012–1110, 57 p.

Garvin J.C., C.S. Jennelle, D. Drake, and S.M. Grodsky. 2011. Response of raptors to a windfarm. Journal of Applied Ecology 48: 199-209.

Kunz T.H. et al. 2007. Assessing impacts of wind-energy development on nocturnally active birds and bats: a guidance document. Journal of Wildlife Management 71: 2449-2486.

Semlitsch R.D. and J.R. Bodie. 2003. Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles. Conservation Biology 17: 1219-1228.

Smith, B.E. and D.A. Keinath. 2007. Northern Leopard Frog (*Rana pipiens*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/northernleopardfrog.pdf [Nov 12 2012].

GABLEHOUSE GRANBERG, LLC

Attorneys and Counselors at Law

TIMOTHY R. GABLEHOUSE
(303) 572-0050
(800) 818-0050
FAX (303) 572-3037
tgablehouse@gcgllc.com

410 SEVENTEENTH STREET
SUITE 1375
DENVER, COLORADO 80202

November 30, 2012 *VIA EMAIL ONLY*

NREL NEPA Comments
National Renewable Energy Laboratory
EHS Office, M.S. RSF 103
15013 Denver West Parkway
Golden, CO 8040

Re: Response to Notice of Public Scoping - Site-Wide Environmental Assessment of the National Renewable Energy Laboratory's Nation Wind Technology Center, Golden, CO (DOE/EA-1914)

Dear NREL/DOE:

We represent the Town of Superior and provide these comments to the scoping document for your consideration on their behalf.

In a letter dated October 31, 2012, DOE/NREL requests scoping comments on a Site-Wide EA intended to support the proposal to increase the facilities and activities located at the Wind Technology Center (WTC). These proposals appear to contemplate facilities and activities that would be orders of magnitude greater than current uses. Unfortunately, the October 31 letter is so deficient in details that it is impossible to know exactly what is proposed.

There was a 2002 EA that evaluated a proposed expansion of the then existing activity at the WTC; however, it is not clear whether those proposals were executed and how much of the current proposal is simply refinement of activities proposed in 2002 but never built. For the reasons stated below, the 2002 EA is now not very relevant and its conclusions cannot be reasonably applied to the current proposal.

While we agree that an EA can be the appropriate initial step in the process for NEPA compliance, we suspect that an EIS will ultimately be necessary given the magnitude of the current proposals. DOE/NREL would be well advised to save time and money by proceeding on that basis now.

Much Has Changed Since the 2002 EA

The WTC borders a portion of the Rocky Flats National Wildlife Refuge (Refuge). The 2002 EA does not consider impacts on the Refuge, basing its conclusion instead on the argument that study of impacts to the Refuge were premature as no management plan for the Refuge had been prepared. See Response to Comments F.4 at Page 5-8 of the 2002 EA.

This conclusion is no longer valid because the Refuge exists and there is now a management plan along with an environmental impact statement that post-date the 2002 EA. Impacts to the Refuge must be added to the list of Environmental Effects/Issues to be scoped during the proposed EA process.

One of the impacts to the Refuge of great concern is weed infestation. As the 2002 EA notes, construction has the potential to promote weed infestation. A report by the Inspector General of the Department of the Interior, "Status of the Rocky Flats National Wildlife Refuge" dated October 28, 2011, concludes that "invasive weeds could potentially destroy the biological diversity of the Refuge." The potential for the proposed action on the WTC to contribute to this problem must be studied.

In March 2003, EPA determined that the WTC was not part of the National Priorities List Rocky Flats Site undergoing extensive testing, evaluation and cleanup and was not, therefore, considered as part of the substantial environmental testing conducted under the RCRA Facility Investigation – Remedial Investigation/Corrective Measures Study – Feasibility Study Report for the Rocky Flats Environmental Technology Site (RI/FS/CRA) completed in 2006. This extensive study finds some evidence of soil contaminants, including heavy metals and radiological contaminants, that could harm public health in the vicinity of the WTC. Specifically, the RCRA Facility Investigation, Contaminant Fate and Transport report, Section 8: Attachment 2, Future Conditions - Groundwater and Air, prepared by DOE in June 2006 describes portions of the WTC as a possible source from which plutonium contamination in near-surface soils could be distributed by wind.

The 2002 EA did not evaluate exposures to persons off-site from contaminated soils disturbed during construction. It refers only to soil sampling done in 1993 - 1995 for the purpose of determining characteristics of a very small area prior to construction of a leach field.

Substantial evidence now exists suggesting that contamination associated with the Rocky Flats Environmental Technology Site could exist on the WTC property. The RI/FS/CRA only considered exposure scenarios for refuge workers and visitors; the 1993 - 1995 soil tests were extremely limited in scope; and the currently proposed activity could involve extensive soil disturbance. The potential for radiological and other contaminants being disturbed during

construction of each of the specific project components now proposed at the WTC site must be considered as part of the new EA.

Noise is listed as an impact to be studied in the currently proposed EA. The proposed EA must evaluate noise, but must do so in the context of increased population, new development and the significant investment surrounding communities have made in recreation and open space directly adjacent to the WTC.

Visual impacts were mentioned but not evaluated in any meaningful fashion in the 2002 EA. The current request for scoping comments does not provide enough detail to understand the actual magnitude of the visual impact that will result from the proposed action. As before, the increased population and new development since 2002 make it clear that this visual impact will be greater than anything previously studied. Also, it should be clear that visual impact, along with noise, are matters of great concern and controversy with wind turbine installations.

A meaningful study of noise and visual impacts, rather than essentially ignoring them as was done in the 2002 EA, is necessary. This will require actual depiction of the visual impacts from the proposed alternative versus no-action and modeling of noise at a level of sophistication normally done in an EIS.

The 2002 EA notes the presence of endangered species in areas that would be impacted by those proposals. The current proposed EA must evaluate impacts on endangered species in a meaningful fashion and it's highly inappropriate for DOE/NREL to have failed to specifically list impacts to endangered species in its October 31, 2012 letter rather than vaguely refer to "biological resources".

The "no-action" alternative must be based on actual site conditions rather than on anything proposed at the time of the 2002 EA, but not built. Conditions have changed too much in the intervening eight years for DOE/NREL to use the selected alternative from the 2002 EA and FONSI as a baseline.

Sincerely,

Timothy R Gablehouse
for Gablehouse Granberg LLC

TRG/tg

Van Dercook, Amy

Subject: FW: Comment letter re Notice of Proposed Scoping - DOE/EA-1914

From: NREL NEPA Comments
Sent: Monday, December 03, 2012 1:20 PM
To: 'tgablehouse@gcgllc.com'
Subject: RE: Comment letter re Notice of Proposed Scoping - DOE/EA-1914

Dear Mr. Gablehouse, we have received your letter dated November 30, 2012. Thank you for your input during the scoping process for the site-wide EA for the National Wind Technology Center.

Brenda Beatty
Senior Environmental/Biological Scientist
EHS Office
National Renewable Energy Laboratory
Ph: (303) 275-3234

From: Timothy Gablehouse [mailto:tgablehouse@gcgllc.com]
Sent: Thursday, November 29, 2012 5:16 PM
To: NREL NEPA Comments
Subject: Comment letter re Notice of Proposed Scoping - DOE/EA-1914

Please acknowledge receipt.

Thank you.

Tim

TIMOTHY R. GABLEHOUSE
GABLEHOUSE GRANBERG, LLC
410 17th St., Suite 1375|Denver, CO 80202|303.572.0050

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 20, 2012

Ms. Beth Moyski
Assistant Town Manager
Town of Superior
124 East Coal Creek Drive
Superior, CO 80027

SUBJECT: U.S. Department of Energy Site-Wide Environmental Assessment for the National Wind Technology Center at the National Renewable Energy Laboratory, Jefferson County, CO

Dear Ms. Moyski,

Thank you for your recent invitation to provide a briefing at an upcoming Town of Superior Board meeting regarding the recent Notice of Public Scoping for the U.S. Department of Energy's Site-Wide Environmental Assessment (EA) of the National Wind Technology Center (NWTC) at the National Renewable Energy Laboratory (NREL). The U.S. Department of Energy (DOE) and NREL appreciate your request and your intent of keeping the citizens of your community informed.

DOE is at the initial stages of its National Environmental Policy Act (NEPA) process and there has been no official decision on potential expansion of facilities or operations at the NWTC. Since DOE must ensure the same information is provided to all interested parties throughout the NEPA process, we are unable to accommodate your request because not all stakeholders would be engaged through a Town of Superior Board meeting.

The NEPA process begins with a public scoping period where federal, state and local agencies and the public are informed of a federal agency's plans to prepare an EA. During this public scoping process, DOE invites stakeholders to provide input on the EA's scope, including the potential issues and impacts to be addressed. This input will help DOE determine the issues to analyze in the EA. DOE would greatly appreciate any input the Town of Superior or its town members have on the potential issues and impacts to be addressed by the EA.

At the end of the public scoping period, DOE will begin drafting the EA. The site-wide EA will evaluate the potential environmental impacts of ongoing and reasonably foreseeable activities over a five-to-ten year time period. DOE intends to conduct a public information meeting when the draft EA is available for public review. The Town of Superior is on our distribution list to be notified when a draft document is ready and when any upcoming DOE public information meetings are scheduled. The review of the draft EA is another important opportunity for the public and federal, state and local agencies to be involved in the NEPA process by providing comments on the draft document.

Ms. Beth Moyski
Assistant Town Manager
November 19, 2012

Future facility construction, research, development and testing proposed for the NWTC is dependent on changing federal budgets and priorities. Currently, there is no proposed date for construction or any budget allocation. The details to be provided in the upcoming EA are the best estimates that can be made, at this time.

DOE welcomes your input throughout our NEPA process. We would like to encourage you to participate in the public scoping process by submitting written comments for consideration by DOE on or before November 30, 2012. Written comments should be submitted to:

NREL NEPA Comments
National Renewable Energy Laboratory
EHS Office, M.S. RSF 103
15013 Denver West Parkway
Golden, CO 80401
(303) 275-4002 (fax)

Comments may also be submitted by email at: NREL.NEPA.Comments@nrel.gov

Sincerely,

Lori Gray

Lori Gray
NEPA Compliance Officer
U.S. Department of Energy
Golden Field Office

NREL NWTC SWEA Scoping Letter Comment Response

No.	Respondent	Correspondence Date	Comment Summary	Response Date	Response to Comment
1	Rachael Bray	10/29/2012	Requested assistance locating scoping letter.	10/30/12	Response sent – correspondence attached
2	Bruce Lonnecker	10/28/2012	Expressed concern over complexity of announcement.		The comment is noted.
3	Roberta Richardson	11/3/2012	Requested review of color purple for turbines to decrease attractiveness to insects with potential to reduce songbird and bat deaths.		The comment is noted. The impact of the proposed action is provided in Section 3, Affected Environment and Environmental Consequences.
4	Eric Cosmos	11/27/2012	Expressed concern about increased number of Wind towers and met towers to views of the Flatirons and Front Range.		Visual impacts of the proposed action are analyzed in section 3.5, Visual Quality and Aesthetics. Figures 3-2 through 3-4 provide existing views from various vantage points. Figures 3-6 through 3-8 provide photosimulation of the same views based on the proposed action.
5	Mike Chiropobs	11/13/2012	Requested information on status & budget for proposed action.	12/2/2012	Response sent – correspondence attached
6	Kacey French – City Boulder Open Space & Mountain Parks Dept.	11/30/2012	Comments pertain to four topics: 1. Suggestion that the EA assess the impact to avian communities, including the ability to remain in compliance with the Bald and Golden Eagle Protection Act as well as the Migratory Bird Treaty Act.		1. The Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act are identified in Section 3.9.1, Definition of the Resource. The existing environment is described in Section 3.9.3.5, Threatened, Endangered and Special Status Species, and the environmental consequences are analyzed in Section 3.9.4, Environmental Consequences.
			2. Suggestion that the EA assess impacts to nearby bat communities.		2. Bat communities are indicated in Section 3.9.3.4, Mammals, and in particular in the subsection titled Bats. Environmental consequences are analyzed in Section 3.9.4, Environmental Consequences.
			3. Suggestion that the EA assess impacts to the Northern Leopard frog in areas adjacent to the proposed building in areas 4A and 4B.		3. The Conference and Learning Facility initially considered for areas 4A or 4B was not included in the final proposed action.

			4. Suggestion that the EA assess impacts to the grassland habitat and movement of elk.	4. Grasslands are identified in Section 3.9.2, Existing Environment for Vegetation, and in particular in the subsection on grasslands. Grasslands are also discussed in Section 3.9.2.2, Conservation Management Areas. Elk are discussed in Section 3.9.3.4, Mammals. Impacts of the proposed action on grasslands and elk are assessed in Section 3.9.4.2, Proposed Action.
7	Timothy R Gablehouse for Gablehouse Granberg, LLC, representing the Town of Superior	11/30/2012	Comments pertain primarily to four topics: 1. Suggestion that impacts on the Rocky Flats National Wildlife Refuge be assessed.	1. The Rocky Flats National Wildlife Refuge is identified in Section 3.1.2.2, Surrounding Areas. Impacts of the proposed action are analyzed in Section 3, Affected Environment and Environmental Consequences. DOE has also consulted with the regional office of U.S. Fish and Wildlife.
			2. Suggestion that potential contamination from the former Rocky Flats Site be evaluated.	2. This location of the NWTC to the former Rocky Flats site is provided in Section 1.2.3. Section 3.8.2.2, Soils provides analysis of potential contamination from the former Rocky Flats Site.
			3. Suggestion that noise from the proposed action be evaluated.	Noise impacts are analyzed in Section 3.3.3.2, Proposed Action and in particular in the subsections titled *Impacts of Construction Noise* and *Impacts from Operational Noise*.
			4. Suggestion that visual impacts of the proposed action be assessed.	Visual impacts of the proposed action are analyzed in Section 3.5, Visual Quality and Aesthetics. Figures 3-2 through 3-4 provide existing views from various vantage points. Figures 3-6 through 3-8 provide photosimulation of the same views based on the proposed action.

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APPENDIX B

AIR EMISSIONS CALCULATIONS

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The methods used to calculate emissions of carbon monoxide (CO), volatile organic compounds (VOCs), oxides of nitrogen (NO_X), sulfur oxides (SO_X), particulate matter less than 10 microns (PM_{10}), fine particulate matter ($PM_{2.5}$), and carbon dioxide (CO_2) from construction-related sources of air pollutant emissions are documented in this appendix.

- Section B.1 – Estimated Air Emissions Resulting from New Construction in Zones 1 and 2, Proposed Action (CY 2015)
- Section B.2 – Estimated Air Emissions Resulting from Modifications in Zones 1 and 2, Proposed Action (CY 2015)
- Section B.3 – Estimated Air Emissions Resulting from Infrastructure Improvements in Zones 1 and 2, Proposed Action (CY 2015)
- Section B.4 – Estimated Air Emissions Resulting from Standby Generator Emissions
- Section B.5 – Estimated Air Emissions Resulting from Wind Turbine and Associated Infrastructure Construction in Zone 2, Proposed Action (CY 2015)
- Section B.6 – Estimated Air Emissions Resulting from Wind Turbine Construction in Zone 2, Proposed Action (CY 2016 or CY 2017)
- Section B.7 – Estimated Air Emissions Resulting from Expanding Power Capacity at the NWTC Site, Proposed Action (CY 2015)

Summary	Summarizes total emissions for the Construction of new Facilities in Zone 1 & 2 (Proposed Action) in 2015
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
Emergency Generator	Estimates emissions from the operation of emergency generators.
AQCR Tier Report	Summarizes total emissions for the Metropolitan Denver Intrastate AQCR report for 2008, to be used to compare the Proposed Action to regional emissions.

Air Emissions for the Proposed Action in 2015

	NO_x (ton)	VOC (ton)	CO (ton)	SO_2 (ton)	PM_{10} (ton)	$PM_{2.5}$ (ton)	CO_2 (ton)
Combustion	4.85	0.61	2.13	0.38	0.35	0.34	549.22
Fugitive Dust	-	-	-	-	6.28	0.63	-
Haul Truck On-Road	0.26	0.06	0.18	0.00	0.01	0.01	127.92
Commuter	0.07	0.07	0.66	0.00	0.01	0.01	119.01
TOTAL	***5.17***	***0.75***	***2.98***	***0.39***	***6.65***	***0.98***	***796.15***

Note: Total $PM_{10}/_{2.5}$ fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO_2 emissions converted to metric tons =	***722.110***	***metric tons***	
State of Colorado's CO_2 emissions =	***96,500,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of Colorado's CO_2 emissions =	***0.00075%***		
United States' CO_2 emissions =	***5,631,300,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of USA's CO_2 emissions =	***0.000013%***		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2013. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide).* Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released January 2013. Data accessed 10 May 2013.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because emissions from the Proposed Action in 2015 are several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

Metropolitian Intrastate AQCR Air Basin

	Point and Area Sources Combined					
Year	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
2008	94,978	128,147	427,106	15,239	68,576	15,665

Source: USEPA National Emissions Inventory (NEI) (http://neibrowser.epa.gov/eis-public-web/home.html). Site visited on 10 May 2013

Air Emissions from the Proposed Action in 2015

	Point and Area Sources Combined					
	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Regional Emissions	94,978	128,147	427,106	15,239	68,576	15,665
Emissions	5.169	0.750	2.980	0.386	6.649	0.979
% of Regional	**0.005%**	**0.0006%**	**0.0007%**	**0.003%**	**0.010%**	**0.006%**

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO_2, CO, $PM_{2.5}$, $PM_{10,}$ and CO_2 due to Construction and Demolition

	General Construction and Modification Activities	**Area Disturbed**		
1.)	Construction of new Wind Turbine Component Research & Testing Facility	120,000	ft^2	Total Area Disturbed
		40,000	ft^2	New Facility
2.)	Grid Storage Test Pad Area	0	ft^2	Existing pads, no new construction
			ft^2	
3.)	Construction of Staging & Maintenance Warehouse	120,000	ft^2	Total Area Disturbed
		40,000	ft^2	New Warehouse

Total Construction Area:	80,000	ft^2	
	1.84	acres	
Total Pavement Area:	0	ft^2	
	0.00	acres	
Total Disturbed Area:	240,000	ft^2	
	5.51	acres	
Construction Duration:	12	months	
Annual Construction Activity:	240	days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0
Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.
Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

	Equipment[d]	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Stationary	Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
	Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
	Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)	Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
	Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
	Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
	Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.

b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The factors used here are the VOC factors.

c) The NONROAD model contains emissions factors for total HC and for VOC. The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO2 emissions by more than a factor of two.

d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO_x	VOC	CO	SO_2**	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			23.052					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NOx = (Total Grading NOx per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft^2)	Total Area (acres)	Total Days	
Grading:	240,000	5.51	4	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	80,000	1.84	240	
Architectural Coating	80,000	1.84	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total 'Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	166.56	10.31	62.84	13.80	10.18	9.88	19,766
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	468.50	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	**9,693.16**	**1,229.96**	**4,265.90**	**766.74**	**695.34**	**674.48**	**1,098,444**

Results: Total Project Annual Emission Rates

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Total Project Emissions (lbs)	9,693.16	1,229.96	4,265.90	766.74	695.34	674.48	1,098,444
Total Project Emissions (tons)	4.847	0.615	2.133	0.383	0.348	0.337	549.222

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006

$PM_{2.5}$ Emissions

$PM_{2.5}$ Multiplier	0.10	(10% of PM_{10} emissions assumed to be $PM_{2.5}$)	EPA 2001; EPA 2006

Control Efficiency	0.50	(assume 50% control efficiency for PM_{10} and $PM_{2.5}$ emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM_{10}/acre-month)

Duration of Construction Project	12	months
Area	0.00	acres

General Construction and Demolition Activities (0.19 ton PM_{10}/acre-month)

Duration of Project	12	months
Area	5.51	acres

	Project Emissions (tons/year)			
	PM_{10} uncontrolled	**PM_{10} controlled**	**$PM_{2.5}$ uncontrolled**	**$PM_{2.5}$ controlled**
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	12.562	6.281	1.256	0.628
Total	**12.562**	**6.281**	**1.256**	**0.628**

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM_{10}/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM_{10}/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM_{10}/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM_{10}/acre-month) and 75% of the average emission factor (0.11 ton PM_{10}/acre-month). The 0.19 ton PM_{10}/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM_{10}/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM_{10}/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM10/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

$PM_{2.5}$ Multiplier **0.10**

$PM_{2.5}$ emissions are estimated by applying a particle size multiplier of 0.10 to PM_{10} emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM_{10} and $PM_{2.5}$ **0.50**

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999.* EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants.* Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1).* Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters
Construction area: 5.51 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.
Terrain is mostly flat.
An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.
200 hp bulldozers are used for site clearing.
300 hp bulldozers are used for stripping, excavation, and backfill.
Vibratory drum rollers are used for compacting.
Stripping, Excavation, Backfill and Compaction require an average of two passes each.
Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day)	equip-days per acre	Acres/yr (project-specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	5.51	0.69
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	5.51	2.69
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	2.75	2.78
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	2.75	1.14
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	5.51	1.93
TOTAL								9.23

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 9.23
Qty Equipment: 3.00
Grading days/yr: 3.08

Haul Truck Emissions

Emissions from hauling excavation material and construction supplies are estimated in this spreadsheet.

Emission Estimation Method: United States Air Force (USAF), Air Force Center for Environmental Excellence (AFCEE), Air Emissions Guide for Air Force Mobile Sources (Revised January 2003).

Assumptions:
Haul trucks carry 20 cubic yards of material per trip.
The average distance from the project site to the materials source is estimated to be 15 miles; therefore, a haul truck will travel 30 miles round trip.
Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Building Materials (Above Ground) =	11,852	cubic yards	Assumes 4 feet of building material are needed for each floor
Amount of Building Materials (Below Ground) =	14,815	cubic yards	Assumes 5 feet of material are needed for the below ground portion of the building
Amount of Excavation Material =	35,556	cubic yards	Assumes 12 feet of material would need to be excavated on average
Amount of Paving Material =	0	cubic yards	
Number of trucks required =	3,111	heavy duty diesel haul truck trips	
Miles per trip =	30	miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO_x	VOC	CO	SO_2	PM10	$PM_{2.5}$	CO_2
HDDV	**2.498**	**0.617**	**1.782**	**0.012**	**0.097**	**0.071**	**1243.400**

Notes:
Emission factors for all pollutants are from USAF AFCEE 2013.
Emission factors are from Tables 5-11 for the 2015 calendar year, high altitude (USAF AFCEE 2013).

HDDV Haul Truck Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**513.992**	**126.955**	**366.667**	**2.469**	**19.959**	**14.609**	**255843.621**
tons	**0.257**	**0.063**	**0.183**	**0.001**	**0.010**	**0.007**	**127.922**

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html.

Assumptions:
Passenger vehicle emission factors for scenario year 2015 are used.

The average roundtrip commute for a construction worker =	30	miles
Number of construction days =	240	days
Number of construction workers (daily) =	30	people

Passenger Vehicle Emission Factors for Year 2015 (lbs/mile)

NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
0.00060188	0.00066355	0.00614108	0.00001070	0.00009259	0.00006015	1.10192837

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>. Accessed 10 May 2013.
Notes:
The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**130.005**	**143.326**	**1326.473**	**2.312**	**19.999**	**12.992**	**238016.529**
tons	**0.065**	**0.072**	**0.663**	**0.001**	**0.010**	**0.006**	**119.008**

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

Metropolitian Denver Intrastate AQCR

			All Emission Sources					
Row #	State	County	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
1	CO	Adams	66,166.23	26,263.59	15,754.51	4,113.54	7,737.02	19,333.51
2	CO	Arapahoe	81,600.76	12,367.17	14,903.74	2,946.89	257.86	17,198.71
3	CO	Boulder	45,011.54	10,596.07	5,430.68	1,352.87	916.72	19,013.11
4	CO	Clear Creek	11,912.27	1,885.71	2,655.93	610.36	17.25	6,297.05
5	CO	Denver	93,351.26	21,309.92	13,878.24	2,743.43	3,261.35	17,554.47
6	CO	Douglas	43,182.53	7,519.29	5,067.58	1,219.57	145.18	18,030.73
7	CO	Gilpin	2,100.91	515.19	477.55	155.45	6.26	4,251.82
8	CO	Jefferson	83,780.29	14,521.39	10,407.51	2,523.01	2,897.01	26,467.27
Grand Total			427,106	94,978	68,576	15,665	15,239	128,147

SOURCE:
http://neibrowser.epa.gov/eis-public-web/home.html
USEPA National Emissions Inventory (NEI)

Summary	Summarizes total emissions for the Modification of Existing Buildings in Zone 1 & 2 (Proposed Action) in 2015
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
Emergency Generator	Estimates emissions from the operation of emergency generators.
AQCR Tier Report	Summarizes total emissions for the Metropolitan Denver Intrastate AQCR report for 2008, to be used to compare the Proposed Action to regional emissions.

Air Emissions for the Proposed Action in 2015

	NO_x (ton)	VOC (ton)	CO (ton)	SO_2 (ton)	PM_{10} (ton)	$PM_{2.5}$ (ton)	CO_2 (ton)
Combustion	4.78	0.46	2.11	0.38	0.34	0.33	541.81
Fugitive Dust	-	-	-	-	0.40	0.04	-
Haul Truck On-Road	0.03	0.01	0.02	0.00	0.00	0.00	14.31
Commuter	0.07	0.07	0.66	0.00	0.01	0.01	119.01
TOTAL	***4.88***	***0.53***	***2.79***	***0.38***	***0.75***	***0.38***	***675.12***

Note: Total $PM_{10}/_{2.5}$ fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO_2 emissions converted to metric tons =	***612.338***	***metric tons***	
State of Colorado's CO_2 emissions =	***96,500,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of Colorado's CO_2 emissions =	***0.00063%***		
United States' CO_2 emissions =	***5,631,300,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of USA's CO_2 emissions =	***0.000011%***		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2013. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide).* Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released January 2013. Data accessed 10 May 2013.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because emissions from the Proposed Action in 2015 are several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

Metropolitan Denver Intrastate AQCR Air Basin

	Point and Area Sources Combined					
Year	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
2008	94,978	128,147	427,106	15,239	68,576	15,665

Source: USEPA National Emissions Inventory (NEI) (http://neibrowser.epa.gov/eis-public-web/home.html). Site visited on 10 May 2013

Air Emissions from the Proposed Action in 2015

	Point and Area Sources Combined					
	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Regional Emissions	94,978	128,147	427,106	15,239	68,576	15,665
Emissions	4.878	0.535	2.793	0.379	0.751	0.380
% of Regional	**0.005%**	**0.0004%**	**0.0007%**	**0.002%**	**0.001%**	**0.002%**

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO_2, CO, $PM_{2.5}$, $PM_{10,}$ and CO_2 due to Construction and Demolition

	ProposedModification Activities	**Area Disturbed**		
4.)	Building 251 Addition	10,000	ft^2	Total Area Disturbed
		5,000	ft^2	Addition
5.)	STL (Building 254) Addition (Zone 1)	5,000	ft^2	Total Area Disturbed
		3,500	ft^2	Building Addition and estimated High Bay Addition
6.)	DERTF Upgrades (Zone 1)	120	ft^2	Total Area Disturbed
		66	ft^2	6 Hydrogen tanks
7.)	Upgrades to 2.5 Dynomometer	0	ft^2	Total Area Disturbed - Interior Upgrades only
8.)	Cool Roof Upgrades	0	ft^2	Total Area Disturbed - Exterior Upgrades only, no ground disturbed

Total Construction Area:	8,566	ft^2	
	0.20	acres	
Total Pavement Area:	0	ft^2	
	0.00	acres	
Total Disturbed Area:	15,120	ft^2	
	0.35	acres	
Construction Duration:	12	months	
Annual Construction Activity:	240	days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0
Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.
Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment[d]		No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Stationary	Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
	Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
	Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)	Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
	Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
	Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity		6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.

b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The factors used here are the VOC factors.

c) The NONROAD model contains emissions factors for total HC and for VOC. The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO2 emissions by more than a factor of two.

d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO_x	VOC	CO	SO_2**	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			7.543					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NOx = (Total Grading NOx per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft^2)	Total Area (acres)	Total Days	
Grading:	15,120	0.35	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	8,566	0.20	240	
Architectural Coating	8,566	0.20	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total 'Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	158.32	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	**9,568.24**	**912.06**	**4,218.77**	**756.40**	**687.70**	**667.07**	**1,083,620**

Results: Total Project Annual Emission Rates

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Total Project Emissions (lbs)	9,568.24	912.06	4,218.77	756.40	687.70	667.07	1,083,620
Total Project Emissions (tons)	4.784	0.456	2.109	0.378	0.344	0.334	541.810

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006

$PM_{2.5}$ Emissions

$PM_{2.5}$ Multiplier	0.10	(10% of PM_{10} emissions assumed to be $PM_{2.5}$)	EPA 2001; EPA 2006
Control Efficiency	0.50	(assume 50% control efficiency for PM_{10} and $PM_{2.5}$ emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM_{10}/acre-month)

Duration of Construction Project	12	months
Area	0.00	acres

General Construction and Demolition Activities (0.19 ton PM_{10}/acre-month)

Duration of Project	12	months
Area	0.35	acres

	Project Emissions (tons/year)			
	PM_{10} uncontrolled	**PM_{10} controlled**	**$PM_{2.5}$ uncontrolled**	**$PM_{2.5}$ controlled**
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	0.791	0.396	0.079	0.040
Total	**0.791**	**0.396**	**0.079**	**0.040**

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM_{10}/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM_{10}/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM_{10}/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM_{10}/acre-month) and 75% of the average emission factor (0.11 ton PM_{10}/acre-month). The 0.19 ton PM_{10}/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM_{10}/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM_{10}/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM10/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

$PM_{2.5}$ Multiplier **0.10**

$PM_{2.5}$ emissions are estimated by applying a particle size multiplier of 0.10 to PM_{10} emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM_{10} and $PM_{2.5}$ **0.50**

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999.* EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants.* Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1).* Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters
Construction area: 0.35 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.
Terrain is mostly flat.
An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.
200 hp bulldozers are used for site clearing.
300 hp bulldozers are used for stripping, excavation, and backfill.
Vibratory drum rollers are used for compacting.
Stripping, Excavation, Backfill and Compaction require an average of two passes each.
Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day)	equip-days per acre	Acres/yr (project-specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.35	0.04
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.35	0.17
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.17	0.18
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.17	0.07
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.35	0.12
TOTAL								0.58

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.58
Qty Equipment: 3.00
Grading days/yr: 0.19

Haul Truck Emissions

Emissions from hauling excavation material and construction supplies are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised January 2013).

Assumptions:
Haul trucks carry 20 cubic yards of material per trip.
The average distance from the project site to the materials source is estimated to be 15 miles; therefore, a haul truck will travel 30 miles round trip.
Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Building Materials (Above Ground) =	1,565	cubic yards	Assumes 4 feet of building material are needed for the single floor of Building 254 and 251 additions, 6 hydrogen tanks, and an estimation of 2,000 square feet of materials for cool roof installations.
Amount of Building Materials (Below Ground) =	1,586	cubic yards	Assumes 5 feet of material are needed for the below ground portion of Buildings 251 and 254 and the proposed hydrogen tanks.
Amount of Excavation Material =	3,807	cubic yards	Assumes 12 feet of material would need to be excavated on average
Amount of Paving Material =	0	cubic yards	
Number of trucks required =	348	heavy duty diesel haul truck trips	
Miles per trip =	30	miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO_x	VOC	CO	SO_2	PM10	$PM_{2.5}$	CO_2
HDDV	**2.498**	**0.617**	**1.782**	**0.012**	**0.097**	**0.071**	**1243.400**

Notes:
Emission factors for all pollutants are from USAF IERA 2013.
Emission factors are from Tables 5-11 for the 2015 calendar year, high altitude (USAF IERA 2013).

HDDV Haul Truck Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**57.483**	**14.198**	**41.007**	**0.276**	**2.232**	**1.634**	**28612.759**
tons	**0.029**	**0.007**	**0.021**	**0.000**	**0.001**	**0.001**	**14.306**

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html.

Assumptions:
Passenger vehicle emission factors for scenario year 2015 are used.

The average roundtrip commute for a construction worker =	30	miles
Number of construction days =	240	days
Number of construction workers (daily) =	30	people

Passenger Vehicle Emission Factors for Year 2015 (lbs/mile)

NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
0.00060188	0.00066355	0.00614108	0.00001070	0.00009259	0.00006015	1.10192837

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>. Accessed 10 May 2013.
Notes:
The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**130.005**	**143.326**	**1326.473**	**2.312**	**19.999**	**12.992**	**238016.529**
tons	**0.065**	**0.072**	**0.663**	**0.001**	**0.010**	**0.006**	**119.008**

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

South Central Coast Air Basin

			All Emission Sources					
Row #	State	County	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
1	CO	Adams	66,166.23	26,263.59	15,754.51	4,113.54	7,737.02	19,333.51
2	CO	Arapahoe	81,600.76	12,367.17	14,903.74	2,946.89	257.86	17,198.71
3	CO	Boulder	45,011.54	10,596.07	5,430.68	1,352.87	916.72	19,013.11
4	CO	Clear Creek	11,912.27	1,885.71	2,655.93	610.36	17.25	6,297.05
5	CO	Denver	93,351.26	21,309.92	13,878.24	2,743.43	3,261.35	17,554.47
6	CO	Douglas	43,182.53	7,519.29	5,067.58	1,219.57	145.18	18,030.73
7	CO	Gilpin	2,100.91	515.19	477.55	155.45	6.26	4,251.82
8	CO	Jefferson	83,780.29	14,521.39	10,407.51	2,523.01	2,897.01	26,467.27
Grand Total			427,105.80	94,978.34	68,575.73	15,665.11	15,238.66	128,146.68

SOURCE:
http://neibrowser.epa.gov/eis-public-web/home.html
USEPA National Emissions Inventory (NEI)

Summary	Summarizes total emissions for the Infrastructure Improvements in Zone 1 & 2 (Proposed Action) in 2015
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the Metropolitan Denver Intrastate AQCR report for 2008, to be used to compare the Proposed Action to regional emissions.

Air Emissions for the Proposed Action in 2015

	NO_x (ton)	VOC (ton)	CO (ton)	SO_2 (ton)	PM_{10} (ton)	$PM_{2.5}$ (ton)	CO_2 (ton)
Combustion	4.85	0.42	2.13	0.38	0.35	0.34	549.56
Fugitive Dust	-	-	-	-	5.88	0.59	-
Haul Truck On-Road	0.14	0.04	0.10	0.00	0.01	0.00	71.92
Commuter	0.07	0.07	0.66	0.00	0.01	0.01	119.01
TOTAL	***5.06***	***0.53***	***2.90***	***0.39***	***6.24***	***0.94***	***740.49***

Note: Total $PM_{10}/_{2.5}$ fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO_2 emissions converted to metric tons =	***671.628***	***metric tons***	
State of Colorado's CO_2 emissions =	***96,500,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of Colorado's CO_2 emissions =	***0.00070%***		
United States' CO_2 emissions =	***5,631,300,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of USA's CO_2 emissions =	***0.000012%***		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2013. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide).* Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released January 2013. Data accessed 10 May 2013.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because emissions from the Proposed Action in 2015 are several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

Metropolitan Denver Intrastate AQCR Air Basin

	Point and Area Sources Combined					
Year	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
2008	94,978	128,147	427,106	15,239	68,576	15,665

Source: USEPA National Emissions Inventory (NEI) (http://neibrowser.epa.gov/eis-public-web/home.html). Site visited on 10 May 2013

Air Emissions from the Proposed Action in 2015

	Point and Area Sources Combined					
	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Regional Emissions	94,978	128,147	427,106	15,239	68,576	15,665
Emissions	5.058	0.531	2.901	0.385	6.242	0.936
% of Regional	**0.005%**	**0.0004%**	**0.0007%**	**0.003%**	**0.009%**	**0.006%**

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO_2, CO, $PM_{2.5}$, $PM_{10,}$ and CO_2 due to Construction and Demolition

ProposedModification Activities	**Area Disturbed**		
9.) Drinking Water Systems Upgrades	102,960	ft^2	Total Area Disturbed - 3.9 miles long, approximately 5 ft wide
10.) Fire Suppression System Upgrades	3,000	ft^2	Total Area Disturbed - new 200,000 gallon tank
	1,300	ft^2	Area of tank (estimated to be 20' diameter, 100' high)
11.) Sanitary Waste Upgrades	60,810	ft^2	Total Area Disturbed - 3,450 linear feet of piping (5 ft wide of disturbed area)
	1,000	ft^2	and 1 acre to house equipment and infrastructure (estimated to be 1,000 square feet)
12.) Road Improvements	3,600	ft^2	Total Area Disturbed (estimated)
	1,200	ft^2	Additional paved area
13.) Data & Telecommunications Improvements	52,800	ft^2	Total Area Disturbed - estimated 2.0 miles, approximately 5 ft wide

Total Construction Area:	2,300	ft^2	
	0.05	acres	
Total Pavement Area:	1,200	ft^2	
	0.03	acres	
Total Disturbed Area:	223,170	ft^2	
	5.12	acres	
Construction Duration:	12	months	
Annual Construction Activity:	240	days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0
Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.
Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

	Equipment[d]	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Stationary	Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
	Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
	Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)	Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
	Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
	Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
	Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.

b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The factors used here are the VOC factors.

c) The NONROAD model contains emissions factors for total HC and for VOC. The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO2 emissions by more than a factor of two.

d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO_x	VOC	CO	SO_2**	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			3.909					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NOx = (Total Grading NOx per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft^2)	Total Area (acres)	Total Days	
Grading:	223,170	5.12	3	(from "Grading" worksheet)
Paving:	1,200	0.03	1	
Demolition:	0	0.00	0	
Building Construction:	2,300	0.05	240	
Architectural Coating	2,300	0.05	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total 'Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	124.92	7.73	47.13	10.35	7.64	7.41	14,825
Paving	45.37	2.61	18.58	3.93	2.78	2.69	5,624
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	85.64	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	**9,696.89**	**847.13**	**4,268.77**	**767.22**	**695.57**	**674.70**	**1,099,127**

Results: Total Project Annual Emission Rates

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Total Project Emissions (lbs)	9,696.89	847.13	4,268.77	767.22	695.57	674.70	1,099,127
Total Project Emissions (tons)	4.848	0.424	2.134	0.384	0.348	0.337	549.563

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006

$PM_{2.5}$ Emissions

$PM_{2.5}$ Multiplier	0.10	(10% of PM_{10} emissions assumed to be $PM_{2.5}$)	EPA 2001; EPA 2006

Control Efficiency	0.50	(assume 50% control efficiency for PM_{10} and $PM_{2.5}$ emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM_{10}/acre-month)

Duration of Construction Project	12	months
Area	0.03	acres

General Construction Activities (0.19 ton PM_{10}/acre-month)

Duration of Project	12	months
Area	5.10	acres

	Project Emissions (tons/year)			
	PM_{10} uncontrolled	**PM_{10} controlled**	**$PM_{2.5}$ uncontrolled**	**$PM_{2.5}$ controlled**
New Roadway Construction	0.139	0.069	0.014	0.007
General Construction Activities	11.618	5.809	1.162	0.581
Total	**11.757**	**5.879**	**1.176**	**0.588**

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM_{10}/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM_{10}/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM_{10}/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM_{10}/acre-month) and 75% of the average emission factor (0.11 ton PM_{10}/acre-month). The 0.19 ton PM_{10}/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM_{10}/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM_{10}/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM10/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

$PM_{2.5}$ Multiplier **0.10**

$PM_{2.5}$ emissions are estimated by applying a particle size multiplier of 0.10 to PM_{10} emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM_{10} and $PM_{2.5}$ **0.50**

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999.* EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants.* Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1).* Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters
Construction area: 5.12 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.
Terrain is mostly flat.
An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.
200 hp bulldozers are used for site clearing.
300 hp bulldozers are used for stripping, excavation, and backfill.
Vibratory drum rollers are used for compacting.
Stripping, Excavation, Backfill and Compaction require an average of two passes each.
Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day)	equip-days per acre	Acres/yr (project-specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	5.12	0.64
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	5.12	2.50
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	2.56	2.58
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	2.56	1.06
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	5.12	1.80
TOTAL								8.58

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 8.58
Qty Equipment: 3.00
Grading days/yr: 2.86

Haul Truck Emissions

Emissions from hauling excavation material and construction supplies are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised January 2013).

Assumptions:
Haul trucks carry 20 cubic yards of material per trip.
The average distance from the project site to the materials source is estimated to be 15 miles; therefore, a haul truck will travel 30 miles round trip.
Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Materials (Piping) =	3,845	cubic yards	Assumes 3 feet of piping and other construction materials needed for drinking water system, sanitary waste upgrades, and data and telemcommunication lines.
Amount of Building Materials (Above Ground) =	341	cubic yards	Assumes 4 feet of material are needed for the aboveground portion of new tank and sewer infrastructure.
Amount of Building Materials (Below Ground) =	30,754	cubic yards	Assumes 5 feet of material are needed for the below ground portion of the proposed water tank and sewer infrastructure, and the drinking water and sanitary water piping upgrades.
Amount of Paving Material =	44	cubic yards	
Number of trucks required =	1,749	heavy duty diesel haul truck trips	
Miles per trip =	30	miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO_x	VOC	CO	SO_2	PM10	$PM_{2.5}$	CO_2
HDDV	**2.498**	**0.617**	**1.782**	**0.012**	**0.097**	**0.071**	**1243.400**

Notes:
Emission factors for all pollutants are from USAF IERA 2013.
Emission factors are from Tables 5-11 for the 2015 calendar year, high altitude (USAF IERA 2013).

HDDV Haul Truck Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**288.985**	**71.378**	**206.153**	**1.388**	**11.222**	**8.214**	**143844.421**
tons	**0.144**	**0.036**	**0.103**	**0.001**	**0.006**	**0.004**	**71.922**

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html.

Assumptions:
Passenger vehicle emission factors for scenario year 2015 are used.

The average roundtrip commute for a construction worker =	30	miles
Number of construction days =	240	days
Number of construction workers (daily) =	30	people

Passenger Vehicle Emission Factors for Year 2015 (lbs/mile)

NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
0.00060188	0.00066355	0.00614108	0.00001070	0.00009259	0.00006015	1.10192837

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>. Accessed 10 May 2013.
Notes:
The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**130.005**	**143.326**	**1326.473**	**2.312**	**19.999**	**12.992**	**238016.529**
tons	**0.065**	**0.072**	**0.663**	**0.001**	**0.010**	**0.006**	**119.008**

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

Metropolitian Denver Intrastate AQCR

			All Emission Sources					
Row #	State	County	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
1	CO	Adams	66,166.23	26,263.59	15,754.51	4,113.54	7,737.02	19,333.51
2	CO	Arapahoe	81,600.76	12,367.17	14,903.74	2,946.89	257.86	17,198.71
3	CO	Boulder	45,011.54	10,596.07	5,430.68	1,352.87	916.72	19,013.11
4	CO	Clear Creek	11,912.27	1,885.71	2,655.93	610.36	17.25	6,297.05
5	CO	Denver	93,351.26	21,309.92	13,878.24	2,743.43	3,261.35	17,554.47
6	CO	Douglas	43,182.53	7,519.29	5,067.58	1,219.57	145.18	18,030.73
7	CO	Gilpin	2,100.91	515.19	477.55	155.45	6.26	4,251.82
8	CO	Jefferson	83,780.29	14,521.39	10,407.51	2,523.01	2,897.01	26,467.27
Grand Total			427,105.80	94,978.34	68,575.73	15,665.11	15,238.66	128,146.68

SOURCE:
http://neibrowser.epa.gov/eis-public-web/home.html
USEPA National Emissions Inventory (NEI)

Section B.4

Estimated Standby Generator Emissions

Generator horsepower (hp)	Conversion from kW to Btu/hr	Engine Btu/hr (Assume 90% efficiency converting mechanical to electrical power)	Engine MMBtu/hr
200	2545.5	565,657	0.57

Diesel Industrial Engine Emission Factors from AP-42, Section 3.4	NOx	CO	VOC	PM-10	SO_2	CO_2
	lb/MMBtu	lb/MMBtu	lb/MMBtu	lb/MMBtu	lb/MMBtu	lb/MMBtu
Emission Factor	3.2	0.85	0.09	0.1	1.01	165

Assume max. 100 hr/yr operation and testing per generator	NOx	CO	VOC	PM-10	SO_2	CO_2
	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)
	181.01	48.08	5.09	5.66	57.13	9,333.34

Emissions Per Generator	NOx	CO	VOC	PM-10	SO_2	CO_2
	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
	0.091	**0.024**	**0.0025**	**0.0028**	**0.029**	**4.667**

Source: USEPA 1996. *AP-42. Large Stationary Diesel And All Stationary Duel-fuel Engines.* Table 3.4-1. Page 3.4-5.

Summary	Summarizes total emissions for the Construction of Wind Turbines and Associated Infrastructure in Zone 2 (Proposed Action) in 2015 - 2017
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
Emergency Generator	Estimates emissions from the operation of emergency generators.
AQCR Tier Report	Summarizes total emissions for the Metropolitan Denver Intrastate AQCR report for 2008, to be used to compare the Proposed Action to regional emissions.

Air Emissions for the Proposed Action in 2015 thru 2017

	NO_x (ton)	VOC (ton)	CO (ton)	SO_2 (ton)	PM_{10} (ton)	$PM_{2.5}$ (ton)	CO_2 (ton)
Combustion	66.15	15.14	35.51	16.13	2.06	2.00	7,181.57
Fugitive Dust	-	-	-	-	8.98	0.90	-
Haul Truck On-Road	0.01	0.00	0.01	0.00	0.00	0.00	5.92
Commuter	0.07	0.07	0.66	0.00	0.01	0.01	119.01
TOTAL	***66.22***	***15.21***	***36.18***	***16.13***	***11.06***	***2.91***	***7,306.50***

Note: Total $PM_{10}/_{2.5}$ fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO_2 emissions converted to metric tons =	***6,626.999***	***metric tons***	
State of Colorado's CO_2 emissions =	***96,500,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of Colorado's CO_2 emissions =	***0.00687%***		
United States' CO_2 emissions =	***5,631,300,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of USA's CO_2 emissions =	***0.000118%***		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2013. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide).* Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released January 2013. Data accessed 10 May 2013.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because emissions from the Proposed Action in 2015 - 2017 are several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

Metropolitian Intrastate AQCR Air Basin

	Point and Area Sources Combined					
Year	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
2008	94,978	128,147	427,106	15,239	68,576	15,665

Source: USEPA National Emissions Inventory (NEI) (http://neibrowser.epa.gov/eis-public-web/home.html). Site visited on 10 May 2013

Air Emissions from the Proposed Action in 2015 thru 2017

	Point and Area Sources Combined					
	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Regional Emissions	94,978	128,147	427,106	15,239	68,576	15,665
Emissions	66.224	15.212	36.182	16.133	11.057	2.907
% of Regional	**0.070%**	**0.0119%**	**0.0085%**	**0.106%**	**0.016%**	**0.019%**

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO_2, CO, $PM_{2.5}$, $PM_{10,}$ and CO_2 due to Construction.

	General Construction and Modification Activities	**Area Disturbed**		
1.)	Construction of 3 utility-scale turbines	261,360	ft^2	Total Area Disturbed; based on 2 acres per turbine.
2.)	Construction of 4 mid-scale turbines	17,424	ft^2	Total Area Disturbed; based on 0.1 acres per turbine
3.)	Construction of 11 small turbines	47,916	ft^2	Total Area Disturbed; based on 0.1 acres per turbine

Total Disturbed Area:	343,250	ft^2	
	7.88	acres	
Construction Duration:	12	months	
Annual Construction Activity:	240	days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: U.S. EPA NONROAD Emissions Model, Version 2005.0.0, Wind Energy Siting Study (2008), Wind Energy Final Programmatic Environmental Impact Statement (2005), and Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling-- Compression-Ignition (EPA420-P-04-009)
Emission factors are taken from the NONROAD model and crankcase Emission Factors for Nonroad Engine Modeling-- Compression-Ignition

Wind Turbine Construction (Utility-Scale)

Equipment [c, f]	No. Reqd per turbine	NO_x (lb/turbine)	VOC[a] (lb/turbine)	CO (lb/turbine)	SO_2[b] (lb/turbine)	PM_{10} (lb/turbine)	$PM_{2.5}$[d] (lb/turbine)	CO_2[e] (lb/turbine)
Site Preparation								
Backhoe	2	1555.5817	334.2913	825.4107	376.9613	47.6198	46.1913	167575.24
Dozer	2	2074.1090	445.7218	1100.5476	502.6150	63.4931	61.5883	223,433.65
Loader	1	777.7909	167.1457	412.7054	188.4806	23.8099	23.0956	83787.62
Truck	1	777.7909	167.1457	412.7054	188.4806	23.8099	23.0956	83787.62
Concrete Truck	16	2539.7253	557.1522	1375.6845	628.2688	79.3664	76.9854	279292.07
Dump/Haul Truck	2	2285.7527	501.4370	1238.1161	565.4419	71.4298	69.2869	251362.86
Foundation and Tower Construction								
Hydraulic crane	1	777.7909	167.1457	412.7054	188.4806	23.8099	23.0956	83787.62
Skid Steer	1	777.7909	167.1457	412.7054	188.4806	23.8099	23.0956	83787.62
Truck	1	777.7909	167.1457	412.7054	188.4806	23.8099	23.0956	83787.62
Welding Rig	1	222.2260	234.0039	146.8279	47.3821	11.9050	11.5478	23427.75
Dump/Haul Truck	6	1142.8764	250.7185	619.0580	282.7209	35.7149	34.6434	125681.43
Paver/Compactor	1	777.7909	167.1457	412.7054	188.4806	23.8099	23.0956	83787.62
Roller	1	777.7909	167.1457	412.7054	188.4806	23.8099	23.0956	83787.62
		15264.81	3493.34	8194.58	3722.75	476.20	461.91	1657286.35

Wind Turbine Construction (Mid-scale)

Equipment [c, f]	No. Reqd per turbine	NO_x (lb/turbine)	VOC[a] (lb/turbine)	CO (lb/turbine)	SO_2[b] (lb/turbine)	PM_{10} (lb/turbine)	$PM_{2.5}$[d] (lb/turbine)	CO_2[e] (lb/turbine)
Site Preparation								
Backhoe	2	777.7909	167.1457	412.7054	188.4806	23.8099	23.0956	83787.62
Dozer	2	1037.0545	222.8609	550.2738	251.3075	31.7466	30.7942	111,716.83
Loader	1	388.8954	83.5728	206.3527	94.2403	11.9050	11.5478	41893.81
Truck	1	388.8954	83.5728	206.3527	94.2403	11.9050	11.5478	41893.81
Concrete Truck	16	1269.8626	278.5761	687.8423	314.1344	39.6832	38.4927	139646.03
Dump/Haul Truck	2	1142.8764	250.7185	619.0580	282.7209	35.7149	34.6434	125681.43
Foundation and Tower Construction								
Hydraulic crane	1	388.8954	83.5728	206.3527	94.2403	11.9050	11.5478	41893.81
Skid Steer	1	388.8954	83.5728	206.3527	94.2403	11.9050	11.5478	41893.81
Truck	1	388.8954	83.5728	206.3527	94.2403	11.9050	11.5478	41893.81
Welding Rig	1	111.1130	117.0020	73.4139	23.6910	5.9525	5.7739	11713.88
Dump/Haul Truck	6	571.4382	125.3593	309.5290	141.3605	17.8574	17.3217	62840.72
Paver/Compactor	1	388.8954	83.5728	206.3527	94.2403	11.9050	11.5478	41893.81
Roller	1	388.8954	83.5728	206.3527	94.2403	11.9050	11.5478	41893.81
		7632.40	1746.67	4097.29	1861.38	238.10	230.96	828643.17

Wind Turbine Construction (Small-scale)

Equipment [c, f]	No. Reqd per turbine	NO_x (lb/turbine)	VOC[a] (lb/turbine)	CO (lb/turbine)	SO_2[b] (lb/turbine)	PM_{10} (lb/turbine)	$PM_{2.5}$[d] (lb/turbine)	CO_2[e] (lb/turbine)
Site Preparation								
Backhoe	2	518.5272	111.4304	275.1369	125.6538	15.8733	15.3971	55858.41
Dozer	2	691.3697	148.5739	366.8492	167.5383	21.1644	20.5294	74,477.88
Loader	1	259.2636	55.7152	137.5685	62.8269	7.9366	7.6985	27929.21
Truck	1	259.2636	55.7152	137.5685	62.8269	7.9366	7.6985	27929.21
Concrete Truck	16	846.5751	185.7174	458.5615	209.4229	26.4555	25.6618	93097.36
Dump/Haul Truck	2	761.9176	167.1457	412.7054	188.4806	23.8099	23.0956	83787.62
Foundation and Tower Construction								
Hydraulic crane	1	259.2636	55.7152	137.5685	62.8269	7.9366	7.6985	27929.21
Skid Steer	1	259.2636	55.7152	137.5685	62.8269	7.9366	7.6985	27929.21
Truck	1	259.2636	55.7152	137.5685	62.8269	7.9366	7.6985	27929.21
Welding Rig	1	74.0753	78.0013	48.9426	15.7940	3.9683	3.8493	7809.25
Dump/Haul Truck	6	380.9588	83.5728	206.3527	94.2403	11.9050	11.5478	41893.81
Paver/Compactor	1	259.2636	55.7152	137.5685	62.8269	7.9366	7.6985	27929.21
Roller	1	259.2636	55.7152	137.5685	62.8269	7.9366	7.6985	27929.21
		5088.27	1164.45	2731.53	1240.92	158.73	153.97	552428.78

a) VOC emissions are assumed to be equal to 1.053 times the HC emissions.

b) The SO_2 emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Action construction will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore conservatively over-estimate SO2 emissions by more than a factor of two.

c) The equipment list above was based on Wind Energy Siting Study (2008) and Wind Energy Final Programmatic Environmental Impact Statement (2005)

d) $PM_{2.5}$ are estimated as 0.97 times the PM_{10} emissions

e) CO_2 emission factors are based on brake-specific fuel consumption

f) Construction equipment emission rates were calculated assuming equipment would meet Tier 2 and Tier 3 emissions standards for nonroad engines.

Sample Daily Construction Emission Calculation:
(NOx emission factor - based on equipment type and horsepower)(equipment horsepower)(hours used per day)(number used)(pound/gram conversion factor)

Sample Preferred Alignment Total Construction Calculation:
(Daily Construction Emissions) (Number of days used during project life)

Results: Total Project Annual Emission Rates

	NOx	VOC	CO	SO2	PM10	PM2.5	CO2
Total Project Emissions (lbs)	132294.9943	30275.65212	71019.7131	32263.871	4127.05355	4003.241942	14363148.35
Total Project Emissions (tons)	66.14749714	15.138	35.510	16.132	2.064	2.002	7181.574173

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006

$PM_{2.5}$ Emissions

$PM_{2.5}$ Multiplier	0.10	(10% of PM_{10} emissions assumed to be $PM_{2.5}$)	EPA 2001; EPA 2006

Control Efficiency	0.50	(assume 50% control efficiency for PM_{10} and $PM_{2.5}$ emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM_{10}/acre-month)

Duration of Construction Project	12	months
Area	0.00	acres

General Construction and Demolition Activities (0.19 ton PM_{10}/acre-month)

Duration of Project	12	months
Area	7.88	acres

	Project Emissions (tons/year)			
	PM_{10} uncontrolled	**PM_{10} controlled**	**$PM_{2.5}$ uncontrolled**	**$PM_{2.5}$ controlled**
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	17.966	8.983	1.797	0.898
Total	**17.966**	**8.983**	**1.797**	**0.898**

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM_{10}/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM_{10}/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM_{10}/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM_{10}/acre-month) and 75% of the average emission factor (0.11 ton PM_{10}/acre-month). The 0.19 ton PM_{10}/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM_{10}/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM_{10}/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM10/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

$PM_{2.5}$ Multiplier **0.10**

$PM_{2.5}$ emissions are estimated by applying a particle size multiplier of 0.10 to PM_{10} emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM_{10} and $PM_{2.5}$ **0.50**

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999.* EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants.* Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1).* Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Haul Truck Emissions

Emissions from hauling excavation material and construction supplies are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Assumptions:
Haul trucks carry 20 cubic yards of material per trip.
The average distance from the project site to the materials source is estimated to be 15 miles; therefore, a haul truck will travel 30 miles round trip.
Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Transportation of Wind Turbine components =	144		Assumes one wind turbine (any size) can require up to eight hauls to the project site – one nacelle, three blades, and three to four tower sections.
Number of trucks required =	144	heavy duty diesel haul truck trips	
Miles per trip =	30	miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO_x	VOC	CO	SO_2	PM10	$PM_{2.5}$	CO_2
HDDV	**2.498**	**0.617**	**1.782**	**0.012**	**0.097**	**0.071**	**1243.400**

Notes:
Emission factors for all pollutants are from USAF IERA 2013.
Emission factors are from Tables 5-11 for the 2015 calendar year, high altitude (USAF IERA 2013).

HDDV Haul Truck Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**23.790**	**5.876**	**16.971**	**0.114**	**0.924**	**0.676**	**11841.905**
tons	**0.012**	**0.003**	**0.008**	**0.000**	**0.000**	**0.000**	**5.921**

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html.

Assumptions:
Passenger vehicle emission factors for scenario year 2015 are conservatively used.

The average roundtrip commute for a construction worker =	30	miles
Number of construction days =	240	days
Number of construction workers (daily) =	30	people

Passenger Vehicle Emission Factors for Year 2015 (lbs/mile)

NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
0.00060188	0.00066355	0.00614108	0.00001070	0.00009259	0.00006015	1.10192837

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>. Accessed 10 May 2013.
Notes:
The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**130.005**	**143.326**	**1326.473**	**2.312**	**19.999**	**12.992**	**238016.529**
tons	**0.065**	**0.072**	**0.663**	**0.001**	**0.010**	**0.006**	**119.008**

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

Metropolitian Denver Intrastate AQCR

			All Emission Sources					
Row #	State	County	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
1	CO	Adams	66,166.23	26,263.59	15,754.51	4,113.54	7,737.02	19,333.51
2	CO	Arapahoe	81,600.76	12,367.17	14,903.74	2,946.89	257.86	17,198.71
3	CO	Boulder	45,011.54	10,596.07	5,430.68	1,352.87	916.72	19,013.11
4	CO	Clear Creek	11,912.27	1,885.71	2,655.93	610.36	17.25	6,297.05
5	CO	Denver	93,351.26	21,309.92	13,878.24	2,743.43	3,261.35	17,554.47
6	CO	Douglas	43,182.53	7,519.29	5,067.58	1,219.57	145.18	18,030.73
7	CO	Gilpin	2,100.91	515.19	477.55	155.45	6.26	4,251.82
8	CO	Jefferson	83,780.29	14,521.39	10,407.51	2,523.01	2,897.01	26,467.27
Grand Total			427,106	94,978	68,576	15,665	15,239	128,147

SOURCE:
http://neibrowser.epa.gov/eis-public-web/home.html
USEPA National Emissions Inventory (NEI)

					Emission Factors						
					NO_x	HC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
	Rated Power (hp)	Hours of Use per day	No. Used	Days Used	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/hp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr
Site Preparation - Utility											
Backhoe	150	8	2	60	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Bulldozer	200	8	2	60	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Loader	150	8	1	60	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Water truck	200	6	1	60	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Concrete truck	250	1	16	60	4.8	1.0	2.6	1.187408	0.15	0.15	527.8531
Dump/Haul Truck	300	6	2	60	4.8	1.0	2.6	1.187408	0.15	0.15	527.8531
Construction											
Skid Steer	150	8	1	60	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Hydraulic Crane	200	6	1	60	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Water Truck	200	6	1	60	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Welding Rig	50	6	1	60	5.6	5.6	3.7	1.194008	0.3	0.29	590.3695
Dump/Haul Truck	300	1	6	60	4.8	1.0	2.6	1.187408	0.15	0.15	527.8531
Paver/Compactor	150	8	1	60	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Roller/Sheepsfoot	150	8	1	60	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531

Emissions each day

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
Site Preparation - Utility							
Backhoe	25.92636203	5.57152229	13.75684516	6.282687728	0.793664144	0.76985422	2792.920673
Bulldozer	34.56848271	7.428696386	18.34246021	8.37691697	1.058218858	1.026472293	3723.89423
Loader	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Water truck	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Concrete truck	42.32875434	9.285870483	22.92807527	10.47114621	1.322773573	1.283090366	4654.867788
Dump/Haul Truck	38.0958789	8.357283435	20.63526774	9.424031591	1.190496216	1.154781329	4189.381009
Construction							
Skid Steer	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Hydraulic Crane	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Water Truck	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Welding Rig	3.703766005	3.900065603	2.44713111	0.789701119	0.198416036	0.192463555	390.462568
Dump/Haul Truck	19.04793945	4.178641717	10.31763387	4.712015796	0.595248108	0.577390665	2094.690505
Paver/Compactor	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Roller/Sheepsfoot	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Total	254.41	58.22	136.58	62.05	7.94	7.70	27,621.44

Emissions per turbine

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
	lbs	lbs	lbs	lbs	lbs	lbs	lbs
Site Preparation - Utility							
Backhoe	1555.581722	334.2913374	825.4107096	376.9612637	47.61984863	46.19125317	167575.2404
Bulldozer	2074.108963	445.7217832	1100.547613	502.6150182	63.49313151	61.58833756	223433.6538
Loader	777.790861	167.1456687	412.7053548	188.4806318	23.80992432	23.09562659	83787.62018
Water truck	777.790861	167.1456687	412.7053548	188.4806318	23.80992432	23.09562659	83787.62018
Concrete truck	2539.72526	557.152229	1375.684516	628.2687728	79.36641438	76.98542195	279292.0673
Dump/Haul Truck	2285.752734	501.4370061	1238.116064	565.4418955	71.42977295	69.28687976	251362.8605
Construction							
Skid Steer	777.790861	167.1456687	412.7053548	188.4806318	23.80992432	23.09562659	83787.62018
Hydraulic Crane	777.790861	167.1456687	412.7053548	188.4806318	23.80992432	23.09562659	83787.62018
Water Truck	777.790861	167.1456687	412.7053548	188.4806318	23.80992432	23.09562659	83787.62018
Welding Rig	222.2259603	234.0039362	146.8278666	47.38206712	11.90496216	11.54781329	23427.75408
Dump/Haul Truck	1142.876367	250.718503	619.0580322	282.7209477	35.71488647	34.64343988	125681.4303
Paver/Compactor	777.790861	167.1456687	412.7053548	188.4806318	23.80992432	23.09562659	83787.62018
Roller/Sheepsfoot	777.790861	167.1456687	412.7053548	188.4806318	23.80992432	23.09562659	83787.62018
Total	15,264.81	3,493.34	8,194.58	3,722.75	476.20	461.91	1,657,286.35
Total (tons)	7.632403517	1.746672238	4.097291143	1.861377194	0.238099243	0.230956266	828.6431738

					Emission Factors						
					NO_x	HC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
	Rated Power (hp)	Hours of Use per day	No. Used	Days Used	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/hp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr
Site Preparation - Mid											
Backhoe	150	8	2	30	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Bulldozer	200	8	2	30	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Loader	150	8	1	30	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Water truck	200	6	1	30	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Concrete truck	250	1	16	30	4.8	1.0	2.6	1.187408	0.15	0.15	527.8531
Dump/Haul Truck	300	6	2	30	4.8	1.0	2.6	1.187408	0.15	0.15	527.8531
Construction											
Skid Steer	150	8	1	30	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Hydraulic Crane	200	6	1	30	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Water Truck	200	6	1	30	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Welding Rig	50	6	1	30	5.6	5.6	3.7	1.194008	0.3	0.29	590.3695
Dump/Haul Truck	300	1	6	30	4.8	1.0	2.6	1.187408	0.15	0.15	527.8531
Paver/Compactor	150	8	1	30	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Roller/Sheepsfoot	150	8	1	30	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531

	Emissions each day						
	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
Site Preparation - Mid							
Backhoe	25.92636203	5.57152229	13.75684516	6.282687728	0.793664144	0.76985422	2792.920673
Bulldozer	34.56848271	7.428696386	18.34246021	8.37691697	1.058218858	1.026472293	3723.89423
Loader	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Water truck	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Concrete truck	42.32875434	9.285870483	22.92807527	10.47114621	1.322773573	1.283090366	4654.867788
Dump/Haul Truck	38.0958789	8.357283435	20.63526774	9.424031591	1.190496216	1.154781329	4189.381009
Construction							
Skid Steer	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Hydraulic Crane	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Water Truck	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Welding Rig	3.703766005	3.900065603	2.44713111	0.789701119	0.198416036	0.192463555	390.462568
Dump/Haul Truck	19.04793945	4.178641717	10.31763387	4.712015796	0.595248108	0.577390665	2094.690505
Paver/Compactor	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Roller/Sheepsfoot	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Total	254.41	58.22	136.58	62.05	7.94	7.70	27,621.44

Emissions per turbine

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
	lbs	lbs	lbs	lbs	lbs	lbs	lbs
Site Preparation - Mid							
Backhoe	777.790861	167.1456687	412.7053548	188.4806318	23.80992432	23.09562659	83787.62018
Bulldozer	1037.054481	222.8608916	550.2738064	251.3075091	31.74656575	30.79416878	111716.8269
Loader	388.8954305	83.57283435	206.3526774	94.24031591	11.90496216	11.54781329	41893.81009
Water truck	388.8954305	83.57283435	206.3526774	94.24031591	11.90496216	11.54781329	41893.81009
Concrete truck	1269.86263	278.5761145	687.842258	314.1343864	39.68320719	38.49271098	139646.0336
Dump/Haul Truck	1142.876367	250.718503	619.0580322	282.7209477	35.71488647	34.64343988	125681.4303
Construction							
Skid Steer	388.8954305	83.57283435	206.3526774	94.24031591	11.90496216	11.54781329	41893.81009
Hydraulic Crane	388.8954305	83.57283435	206.3526774	94.24031591	11.90496216	11.54781329	41893.81009
Water Truck	388.8954305	83.57283435	206.3526774	94.24031591	11.90496216	11.54781329	41893.81009
Welding Rig	111.1129801	117.0019681	73.41393331	23.69103356	5.952481079	5.773906646	11713.87704
Dump/Haul Truck	571.4381836	125.3592515	309.5290161	141.3604739	17.85744324	17.32171994	62840.71514
Paver/Compactor	388.8954305	83.57283435	206.3526774	94.24031591	11.90496216	11.54781329	41893.81009
Roller/Sheepsfoot	388.8954305	83.57283435	206.3526774	94.24031591	11.90496216	11.54781329	41893.81009
Total	7,632.40	1,746.67	4,097.29	1,861.38	238.10	230.96	828,643.17
Total (tons)	2.544134506	0.582224079	1.365763714	0.620459065	0.079366414	0.076985422	276.2143913

					Emission Factors						
					NO_x	HC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
	Rated Power (hp)	Hours of Use per day	No. Used	Days Used	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/hp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr
Site Preparation - Small											
Backhoe	150	8	2	20	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Bulldozer	200	8	2	20	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Loader	150	8	1	20	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Water truck	200	6	1	20	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Concrete truck	250	1	16	20	4.8	1.0	2.6	1.187408	0.15	0.15	527.8531
Dump/Haul Truck	300	6	2	20	4.8	1.0	2.6	1.187408	0.15	0.15	527.8531
Construction											
Skid Steer	150	8	1	20	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Hydraulic Crane	200	6	1	20	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Water Truck	200	6	1	20	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Welding Rig	50	6	1	20	5.6	5.6	3.7	1.194008	0.3	0.29	590.3695
Dump/Haul Truck	300	1	6	20	4.8	1.0	2.6	1.187408	0.15	0.15	527.8531
Paver/Compactor	150	8	1	20	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531
Roller/Sheepsfoot	150	8	1	20	4.9	1.0	2.6	1.187408	0.15	0.15	527.8531

	Emissions each day						
	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
Site Preparation - Small							
Backhoe	25.92636203	5.57152229	13.75684516	6.282687728	0.793664144	0.76985422	2792.920673
Bulldozer	34.56848271	7.428696386	18.34246021	8.37691697	1.058218858	1.026472293	3723.89423
Loader	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Water truck	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Concrete truck	42.32875434	9.285870483	22.92807527	10.47114621	1.322773573	1.283090366	4654.867788
Dump/Haul Truck	38.0958789	8.357283435	20.63526774	9.424031591	1.190496216	1.154781329	4189.381009
Construction							
Skid Steer	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Hydraulic Crane	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Water Truck	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Welding Rig	3.703766005	3.900065603	2.44713111	0.789701119	0.198416036	0.192463555	390.462568
Dump/Haul Truck	19.04793945	4.178641717	10.31763387	4.712015796	0.595248108	0.577390665	2094.690505
Paver/Compactor	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Roller/Sheepsfoot	12.96318102	2.785761145	6.87842258	3.141343864	0.396832072	0.38492711	1396.460336
Total	254.41	58.22	136.58	62.05	7.94	7.70	27,621.44

Emissions per turbine

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
	lbs	lbs	lbs	lbs	lbs	lbs	lbs
Site Preparation - Small							
Backhoe	518.5272406	111.4304458	275.1369032	125.6537546	15.87328288	15.39708439	55858.41345
Bulldozer	691.3696542	148.5739277	366.8492043	167.5383394	21.16437717	20.52944585	74477.88461
Loader	259.2636203	55.7152229	137.5684516	62.82687728	7.936641438	7.698542195	27929.20673
Water truck	259.2636203	55.7152229	137.5684516	62.82687728	7.936641438	7.698542195	27929.20673
Concrete truck	846.5750868	185.7174097	458.5615053	209.4229243	26.45547146	25.66180732	93097.35576
Dump/Haul Truck	761.9175781	167.1456687	412.7053548	188.4806318	23.80992432	23.09562659	83787.62018
Construction							
Skid Steer	259.2636203	55.7152229	137.5684516	62.82687728	7.936641438	7.698542195	27929.20673
Hydraulic Crane	259.2636203	55.7152229	137.5684516	62.82687728	7.936641438	7.698542195	27929.20673
Water Truck	259.2636203	55.7152229	137.5684516	62.82687728	7.936641438	7.698542195	27929.20673
Welding Rig	74.07532009	78.00131206	48.9426222	15.79402237	3.968320719	3.849271098	7809.251359
Dump/Haul Truck	380.958789	83.57283435	206.3526774	94.24031591	11.90496216	11.54781329	41893.81009
Paver/Compactor	259.2636203	55.7152229	137.5684516	62.82687728	7.936641438	7.698542195	27929.20673
Roller/Sheepsfoot	259.2636203	55.7152229	137.5684516	62.82687728	7.936641438	7.698542195	27929.20673
Total	5,088.27	1,164.45	2,731.53	1,240.92	158.73	153.97	552,428.78
Total (tons)	2.544134506	0.582224079	1.365763714	0.620459065	0.079366414	0.076985422	276.2143913

Summary	Summarizes total emissions for the Construction of Wind Turbines and Associated Infrastructure in Zone 2 (Proposed Action) in 2016
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
Emergency Generator	Estimates emissions from the operation of emergency generators.
AQCR Tier Report	Summarizes total emissions for the Metropolitan Denver Intrastate AQCR report for 2008, to be used to compare the Proposed Action to regional emissions.

Air Emissions for the Proposed Action in FY2016

	NO_x (ton)	VOC (ton)	CO (ton)	SO_2 (ton)	PM_{10} (ton)	$PM_{2.5}$ (ton)	CO_2 (ton)
Combustion	4.75	0.38	2.09	0.38	0.34	0.33	538.21
Fugitive Dust	-	-	-	-	0.46	0.05	-
Haul Truck On-Road	0.01	0.00	0.01	0.00	0.00	0.00	5.17
Commuter	0.06	0.07	0.62	0.00	0.01	0.01	119.53
TOTAL	***4.82***	***0.45***	***2.72***	***0.38***	***0.81***	***0.38***	***662.92***

Note: Total $PM_{10}/_{2.5}$ fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO_2 emissions converted to metric tons =	***601.267***	***metric tons***	
State of Colorado's CO_2 emissions =	***96,500,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of Colorado's CO_2 emissions =	***0.00062%***		
United States' CO_2 emissions =	***5,631,300,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of USA's CO_2 emissions =	***0.000011%***		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2013. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide).* Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released January 2013. Data accessed 10 May 2013.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because emissions from the Proposed Action in 2016 are several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

Metropolitian Intrastate AQCR Air Basin

	Point and Area Sources Combined					
Year	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
2008	94,978	128,147	427,106	15,239	68,576	15,665

Source: USEPA National Emissions Inventory (NEI) (http://neibrowser.epa.gov/eis-public-web/home.html). Site visited on 10 May 2013

Air Emissions from the Proposed Action in 2016

	Point and Area Sources Combined					
	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Regional Emissions	94,978	128,147	427,106	15,239	68,576	15,665
Emissions	4.818	0.448	2.722	0.377	0.813	0.384
% of Regional	**0.005%**	**0.0003%**	**0.0006%**	**0.002%**	**0.001%**	**0.002%**

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO_2, CO, $PM_{2.5}$, $PM_{10,}$ and CO_2 due to Construction and Demolition

	General Construction and Modification Activities	**Area Disturbed**		
4.)	Construction of gravel access road	8,800	ft^2	Total Area Disturbed - approximately 400' x 22'
5.)	Installation of electrical cable and fiber optics	4,000	ft^2	Total Area Disturbed - approximately 400' x 10'
6.)	Construstion of 2 data sheds	3,750	ft^2	Total Area Disturbed (estimated)
		1,250	ft^2	Two 25' x 25' sheds
7.)	Construction of 11 meterological towers	1,100	ft^2	Total Area Disturbed

Total Construction Area:	1,250	ft^2	
	0.03	acres	
Total Pavement Area:	0	ft^2	
	0.00	acres	
Total Disturbed Area:	17,650	ft^2	
	0.41	acres	
Construction Duration:	12	months	
Annual Construction Activity:	240	days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0
Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.
Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment[d]		No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Stationary	Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
	Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
	Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)	Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
	Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
	Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity		6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be

b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC.
three times the default fleet for a 10 acre project.
The factors used here are the VOC factors.

c) The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used
The NONROAD model contains emissions factors for total HC and for VOC.
for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-

d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was
estimate SO2 emissions by more than a factor of two.

assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO_x	VOC	CO	SO_2**	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NOx = (Total Grading NOx per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft^2)	Total Area (acres)	Total Days	
Grading:	17,650	0.41	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	1,250	0.03	240	
Architectural Coating	1,250	0.03	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total 'Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Total Emissions (lbs):	**9,496.76**	**753.73**	**4,187.46**	**751.37**	**681.52**	**661.07**	**1,076,424**

Results: Total Project Annual Emission Rates

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Total Project Emissions (lbs)	9,496.76	753.73	4,187.46	751.37	681.52	661.07	1,076,424
Total Project Emissions (tons)	4.748	0.377	2.094	0.376	0.341	0.331	538.212

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006

$PM_{2.5}$ Emissions

$PM_{2.5}$ Multiplier	0.10	(10% of PM_{10} emissions assumed to be $PM_{2.5}$)	EPA 2001; EPA 2006

Control Efficiency	0.50	(assume 50% control efficiency for PM_{10} and $PM_{2.5}$ emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM_{10}/acre-month)

Duration of Construction Project	12	months
Area	0.00	acres

General Construction Activities (0.19 ton PM_{10}/acre-month)

Duration of Project	12	months
Area	0.41	acres

	Project Emissions (tons/year)			
	PM_{10} uncontrolled	**PM_{10} controlled**	**$PM_{2.5}$ uncontrolled**	**$PM_{2.5}$ controlled**
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	0.924	0.462	0.092	0.046
Total	**0.924**	**0.462**	**0.092**	**0.046**

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM_{10}/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM_{10}/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM_{10}/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM_{10}/acre-month) and 75% of the average emission factor (0.11 ton PM_{10}/acre-month). The 0.19 ton PM_{10}/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM_{10}/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM_{10}/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM10/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

$PM_{2.5}$ Multiplier **0.10**

$PM_{2.5}$ emissions are estimated by applying a particle size multiplier of 0.10 to PM_{10} emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM_{10} and $PM_{2.5}$ **0.50**

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999.* EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants.* Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1).* Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters
Construction area: 0.41 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.
Terrain is mostly flat.
An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.
200 hp bulldozers are used for site clearing.
300 hp bulldozers are used for stripping, excavation, and backfill.
Vibratory drum rollers are used for compacting.
Stripping, Excavation, Backfill and Compaction require an average of two passes each.
Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day)	equip-days per acre	Acres/yr (project-specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.41	0.05
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.41	0.20
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.20	0.20
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.20	0.08
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.41	0.14
TOTAL								0.68

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.68
Qty Equipment: 3.00
Grading days/yr: 0.23

Haul Truck Emissions

Emissions from hauling excavation material and construction supplies are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Assumptions:
Haul trucks carry 20 cubic yards of material per trip.
The average distance from the project site to the materials source is estimated to be 15 miles; therefore, a haul truck will travel 30 miles round trip.
Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Building Materials (Above Ground) =	185	cubic yards	Assumes 4 feet of building material are needed for data sheds
Amount of Building Materials (Below Ground) =	231	cubic yards	Assumes 5 feet of material are needed for the below ground portion of the data sheds
Amount of Excavation Material =	556	cubic yards	Assumes 12 feet of material would need to be excavated on average
Amount of Paving Material =	1,544	cubic yards	Assumes 3 feet of excavated material excavated and removed on average for access road, utilities, and towers.
Number of trucks required =	126	heavy duty diesel haul truck trips	
Miles per trip =	30	miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO_x	VOC	CO	SO_2	PM10	$PM_{2.5}$	CO_2
HDDV	**2.195**	**0.599**	**1.593**	**0.012**	**0.089**	**0.063**	**1243.400**

Notes:
Emission factors for all pollutants are from USAF IERA 2013.
Emission factors are from Tables 5-12 for the 2016 calendar year, high altitude (USAF IERA 2013).

HDDV Haul Truck Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**18.267**	**4.985**	**13.257**	**0.100**	**0.741**	**0.524**	**10347.961**
tons	**0.009**	**0.002**	**0.007**	**0.000**	**0.000**	**0.000**	**5.174**

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html.

Assumptions:
Passenger vehicle emission factors for scenario year 2016 are conservatively used.

The average roundtrip commute for a construction worker =	30	miles
Number of construction days =	240	days
Number of construction workers (daily) =	30	people

Passenger Vehicle Emission Factors for Year 2016 (lbs/mile)

NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
0.00055658	0.00063254	0.00575800	0.00001071	0.00009392	0.00006131	1.10677664

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>. Accessed 10 May 2013.
Notes:
The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**120.221**	**136.630**	**1243.727**	**2.312**	**20.286**	**13.244**	**239063.755**
tons	**0.060**	**0.068**	**0.622**	**0.001**	**0.010**	**0.007**	**119.532**

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

Metropolitian Denver Intrastate AQCR

			All Emission Sources					
Row #	State	County	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
1	CO	Adams	66,166.23	26,263.59	15,754.51	4,113.54	7,737.02	19,333.51
2	CO	Arapahoe	81,600.76	12,367.17	14,903.74	2,946.89	257.86	17,198.71
3	CO	Boulder	45,011.54	10,596.07	5,430.68	1,352.87	916.72	19,013.11
4	CO	Clear Creek	11,912.27	1,885.71	2,655.93	610.36	17.25	6,297.05
5	CO	Denver	93,351.26	21,309.92	13,878.24	2,743.43	3,261.35	17,554.47
6	CO	Douglas	43,182.53	7,519.29	5,067.58	1,219.57	145.18	18,030.73
7	CO	Gilpin	2,100.91	515.19	477.55	155.45	6.26	4,251.82
8	CO	Jefferson	83,780.29	14,521.39	10,407.51	2,523.01	2,897.01	26,467.27
Grand Total			427,106	94,978	68,576	15,665	15,239	128,147

SOURCE:
http://neibrowser.epa.gov/eis-public-web/home.html
USEPA National Emissions Inventory (NEI)

Summary	Summarizes total emissions for Expanding Power Capacity (Proposed Action) in 2015
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
Emergency Generator	Estimates emissions from the operation of emergency generators.
AQCR Tier Report	Summarizes total emissions for the Metropolitan Denver Intrastate AQCR report for 2008, to be used to compare the Proposed Action to regional emissions.

Air Emissions for the Proposed Action in FY2015

	NO_x (ton)	VOC (ton)	CO (ton)	SO_2 (ton)	PM_{10} (ton)	$PM_{2.5}$ (ton)	CO_2 (ton)
Combustion	4.83	0.62	2.13	0.38	0.35	0.34	546.75
Fugitive Dust	-	-	-	-	5.74	0.57	-
Haul Truck On-Road	0.28	0.07	0.20	0.00	0.01	0.01	139.68
Commuter	0.07	0.07	0.66	0.00	0.01	0.01	119.01
TOTAL	***5.17***	***0.76***	***2.99***	***0.38***	***6.10***	***0.92***	***805.44***

Note: Total $PM_{10}/_{2.5}$ fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO_2 emissions converted to metric tons =	***730.537***	***metric tons***	
State of Colorado's CO_2 emissions =	***96,500,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of Colorado's CO_2 emissions =	***0.00076%***		
United States' CO_2 emissions =	***5,631,300,000***	***metric tons***	*(U.S. DOE/EIA 2013)*
Percent of USA's CO_2 emissions =	***0.000013%***		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2013. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide).* Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released January 2013. Data accessed 10 May 2013.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because emissions from the Proposed Action in 2015 are several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

Metropolitan Denver Intrastate AQCR Air Basin

	Point and Area Sources Combined					
Year	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
2008	94,978	128,147	427,106	15,239	68,576	15,665

Source: USEPA National Emissions Inventory (NEI) (http://neibrowser.epa.gov/eis-public-web/home.html). Site visited on 10 May 2013

Air Emissions from the Proposed Action in 2015

	Point and Area Sources Combined					
	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Regional Emissions	94,978	128,147	427,106	15,239	68,576	15,665
Emissions	5.171	0.762	2.989	0.384	6.104	0.924
% of Regional	**0.005%**	**0.0006%**	**0.0007%**	**0.003%**	**0.009%**	**0.006%**

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO_2, CO, $PM_{2.5}$, $PM_{10,}$ and CO_2 due to Construction and Demolition

	ProposedModification Activities	**Area Disturbed**		
1.)	Construction of Substation	163,350	ft^2	Total Area Disturbed
		54,450	ft^2	Facility
2.)	Addition and upgrades of existing substation	30,492	ft^2	Total Area Disturbed
		30,492	ft^2	Building Addition
3.)	Installation of aboveground transmission lines	25,344	ft^2	Total Area Disturbed - 4.8 miles, approximately 1 foot wide

Total Construction Area:	84,942	ft^2	
	1.95	acres	
Total Pavement Area:	0	ft^2	
	0.00	acres	
Total Disturbed Area:	219,186	ft^2	
	5.03	acres	
Construction Duration:	12	months	
Annual Construction Activity:	240	days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0
Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.
Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

	Equipment[d]	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c] (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Stationary	Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
	Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
	Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)	Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
	Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
	Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
	Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Reqd.[a] per 10 acres	NO_x (lb/day)	VOC[b] (lb/day)	CO (lb/day)	SO_2[c]	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO_2 (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.

b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The factors used here are the VOC factors.

c) The NONROAD model contains emissions factors for total HC and for VOC. The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO2 emissions by more than a factor of two.

d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO_x	VOC	CO	SO_2**	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			23.753					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NOx = (Total Grading NOx per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft^2)	Total Area (acres)	Total Days	
Grading:	219,186	5.03	3	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	84,942	1.95	240	
Architectural Coating	84,942	1.95	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total 'Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Grading Equipment	124.92	7.73	47.13	10.35	7.64	7.41	14,825
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	482.52	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	**9,651.52**	**1,241.41**	**4,250.19**	**763.29**	**692.79**	**672.01**	**1,093,503**

Results: Total Project Annual Emission Rates

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Total Project Emissions (lbs)	9,651.52	1,241.41	4,250.19	763.29	692.79	672.01	1,093,503
Total Project Emissions (tons)	4.826	0.621	2.125	0.382	0.346	0.336	546.751

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM_{10}/acre-month	MRI 1996; EPA 2001; EPA 2006

$PM_{2.5}$ Emissions

$PM_{2.5}$ Multiplier	0.10	(10% of PM_{10} emissions assumed to be $PM_{2.5}$)	EPA 2001; EPA 2006

Control Efficiency	0.50	(assume 50% control efficiency for PM_{10} and $PM_{2.5}$ emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM_{10}/acre-month)

Duration of Construction Project	12	months
Area	0.00	acres

General Construction and Demolition Activities (0.19 ton PM_{10}/acre-month)

Duration of Project	12	months
Area	5.03	acres

	Project Emissions (tons/year)			
	PM_{10} uncontrolled	**PM_{10} controlled**	**$PM_{2.5}$ uncontrolled**	**$PM_{2.5}$ controlled**
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	11.473	5.736	1.147	0.574
Total	**11.473**	**5.736**	**1.147**	**0.574**

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM_{10}/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM_{10}/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM_{10}/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM_{10}/acre-month) and 75% of the average emission factor (0.11 ton PM_{10}/acre-month). The 0.19 ton PM_{10}/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM_{10}/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM_{10}/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM_{10}/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM10/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

$PM_{2.5}$ Multiplier **0.10**

$PM_{2.5}$ emissions are estimated by applying a particle size multiplier of 0.10 to PM_{10} emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM_{10} and $PM_{2.5}$ **0.50**

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM_{10} and $PM_{2.5}$ in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999.* EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants.* Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1).* Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 5.03 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.
An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.
200 hp bulldozers are used for site clearing.
300 hp bulldozers are used for stripping, excavation, and backfill.
Vibratory drum rollers are used for compacting.
Stripping, Excavation, Backfill and Compaction require an average of two passes each.
Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day)	equip-days per acre	Acres/yr (project-specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	5.03	0.63
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	5.03	2.46
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	2.52	2.54
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	2.52	1.04
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	5.03	1.76
TOTAL								8.43

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 8.43
Qty Equipment: 3.00
Grading days/yr: 2.81

Haul Truck Emissions

Emissions from hauling excavation material and construction supplies are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised January 2013).

Assumptions:
Haul trucks carry 20 cubic yards of material per trip.
The average distance from the project site to the materials source is estimated to be 15 miles; therefore, a haul truck will travel 30 miles round trip.
Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Building Materials (Above Ground) =	12,584	cubic yards	Assumes 4 feet of building material are needed for the single floor of the proposed substation and substation addition.
Amount of Building Materials (Below Ground) =	15,730	cubic yards	Assumes 5 feet of material are needed for the below ground portion of the proposed substation and substation addition.
Amount of Excavation Material =	37,752	cubic yards	Assumes 12 feet of material would need to be excavated on average for proposed substation and substation addition
Amount of Materials, transmissions lines =	1,877	cubic yards	Assumes 2 foot depth of material would need to be hauled on average for the proposed transmissions lines
Number of trucks required =	3,397	heavy duty diesel haul truck trips	
Miles per trip =	30	miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO_x	VOC	CO	SO_2	PM10	$PM_{2.5}$	CO_2
HDDV	**2.498**	**0.617**	**1.782**	**0.012**	**0.097**	**0.071**	**1243.400**

Notes:
Emission factors for all pollutants are from USAF IERA 2013.
Emission factors are from Tables 5-11 for the 2015 calendar year, high altitude (USAF IERA 2013).

HDDV Haul Truck Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**561.251**	**138.628**	**400.380**	**2.696**	**21.794**	**15.952**	**279367.529**
tons	**0.281**	**0.069**	**0.200**	**0.001**	**0.011**	**0.008**	**139.684**

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html.

Assumptions:
Passenger vehicle emission factors for scenario year 2015 are used.

The average roundtrip commute for a construction worker =	30	miles
Number of construction days =	240	days
Number of construction workers (daily) =	30	people

Passenger Vehicle Emission Factors for Year 2015 (lbs/mile)

NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
0.00060188	0.00066355	0.00614108	0.00001070	0.00009259	0.00006015	1.10192837

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>. Accessed 10 May 2013.
Notes:
The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
lbs	**130.005**	**143.326**	**1326.473**	**2.312**	**19.999**	**12.992**	**238016.529**
tons	**0.065**	**0.072**	**0.663**	**0.001**	**0.010**	**0.006**	**119.008**

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

South Central Coast Air Basin

			All Emission Sources					
Row #	State	County	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
1	CO	Adams	66,166.23	26,263.59	15,754.51	4,113.54	7,737.02	19,333.51
2	CO	Arapahoe	81,600.76	12,367.17	14,903.74	2,946.89	257.86	17,198.71
3	CO	Boulder	45,011.54	10,596.07	5,430.68	1,352.87	916.72	19,013.11
4	CO	Clear Creek	11,912.27	1,885.71	2,655.93	610.36	17.25	6,297.05
5	CO	Denver	93,351.26	21,309.92	13,878.24	2,743.43	3,261.35	17,554.47
6	CO	Douglas	43,182.53	7,519.29	5,067.58	1,219.57	145.18	18,030.73
7	CO	Gilpin	2,100.91	515.19	477.55	155.45	6.26	4,251.82
8	CO	Jefferson	83,780.29	14,521.39	10,407.51	2,523.01	2,897.01	26,467.27
Grand Total			427,105.80	94,978.34	68,575.73	15,665.11	15,238.66	128,146.68

SOURCE:
http://neibrowser.epa.gov/eis-public-web/home.html
USEPA National Emissions Inventory (NEI)

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APPENDIX C

PLANT SPECIES RECORDED ON SITE

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Appendix C
Plant Species Recorded On Site

Scientific Binomial (Synonym)	Common Name
Xeric Mixed Grasslands	
Asclepias pumila	Plains milkweed
Yucca glauca	Yucca
Allium textile	Wild onion
Eremogone fendleri	Desert sandwort
Paronychia jamesii	James' nailwort
Amaranthus retroflexus	Redroot pigweed
Rhus aromatica var. trilobata	Skunkbrush
Harbouria trachypleura	Whisk broom parsley
Lomatium orientale	Lomatium
Apocynum cannabinum	Indian hemp
Asclepias speciosa	Showy milkweed
Achillea lanulosa	Yarrow
Acosta diffusa (Centaurea diffusa)	Diffuse knapweed
Ambrosia psilostachya	Western ragweed
Anaphalis margaritace	Pearly everlasting
Antennaria rosea	Pussytoes
Arnica fulgens	Arnica
Artemisia campestris	Field sagewort
Artemisia frigida	Fringed sagebrush
Artemisia ludoviciana	Prairie sagewort
Aster ericoides	White aster
Aster porteri	White aster
Breea arvensis (Circium arvense)	Canada thistle
Brickellia eupatorioides *Carduus nutans*	Brickellia Musk thistle
Chrysothamnus nauseosus	Rubber rabbitbrush
Cichorium intybus	Chicory
Cirsium undulatum	Wavyleaf thistle
Cirsium vulgare	Bull thistle
Conyza canadensis	Horseweed
Erigeron divergens	Spreading fleabane
Gaillardia aristata	Blanketflower
Grindelia squarrosa	Curlycup gumweed
Gutierrezia sarothrae	Broom snakeweed
Helianthus annuus	Common sunflower

Scientific Binomial (Synonym)	Common Name
Helianthus petiolaris	Prairie sunflower
Helianthus rigidus	Stiff sunflower
Lactuca serriola	Prickly lettuce
Liatris punctata	Dotted gayfeather
Oligosporus dracunculus (Artemisia dracunculus)	Wild tarragon
Ratibida columnifera	Prairie coneflower
Senecio crassulus	Butterweed
Senecio integerrimus	Groundsel
Senecio spartioides	Groundsel
Solidago missouriensis	Prairie goldenrod
Solidago mollis	Soft goldenrod
Solidago nana	Goldenrod
Taraxacum officinale	Common dandelion
Townsendia hookeri	Easter daisy
Tragopogon dubius	Goatsbeard
Cynoglossum officinale	Houndstongue
Lithospermum incisum	Narrowleaf gromwell
Oreocarya virgata (Cryptantha virgata)	Miner's candle
Alyssum alyssoides	Pale alyssum
Cardaria draba	Whitetop
Erysimum capitatum	Western wallflower
Lesquerella ludoviciana	Bladderpod
Sisymbrium altissimum	Tumbling mustard
Coryphantha missouriensis	Yellow pincushion
Echinocereus viridiflorus	Hen-and-chicks
Opuntia fragilis	Brittle cactus
Opuntia macrorhiza	Plains prickly pear
Calochortus gunnisonii	Mariposa lily
Symphoricarpos occidentalis	Western snowberry
Bassia sieversiana (Kochia scoparia)	Kochia
Chenopodium album	Common lambsquarters
Kochia scoparia (Bassia sieversiana)	Summer cypress
Convolvulus arvensis	Field bindweed
Carex brevior	Sedge
Carex filifolia	Thread -leafed sedge
Tithymalus brachyceras	Spurge
Ephorbia esula	Leafy spurge
Tithymalus montanus	Spurge
Astragalus crassicarpus	Groundplum milkvetch

Scientific Binomial (Synonym)	Common Name
Astragalus mollissimus	Wooly locoweed
Astragalus sp.	Locoweed
Dalea purpurea (Petalostemon purpurea)	Purple prairie clover
Glycyrrhiza lepidota	American licorice
Lupinus argenteus	Silver lupine
Melilotus albus	White sweetclover
Melilotus officinalis	Yellow sweetclover
Oxytropis lambertii	Lambert locoweed
Psoralidium tenuiflora	Slimflower scurfpea
Thermopsis rhombifolia	Prairie goldenpea
Pneumonanthe affinis (Gentiana affinis)	Bottle gentian
Erodium cicutarium	Filaree
Delphinium nuttallianum	Blue larkspur
Phacelia heterophylla (Phacelia hastata var. leucophylla)	Scorpioweed
Hypericum perforatum	St. Johnswort
Iris missouriensis	Wild iris
Juncus sp.	Rush
Leucocrinum montanum	Sand lily
Linum lewisii	Perennial flax
Sphaeralcea coccinea	Scarlet globemallow
Toxicoscordion venenosum (Zigadenus venenosus)	Death camass
Calylophus serrulatus	Shrubby evening-primrose
Gaura coccinea	Scarlet gaura
Oenothera howardii (Oenothera brachycarpa)	Evening-primrose
Aphyllon fasciculatum (Orobanche fasciculata)	Broomrape
Oxalis dillenii	Woodsorrel
Argemone polyanthemos	Prickly poppy
Pinus ponderosa	Ponderosa pine
Plantago lanceolata	English plantain
Agropyron cristatum	Crested wheatgrass
Agrostis scabra	Ticklegrass
Andropogon gerardii	Big bluestem
Anisantha tectorum (Bromus tectorum)	Cheatgrass
Aristida purpurea (Aristida purpurea var. robusta)	Red three-awn
Bouteloua curtipendula	Side-oats grama
Bromopis inermis (Bromus inermis)	Smooth bromegrass
Buchloë dactyloides	Buffalograss
Chondrosum gracile (Bouteloua gracilis)	Blue grama
Dactylis glomerata	Orchard grass

Scientific Binomial (Synonym)	Common Name
Elymus canadensis	Canada wild rye
Elymus trachycaulus (Agropyron caninum ssp. majus)	Slender wheatgrass
Koeleria macrantha (Koeleria pyramidata)	Junegrass
Lophopyrum elongatum (Agropyron elongatum)	Tall wheatgrass
Muhlenbergia montana	Mountain muhly
Oryzopsis hymenoides	Indian ricegrass
Panicum capillare	Witchgrass
Panicum virgatum	Switchgrass
Pascopyrum smithii (Agropyron smithii)	Western wheatgrass
Pleum pratense	Common timothy
Poa compressa	Canada bluegrass
Poa pratensis	Kentucky bluegrass
Poa secunda (Poa canbyi)	Canby bluegrass
Schizachyrium scoparium (Andropogon scoparius)	Little bluestem
Sorghastrum nutans	Indian-grass
Sporobolus cryptandrus	Sand dropseed
Stipa comata	Needle-and-thread
Stipa viridula	Green needlegrass
Ipomopsis spicata	Ipomopsis
Eriogonum alatum	Winged eriogonum
Eriogonum sp.	Wild buckwheat
Eriogonum umbellatum	Wild buckwheat
Pterogonum alatum (Erigeron alatum)	Winged buckwheat
Rumex crispus	Curly dock
Talinum parviflorum	Prairie fameflower
Crataegus erythropoda	Hawthorn
Potentilla hippiana	Wooly cinquefoil
Potentilla recta	Sulfur cinquefoil
Rosa sayi (Rosa acicularis)	Prickly wild rose
Rosa woodsii	Woods rose
Commandra umbellata	Bastard-toadflax
Castilleja sessiliflora	Downy paintbrush
Linaria genistifolia subsp. dalmatica (Linaria dalmatica)	Dalmatian toadflax
Penstemon virgatus	Penstemon
Verbascum blattaria	Moth mullein
Verbascum thapsus	Common mullein
Verbena bracteata	Prostrate verbena
Viola nuttallii	Yellow prairie violet
Mesic Mixed Grassland	
Allium textile	Wild onion

Scientific Binomial (Synonym)	**Common Name**
Acosta diffusa (Centaurea diffusa)	Diffuse knapweed
Ambrosia psilostachya	Western ragweed
Artemisia ludoviciana	Prairie sagewort
Aster porteri	White aster
Breea arvensis (Cirsium arvense)	Canada thistle
Carduus nutans	Musk thistle
Cirsium undulatum	Wavyleaf thistle
Gaillardia aristata	Blanketflower
Lactuca serriola	Prickly lettuce
Liatris punctata	Dotted gayfeather
Ratibida columnifera	Prairie coneflower
Tragopogon dubius	Salsify
Lithospermum arvense	Corn gromwell
Lesquerella ludoviciana	Bladderpod
Thlaspi arvense	Fanweed
Convolvulus arvensis	Field bindweed
Eleocharis palustris	Spikerush
Melilotus officinalis	Yellow sweetclover
Psoralidium tenuiflora	Slimflower scurfpea
Pneumonanthe affinis (Gentiana affinis)	Bottle gentian
Phaceelia heterophylla (Phacelia hastata var. leucophylla)	Scorpionweed
Hypericum perforatum	St. Johnswort
Agrostis gigantea (Agrostis alba)	Redtop
Andropogon gerardii	Big bluestem
Bouteloua curtipendula	Side-oats grama
Bromopis inermis (Bromus inermis)	Smooth bromegrass
Koeleria macrantha (Koeleria pyramidata)	Junegrass
Muhlenbergia montana	Mountain muhly
Panicum virgatum	Switchgrass
Pascopyrum smithii (Agropyron smithii)	Western wheatgrass
Poa compressa	Canada bluegrass
Poa fendleriana	Muttongrass
Poa pratensis	Kentucky bluegrass
Polypogon monspeliensis	Rabbitfoot grass
Schizachyrium scoparium (Andropogon scoparius)	Little bluestem
Sorghastrum nutans	Indian-grass
Ranunculus sp.	Buttercup
Geum aleppicum	Avens
Rosa sayi (Rosa acicularis)	Prickly wild rose

Scientific Binomial (Synonym)	Common Name
Commandra umbellata	Bastard-toadflax
Verbascum thapsis	Common mullein
Veronica peregrina	Purslane speedwell
Typha latifolia	Common cattail
Ponderosa Pine Woodland	
Yucca glauca	Yucca
Allium textile	Wild onion
Cerastrium strictum	Mouse-ear
Eremogone fendleri	Desert sandwort
Eremogone hookeri (Arenaria hookeri)	Desert sandwort
Paronychia jamesii	James' nailwort
Rhus aromatica var. trilobata	Skunkbrush
Toxicodendron rydbergii	Poison ivy
Harbouria trachypleura	Whisk broom parsley
Apocynum cannabinum	Indian hemp
Achillea lanulosa	Yarrow
Acosta diffusa (Centaurea diffusa)	Diffuse knapweed
Ambrosia psilostachya	Western ragweed
Antennaria rosea	Pussytoes
Artemisia absinthium	Wormwood
Artemisia ludoviciana	Prairie sagewort
Aster ericoides	White aster
Brickellia eupatorioides	Brickellia
Breea arvensis (Cirsium arvense)	Canada thistle
Cirsium undulatum	Wavyleaf thistle
Grindelia revoluta	Gumweed
Grindelia squarrosa	Curlycup gumweed
Gutierrezia sarothrae	Broom snakeweed
Heterotheca villosa (Chrysopsis villosa)	Hairy golden aster
Lactuca serriola	Prickly lettuce
Liatris punctata	Dotted gayfeather
Oligosporus dracunculus (Artemisia dracunculus)	Wild tarragon
Senecio crassulus	Butterweed
Senecio spartioides	Groundsel
Solidago mollis	Soft goldenrod
Taraxacum officinale	Common dandelion
Cynoglossum officinale	Houndstongue
Lithospermum incisum	Narrowleaf gromwell
Alyssum alyssoides	Pale alyssum
Erysimum capitatum	Western wallflower

Scientific Binomial (Synonym)	Common Name
Coryphantha vivipara var. vivipara	Nipple cactus
Echinocereus viridiflorus	Hen-and-chicks
Opuntia macrorhiza	Plains prickly pear
Opuntia polyacantha	Plains prickly pear
Campanula rotundifolia	Common harebell
Symphoricarpos occidentalis	Western snowberry
Townsendia hookeri	Easter daisy
Chenopodium album	Common lambsquarters
Convolvulus arvensis	Field bindweed
Carex brevior	Sedge
Carex filifolia	Thread-leafed sedge
Carex sp.	Sedge
Astragalus mollissimus	Wooly locoweed
Dalea purpurea (Petalostemon purpurea)	Purple prairie clover
Lupinus argenteus	Silver lupine
Oxytropis lambertii	Lambert locoweed
Psoralidium tenuiflora	Slimflower scurfpea
Thermopsis rhombifolia	Prairie goldenpea
Frasera speciosa	Monument plant
Pneumonanthe affinis (Gentiana affinis)	Bottle gentian
Geranium caespitosum	Wild geranium
Geranium viscosissimum	Sticky geranium
Ribes aureum	Golden current
Ribes cereum	Wax current
Delphinium nuttallianum	Blue larkspur
Phacelia heterophylla (Phacelia hastata)	Scorpioweed
Hypericum perforatum	St. Johnswort
Monarda fistulosa	Bee balm
Leucocrinum montanum	Sand lily
Calylophus serrulatus	Shrubby eveningprimrose
Oenothera coronopifolia	Combleaf eveningprimrose
Oxalis dillenii	Woodsorrel
Pinus ponderosa	Ponderosa pine
Pseudotsuga menziesii	Douglas-fir
Agropyron cristatum	Crested wheatgrass
Agrostis scabra	Ticklegrass
Andropogon gerardii	Big bluestem
Anisantha tectorum (Bromus tectorum)	Cheatgrass
Aristida purpurea	Three-awn
Bouteloua curtipendula	Side-oats grama

Scientific Binomial (Synonym)	Common Name
Bromopis inermis (Bromus inermis)	Smooth bromegrass
Chondrosum gracile (Bouteloua gracilis)	Blue grama
Critesion jubatum (Hordeum jubatum)	Foxtail barley
Elymus elymoides (Sitanion hystrix)	Bottletail squirreltail
Hesperostipa comata (Stipa comata)	Needle-and-thread
Koeleria macrantha (Koeleria pyramidata)	Junegrass
Muhlenbergia 10ontana	Mountain muhly
Nassella viridula Stipa viridula	Green needlegrass
Pascopyrum smithii Agropyron smithii	Western wheatgrass
Poa compressa	Canada bluegrass
Poa pratensis	Kentucky bluegrass
Schizachyrium scoparium (Andropogon scoparius)	Little bluestem
Pulsatilla patens Anemone patens	Pasque flower
Amelanchier utahensis	Serviceberry
Cerasus pumila subsp. besseyi (Prunus pumila var. bessyi)	Sand cherry
Crataegus erythropoda	Hawthorn
Drymocallis fissa (Potentilla fissa)	Cinquefoil
Oreobatus deliciosus (Rubus deliciousus)	Boulder raspberry
Padus virginiana (Prunus virginiana)	Chokecherry
Potentilla hippiana	Wooly cinquefoil
Potentilla ovina	Potentilla
Potentilla recta	Sulfur cinquefoil
Rosa arkansana	Prairie rose
Rosa woodsii	Woods rose
Galium aparine	Catchweed bedstraw
Galium septentrionale	Northern bedstraw
Commandra umbellata	Bastard-toadflax
Penstemon secundiflorus	Penstemon
Penstemon virgatus	Penstemon
Verbascum blattaria	Moth mullein
Verbascum thapsus	Common mullein
Viola nuttallii	Yellow prairie violet
Upland Shrubland	
Cerastrium strictum	Mouse-ear
Eremogone fendleri	Desert sandwort
Paronychia jamesii	James' nailwort
Rhus aromatica var. trilobata	Skunkbrush
Toxicodendron rydbergii	Poison ivy
Lomatium orientale	Lomatium

Scientific Binomial (Synonym)	Common Name
Achillea lanulosa	Yarrow
Acosta diffusa (Centaurea diffusa)	Diffuse knapweed
Ambrosia psilostachya	Western ragweed
Antennaria rosea	Pussytoes
Artemisia frigida	Fringed sagebrush
Artemisia ludoviciana	Prairie sagewort
Aster porteri	White aster
Carduus nutans	Musk thistle
Cirsium undulatum	Wavyleaf thistle
Gallardia aristata	Blanketflower
Grindelia squarrosa	Curlycup gumweed
Gutierrezia sarothrae	Broom snakeweed
Helianthus rigidus	Stiff sunflower
Heterotheca villosa (Chrysopsis villosa)	Hairy golden aster
Lactuca serriola	Prickly lettuce
Liatris punctata	Dotted gayfeather
Oligosporus dracunculus (Artemisia dracunculus)	Wild tarragon
Senecio crassulus	Butterweed
Solidago missouriensis	Prairie goldenrod
Solidago mollis	Soft goldenrod
Solidago speciosa var. pallida	Goldenrod
Tragopogon dubius	Goatsbeard
Cynoglossum officinale	Houndstongue
Alyssum sp.	Alyssum
Erysimum capitatum	Western wallflower
Sisymbrium altissimum	Tumbling mustard
Echinocereus viridiflorus	Hen-and-chicks
Opuntia polyacantha	Plains prickly pear
Campanula rotundifolia	Common harebell
Symphoricarpos occidentalis	Western snowberry
Bassia sieversiana (Kochia scoparia)	Kochia
Carex brevior	Sedge
Carex filifolia	Thread-leafed sedge
Euphorbia esula	Leafy spurge
Dalea purpurea (Petalostemon purpurea)	Purple prairie clover
Oxytropis lambertii	Lambert locoweed
Psoralidium tenuiflora	Slimflower scurfpea
Thermopsis divaricarpa	Prairie goldenpea
Pneumonanthe affinis (Gentiana affinis)	Bottle gentian
Ribes cereum	Wax current

Scientific Binomial (Synonym)	Common Name
Delphinium nuttallianum	Blue larkspur
Hypericum perforatum	St. Johnswort
Leucocrinum montanum	Sand lily
Linum lewisii	Perennial flax
Calylophus serrulatus	Shrubby evening-primrose
Pinus ponderosa	Ponderosa pine
Andropogon gerardii	Big bluestem
Anisantha tectorum (Bromus tectorum)	Cheatgrass
Bromopis inermis (Bromus inermis)	Smooth bromegrass
Bouteloua curtipendula	Side-oats grama
Chondrosum gracile (Bouteloua gracilis)	Blue grama
Critesion jubatum (Hordeum jubatum)	Foxtail barley
Elymus canadensis	Canada wild rye
Elymus elymoides (Sitonion hystrix)	Bottlebrush squirreltail
Hesperostipa comata (Stipa comata)	Needle-and-thread
Koeleria macrantha (Koeleria pyramidata)	Junegrass
Muhlenbergia montana	Mountain muhly
Nassella viridula (Stipa viridula)	Green needlegrass
Pascopyrum smithii (Agropyron smithii)	Western wheatgrass
Poa compressa	Canada bluegrass
Poa pratense	Kentucky bluegrass
Schizachyrium scoparium (Andropogon scoparius)	Little bluestem
Sorghastrum nutans	Indian-grass
Eriogonum umbellatum	Wild buckwheat
Pterogonum alatum (Erigeron alatum)	Winged buckwheat
Amelanchier utahensis	Serviceberry
Cerasus pumila subsp. besseyi (Prunus pumila var. bessyi)	Sand cherry
Crataegus erythropoda	Hawthorn
Padus virginiana (Prunus virginiana)	Chokecherry
Potentilla ovina	Potentilla
Potentilla recta	Sulfur cinquefoil
Prunus americana	Wild plum
Rosa arkansana	Prairie rose
Rosa woodsii	Woods rose
Commandra umbellata	Bastard-toadflax
Castilleja sessiliflora	Downy paintbrush
Linerea genestifolia subsp. dalmatica (Linerea dalmatica)	Dalmatian toadflax
Penstemon secundiflorus	Penstemon
Penstemon virgatus	Penstemon

Scientific Binomial (Synonym)	Common Name
Verbascum thapsus	Common mullein
Palustrine Emergent Wetland	
Breea arvensis (Cirsium arvense)	Canada thistle
Cardamine breweri	Bittercress
Neolepia campestre (Lepidium campestre)	Fieldcress
Symphoricarpos occidentalis	Western snowberry
Carex nebrascensis	Nebraska sedge
Eleocharis palustris	Spikerush
Scirpus pallidus	Bulrush
Juncus arcticus	Rush
Juncus balticus	Baltic rush
Juncus effusus	Rush
Juncus longistylis	Rush
Juncus tenuis	Rush
Juncus torreyi	Torrey's rush
Marrubium vulgare	Horehound
Mentha arvensis	Fieldmint
Epilobium cilatum	Willow herb
Oenothera villosa	Common evening-primrose
Andropogon gerardii	Big bluestem
Anisantha tectorum (Bromus tectorum)	Cheatgrass
Critesion jubatum (Hordeum jubatum)	Foxtail barley
Koeleria macrantha (Koeleria pyramidata)	Junegrass
Pascopyrum smithii (Agropyron smithii)	Western wheatgrass
Poa compressa	Canada bluegrass
Poa pratensis	Kentucky bluegrass
Polypogon monspeliensis	Rabbitfoot grass
Schizachyrium scoparium (Andropogon scoparius)	Little bluestem
Geum aleppicum	Yellow avens
Padus virginiana subsp. melanocarpa (Prunus virginiana)	Chokecherry
Galium aparine	Catchweed bedstraw
Populus angustifolia	Narrowleaf cottonwood
Salix amygdaloides	Peach-leaf willow
Salix exigua	Sandbar willow
Veronica peregrina	Purslane speedwell
Typha latifolia	Common cattail
Typha angustifolia	Narrow-leaved cattail
Riparian Fringe Wetland	
Lomatium orientale	Lomatium

Scientific Binomial (Synonym)	**Common Name**
Asclepias speciosa	Showy milkweed
Achillea lanulosa	Yarrow
Acosta diffusa (Centaurea diffusa)	Diffuse knapweed
Ambrosia psilostachya	Western ragweed
Ambrosia trifida	Giant ragweed
Arnica fulgens	Arnica
Artemisia ludoviciana (Populus deltoides)	Prairie sagewort
Aster ericoides	White aster
Breea arvensis (Cirsium arvense)	Canada thistle
Brickellia eupatorioides	Brickellia
Carduus nutans	Musk thistle
Cichorium intybus	Chicory
Conyza canadensis	Horseweed
Erigeron divergens	Spreading fleabane
Gaillardia aristata	Blanketflower
Grindelia squarrosa	Curlycup gumweed
Helianthus annuus	Common sunflower
Heterotheca villosa (Chrysopsis villosa)	Hairy golden aster
Lactuca serriola	Prickly lettuce
Liatris punctata	Dotted gayfeather
Onopordum acanthium	Scotch thistle
Ratibida columnifera	Prairie coneflower
Senecio crassulus	Butterweed
Senecio integerrimus	Grounsel
Solidago missouriensis	Prairie goldenrod
Tragopogon dubius	Goatsbeard
Cynoglossum officinale	Houndstongue
Nasturtium officinale	Watercress
Alyssum minus	Alyssum
Neolepia campestre (Lepidium campestre)	Fieldcress
Noccaea montana	Wild candytuft
Rorippa sinuata	Spreading yellowcress
Sisymbrium altissimum	Tall tumblemustard
Thlaspi arvense	Field pennycress (Fanweed)
Opuntia macrorhiza	Plains prickly pear
Campanula rotundifolia	Common harebell
Lobelia siphilitica	Blue cardinal flower
Symphoricarpos occidentalis	Western snowberry
Saponaria officinalis	Bouncing Bet
Bassia sieversiana (Kochia scoparia)	Kochia

Scientific Binomial (Synonym)	Common Name
Chenopodium album	Common lambsquarters
Tradescantia occidentalis	Spiderwort
Maianthemum stellatum (Smilacina stellata)	False solomon's seal
Convolvulus arvensis	Field bindweed
Carex hystricina	Sedge
Carex languinosa	Sedge
Carex nebrascensis	Nebraska sedge
Carex utriculata (Carex rostrata)	Sedge
Eleocharis palustris	Spikerush
Dalea purpurea (Petalostemon purpurea)	Purple prairie clover
Glycyrrhiza lepidota	American licorice
Lupinus argenteus	Silver lupine
Medicago sativa	Alfalfa
Melilotus officinalis	Yellow sweetclover
Psoralidium tenuiflora	Slimflower scurfpea
Thermopsis rhombifolia	Prairie goldenpea
Ribes aureum	Golden current
Phacelia heterophylla (Phacelia hastata)	Scorpionweed
Hypericum perforatum	St. Johnswort
Iris missouriensis	Wild iris
Juncus nodosus	Knotted rush
Carex simulata	Rush
Juncus articulates	Rush
Juncus balticus	Baltic rush
Juncus bufonius	Toad rush
Juncus effusus	Rush
Juncus ensifolius	Rush
Juncus longistylis	Rush
Juncus sp.	Rush
Marrubium vulgare	Horehound
Mentha arvensis	Fieldmint
Monarda fistulosa	Bee balm
Nepeta cataria	Catnip
Lemna turionifera	Duckweed
Calylophus serrulatus	Shrubby evening-primrose
Epilobium cilatum	Willow herb
Gaura parviflora	Smallflower gaura
Oenothera villosa	Common eveningprimrose
Oxalis dillenii	Woodsorrel
Argemone polyanthemos	Prickly poppy

Scientific Binomial (Synonym)	**Common Name**
Pinus ponderosa	Ponderosa pine
Plantago lanceolata	English plantain
Plantago major	Common plantain
Agropyron cristatum	Crested wheatgrass
Agrostis gigantea (Agrostis alba)	Redtop
Agrostis scabra	Ticklegrass
Andropogon gerardii	Big bluestem
Anisantha tectorum (Bromus tectorum)	Cheatgrass
Bromopis inermis (Bromus inermis)	Smooth bromegrass
Buchloë dactyloides	Buffalograss
Critesion jubatum (Hordeum jubatum)	Foxtail barley
Dactylis glomerata	Orchard grass
Danthonia spicata	Poverty oatgrass
Elymus trachycaulus (Agropyron caninum)	Slender wheatgrass
Festuca pratensis	Meadow fescue
Glyceria grandis	Tall mannagrass
Glyceria striata	Fowl mannagrass
Hesperostipa comata (Stipa comata)	Needle-and-thread
Koeleria macrantha (Koeleria pyramidata)	Junegrass
Lophopyrum elongatum (Agropyron elongatum)	Tall wheatgrass
Muhlenbergia filiformis	Pull-up muhly
Muhlenbergia montana	Mountain muhly
Panicum virgatum	Switchgrass
Elymus canadensis	Canada wild rye
Pascopyrum smithii (Agropyron smithii)	Western wheatgrass
Phleum pratense	Common Timothy
Poa compressa	Canada bluegrass
Poa fendleriana	Muttongrass
Poa pratensis	Kentucky bluegrass
Schizachyrium scoparium (Andropogon scoparius)	Little bluestem
Sorghastrum nutans	Indian-grass
Spartina pectinata	Prairie cordgrass
Sporobolus airoides	Alkaline sacatone
Sporobolus cryptandrus	Sand dropseed
Rumex crispus	Curly dock
Clematis ligusticifolia	Virgin's bower
Agrimonia striata	Agripmony
Geum macrophyllum	Large-leaved avens
Padus virginiana (Prunus virginiana)	Chokecherry
Potentilla hippiana	Wooly cinquefoil

Scientific Binomial (Synonym)	Common Name
Potentilla recta	Sulfur cinquefoil
Rosa sayi (Rosa acicularis)	Prickly wild rose
Galium aparine	Catchweed bedstraw
Populus deltoides	Plains cottonwood
Salix alba var. vitellina	Golden osier
Salix amygdaloides	Peach-leaf willow
Salix exigua	Sandbar willow
Salix fragilis	Crack willow
Verbascum blattaria	Moth mullein
Verbascum thapsus	Common mullein
Mimulus glabratus	Monkeflower
Veronica peregrina	Purslane speedwell
Typha angustifolia	Narrow-leaved cattail
Typha latifolia	Common cattail
Groundwater Seep Wetland	
Apocynum cannabinum	Indian hemp
Asclepias speciosa	Showy milkweed
Arnica fulgens	Arnica
Acosta diffusa (Centaurea diffusa)	Diffuse knapweed
Aster adscendens (Aster chilensis)	Aster
Breea arvensis (Cirsium arvense)	Canada thistle
Carduus nutans	Musk thistle
Helianthus annuus	Common sunflower
Solidago serotinoides	Goldenrod
Xanthium strumarium	Cocklebur
Cynoglossum officinale	Houndstongue
Symphoricarpos occidentalis	Western snowberry
Bassia sieversiana (Kochia scoparia)	Kochia
Carex languinosa	Sedge
Carex nebrascensis	Nebraska sedge
Carex utriculata (Carex rostrata)	Sedge
Dipsacus fullonum (Dipsacus sylvestris)	Common teasel
Hippochaete laevigata (Equisetum laevigatum)	Smooth scouring rush
Amorpha fruticosa	False indigo
Glycyrrhiza lepidota	American licorice
Melilotus albus	White sweetclover
Melilotus officinalis	Yellow sweetclover
Hypericum perforatum	St. Johnswort
Iris missouriensis	Wild iris
Juncus balticus	Baltic rush

Scientific Binomial (Synonym)	Common Name
Juncus effusus	Rush
Marrubium vulgare	Horehound
Mentha arvensis	Fieldmint
Oenothera villosa	Common evening-primrose
Plantago lanceolata	English plantain
Agrostis gigantea (Agrostis alba)	Redtop
Bromopis inermis (Bromus inermis)	Smooth bromegrass
Critesion jubatum (Hordeum jubatum)	Foxtail barley
Dactylis glomerata	Orchard grass
Nasselaa viridula (Stipa viridula)	Green needlegrass
Panicum capillare	Witchgrass
Panicum virgatum	Switchgrass
Pascopyrum smithii (Agropyron smithii)	Western wheatgrass
Poa compressa	Canada bluegrass
Poa pratensis	Kentucky bluegrass
Spartina pectinata	Prairie cordgrass
Geum macrophyllum	Large-leaved avens
Prunus americana	Wild plum
Rosa sayi (Rosa acicularis)	Prickly wild rose
Rosa woodsii	Woods rose
Salix exigua	Sandbar willow
Verbascum blattaria	Moth mullein
Verbascum thapsus	Common mullein
Typha angustifolia	Narrow-leaved cattail
Typha latifolia	Common cattail
Seasonal Pond	
Achillea lanulosa	Yarrow
Acosta diffusa (Centaurea diffusa)	Diffuse knapweed
Ambrosia psilostachya	Western ragweed
Aster porteri	White aster
Breea arvensis (Cirsium arvense)	Canada thistle
Conyza canadensis	Horseweed
Erigeron divergens	Spreading fleabane
Grindelia squarrosa	Curlycup gumweed
Helianthus annuus	Common sunflower
Lactuca serriola	Prickly lettuce
Oligosporus campestris (Artemisia campestris)	Western sagewort
Xanthium strumarium	Cocklebur
Alyssum minus	Alyssum
Descurainia sp.	Tansy mustard

Scientific Binomial (Synonym)	Common Name
Neolepia campestre (Lepidium campestre)	Fieldcress
Sisymbrium altissimum	Tumbling mustard
Thlaspi arvense	Fanweed
Calochortus gunnisonii	Mariposa lily
Carex nebrascensis	Nebraska sedge
Carex utriculata (Carex rostrata)	Sedge
Eleocharis palustris	Spikerush
Dalea purpurea (Petalostemon purpurea)	Purple prairie clover
Glycyrrhiza lepidota	American licorice
Erodium cicutarium	Filaree
Juncus balticus	Baltic rush
Juncus effusus	Rush
Agropyron cristatum	Crested wheatgrass
Anisantha tectorum (Bromus tectorum)	Cheatgrass
Bromopsis inermis (Bromus inermis)	Smooth brome
Critesion jubatum (Hordeum jubatum)	Foxtail barley
Distichlis spicata	Salt-grass
Koeleria macrantha (Koeleria pyramidata)	Junegrass
Pascopyrum smithii (Agropyron smithii)	Western wheatgrass
Poa compressa	Canada bluegrass
Poa pratensis	Kentucky bluegrass
Persicaria 21aculate (Polygonum persicaria)	Lady's thumb
Persicaria pennsylvanica (Polygonum pennsylcanicum)	Pennsylvania smartweed
Rumex crispus	Curly dock
Agrimonia striata	Agrimony
Verbascum blattaria	Moth mullein
Typha angustifolia	Narrow-leaved cattail
Typha latifolia	Common cattail
Disturbed	
Yucca glauca	Yucca
Paronychia jamesii	James' nailwort
Amaranthus retroflexus	Redroot pigweed
Lomatium orientale	Lomatium
Apocynum cannabinum	Indian hemp
Asclepias speciosa	Showy milkweed
Achillea lanulosa	Yarrow
Acosta diffusa (Centaurea diffusa)	Diffuse knapweed
Ambrosia psilostachya	Western ragweed
Artemisia frigida	Fringed sagebrush
Artemisia ludoviciana	Prairie sagewort

Scientific Binomial (Synonym)	**Common Name**
Aster ericoides	White aster
Breea arvensis (Cirsium arvense)	Canada thistle
Carduus nutans	Musk thistle
Centaurea maculosa	Spotted knapweed
Cichorium intybus	Chicory
Conyza canadensis	Horseweed
Dyssodia papposa	Fetid marigold
Erigeron divergens	Spreading fleabane
Grindelia squarrosa	Curlycup gumweed
Gutierrezia sarothrae	Broom snakeweed
Helianthus annuus	Common sunflower
Lactuca serriola	Prickly lettuce
Liatris punctata	Dotted gayfeather
Ratibida columnifera	Prairie coneflower
Solidago spathulata	Goldenrod
Sonchus arvensis	Field sow thistle
Taraxacum officinale	Common dandelion
Xanthium strumarium	Cocklebur
Lithospermum incisum	Narrowleaf gromwell
Alyssum alyssoides	Pale alyssum
Cardaria draba	Whitetop
Sisymbrium altissimum	Tumbling mustard
Bassia sieversiana (Kochia scoparia)	Kochia
Chenopodium murale	Nettleleaf goosefoot
Kochia scoparia (Bassia sieversiana)	Summer cypress
Salsola australis (Salsola iberica)	Russian-thistle
Salsola iberica	Russian-thistle
Teloxys botrys	Woordseed
Convolvulus arvensis	Field bindweed
Carex brevior	Sedge
Chamaesyce glyptosperma (Euphorbia glyptosperma)	Ridgeseed spurge
Euphorbia esula	Leafy spurge
Tithymalus brachyceras	Spurge
Astragalus cicer	Cicer milkvetch
Medicago sativa	Alfalfa
Melilotus albus	White sweetclover
Melilotus officinalis	Yellow sweetclover
Oxytropis lambertii	Lambert locoweed
Psoralidium tenuiflora	Slimflower scurfpea
Trifolium pratense	Red clover

Scientific Binomial (Synonym)	**Common Name**
Hypericum perforatum	St. Johnswort
Juncus longistylis	Rush
Leucocrinum montanum	Sand lily
Linum lewisii	Perennial flax
Calylophus serrulatus	Shrubby evening-primrose
Gaura parviflora	Smallflower gaura
Oxalis dillenii	Woodsorrel
Plantago lanceolata	English plantain
Plantago major	Common plantain
Agropyron cristatum	Crested wheatgrass
Andropogon gerardii	Big bluestem
Anisantha tectorum (Bromus tectorum)	Cheatgrass
Aristida purpurea	Three-awn
Bouteloua curtipendula	Side-oats grama
Bromopis inermis (Bromus inermis)	Smooth bromegrass
Buchloë dactyloides	Buffalograss
Chondrosum gracile (Bouteloua gracilis)	Blue grama
Critesion jubatum (Hordeum jubatum)	Foxtail barley
Dactylis glomerata	Orchard grass
Echinochloa crusgalli	Barnyard grass
Elymus elymoides(Sitanion hystrix)	Bottletail squirreltail
Elymus trachycaulus (Agropyron caninum)	Slender wheatgrass
Elytrigia dasystachyum (Agropyron dasystachyum)	Thickspike wheatgrass
Eragrostis cilianensis	Stinkgrass
Festuca ovina	Sheep fescue
Hesperostipa comata (Stipa comata)	Needle-and-thread
Koeleria macrantha (Koeleria pyramidata)	Junegrass
Lophopyrum elongatum (Agropyron elongatum)	Tall wheatgrass
Muhlenbergia montana	Mountain muhly
Panicum capillare	Witchgrass
Panicum virgatum	Switchgrass
Pascopyrum smithii (Agropyron smithii)	Western wheatgrass
Poa compressa	Canada bluegrass
Poa fendleriana	Muttongrass
Poa pratensis	Kentucky bluegrass
Schizachyrium scoparium (Andropogon scoparius)	Little bluestem
Setaria viridis	Green floxtail
Sporobolus cryptandrus	Sand dropseed
Thinopyrum intermedium (Agropyrum intermedium)	Intermediate wheatgrass
Triticum aestivum	Wheat

Scientific Binomial (Synonym)	**Common Name**
Rumex crispus	Curly dock
Potentilla hippiana	Wooly cinquefoil
Rosa arkansana	Prairie rose
Commandra umbellata	Bastard-toadflax
Verbascum blattaria	Moth mullein
Verbascum thapsus	Common mullein
Leiostemon ambiguum	
Physalis virginiana	Virginia ground-cherry
Solanum rostratum	Buffalobur
Verbena bracteata	Prostrate verbena
Viola nuttallii	Yellow prairie violet

APPENDIX D

WILDLIFE SPECIES RECORDED IN THE VICINITY OF NWTC

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Appendix D
Wildlife Species Recorded in Vicinity

Common Name	Scientific Binomial
Mammals	
Thirteen-lined ground squirrel (burrows only)	*Spermophilus tridecemlineatus*
Deer Mouse	*Peromyscus maniculatus*
Mexican Woodrat	*Neotoma mexicana*
Prairie Vole	*Microtus ochrogaster*
Meadow Vole	*Microtus pennsylvanicus*
Western Harvest Mouse	*Reithrodontomys megalotis*
Desert cottontail	*Sylvilagus audubonii*
Masked Shrew	*Sorex cinereus*
Myotis bats* (acoustical monitoring)	*Myotis sp.*
Big brown bat acoustical monitoring)	*Eptesicus fuscus*
Fringed myotis (acoustical monitoring)	*Myotis thysanodes*
Silver-haired bat (acoustical monitoring)	*Lasionycteris noctivagans*
Hoary bat (acoustical monitoring)	*Lasiurus cinereus*
Eastern red bat (acoustical monitoring)	*Lasiurus borealis*
Coyote (scat only)	*Canis latrans*
American elk	*Cervus canadensis*
Mule deer (beds)	*Odocoileus hemionus*
Amphibians	
Boreal chorus frog	*Pseudacris maculata*
Woodhouse's toad (deceased)	*Bufo woodhousii*
Reptiles	
Bull snake (observed on road)	*Pituophis catenifer*
Terrestrial Arthropods	
Checkered white	*Pontia protodice*
Western white	*Pontia occidentalis*
Cabbage white	*Pieris rapae*
Orange sulphur	*Colias eurytheme*
Dainty sulphur	*Nathalis iole*
Gray hairstreak	*Strymon melinus*
Aphrodite fritillary	*Speyeria aphrodite*
Common wood nymph	*Cercyonis pegala*

*Included in this group may be one or more of the following species: western small-foot myotis, western long-eared myotis, little brown bat, and long-legged myotis.

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APPENDIX E

ENVIRONMENTAL PERMITS, NOTIFICATIONS, AND REGISTRATIONS

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APPENDIX E

ENVIRONMENTAL PERMITS, NOTIFICATIONS, AND REGISTRATIONS

NWTC site operations and/or implementation of the Proposed Action involve or may involve permits, notifications, and registrations of the types listed in NREL's Environmental Performance Report 2011 (NREL 2011). Additional project-specific permits may be associated with the Proposed Action. Both current and potential permits, notifications, and registrations are listed in the table below.

Environmental Permits, Notifications, and Registrations applicable to NWTC

Type	Location/ Description	Category	Issuing Agency	ID #	Permit or Registration Status
Current Site-Wide Permits, Notifications, and Registrations (NREL 2011)					
Air	Laboratory-wide servicing of CFC-containing equipment	Notification	CDPHE Air Pollution Control Division	647	Completed
Air	NWTC Site 4.0 diesel-fired emergency generator	Permit	CDPHE Air Pollution Control Division	10JE1712	Active
Drinking water system	NWTC drinking water system ID number	Registration	CDPHE Water Quality Control Division	CO0230860	In Effect; Does Not Expire
Hazardous waste	NWTC RCRA hazardous waste generator status EPA ID	Notification	CDPHE Hazardous Materials and Waste Management Division	COD983802448	Completed
Storm Water	NWTC pedestrian safety construction project	Permit	EPA	COR10ES2F	Active
Storm Water	NWTC dynamometer expansion construction project	Permit	EPA	COR10EP6F	Active
Storm Water	NWTC site entrance construction project	Permit	EPA	COR10E06F	Active
Potential Project-specific Permits, Notifications, and Registrations associated with Proposed Action					
Aboveground Tanks	Some aboveground tanks containing chemicals, oils, fuels, and other fluids require registration,	Registration	Colorado Department of Labor, Division of Oil and Public Safety	NA	NA

Type	Location/ Description	Category	Issuing Agency	ID #	Permit or Registration Status
Air	For fugitive construction dust, depending upon duration and area of disturbance	Permit	CDPHE Air Pollution Control Division	NA	NA
Air	For proposed standby generators, depending upon pollutants and emissions.	Permit	CDPHE Air Pollution Control Division	NA	NA
Air	For minor HAPs sources depending upon emissions	Permit	CDPHE Air Pollution Control Division	NA	NA
Airport height restrictions	New turbines and towers require coordination to address FAA requirements associated with Jefferson County Airport height restrictions and Form 7460–1, Notice of Proposed Construction or Alteration may be required.	Notification	FAA	NA	NA
Geology	Notification of Surface Development may be required to mineral estate owners	Notification	Jefferson County Clerk	NA	NA
Groundwater	For activities that could impact groundwater, e.g., drinking water, groundwater monitoring, or geothermal installations	Permit	State of Colorado Office of State Engineers	NA	NA
Storm Water	For construction sites, depending upon area disturbed. A Notice of Intent must be filed under the Construction General Permit.	Notification	EPA	NA	NA
Waste Management	Notification to DOE's emergency notification system is required for spills exceeding a reporting threshold.	Notification	DOE	NA	NA
Wetlands	Clean Water Act, Section 404 permits could be required for certain actions involving "wetlands" and other waters of the United States	Permit	USACE	NA	NA

Type	Location/ Description	Category	Issuing Agency	ID #	Permit or Registration Status
Wildlife	For activities that may affect a listed species, the agency is required to consult with the USFWS.	Consultation	USFWS	NA	NA
Wildlife	For "taking" of eagles, permit is required by Bald and Golden Eagle Protection Act	Permit	USFWS	NA	NA
Wildlife	For measurable negative impact on migratory birds, EO 13186 requires the responsible agency to consult with the USFWS and obtain a Migratory Bird Depredation Permit.	Permit	USFWS	NA	NA

Reference: NREL Environmental Performance Report 2011, Annual Site Environmental Report per the U.S. Department of Energy Order 231.1B

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APPENDIX F

CONSULTATION LETTERS

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Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

August 20, 2013

Donna Warren
Manager, Environmental Policy Team
AJV-114
Federal Aviation Administration
800 Independence Ave SW
Room 422
Washington, DC 20591

SUBJECT: NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION
PROPOSED IMPROVEMENTS FOR THE
DEPARTMENT OF ENERGY'S NATIONAL WIND TECHNOLOGY
CENTER AT THE NATIONAL RENEWABLE ENERGY LABORATORY,
GOLDEN, CO (DOE/EA-1914)

Dear Ms. Warren:

The U.S. Department of Energy (DOE) is notifying the Federal Aviation Administration (FAA), under the National Environmental Policy Act (NEPA), of the proposed improvements to the National Wind Technology Center (NWTC). The NWTC is located in Jefferson County, Colorado (Figure 1). The mailing address for the NWTC is 18299 West 20th Avenue, Louisville, CO 80027. DOE is completing a Site-Wide Environmental Assessment (EA) of the NWTC to include analysis of potential environmental impacts due to continued operations and future site development.

Background

Currently, four utility-scale turbines over 200 feet above ground level (AGL) are located at the NWTC. In addition, six meteorological towers over 199 feet AGL are onsite. Several other mid-scale and small-scale turbines exist onsite. For each structure, per the requirements outline in CFR Title 14 Part 77.9, a FAA Form 7460-1 (Notice of Proposed Construction or Alteration) was completed by NREL Environmental personnel and submitted to the FAA Obstruction Evaluation Group for a hazard determination. **Table 1** presents the existing turbines and meteorological towers; as well as, respective heights of the structures.

Table 1. Existing Turbines and Meteorological Towers at the NWTC

Size Range	Number of Turbines	Hub Height (feet)	Rotor Blade Diameter (feet)	Max. Rotor Blade Tip Height (feet)[a]	Max. Height Meteorological Towers (feet)
Utility-scale	4	262 to 295	253 to 331	459	443
Mid-scale	3	75 to 120	62 to 138	189	262
Small-scale	9	30 to 80	7 to 28	94	262

[a] Maximum height from ground to tip of rotor blade at highest point of rotation.

Project Description

The Proposed Action would add wind turbines and meteorological towers to potentially include any combination of up to seven large utility-scale wind turbines, up to seven mid-scale turbines and thirty meteorological towers at the NWTC, as described below in **Table 2**. In addition, several small-scale turbines are proposed.

Table 2. Total Proposed Wind Turbines and Meteorological Towers at the NWTC

Size Range	Max. Number of Turbines	Max. Hub Height (feet)	Max. Rotor Blade Diameter (feet)	Max. Rotor Blade Tip Height (feet) [a]	Max. Height Meteorological Towers (feet) [b]
Utility-scale	7	328	492	574	656
Mid-scale	7	295	331	462	545
Small-scale	20	80	62	112	262

[a] Maximum height from ground to tip of rotor blade at highest point of rotation.

[b] Assumes meteorological tower height is 82 feet (25 meters) above maximum rotor height.

For this proposed action, three additional utility-scale turbines, four additional mid-scale turbines and eleven meteorological towers would potentially be greater than 200 feet AGL. The turbines and towers could be located anywhere within the boundary of the NWTC.

Since the specific locations of the turbines have not been selected, the boundaries of NWTC are shown on Figure 1 (attached), using latitude/longitude coordinates to complete a polygon that would enclose the potential turbine locations.

Table 3. NWTC Boundary Coordinates

Potential Turbine Boundary	Latitude	Longitude
NW Point A	N 39 degrees 54' 50.34"	W 105 degrees 14' 11.53"
NE Point B	N 39 degrees 54' 50.57"	W 105 degrees 13' 6.32"
S Point C	N 39 degrees 54' 24.68"	W 105 degrees 14' 11.06"
S Point D	N 39 degrees 54' 24.33"	W 105 degrees 13' 40.16"
S Point E	N 39 degrees 54' 16.62"	W 105 degrees 13' 40.24"
S Point F	N 39 degrees 54' 20.60"	W 105 degrees 13' 20.16"

The requirements for filing with the Federal Aviation Administration for proposed structures vary based on a number of factors: height, proximity to an airport, location, and frequencies emitted from the structure, etc. For each structure, per the requirements outline in CFR Title 14 Part 77.9, a FAA Form 7460-1 (Notice of Proposed Construction or Alteration) would be completed by NREL Environmental personnel and submitted to the FAA Obstruction Evaluation Group for a hazard determination.

We appreciate your continued coordination regarding projects at NREL, and we look forward to working with the FAA in the future. Please feel free to contact me at 720-356-1568 if you have any questions regarding this project.

Sincerely,

Amy L. Van Dercook, P.G.
NEPA Document Manager
U.S. Department of Energy, Golden Field Office

Enclosures: Figure 1
FAA Form7460-1

cc: Chris Cody, FAA
Donna O'Neill, FAA

Figure 1 - Polygon of NWTC Property Boundary (Approximate)

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

§77.13 Construction or alteration requiring notice.

(a) Except as provided in §77.15, each sponsor who proposes any of the following construction or alteration shall notify the Administrator in the form and manner prescribed in §77.17.

(1) Any construction or alteration of more than 200 feet in height above the ground level at its site.

(2) Any construction or alteration of greater height than imaginary surface extending outward and upward at one of the following slopes:

(i) 1 00 to 1 for horizontal distance of 20,000 feet from the nearest point of the nearest runway of each airport specified in paragraph (a)(5) or this section with at least one runway more than 3,200 feet in actual length, excluding heliports.

(ii) 50 to 1 for horizontal distance of 10,000 feet from the nearest point of the nearest runway of each airport specified in paragraph (a)(5) of this section with its longest runway no more than 3,200 feet in actual length, excluding heliports.

(iii) 25 to 1 for a horizontal distance of 5,000 feet from the nearest point of the nearest landing and takeoff area of each heliport specified in paragraph (a)(5) of this section.

(3) Any highway, railroad, or other traverse way for mobile objects, of a height which, if adjusted upward 17 feet for an Interstate Highway that is part of the National System of Military and Interstate Highways where overcrossings are designed for a minimum of 17 feet vertical distance, 16 feet for any other public roadway, 10 feet or the height of the highest mobile object that would normally traverse the road, whichever is greater, for a private road, 23 feet for a railroad, and for a waterway or any other traverse way not previously mentioned, an amount equal to the height of the highest mobile object that would normally traverse it, would exceed a standard of paragraph (a)(1) or (2) of this section.

(4) When requested by the FAA, any construction or alteration that would be in an instrument approach area (defined in the FAA standards governing instrument approach procedures) and available information indicates it might exceed a standard of Subpart C of this part.

(5) Any construction or alteration on any of the following airports (including heliports):

(i) An airport that is available for public use and is listed in the Airport Directory of the current Airman's Information Manual or in either the Alaska or Pacific Airman's Guide and Chart Supplement.

(ii) An airport under construction, that is the subject of a notice or proposal on file with the Federal Aviation Administration, and except for military airports, it is clearly indicated that airport will be available for public use.

(iii) An airport that is operated by an armed force of the United States.

(b) Each sponsor who proposes construction or alteration that is the subject of a notice under paragraph (a) of this section and is advised by an FAA regional office that a supplemental notice is required shall submit that notice on a prescribed form to be received by the FAA regional office at least 48 hours before the start of construction or alteration.

(c) Each sponsor who undertakes construction or alteration that is the subject of a notice under paragraph (a) of this section shall, within 5 days after that construction or alteration reaches its greatest height, submit a supplemental notice on a prescribed form to the FAA regional office having jurisdiction over the region involved, if –

(1) The construction or alteration is more than 200 feet above the surface level of its site; or

(2) An FAA regional office advises him that submission of the form is required.

§77.15 Construction or alteration not requiring notice.

No person is required to notify the Administrator for any of the following construction or alteration:

(a) Any object that would be shielded by existing structures of a permanent and substantial character or by natural terrain or topographic features of equal or greater height, and would be located in the congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded will not adversely affect safety in air navigation.

(b) Any antenna structure of 20 feet or less in height except one that would increase the height of another antenna structure.

(c) Any air navigation facility, airport visual approach or landing air, aircraft arresting device, or meteorological device, of a type approved by the Administrator, or an appropriate military service on military airports, the location and height of which is fixed by its functional purpose.

(d) Any construction or alteration for which notice is required by any other FAA regulation.

§77.17 Form and time of notice

(a) Each person who is required to notify the Administrator under §77.13 (a) shall send one executed form set of FAA Form 7460-1, Notice of Proposed Construction or Alteration, to the Manager, Air Traffic Division, FAA Regional Office having jurisdiction over the area within which the construction or alteration will be located. Copies of FAA Form 7460-1 may be obtained from the headquarters of the Federal Aviation Administration and the regional offices.

(b) The notice required under §77.13 (a)(1) through (4) must be submitted at least 30 days before the earlier of the following dates –

(1) The date the proposed construction or alteration is to begin.

(2) The date an application for a construction permit is to be filed.

However, a notice relating to proposed construction or alteration that is subject to the licensing requirements of the Federal Communications Act may be sent to the FAA at the same time the application for construction is filed with the Federal Communications Commission, or at any time before that filing.

(c) A proposed structure or an alteration to an existing structure that exceeds 2,000 feet in height above the ground will be presumed to be a hazard to air navigation and to result in an inefficient utilization of airspace and the applicant has the burden of overcoming that presumption. Each notice submitted under the pertinent provisions of this part 77 proposing a structure in excess of 2,000 feet above ground, or an alteration that will make an existing structure exceed that height, must contain a detailed showing directed to meeting this burden. Only in exceptional cases, where the FAA concludes that a clear and compelling showing has been made that it would not result in an inefficient utilization of the airspace and would not result in a hazard to air navigation, will a determination of no hazard be issued.

(d) In the case of an emergency involving essential public services, public health, or public safety that required immediate construction or alteration, the 30 day requirement in paragraph (b) of this section does not apply and the notice may be sent by telephone, telegraph, or other expeditious means, with an executed FAA Form 7460-1 submitted within five (5) days thereafter. Outside normal business hours, emergency notices by telephone or telegraph may be submitted to the nearest FAA Flight Service Station.

(e) Each person who is required to notify the Administrator by paragraph (b) or (c) of §77.13, or both shall send an executed copy of FAA Form 7460-2, Notice of Actual Construction or Alteration, to the Manager, Air Traffic Division, FAA Regional Office having jurisdiction over the area involved.

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office Obstruction Evaluation Service, AJR-322
2601 Meacham Boulevard
Fort Worth, TX 76193
Fax: 817-338-1991
Phone: 817-338-1990

Website: https://oeaaa.faa.gov

INSTRUCTIONS FOR COMPLETING FAA FORM 7460-1

PLEASE TYPE or PRINT

ITEM #1. Please include the name, address and phone number of a personal contact point as well as the company name.

ITEM #2. Please include the name, address and phone number of a personal contact point as well as the company name.

ITEM #3. New Construction would be a structure that has not yet been built.

Alteration is a change to an existing structure such as the addition of a side mounted antenna, a change to the marking and lighting, a change to power and/or frequency, or a change to the height. The nature of the alteration shall be included in **ITEM #21** "Complete Description of Proposal".

Existing would be a correction to the latitude and/or longitude, a correction to the height, or if filing on an existing structure which has never been studied by the FAA. The reason for the notice shall be included in **ITEM #21** "Complete Description of Proposal"

ITEM #4. If Permanent, so indicate. If Temporary, such as a crane or drilling derrick, enter the estimated length of time the temporary structure will be up.

ITEM #5. Enter the date that construction is expected to start and the date that construction should be completed.

ITEM #6. Please indicate the type of structure. **DO NOT LEAVE BLANK.**

ITEM #7. In the event that obstruction marking and lighting is required, please indicate type desired. If no preference, check "other" and indicate "no preference" **DO NOT LEAVE BLANK.** ***NOTE:*** *High intensity lighting shall be used only for structures over 500' AGL.* In the absence of high intensity lighting for structures over 500' AGL, marking is also required.

ITEM #8. If this is an existing tower that has been registered with the FCC, enter the FCC Antenna Structure Registration number here.

ITEM #9 and #10. Latitude and longitude must be geographic coordinates, accurate to within the nearest second or to the nearest hundredth of a second if known. Latitude and longitude derived solely from a **hand-held GPS instrument is NOT acceptable**. A hand-held GPS is only accurate to within 100 meters (328 feet) 95 percent of the time. This data, when plotted, should match the site depiction submitted under **ITEM #20**.

ITEM #11. NAD 83 is preferred; however, latitude and longitude may be submitted in NAD 27. Also, in some geographic areas where NAD 27 and NAD 83 are not available other datums may be used. It is important to know which datum is used. **DO NOT LEAVE BLANK.**

ITEM #12. Enter the name of the nearest city and state to the site. If the structure is or will be in a city, enter the name of that city and state.

ITEM #13. Enter the **full** name of the nearest public-use ***(not private-use)*** airport or heliport or military airport or heliport to the site.

ITEM #14. Enter the distance **from** the airport or heliport listed in **#13 to the structure.**

ITEM #15. Enter the direction **from** the airport or heliport listed in **#13 to the structure.**

ITEM #16. Enter the site elevation above mean sea level and expressed in whole feet rounded to the nearest foot (e.g. 17'3" rounds to 17', 17'6" rounds to 18'). This data should match the ground contour elevations for site depiction submitted under **ITEM #20**.

ITEM #17. Enter the total structure height **above ground level** in **whole feet** rounded to the **next highest foot** (e.g. 17'3" rounds to 18'). **The total structure height shall include anything mounted on top of the structure, such as antennas, obstruction lights, lightning rods, etc.**

ITEM #18. Enter the overall height above mean sea level and expressed in **whole feet.** This will be the total of **ITEM #16 + ITEM #17**.

ITEM #19. If an FAA aeronautical study was previously conducted, enter the previous study number.

ITEM #20. Enter the relationship of the structure to roads, airports, prominent terrain, existing structures, etc. Attach an 8-1/2" x 11" non-reduced copy of the appropriate 7.5 minute U.S. Geological Survey *(USGS)* Quadrangle Map MARKED WITH A PRECISE INDICATION OF THE SITE LOCATION. To obtain maps, contact USGC at 1-800-435-7627 or via internet at "http://mapping.usgs.gov". If available, attach a copy of a documented site survey with the surveyor's certification stating the amount of vertical and horizontal accuracy in feet.

ITEM #21.

- For transmitting stations, include maximum effective radiated power *(ERP)* and all frequencies.
- For antennas, include the type of antenna and center of radiation *(Attach the antenna pattern, if available)*.
- For microwave, include azimuth relative to true north.
- For overhead wires or transmission lines, include size and configuration of wires and their supporting structures *(Attach depiction)*.
- For **each** pole/support, include coordinates, site elevation, and structure height above ground level or water.
- For buildings, include site orientation, coordinates of **each** corner, dimensions, and construction materials.
- For alterations, explain the alteration thoroughly.
- For existing structures, thoroughly explain the reason for notifying the FAA *(e.g. corrections, no record or previous study, etc.)*.

Filing this information with the FAA does not relieve the sponsor of this construction or alteration from complying with any other federal, state or local rules or regulations. If you are not sure what other rules or regulations apply to your proposal, contact local/state aviations and zoning authorities.

Paperwork Reduction Work Act Statement: This information is collected to evaluate the effect of proposed construction or alteration on air navigation and is not confidential. Providing this information is mandatory for anyone proposing construction or alteration that meets or exceeds the criteria contained in 14 CFR, part 77. We estimate that the burden of this collection is an average 19 minutes per response. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control number for this collection is 2120-0001. Comments concerning the accuracy of this burden and suggestions for reducing the burden should be directed to the FAA at: 800 Independence Ave. SW, Washington, DC 20591, Attn: Information Collection Clearance Officer, ABA-20

Please Type or Print on This Form

Form Approved OMB No.2120-0001
Expiration Date: 9/30/2010

U.S. Department of Transportation
Federal Aviation Administration

Failure To Provide All Requested Information May Delay Processing of Your Notice

Notice of Proposed Construction or Alteration

FOR FAA USE ONLY
Aeronautical Study Number

1. Sponsor *(person, company, etc. proposing this action)*:
Attn. of:
Name:
Address:
City: State: Zip:
Telephone: Fax:

2. Sponsor's Representative *(if other than #1)*:
Attn. of:
Name:
Address:
City: State: Zip:
Telephone: Fax:

3. Notice of: ☐ New Construction ☐ Alteration ☐ Existing

4. Duration: ☐ Permanent ☐ Temporary (____ months, ____ days)

5. Work Schedule: Beginning End

6. Type: ☐ Antenna Tower ☐ Crane ☐ Building ☐ Power Line
☐ Landfill ☐ Water Tank ☐ Other

7. Marking/Painting and/or Lighting Preferred:
☐ Red Lights and Paint ☐ Dual - Red and Medium Intensity White
☐ White - Medium Intensity ☐ Dual - Red and High Intensity White
☐ White - High Intensity ☐ Other

8. FCC Antenna Structure Registration Number *(if applicable)*:

9. Latitude: ° ' "

10. Longitude: ° ' "

11. Datum: ☐ NAD 83 ☐ NAD 27 ☐ Other

12. Nearest: City: State

13. Nearest *Public-use* *(not private-use)* or Military Airport or Heliport:

14. Distance from #13. to Structure:

15. Direction from #13. to Structure:

16. Site Elevation *(AMSL)*: ft

17. Total Structure Height *(AGL)*: ft

18. Overall Height (#16 + #17) *(AMSL)*: ft

19. Previous FAA Aeronautical Study Number *(if applicable)*:
-OE

20. Description of Location: *(Attach a USGS 7.5 minute Quadrangle Map with the precise site marked and any certified survey)*

21. Complete Description of Proposal:

Frequency/Power (kW)	

Notice is required by 14 Code of Federal Regulations, part 77 pursuant to 49 U.S.C., Section 44718. Persons who knowingly and willingly violate the notice requirements of part 77 are subject to a civil penalty of $1,000 per day until the notice is received, pursuant to 49 U.S.C., Section 46301(a)

I hereby certify that all of the above statements made by me are true, complete, and correct to the best of my knowledge. In addition, I agree to mark and/or light the structure in accordance with established marking & lighting standards as necessary.

Date	Typed or Printed Name and Title of Person Filing Notice	Signature

Date: July 11, 2013

Type of Notification: NEW

Project: Department of Energy's National Wind Technology Center
Long-Term Site Improvements (5-10 years)

County: Jefferson

State: Colorado

Project Sponsor: U.S Department of Energy: Energy Efficiency and Renewable Energy

DOE NEPA Compliance Officer: Lori Gray
Phone: (720) 356-1568

DOE Mailing Address: Department of Energy-Golden Field Office
c/o Lori Gray
1617 Cole Blvd
Golden, CO 80401

Facility Location:
GPS Coordinates (Main Bldg): N 39 degrees 54' 47.35" and W 105 degrees 13' 21.78"

Street Address: 18299 West 120th Avenue
Louisville, CO 80027

Turbine & Meteorological Tower Description:

Table 1. Total Proposed Wind Turbines and Meteorological Towers at the NWTC

Size Range	Output	Max. Number of Turbines	Max. Hub Height (meters)	Max. Rotor Blade Diameter (meters)	Max. Rotor Blade Tip Height (meters) [a]	Max. Height Meteorological Towers (meters) [b]
Utility-scale	1 MW to 5 MW	7	100	150	175	200
Mid-scale	100 kW to 1 MW	7	90	101	141	166
Small-scale	1 W to 100 kW	20	24	19	34	80

[a] Maximum height from ground to tip of rotor blade at highest point of rotation.

[b] Assumes up to 30 meteorological towers.

Monitoring Equipment Description:

Meteorological tower data collection could be used in combination with remote sensing devices, such as LIDAR or sound detection and ranging (SODAR) equipment. SODAR is a meteorological instrument used as a wind profiler to measure the scattering of sound waves by atmospheric turbulence. SODAR systems are used to measure wind speed at various heights above the ground, and the thermodynamic structure of the lower layer of the atmosphere. SODAR systems are like radar (radio detection and ranging) systems except that sound waves rather than radio waves are used for detection. LIDAR is a remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light.

Up to 10 cube-shaped or trailer-mounted LIDAR and/or SODAR devices would be installed at various field test sites at any one time.

Proposed Locations (Facility Boundary Points):

The specific locations of the turbines, meteorological towers and monitoring equipment have not been selected. Locations could be anywhere within the boundaries of the facility. Using latitude/longitude coordinates, a polygon was created to enclose the potential locations.

Potential Turbine Boundary	Latitude	Longitude
NW Point A	N 39 degrees 54’ 50.34”	W 105 degrees 14’ 11.53”
NE Point B	N 39 degrees 54’ 50.57”	W 105 degrees 13’ 6.32”
S Point C	N 39 degrees 54’ 24.68”	W 105 degrees 14’ 11.06”
S Point D	N 39 degrees 54’ 24.33”	W 105 degrees 13’ 40.16”
S Point E	N 39 degrees 54’ 16.62”	W 105 degrees 13’ 40.24”
S Point F	N 39 degrees 54’ 20.60”	W 105 degrees 13’ 20.16”

Maps: PLEASE SEE ATTACHED (Figure 1)

Submitted to:

Edward Davison
Email: edavison@ntia.doc.gov
Work Phone: (202) 482-5526
National Telecommunications & Information Administration (NTIA)
Domestic Spectrum Policies & IRAC Support Division (DSID)

&

Joyce C. Henry
Email: jhenry@ntia.doc.gov
Work Phone: (202) 482-1850/51
National Telecommunications & Information Administration (NTIA)
Office of Spectrum Management/HQ

Figure 1 - Polygon of NWTC Property Boundary (Approximate)

UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

SEP 10 2013

Ms. Lori Gray
US Department of Energy-Golden Field Office
1617 Cole Blvd.
Golden, CO 80401

Re: National Wind Technology Project: Jefferson County, CO

Dear Ms. Gray:

In response to your request on July 11, 2013, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the National Wind Technology Center Project, located in Jefferson County, Colorado.

After a 45+ day period of review, there was one agency, the **Department of the Navy,** who had issues with turbine placement in this area. Comments from the DON reviewer are as follows:

> Research reveals possible harmful impact to the Department of the Navy systems. Point of contact for these comments is Mr. Ken Stowe, NMSC, DISA, phone, 301-225-3833, or fax 301-225-0583, e-mail ken.stowe@navy.mil, or kenneth.stowe1@navy.smil.mil.

While the other IRAC agencies did not identify any concerns regarding radio frequency blockage, this does not eliminate the need for the wind energy facilities to meet any other requirements specified by law related to these agencies. For example, this review by the IRAC does not eliminate any need that may exist to coordinate with the Federal Aviation Administration concerning flight obstruction.

Thank you for the opportunity to review these proposals.

Sincerely,

Karl B. Nebbia
Associate Administrator
Office of Spectrum Management

From: Van Dercook, Amy
To: "ken.stowe@navy.mil"
Subject: FW: **WindMill Response Letter**: National Wind Tech Project: Jefferson County, CO
Date: Wednesday, September 11, 2013 12:06:00 PM
Attachments: NationalWindTechCntr_R.pdf
2013.07.11_NTIA_Submittal_NWTC.pdf

Dear Mr. Stowe:

I just received this correspondence from the NTIA. I would like to set up a date and time to discuss this project. I am available all day tomorrow.

Thank you,
Amy Van Dercook, P.G.
U.S. Department of Energy | Golden Field Office
1617 Cole Blvd., Golden, CO 80401-3393
Phone: 720.356.1666 | Mobile: 720.233.5392
Email: amy.vandercook@go.doe.gov

From: Joyce Henry [mailto:JHenry@ntia.doc.gov]
Sent: Wednesday, September 11, 2013 11:21 AM
To: Van Dercook, Amy
Subject: **WindMill Response Letter**: National Wind Tech Project: Jefferson County, CO

Dear Amy:

Please see attached the NTIA Response Letter for the National Wind Technology Center Project, located in Jefferson County, Colorado.

After a 45+ day period of review, we received responses from Department of Agriculture (DOA), Department of Homeland Security (DHS), Department of Commerce (DOC), and Department of Justice (DOJ), stating No Harmful Interference Anticipated (NHIA).

There was one agency that did have issues with turbine placement in this area, the Department of the Navy (DON). Please see the comments from the agency reviewer, included in this final letter.

In the event that an agency has expressed concerns, we encourage you to work with the agency representatives directly to resolve all issues. If issues cannot be resolved, you may contact our office via phone or e-mail for resolution.

Joyce Countee Henry
Admin Assistant
Department of Commerce (DOC)
National Telecommunications
Information Administration (NTIA)
Office of Spectrum Management (OSM HQ)
Wk: 202-482-1850
202-482-2215 (private line)
Fax: 202-482-4396

From:	Stowe, Ken L CIV NMSC
To:	"Joyce Henry"
Cc:	Pearce, Elvira CIV NMSC; Copeland, Guy G CIV NMSC; Potter, Russell W. CIV NMCSO NW
Subject:	RE: [faslist] ^^WindMill Action Item^^: National Wind Technology Project: Jefferson County, CO
Date:	Monday, December 16, 2013 12:33:46 PM

Good Afternoon Joyce,

Please be advised that after further analysis, my research reveals no possible harmful impact to the Department of the Navy systems.

Thank You,

Mr. Ken Stowe
Frequency Assignment Subcommittee Rep
Navy & Marine Corps Spectrum Center (NMSC)
Defense Information System Agency
6916 Cooper Avenue
ATTN: NMSC SMO 41518
P.O. Box 549
Ft. Meade, MD 20755-0549
COM: (301) 225-3833
DSN: 375-3833
FAX: 301-225-0583
NIP: ken.stowe@navy.mil
SIP: kenneth.stowe1@navy.smil.mil

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

February 10, 2014

Mr. Terry McKee
U.S. Army Corps of Engineers
Denver Regulatory Office
9307 South Wadsworth Blvd.
Littleton, CO 80128-6901

SUBJECT: National Wind Technology Center Wetland Delineation Review Request Relevant To May 2012 Site Visit and Jurisdictional Determination

Dear Mr. McKee,

With this letter, the National Renewable Energy Laboratory and the Department of Energy (DOE) requests that the U.S. Army Corps of Engineers (USACE) review the wetland delineation shown on the attached figure in the Coal Creek watershed and determine that it is accurate and acceptable to your office.

You may recall that you visited the National Wind Technology Center (NWTC) in May 2012 and we walked two drainages both in the Coal Creek Watershed. One is Rock Creek that leads into the Rocky Flats National Wildlife Refuge and the other is a tributary of Coal Creek. You concluded that both drainages were *waters of the U.S.*

At this time, the delineated wetlands associated with these two drainages do not fall within any areas of impact associated with current or future projects on the NWTC, but we submit this wetland delineation to assist in your Jurisdictional Determination.

The delineated wetland boundaries as well as ephemeral drainages within the area being evaluated are shown in the attached exhibit. The completed data sheets from the Great Plains Region Supplement are also attached.

We appreciate your review of the attached wetland delineation and assessment of possible jurisdictional waters and look forward to your response. We will use the resulting information for future site environmental management. Please contact Tom Ryon at 303-275-3252 or Genny Braus at 303-275-3251 with NREL Environment, Health & Safety with any questions you may have.

Sincerely,

Genevieve Braus

Genevieve Braus, Senior Environmental Specialist

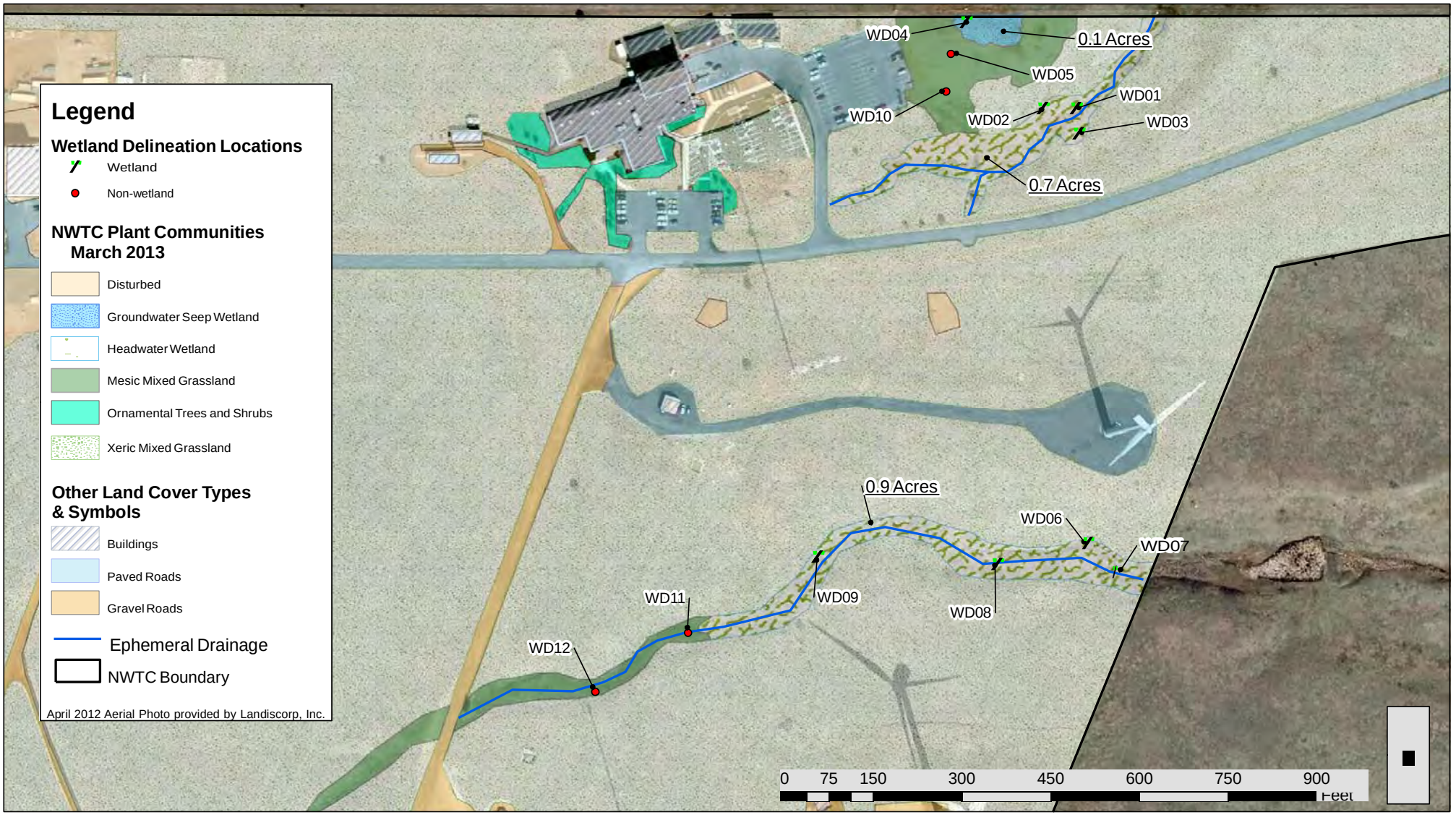
15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

Attachments

Cc: Lori Gray, DOE GO
Amy Van Dercook, DOE GO
John Eickhoff – NREL, EHS
Brenda Beatty – NREL, EHS
Tom Ryon – NREL, EHS

15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000



Wetland Delineation Map and Location of Sampling Locations, 2012

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 5/10/12
Applicant/Owner: Department of Energy - NREL State: CO Sampling Point: WD01
Investigator(s): T. Ryan Section, Township, Range: 3, T2S, R70W
Landform (hillslope, terrace, etc.): Drainage Seasonal Local relief (concave, convex, none): concave Slope (%): 10
Subregion (LRR): LRR G Lat: 39°54.817' Long: 105°13.213 Datum: WGS 84
Soil Map Unit Name: Golden Area & Nederland very cobbly sandy loam NWI classification: PEMF
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes Y	No ____	
Wetland Hydrology Present?	Yes Y	No ____	

Remarks:
N39°54.817 5m veg plot
W105°13.213 12m downstream from SW138

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10 m)			
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10 m)			
1. Rose (ROWO)	5	N	UPL
2. Strawberry (SyOC)	10	Y	UPL
3.			
4.			
5.			
	15 = Total Cover		
Herb Stratum (Plot size: 5)			
1. Juncus sp (arcticus)	60	Y	FACW
2. mustard-cress	1	N	UPL
3. mint (Mentha arvensis)	10	N	FACW
4. Geranium	T	N	FAC
5. Cinquefoil	5	N	FAC
6. Brim	25	Y	UPL
7. mullein	3	N	UPL
8. foxtail	10	N	FAC
9. Watercress	10	N	OBL
10. Poa sp, Bromus, unkl	T	N	
	124 = Total Cover		
Woody Vine Stratum (Plot size: 5)			
1. moss	1		
2.			
	0 = Total Cover		

50% = 62
20% = 24.8

% Bare Ground in Herb Stratum 1

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): 1 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0.25 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	70	x 2 =	140
FAC species	5	x 3 =	15
FACU species	6	x 4 =	0
UPL species	44	x 5 =	220
Column Totals:	129 (A)		385 (B)

Prevalence Index = B/A = 2.9

Hydrophytic Vegetation Indicators:
N 1 - Rapid Test for Hydrophytic Vegetation
N 2 - Dominance Test is >50%
Y 3 - Prevalence Index is ≤3.0[1]
N 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
N Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: WD61

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	—	—	organic				O	Organic
1-7	5YR 2.5/1	100					silty/loamy root/organic/soil	
7-11	7.5YR 2.5/1	90	7.5YR 5/8	10			Loamy/clayey	
11-20	7.5YR 4/1	75	5YR 5/8	25			Loamy/clayey	

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5) (**LRR F**)
- 1 cm Muck (A9) (**LRR F, G, H**)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- N Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Y Redox Dark Surface (F6)
- N Depleted Dark Surface (F7)
- Redox Depressions (F8)
- High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- N 1 cm Muck (A9) (**LRR I, J**)
- Coast Prairie Redox (A16) (**LRR F, G, H**)
- Dark Surface (S7) (**LRR G**)
- High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

redox features @ 7-11" & 11-20"

Grey Soil matrix @ 11-20" but not Gley.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- Water Marks (B1)
- X Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- Salt Crust (B11)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Dry-Season Water Table (C2)
- Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- X Presence of Reduced Iron (C4)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- Surface Soil Cracks (B6)
- Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- N FAC-Neutral Test (D5)
- Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes X No _____ Depth (inches): <1

Water Table Present? Yes X No _____ Depth (inches): 16

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 12

Wetland Hydrology Present? Yes X No _____

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

See Rocky Flats SW138

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 5/10/12
Applicant/Owner: DOE/NREL State: CO Sampling Point: WD#2
Investigator(s): T. Ryon Section, Township, Range: 3, T2S, R70W
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%): 5
Subregion (LRR): LRR G Lat: 39°54.818'N Long: 105°13.224'W Datum: WGS 84
Soil Map Unit Name: Golden Area: Nederland very cobbly sandy loam NWI classification: PEMF
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10m)			
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 10m)			
1. Snowberry (SYOC)	5	Y	UPL
2. Rose (ROWO)	1	N	
3.			
4.			
5.			
	6 = Total Cover		
Herb Stratum (Plot size: ____)			
1. Juncus arcticus	50	Y	FACW
2. Carex nebraskensis	31	Y	OBL
3. Spartina pectinata	20	N	FACW
4. mullein	10	N	UPL
5. C. Thistle	10	N	FACU
6. BR IN	30	N	UPL
7. Poa sp	T	N	
8. Bedstraw (Galium aparine)	1	N	FACU
9. Teasel	5	N	FACU
10. unk1 + unk2 + unk3	T	N	?
	155 = Total Cover		50% = 77.5, 20% = 31.0
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66.6 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	30	x 1 =	30
FACW species	70	x 2 =	140
FAC species	0	x 3 =	0
FACU species	11	x 4 =	44
UPL species	40	x 5 =	200
Column Totals:	151 (A)		414 (B)

Prevalence Index = B/A = 2.7

Hydrophytic Vegetation Indicators:
__ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: WDP2

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	organic							
2-7	5YR 1/1	100					SCL	sandy clay loam
7-19	G1 3/N	95	7.5YR 6/6	5	D		CL	Gley 1 Clay Loam
19-24	G1 6/N	80	10YR 6/8	20	RM		CL	Gley 1 clay loam

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- — Black Histic (A3)
- — Hydrogen Sulfide (A4)
- — Stratified Layers (A5) **(LRR F)**
- — 1 cm Muck (A9) **(LRR F, G, H)**
- N Depleted Below Dark Surface (A11)
- Y Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- N 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- N Sandy Gleyed Matrix (S4)
- — Sandy Redox (S5)
- — Stripped Matrix (S6)
- — Loamy Mucky Mineral (F1)
- — Loamy Gleyed Matrix (F2)
- — Depleted Matrix (F3)
- — Redox Dark Surface (F6)
- — Depleted Dark Surface (F7)
- — Redox Depressions (F8)
- — High Plains Depressions (F16) **(MLRA 72 & 73 of LRR H)**

Indicators for Problematic Hydric Soils[3]:

- N 1 cm Muck (A9) **(LRR I, J)**
- — Coast Prairie Redox (A16) **(LRR F, G, H)**
- — Dark Surface (S7) **(LRR G)**
- — High Plains Depressions (F16) **(LRR H outside of MLRA 72 & 73)**
- — Reduced Vertic (F18)
- — Red Parent Material (TF2)
- — Very Shallow Dark Surface (TF12)
- — Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: NA

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

Very dark - Black Soil to 19"

Some a dark Gley, then grey with redox 20%

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- N Surface Water (A1)
- N High Water Table (A2)
- N Saturation (A3)
- N Water Marks (B1)
- N Sediment Deposits (B2)
- N Drift Deposits (B3)
- N Algal Mat or Crust (B4)
- N Iron Deposits (B5)
- N Inundation Visible on Aerial Imagery (B7)
- N Water-Stained Leaves (B9)
- N Salt Crust (B11)
- — Aquatic Invertebrates (B13)
- — Hydrogen Sulfide Odor (C1)
- — Dry-Season Water Table (C2)
- Y Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
- N Presence of Reduced Iron (C4)
- N Thin Muck Surface (C7)
- N Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- N Surface Soil Cracks (B6)
- N Sparsely Vegetated Concave Surface (B8)
- N Drainage Patterns (B10)
- N Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
- N Crayfish Burrows (C8)
- N Saturation Visible on Aerial Imagery (C9)
- Y Geomorphic Position (D2)
- Y FAC-Neutral Test (D5)
- N Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes X No _____ Depth (inches): 24

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 19

Wetland Hydrology Present? Yes X No _____

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

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 5/15/12

Applicant/Owner: DOE/NREL State: CO Sampling Point: WD03

Investigator(s): Thomas Ryon Section, Township, Range: 3, T2S, R70W

Landform (hillslope, terrace, etc.): Drainage Local relief (concave, convex, none): concave Slope (%): 20

Subregion (LRR): LRR G Lat: 39° 54.821' Long: 105° 13.212 Datum: WGS 84

Soil Map Unit Name: Golden Area: Nederland very cobbly sandy loam NWI classification: PEME

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____ Soil ____, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ Soil ____, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks: Wetlands were restored from cultivated agricultural fields as part of a wetland bank project. New delineated area along eastern side of main wetland. No criteria met.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 10)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. Juncus arcticus	80	Y	FACW
2. Mentha arvensis	10	N	FACW
3. Bromus inermis	10	N	UPL
4. Geranium	5	N	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	105 = Total Cover	50% = 52.5	
		20% = 21	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
% Bare Ground in Herb Stratum ____	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	90	x 2 =	180
FAC species	5	x 3 =	15
FACU species	0	x 4 =	0
UPL species	10	x 5 =	50
Column Totals:	105 (A)		245 (B)

Prevalence Index = B/A = 2.33

Hydrophytic Vegetation Indicators:

N Dominance Test is >50%

Y Prevalence Index is ≤3.0[1]

N Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

N Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WD 03

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2								organic
2-7	5YR 2.5/1	100						
7-12	7.5YR 2.5/1	80	7.5YR 5/8	20				
12-20	7.5YR 4/1	70	5YR 5/8	30				

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

Hydric Soil Indicators:

- A Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5) **(LRR F)**
- 1 cm Muck (A9) **(LRR F, G, H)**
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- High Plains Depressions (F16) **(MLRA 72 & 73 of LRR H)**

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) **(LRRI, J)**
- Coast Prairie Redox (A16) **(LRR F, G, H)**
- Dark Surface (S7) **(LRR G)**
- High Plains Depressions (F16) **(LRRH outside of MLRA 72 & 73)**
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Water-Stained Leaves (B9)
- Salt Crust (B11)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Dry-Season Water Table (C2)
- Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
- Presence of Reduced Iron (C4)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- Surface Soil Cracks (B6)
- Sparsely Vegetated Concave Surface (B8)
- Drainage Patterns (B10)
- Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Geomorphic Position (D2)
- FAC-Neutral Test (D5)
- Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes X No ____ Depth (inches): 16

Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 10

Wetland Hydrology Present? Yes X No ____

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

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 5/11/12

Applicant/Owner: DOE/NREL State: CO Sampling Point: WP04

Investigator(s): T. Ryon Section, Township, Range: 4, T2S, R70W

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 3

Subregion (LRR): LRR G Lat: 39°54.443' Long: 105°13.995' Datum: WGS 84

Soil Map Unit Name: Golden Area: Nederland very cobbly sandy loam NWI classification: PEMF

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes ____	No ____	
Wetland Hydrology Present?	Yes ____	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 10m)			
1. Snowberry (SYOC)	10	Y	UPL
2. Rose (Rowo)	3	Y	FACU
3.			
4.			
5.			
	13 = Total Cover		
Herb Stratum (Plot size: ____)			
1. Juncus arcticus	80	Y	FACW
2. (Teasel)	(70)	(Y)	(IN)
3. Eriocoreg ?	10	N	OBL
4. mustard	3	N	—
5. Carex nebraskensis	5	N	OBL
6. Canada thistle	1	N	FACU
7. Geum macrophyllum	10	N	FACW
8. Spartina	20	N	FACW
9. Poa	10	N	FACU
10.			
	(139) 209 = Total Cover		50%-104.5
Woody Vine Stratum (Plot size: ____)	(69.5)		20%-41.8
1.	(27.9)		
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 5

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	110	x 2 =	220
FAC species	0	x 3 =	0
FACU species	14	x 4 =	56
UPL species	10	x 5 =	50
Column Totals:	149 (A)		341 (B)

Prevalence Index = B/A = 2.29

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- N 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- N Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: WD 04

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/1	100	—	—	—	—	SCL	A - organic
4-9	7.5YR 2.5/1	100					CL	
9-13	7.5YR 6/1	70	7.5YR 5/8	30	C	M	CL	Large gravel & cobble
13-20	10YR 5/1	60	7.5YR 5/8	40	C	M	LC	Some gravel - type

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5) (**LRR F**)
- 1 cm Muck (A9) (**LRR F, G, H**)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- N Loamy Mucky Mineral (F1)
- N Loamy Gleyed Matrix (F2)
- Y Depleted Matrix (F3)
- N Redox Dark Surface (F6)
- N Depleted Dark Surface (F7)
- N Redox Depressions (F8)
- N High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- N 1 cm Muck (A9) (**LRR I, J**)
- Coast Prairie Redox (A16) (**LRR F, G, H**)
- Dark Surface (S7) (**LRR G**)
- High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- N Surface Water (A1)
- N High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Y Inundation Visible on Aerial Imagery (B7)
- N Water-Stained Leaves (B9)
- N Salt Crust (B11)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Dry-Season Water Table (C2)
- Y Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- Y Presence of Reduced Iron (C4)
- N Thin Muck Surface (C7)
- N Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- N Surface Soil Cracks (B6)
- Sparsely Vegetated Concave Surface (B8)
- Drainage Patterns (B10)
- Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Geomorphic Position (D2)
- FAC-Neutral Test (D5)
- Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes N No _____ Depth (inches): _____

Water Table Present? Yes Y No _____ Depth (inches): 19

Saturation Present? (includes capillary fringe) Yes Y No _____ Depth (inches): 18

Wetland Hydrology Present? Yes X No _____

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

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 5/15/12

Applicant/Owner: DOE/NREL State: CO Sampling Point: WD 05

Investigator(s): T. Ryan Section, Township, Range: 4, T2S R70W

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): none Slope (%): 2

Subregion (LRR): LRR G Lat: 39°54.451' Long: 105°13.981' Datum: WGS 84

Soil Map Unit Name: Golden Area: Nederland very cobbly sandy loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology N/ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology N/ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 10m)			
1. Wild Rose	20	Y	UPL
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 5)			
1. Prairie cordgrass	30	Y	FACW
2. Smooth Brome	50	Y	UPL
3. Wild Iris	30	N	FACW
4. Juncus arcticus	25		FACW
5. Teasel	10		FAC
6. Canada Thistle	5		FACU
7. Cut. Primrose	3		FACW
8. Poa Sp.	3		FACW
9. Blue-eyed grass stem	1		FAC
10. Yarrow, Horsetail, wild mullen	T		
	157 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.	50% = 76		
2.	20% = 30.4		
	____ = Total Cover		

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	55	x 2 =	110
FAC species	1	x 3 =	3
FACU species	11	x 4 =	44
UPL species	75	x 5 =	375
Column Totals:	142 (A)		532 (B)

Prevalence Index = B/A = 3.7

Hydrophytic Vegetation Indicators:

N 1 - Rapid Test for Hydrophytic Vegetation

N 2 - Dominance Test is >50%

N 3 - Prevalence Index is ≤3.0[1]

N 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

N Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ____ No N

Remarks:

SOIL

Sampling Point: WD05

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1								organics
1-4	7.5YR 3/3	100					SCL	gravelly
4-15	2.5YR 3/1	100					CL	Larger gravel
15-18	10YR 5/4	25	7.5YR 3/1	25			CL	" "

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR F)**
- ___ 1 cm Muck (A9) **(LRR F, G, H)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) **(MLRA 72 & 73 of LRR H)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR I, J)**
- ___ Coast Prairie Redox (A16) **(LRR F, G, H)**
- ___ Dark Surface (S7) **(LRR G)**
- ___ High Plains Depressions (F16) **(LRR H outside of MLRA 72 & 73)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- W Surface Water (A1)
- W High Water Table (A2)
- W Saturation (A3)
- W Water Marks (B1)
- W Sediment Deposits (B2)
- W Drift Deposits (B3)
- W Algal Mat or Crust (B4)
- W Iron Deposits (B5)
- W Inundation Visible on Aerial Imagery (B7)
- W Water-Stained Leaves (B9)
- W Salt Crust (B11)
- W Aquatic Invertebrates (B13)
- W Hydrogen Sulfide Odor (C1)
- W Dry-Season Water Table (C2)
- W Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
- W Presence of Reduced Iron (C4)
- W Thin Muck Surface (C7)
- W Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- W Surface Soil Cracks (B6)
- W Sparsely Vegetated Concave Surface (B8)
- ? Drainage Patterns (B10)
- W Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
- W Crayfish Burrows (C8)
- W Saturation Visible on Aerial Imagery (C9)
- Y Geomorphic Position (D2)
- W FAC-Neutral Test (D5)
- W Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

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

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 6/21/12
Applicant/Owner: NREL/DOE CO State: CO Sampling Point: WD06
Investigator(s): Thomas Ryan Section, Township, Range:
Landform (hillslope, terrace, etc.): Drainage/slope Local relief (concave, convex, none): concave Slope (%): 10
Subregion (LRR): LRR G Lat: 39°54.696 Long: 105°13.208 Datum: WGS84
Soil Map Unit Name: Golden Area: Nederland very cobbly sandy loam NWI classification: PEMC
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes ____ No ____	

Remarks: somewhat dry season this Spring
Site is elongated to follow stream & include adj toe of slope

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 50)			
1.			
2. None			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 50)			
1. Snowberry	1%	Y	UPL
2.			
3.			
4.			
5.			
	1% = Total Cover		
Herb Stratum (Plot size: ____)			
1. Juncus articus	80	Y	FACW
2. Eleocharis	1	N	OBL
3. Carex sp (nebrascka)	5	N	OBL
4. mint (Mentha arvensis)	1	N	FACW
5. Catnip (Nepeta)	3	N	FACU
6. Mullein	3	N	UPL
7. Creeping Primrose	3	N	FACU
8. St Johns wort	3	N	UPL
9. Cinquefoil Potentilla	3	N	FAC
10. Canada thistle	5	N	FACU
	10 = Total Cover		FACW
Woody Vine Stratum (Plot size: ____)			N 50%=62.5
1. Geranium FAC	3	N	20%=24.2
2. Fescue Red FAC	1	N	
	121 = Total Cover		

% Bare Ground in Herb Stratum 5

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	6	x 1 =	6
FACW species	81	x 2 =	162
FAC species	7	x 3 =	21
FACU species	21	x 4 =	84
UPL species	6	x 5 =	30
Column Totals:	121 (A)		303 (B)

Prevalence Index = B/A = 2.5

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: WDP6

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	Organic							
2-6	5YR 3/2	100					Sandy loam w/ gravelly small	
6-13	7.5YR 4/2	60	7.5YR 6/4	40	RM	M	Sandy loam gravelly medium	
13-18	Gley1 3/5GY	50	5YR 5/6	30	C	M	Silty clay loam gravelly gravel	
T	10YR 4/3	20						

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Stratified Layers (A5) **(LRR F)**
- N 1 cm Muck (A9) **(LRR F, G, H)**
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- N 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- N Sandy Gleyed Matrix (S4)
- Y Sandy Redox (S5)
- N Stripped Matrix (S6)
- N Loamy Mucky Mineral (F1)
- N Loamy Gleyed Matrix (F2)
- Y Depleted Matrix (F3)
- N Redox Dark Surface (F6)
- N Depleted Dark Surface (F7)
- N Redox Depressions (F8)
- N High Plains Depressions (F16) **(MLRA 72 & 73 of LRR H)**

Indicators for Problematic Hydric Soils[3]:

- N 1 cm Muck (A9) **(LRR I, J)**
- Coast Prairie Redox (A16) **(LRR F, G, H)**
- Dark Surface (S7) **(LRR G)**
- High Plains Depressions (F16) **(LRR H outside of MLRA 72 & 73)**
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): NONE

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks: Root zone to 6'

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- N Surface Water (A1)
- N High Water Table (A2)
- N Saturation (A3)
- Y Water Marks (B1)
- N Sediment Deposits (B2)
- N Drift Deposits (B3)
- N Algal Mat or Crust (B4)
- Y Iron Deposits (B5)
- N Inundation Visible on Aerial Imagery (B7)
- N Water-Stained Leaves (B9)
- N Salt Crust (B11)
- N Aquatic Invertebrates (B13)
- N Hydrogen Sulfide Odor (C1)
- N Dry-Season Water Table (C2)
- N Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
- N Presence of Reduced Iron (C4) below 14"
- N Thin Muck Surface (C7)
- _____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- N Surface Soil Cracks (B6)
- N Sparsely Vegetated Concave Surface (B8)
- Y Drainage Patterns (B10)
- N Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
- N Crayfish Burrows (C8)
- N Saturation Visible on Aerial Imagery (C9)
- Y Geomorphic Position (D2)
- _____ FAC-Neutral Test (D5)
- N Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

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

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 6/21/12
Applicant/Owner: NREL/DOE GO State: CO Sampling Point: WP 07
Investigator(s): Thomas Ryan Section, Township, Range: 3, T2S, R70W
Landform (hillslope, terrace, etc.): Drainage/seep Local relief (concave, convex, none): Concave Slope (%): 2
Subregion (LRR): LRR G Lat: 39°54.698 Long: 105°13.197 Datum: WGS84
Soil Map Unit Name: Golden Area: Nederland very cobbly sandy loam NWI classification: PEMC
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:
Elevation 5,983'

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 50 m)			
1.			
2. None			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 50 m)			
1. Wax currant/Rocky Mtn	5	Y	FACU
2. Snowberry	10	Y	UPL
3.			
4.			
5.			
	15 = Total Cover	50%=7.5	20%=3
Herb Stratum (Plot size: 10 m)			
1. Cattail Broad	40	Y	OBL
2. Eleocharis	20	Y	OBL
3. Juncus	20	Y	FACW
4. Carex Nebraskensis	10	N	OBL
5. Cinquefoil (Potentilla)	5	N	
6. Canada thistle	5	N	FACU
7. Poa spp	T	N	FACU
8. Carex spp	3	N	
9. Hounds Tongue	1	N	FACU
10. Duck meat/water cress	3	N	OBL
	1 = Total Cover		108
Woody Vine Stratum (Plot size: 10 m)		50% = 54	
1. Virginia Creeper	3	20% = 21.6	
2.			
	3 = Total Cover		

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 3 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 60% (A/B)

Prevalence Index worksheet:

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

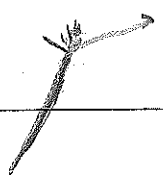
Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Rush?



SOIL

Sampling Point: WD07

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
Not Recorded								

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- Y Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- Y 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- Y Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- Y Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks: Obvious wetland

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- Y Surface Water (A1)
- Y High Water Table (A2)
- Y Saturation (A3)
- N Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- N Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- N Surface Soil Cracks (B6)
- N Sparsely Vegetated Concave Surface (B8)
- Y Drainage Patterns (B10)
- N Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- N Crayfish Burrows (C8)
- N Saturation Visible on Aerial Imagery (C9)
- Y Geomorphic Position (D2)
- Y FAC-Neutral Test (D5)
- N Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 2"
Water Table Present? Yes Y No ___ Depth (inches): at Surface
Saturation Present? (includes capillary fringe) Yes Y No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

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

Remarks: upper Drainage Rush + carex Cattails Rush Fence 10-16m wide (Rock)Seep

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 6/21/12

Applicant/Owner: NREL/DOE-GO State: CO Sampling Point: WD08

Investigator(s): Thomas Ryan Section, Township, Range: 3, T2S, R70W

Landform (hillslope, terrace, etc.): Drainage Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRR): LRR G Lat: 39°54.690 Long: 105°13.241 Datum: WGS84

Soil Map Unit Name: Golden Area: Nederland very cobbly sandy loam NWI classification: PEME

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 50)			
1.			
2. NONE			
3.			
4.			
= Total Cover	Ø		
Sapling/Shrub Stratum (Plot size: 50)			
1. Snowberry	5	(Y)	UPL
2.			
3.			
4.			
5.			
= Total Cover	5		
Herb Stratum (Plot size: ___)			
1. Juncus arcticus	60	(Y)	FACW
2. Golden Banner	5	N	FAC
3. Canada thistle	15	(Y)	FACU
4. Wild Licorice	10	N	FACU
5. St Johns wort	T	N	UPL
6. Poa spp	5	N	FACU
7. Smooth Brome	10	N	UPL
8. Mullen	5	N	UPL
9. Red Fescue	20	N	FAC
10. Carex nebraskensis	5	N	OBL
Golden Rod T Cinquefoil T			
= Total Cover	135		
	67.5 – 50%		
	27 – 20%		
Woody Vine Stratum (Plot size: ___)			
1. NONE			
2.			
= Total Cover	Ø		
% Bare Ground in Herb Stratum 3			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	5	x 1 = 5
FACW species	60	x 2 = 120
FAC species	25	x 3 = 75
FACU species	30	x 4 = 120
UPL species	20	x 5 = 100
Column Totals:	140 (A)	420 (B)

Prevalence Index = B/A = 3.0

Hydrophytic Vegetation Indicators:

N 1 - Rapid Test for Hydrophytic Vegetation
N 2 - Dominance Test is >50%
Y 3 - Prevalence Index is ≤3.0[1]
N 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
N Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: WD08

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-1	organic							
1-6	10YR 2/2	70	5YR 5/8	30	D	RM	Silty loam	small [illegible]
6-13	10YR 3/2	60	5YR 5/8	40	D	RM	silty clay loam	[illegible]

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Stratified Layers (A5) (**LRR F**)
- N 1 cm Muck (A9) (**LRR F, G, H**)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- N 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- N Loamy Mucky Mineral (F1)
- N Loamy Gleyed Matrix (F2)
- Y Depleted Matrix (F3)
- Y Redox Dark Surface (F6)
- Y Depleted Dark Surface (F7)
- N Redox Depressions (F8)
- N High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- N 1 cm Muck (A9) (**LRR I, J**)
- N Coast Prairie Redox (A16) (**LRR F, G, H**)
- N Dark Surface (S7) (**LRR G**)
- N High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- N Reduced Vertic (F18)
- N Red Parent Material (TF2)
- N Very Shallow Dark Surface (TF12)
- N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- N Surface Water (A1)
- N High Water Table (A2)
- N Saturation (A3)
- N Water Marks (B1)
- N Sediment Deposits (B2)
- N Drift Deposits (B3)
- N Algal Mat or Crust (B4)
- N Iron Deposits (B5)
- N Inundation Visible on Aerial Imagery (B7)
- N Water-Stained Leaves (B9)
- N Salt Crust (B11)
- N Aquatic Invertebrates (B13)
- N Hydrogen Sulfide Odor (C1)
- N Dry-Season Water Table (C2)
- Y Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- Y Presence of Reduced Iron (C4)
- N Thin Muck Surface (C7)
- N Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- N Surface Soil Cracks (B6)
- N Sparsely Vegetated Concave Surface (B8)
- N Drainage Patterns (B10)
- Y Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- N Crayfish Burrows (C8)
- N Saturation Visible on Aerial Imagery (C9)
- Y Geomorphic Position (D2)
- N FAC-Neutral Test (D5)
- N Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes X No ____

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

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 6/27/12
Applicant/Owner: NREL/DOE State: CO Sampling Point: WD09
Investigator(s): Thomas Ryan Section, Township, Range: 4, T2S, R70W
Landform (hillslope, terrace, etc.): Drainage Local relief (concave, convex, none): concave Slope (%): 3
Subregion (LRR): LRR G Lat: 39°54.692 Long: 105°13.306 Datum: WGS84
Soil Map Unit Name: Golden Area: Nederland very cobbly, sandy loam NWI classification: PEME
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes X No ____
Is the Sampled Area within a Wetland? Yes X No ____

Remarks: wows start above this point, see: wows-start. WD09 = P3 on Ryan GPS
wetlands begin/end above this point = WetlStart

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 50)			
1.			
2. None			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 50)			
1.			
2. None			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10)			
1. Smooth Brome	50		UPL
2. Juncus arcticus	60	Y	FACW
3. Canada Thistle	10		FACU
4. St. Johns wort	1		UPL
5. Mullein	2		UPL
6. Golden Rod, Sacs	3		FACU
7. Fescue, Red	25	Y	FAC
8. Western wheat grass	3		FACU
9. Cinquefoil, Hoods	1		FAC
10.			
	114 = Total Cover		
Woody Vine Stratum (Plot size: 0)			
1.			
2.			
	____ = Total Cover		
% Bare Ground in Herb Stratum 3			

50% = 57
20% = 22.8

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	25	x 3 =	75
FACU species	16	x 4 =	64
UPL species	13	x 5 =	65
Column Totals:	114 (A)		324 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:
N 1 - Rapid Test for Hydrophytic Vegetation
Y 2 - Dominance Test is >50%
Y 3 - Prevalence Index is ≤3.0[1]
N 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Points above this sampling location are considered in reference to WD09

SOIL

Sampling Point: WDP9

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	organic							
1-4	10YR 4/2	90	5YR 5/4	10	C	RM	silty loam	
4-13	10YR 3/2	95	5YR 6/6	5	D	RM	silty loam	gravel + cobble

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ✓ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR F)**
- ___ 1 cm Muck (A9) **(LRR F, G, H)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) **(MLRA 72 & 73 of LRR H)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR I, J)**
- ___ Coast Prairie Redox (A16) **(LRR F, G, H)**
- ___ Dark Surface (S7) **(LRR G)**
- ___ High Plains Depressions (F16) **(LRR H outside of MLRA 72 & 73)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

lacking soil characteristics

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ✓ Water Marks (B1)
- ✓ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- ✓ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ✓ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ✓ Salt Crust (B11)
- ✓ Aquatic Invertebrates (B13)
- ✓ Hydrogen Sulfide Odor (C1)
- ✓ Dry-Season Water Table (C2)
- ✓ Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
- ✓ Presence of Reduced Iron (C4)
- ✓ Thin Muck Surface (C7)
- ✓ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ✓ Surface Soil Cracks (B6)
- ✓ Sparsely Vegetated Concave Surface (B8)
- ✓ Drainage Patterns (B10)
- ✓ Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
- ✓ Crayfish Burrows (C8)
- ✓ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ✓ Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ No ___

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

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 6/21/12

Applicant/Owner: NREL/DOE - GO State: CO Sampling Point: WD16

Investigator(s): Thomas Ryan Section, Township, Range: 4, T2S, R70W

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): none Slope (%): 15

Subregion (LRR): LRR G Lat: 39°54.821' Long: 105°13.260 Datum: WGS 84

Soil Map Unit Name: Golden Area | Nederland very cobbly sandy loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____ Soil _____, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____ Soil _____, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

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

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

Remarks: Wetlands were restored from cultivated agricultural fields as part of a wetland bank project. New delineated area along eastern side of main wetland. No criteria met.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2. None			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 10m)			
1. Snowberry	10	Y	UPL
2. Wild Rose	10	Y	UPL
3.			
4.			
5.			
	20 = Total Cover		
Herb Stratum (Plot size: 5m)			
1. Smooth Brome	60	Y	UPL
2. prairie cordgrass	20	N	FACW
3. Juncus arcticus	20	N	FACW
4. Canada thistle	10	N	FACU
5. wild iris	10	N	FACW
6. teasel	T	N	TBD
7. Poa pratensis	5	N	FAC
8. mullein	T	N	UPL
9.			
10.			
	125 = Total Cover		
Woody Vine Stratum (Plot size: _____)	50% = 62.5	20% = 25	
1.			
2.			
% Bare Ground in Herb Stratum _____	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.33 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

N Dominance Test is >50%

N Prevalence Index is ≤3.0[1]

N Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

N Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WD10

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1								organic
1-4	7.5YR 3/3	100					SCL	gravelly
4-15	2.5YR 3/2	100					CL	Large fine
15-18	10YR 5/4	75	7.5YR 3/1	25			CL	Large grave

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

Hydric Soil Indicators:

- ☑ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) **(LRR F)**
- ☐ 1 cm Muck (A9) **(LRR F, G, H)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- ☑ 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- ☑ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ High Plains Depressions (F16) **(MLRA 72 & 73 of LRR H)**

Indicators for Problematic Hydric Soils[3]:

- ☑ 1 cm Muck (A9) **(LRRI, J)**
- ☐ Coast Prairie Redox (A16) **(LRR F, G, H)**
- ☐ Dark Surface (S7) **(LRR G)**
- ☐ High Plains Depressions (F16) **(LRRH outside of MLRA 72 & 73)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☑ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☑ Water-Stained Leaves (B9)
- ☑ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Dry-Season Water Table (C2)
- ☐ Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
- ☐ Presence of Reduced Iron (C4)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☑ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☑ FAC-Neutral Test (D5)
- ☑ Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes ____ No ☒ Depth (inches): _____

Water Table Present? Yes ____ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No ☒ Depth (inches): _____

Wetland Hydrology Present? Yes ____ No ☒

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

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 6/27/12

Applicant/Owner: NREL/DOE-GO State: CO Sampling Point: WD 11

Investigator(s): Thomas Ryan Section, Township, Range: 4, T2S, R70W

Landform (hillslope, terrace, etc.): Drainage Local relief (concave, convex, none): concave Slope (%): 2

Subregion (LRR): LRR G Lat: 39° 54.672 Long: 105° 13.347 Datum: WGS84

Soil Map Unit Name: Golden Area: Nederland very cobbly sandy loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____ Soil ____, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ Soil ____, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks: Wetlands were restored from cultivated agricultural fields as part of a wetland bank project. New delineated area along eastern side of main wetland. No criteria met.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 10m)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 5m)			
1. Bromus inermis	90	Y	UPL
2. Canada Thistle	10	N	FACU
3. Juncus articus	10	N	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	110 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
% Bare Ground in Herb Stratum ____	____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- ____ Prevalence Index is ≤3.0[1]
- ____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WD11

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
			Not Recorded					

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

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR F)**
- ___ 1 cm Muck (A9) **(LRR F, G, H)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) **(MLRA 72 & 73 of LRR H)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRRI, J)**
- ___ Coast Prairie Redox (A16) **(LRR F, G, H)**
- ___ Dark Surface (S7) **(LRR G)**
- ___ High Plains Depressions (F16) **(LRRH outside of MLRA 72 & 73)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- X Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): _____

Water Table Present? Yes ____ No ____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

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

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: NWTC City/County: Jefferson Sampling Date: 6/27/12
Applicant/Owner: NREL/DOE-GO State: CO Sampling Point: WD12
Investigator(s): Thomas Ryan Section, Township, Range: 4, T2S, R70W
Landform (hillslope, terrace, etc.): Drainage Local relief (concave, convex, none): Concave Slope (%): 1
Subregion (LRR): LRR G Lat: 39°54.653 Long: 105° 13.398 Datum: WGS 84
Soil Map Unit Name: Golden Area: Flatirons very cobbly sandy loam NWI classification: n/a
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
Are Vegetation _____ Soil _____, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
Are Vegetation _____ Soil _____, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

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

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

Remarks: Wetlands were restored from cultivated agricultural fields as part of a wetland bank project. New delineated area along eastern side of main wetland. No criteria met.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 10m)			
1. Wild Rose	10	Y	UPL
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5m)			
1. Bromus inermis	80	Y	UPL
2. Cirsium arvense	20	N	FACU
3. Juncus	5	N	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	105 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
% Bare Ground in Herb Stratum _____	_____ = Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): 0 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:
- N Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WD12

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
			Not recorded					

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

Hydric Soil Indicators:

- ✓ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR F)**
- ___ 1 cm Muck (A9) **(LRR F, G, H)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) **(LRR G, H)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR F)**
- ✓ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) **(MLRA 72 & 73 of LRR H)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRRI, J)**
- ___ Coast Prairie Redox (A16) **(LRR F, G, H)**
- ___ Dark Surface (S7) **(LRR G)**
- ___ High Plains Depressions (F16) **(LRRH outside of MLRA 72 & 73)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ✓ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) **(where not tilled)**
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ✓ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) **(where tilled)**
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) **(LRR F)**

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): _____

Wetland Hydrology Present? Yes ___ No X

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

Remarks:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
DENVER REGULATORY OFFICE, 9307 SOUTH WADSWORTH BOULEVARD
LITTLETON, COLORADO 80128-6901

February 12, 2014

Ms, Genevieve Braus
NREL
15013 Denver West Parkway
Golden, CO 80401

RE: Wetland Delineation for the National Wind Technology Center
Corps File No. 200180432

Dear Ms. Braus:

Mr. Terry McKee of my office has reviewed your February 10, 2014 wetland delineation report and map for this project located at 39.911501; -105.219808, Jefferson County, Colorado. Mr. McKee considers your wetland report and map for this property accurate and acceptable.

If any work requires the placement of dredged or fill material, and any excavation associated with a dredged or fill project into wetlands, this office should be notified by a proponent of the project for Department of the Army permits or changes in permit requirements pursuant to Section 404 of the Clean Water Act.

Work in wetlands should be identified and shown on a map identifying the Quarter Section, Township, Range and County and Latitude and Longitude in decimal degrees (example 40.55555; -104.55555) and the dimensions of work in the wetlands. Any loss of an aquatic site may require mitigation. Mitigation requirements will be determined during the Department of the Army permitting review.

The Omaha District, Regulatory Branch is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete our Customer Service Survey found on our website at http://per2.nwp.usace.army.mil/survey.html. If you do not have Internet access, you may call and request a paper copy of the survey that you can complete and return to us by mail or fax. (Completing the survey is a voluntary action)

If there are any questions call **Mr. Terry McKee** at **(720) 922-3851** and **reference Corps No. 200180432.**

Sincerely,

Kiel Downing
Chief, Denver Regulatory Office

Department of Energy
Golden Field Office
15013 Denver West Parkway
Golden, Colorado 80401

October 22, 2013

Susan Linner, Colorado Field Supervisor
U.S. Fish and Wildlife Service
P.O. Box 25486
Denver Federal Center
(MS 65412)
Denver, Colorado 80225

SUBJECT: INITIATION OF INFORMAL SECTION 7 CONSULTATION, COMPLIANCE WITH MIGRATORY BIRD TREATY ACT & BALD AND GOLDEN EAGLE PROTECTION ACT - PROPOSED IMPROVEMENTS FOR THE DEPARTMENT OF ENERGY'S NATIONAL WIND TECHNOLOGY CENTER AT THE NATIONAL RENEWABLE ENERGY LABORATORY, GOLDEN, CO (DOE/EA-1914)

Dear Ms. Linner:

The U.S. Department of Energy (DOE) is initiating informal consultation pursuant to the requirements under Section 7(a)(2) of the Endangered Species Act and the U.S. Fish and Wildlife Service (USFWS) implementing regulations (50 CFR part 402). DOE is also coordinating with your office, as required under the National Environmental Policy Act (NEPA) for the proposed improvements to DOE's National Wind Technology Center (NWTC) at the National Renewable Energy Laboratory (NREL). The NWTC is located in Jefferson County, Colorado.

DOE is currently preparing a Site-Wide Environmental Assessment (EA) of the continued operation and future site development of the NWTC.

A Notice of Scoping for this Site-Wide EA was sent to you to in September 2012. DOE requested that interested parties provide comments, during a 30-day public comment period, on any potential issues or impacts of implementing the Proposed Action, at that time. Due to input received during the scoping period, the Proposed Action description has been revised. A revised Proposed Action is provided in **Attachment I**.

Periodically, surveys are conducted to identify plant and animal species on or near the NWTC to provide data for environmental impacts analysis. A list of surveys is presented in **Table 1** below.

Table 1. Surveys

Type of Survey	Duration	Locations
Raptor Surveys (Monahan, 1996)	17 months	Various vantage points on perimeter or interior roads
Bird and Bat Use and Fatalities Survey (Schmidt et al. 2003)	One year	• Six locations on the NWTC • Five locations on Rocky Flats • Seven locations on Boulder County open space
NWTC Site-Wide EA (2002)	Pre-2002	Summary of various studies
April 2010 Fixed-Point Raptor Migration Survey (Eco-Logic 2011)	One month April 2010	One point at western edge of NWTC
Avian Use of NWTC - Fixed Point (Tetra Tech, 2011a)	One year Jan 2010 - 2011	• 6 locations on NWTC • 3 locations on Rocky Flats National Wildlife Refuge • 3 locations on City of Boulder Open Space
Bird and Bat Mortality Surveys (Tetra Tech, 2011a, 2011b)	One year Aug 2010 - Sep 2011	Around all aerial structures at NWTC
Breeding Bird Surveys (Tetra Tech, 2011a)	May 2011 - Jun 2011	East-west transects, 100 meters apart, across the entire NWTC site
Migratory Nesting Bird Surveys (NREL EHS)	Continuous	NWTC Site
Wetlands Delineation (NREL EHS, 2012)	One-time event	NTWC Site
Wildlife Surveys (Walsh, 2011)	Jul 2010 - May 2011	NWTC Site

Seven parcels of land totaling approximately 69 acres, or 22 percent of the site, have been designated as conservation management areas at the NWTC. These areas protect the site's natural resources and, in the westernmost area, prevent land development within critical wind corridors (upwind fetch areas) as shown on **Figure 3 (Attachment I)**. Designation of specific conservation management areas provides continued protection of the site's unique natural resources. Development at the NWTC is not allowed in drainages, hillside seeps, a seasonal pond, remnant tallgrass prairie within mesic mixed grassland, a prairie dog re-location area, areas designated as ancient soils, or an area designated as critical habitat for the Preble's meadow jumping mouse (the Preble's mouse), a federally listed threatened mammal species.

NREL manages the NWTC to minimize disturbance in these areas and implements protection measures if disturbance occurs, under NREL's natural resource conservation procedure. The procedure outlines further natural resource commitments, such as:

- Preserving existing vegetation;
- Minimizing adverse impacts to natural habitat;
- Practicing sustainable landscaping;
- Performing restoration with native seed mixes;
- Driving on designated roadways;
- Performing ground nesting bird surveys before any activities take place;
- No harming policy for nesting and roosting raptors, bats, snakes, prairie dogs and other wildlife;
- Installing wildlife friendly fencing and corridors; and,
- Practicing weed control.

The Jefferson County Nature Association surveys all of the properties surrounding Rocky Flats and assesses each for weed control. The Jefferson County Nature Association provides an annual report to the Rocky Flats Trustee Council. NWTC land managers have worked closely with the Jefferson County Nature Association and have met with the Jefferson County Weed Coordinator regarding the weed control program at NREL. Of the 16 properties, the NWTC had the best control of noxious weeds and was given the highest rating of "Very Good".

Identified Species at the NWTC

The USFWS has identified four birds, two fish, three plants, one invertebrate, and four mammal species federally classified as threatened, endangered, proposed, or candidate species under the ESA that could potentially occur in Jefferson and Boulder Counties (USFWS 2013a). In addition, bald and golden eagles have been identified with the potential to occur and are protected under the Bald and Golden Eagle Protection Act. In 2013, species were identified using the USFWS's Information, Planning and Conservation System (IPaC). Species that have the potential to occur at the NWTC are identified in **Table 2**.

Critical habitat for the Preble's mouse was designated by USFWS in the southeastern portion of NWTC as presented in **Figure 3 (Attachment I).**

Table 2. Federally Protected Species Found in Jefferson & Boulder Counties, Colorado

Common Name	Scientific Name	Status	Potential to occur at NWTC
Plants			
Ute ladies' tresses	*Spiranthes diluvialis*	FT	Yes
Colorado butterfly plant	*Gaura neomexicana* ssp. *coloradensis*	FT	Yes
Western prairie fringed orchid	*Platanthera praeclara*	FT	No
Invertebrates			
Pawnee montane skipper	*Hesperia leonardus montana*	FT	Yes
Fish			
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	FT	No
Pallid sturgeon	*Scaphirhynchus albus*	FE	No
Birds			
Least tern	*Sternula antillarum*	FE	No
Mexican spotted owl	*Strix occidentalis lucida*	FT	No
Piping plover	*Charadrius melodus*	FT	No
Whooping crane	*Grus americana*	FE	No
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	Yes
Golden eagle	*Aquila chrysaetos*	BGEPA, FSOC	Yes
Mammals			
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	FT	Yes
Canada lynx	*Lynx canadensis*	FT	No
Gunnison's prairie dog	*Cynomys gunnisoni*	FC	No
North American wolverine	*Gulo gulo luscus*	PT	No

Sources: USFWS 2013a
Status Codes:
BGEPA = Bald and Golden Eagle Protection Act
FC= Federal Candidate
FE = Federally Listed Endangered
FSOC = Federal Species of Concern
FT = Federally Listed Threatened
PT = Proposed Threatened

Federally Threatened and Endangered Species

Ute ladies'-tresses orchid and Colorado butterfly plant. Two federally listed threatened plant species, Ute ladies'-tresses orchid and Colorado butterfly plant have the potential to occur at the NWTC. Although marginal habitat for both Ute ladies' tresses and the Colorado butterfly plant occur at NWTC, no species were found during two consecutive years of surveys in 2000 and 2001, as documented in the 2002 NWTC Site-Wide EA. The subsequent 2010-2011 vegetation surveys did not identify individuals of these species (Walsh, 2011). For Ute ladies'-tresses orchid, ephemeral drainages and wetlands on NWTC generally have dense, overgrown vegetation and are not suitable habitat for this species. DOE has concluded that the Proposed Action will *not affect* these listed species as they have not been identified onsite. However, periodic plant surveys are conducted at the

NWTC and if these species are identified, proper management practices would be used and their existence would be documented.

Pawnee Montane Skipper. A member of the butterfly family, the Pawnee montane skipper is a subspecies only occurring in the South Platte Canyon River drainage system in Colorado, which includes portions of Jefferson County, south of the NWTC. Listed as threatened under the ESA in 1987, this skipper occurs in dry, open, ponderosa pine woodlands and has the potential to occur in the northwestern portion of NWTC, in the ponderosa pine area. This area is protected within the designated conservation management area onsite and no activities are being proposed in this area. DOE has concluded that the Proposed Action will *not affect* these listed species as any habitat that would support these two species is within the designated conservation management area and the Proposed Action would not take place in this area.

Preble's Meadow Jumping Mouse. The federally threatened Preble's mouse is the only federally listed species known to occur in close proximity to the NWTC. The Preble's mouse only occurs in Colorado and Wyoming. Historically, they occurred from the Front Range of Colorado east to the South Platte River, and from Colorado Springs north to the North Platte River in Wyoming.

Although the Preble's mouse has not been captured or detected on NWTC during surveys, it does have the potential to occur on the riparian fringe wetlands on the southeastern portion of NWTC. Creeks located east of the NWTC are known to be inhabited by this mouse farther downstream, offsite on the adjacent Rocky Flats Wildlife Refuge. Critical habitat for the Preble's mouse was designated by USFWS in a small area (0.5 acre) in southeastern portion of NWTC. This area is under protection within a NREL conservation management area, since it is considered critical habitat. The habitat designated by USFWS offsite includes the stream width plus 394 feet on either side (Federal Register 50 CFR Part 17). No ground-disturbing activities are proposed within 2,500 feet of or within the critical habitat for the Proposed Action in this protected area, as shown on **Figure 2** and **Figure 3**.

DOE has concluded that the Proposed Action *may affect but is not likely to adversely affect* this listed species or its critical habitat. The Preble's critical habitat on the NWTC is protected in a conservation management area, and the Preble's mouse has not been identified onsite during small mammal surveys. However, periodic animal surveys are conducted at the NWTC and if Preble's are identified, proper management practices would be continued and their existence would be documented.

Bald and Golden Eagle Protection Act & Migratory Bird Treaty Act

Bald Eagle. Although not federally listed under the ESA, the bald eagle remains protected under the Bald and Golden Eagle Protection Act (BGEPA). The bald eagle migrates during the spring and fall, but generally it follows the major river systems of the state or the hogback (a steep ridge) west of the NWTC. Eagles are typically attracted to large open-water bodies and, due to lack of current suitable habitat at the NWTC, any occurrences would likely involve transient or hunting individuals. Historically, bald eagles have been observed in transit to roosting areas. In addition, a pair of bald eagles was observed nesting in a plains cottonwood stand in the Coal Creek drainage channel approximately 2.5 miles northeast of the NWTC. Local ornithologists report five breeding bald eagle pairs existed in Boulder County during 2008-2010 surveys, including the Coal Creek pair (Hallock and Jones 2010). A nesting pair also exists at Standley Lake located 3.8 miles from the NWTC in Jefferson County. The closest nest is 2.5 miles (or 13,200 feet) northeast of the NWTC.

Golden Eagle. Golden eagles use a wide range of habitats including pinyon-juniper woodlands, sagebrush, and grasslands, usually in higher elevations of the western U.S. They build large nests in high places (mainly cliffs) to which they may return for several breeding years. Although golden eagles breed primarily in mountainous habitats in Colorado, there is some limited breeding in the northeastern portion of the state. In winter, golden eagles range widely and occur commonly throughout Colorado. During April 2010, Dinosaur Ridge Raptor Migration Station observers tallied seven golden eagles in migration over the I-70/Morrison Hogback viewing station, located approximately eight miles southwest of the NWTC. Any occurrences at the NWTC would likely involve transient or hunting individuals.

The Proposed Action could have minor impacts on migratory birds, bald eagles and golden eagles due to ground disturbing activities and additional aerial structures at the site. Two types of impacts could affect avian species: some loss of habitat in the Proposed Action footprint and potential collisions with the wind turbines and meteorological tower guy wires.

The loss of habitat from implementing the Proposed Action includes xeric mixed grassland that could be potential foraging habitat for prey species or raptors. There would be a small increase in impervious surface areas of approximately 5 acres for new construction and 7.5 acres for proposed wind turbine towers and associated structures. Installing an electrical substation would increase the impervious surface area by approximately 1.25 acres. The total increase is estimated at 13.75 acres or 4.5% of the total NWTC land area of 305 acres.

As the number, size, and overall operational time of turbines increases and more and taller meteorological towers and guy wires are added at the NWTC, the annual rate of fatalities could increase incrementally relative to current conditions. Development of the site could increase fatalities in proportion to the numbers of turbines. In surveys conducted on NWTC in 2010 to 2011, a total of five avian carcasses were found. Avian fatalities were found in every season except winter. These fatalities included black-billed magpie, mourning dove, red-winged blackbird, an unknown sparrow, and an unknown passerine. No raptors carcasses were observed.

For comparison purposes, wind turbines have been considered less significant than other human-caused deaths of birds. Mortalities caused by house cats and collisions with buildings, vehicles, and communication towers are all estimated to have caused billions of avian deaths while wind turbine collisions remain in the thousands. As a reference, airplane strikes have been estimated to be just less than wind turbines in terms of numbers of avian mortalities.

Several variables are involved when considering avian mortality rates for *commercial* wind farms. The NWTC is not a *commercial* wind farm and is considered a research site with relatively small numbers of turbines compared to typical wind farms. In addition, red or dual red and white strobe-like or flashing lights, not steady burning lights, would be added to wind turbines and permanent meteorological towers in accordance with FAA safety requirements and the USFWS land-based wind energy guidelines. The aerial structures at the NWTC pose a negligible threat to resident and migratory birds, including raptors.

The closest bald eagle nest is 2.5 miles (or 13,200 feet) northeast of the NWTC and natural landscape buffers exist between the NWTC and the nesting site. In accordance with the National Bald Eagle Management Guidelines (USFWS 2007), no activities can be conducted within 660 feet of a bald eagle nest; therefore, no impacts to the closest nest are expected as a result of the Proposed Action. If an eagle is injured or a carcass is observed, USFWS will be contacted for additional consultation in accordance with the BGEPA.

No long-term or sustained avian population impacts are likely given industry history and available NWTC site mortality data. For these reasons, long- and short-term, negligible adverse impacts on the bird population would be anticipated from implementing the Proposed Action.

DOE has concluded that there would be *no effect* to the following species:

- Ute ladies'-tresses orchid;
- Colorado butterfly plant; and,
- Pawnee Montane Skipper.

DOE has concluded that the Proposed Action *may affect but is not likely to adversely affect* the Preble's mouse or its designated critical habitat.

We are requesting concurrence from your office with the conclusions in this letter. If USFWS has any concerns or would like additional information please contact me via e-mail at amy.vandercook@go.doe.gov or by phone at 720-356-1666. In addition, you may mail comments to:

Department of Energy-Golden Field Office
c/o Amy Van Dercook
15013 Denver West Parkway
Golden, Colorado 80401

Please provide acknowledgement of this request within 30 days of the receipt of this letter to assist us in moving the consultation process forward. DOE will include this correspondence in an appendix to the EA. The DOE Golden Field Office welcomes your input throughout our NEPA Process.

Sincerely,

Amy L. Van Dercook, P.G.
NEPA Document Manager
U.S. Department of Energy-Golden Field Office

Attachment I – Project Background & Description
Figures 1 & 2
Figure 3

ATTACHMENT I

SITE BACKGROUND AND DESCRIPTION

The National Renewable Energy Laboratory (NREL) is the premier DOE national laboratory dedicated to the research, development, and deployment of renewable energy and energy efficiency technologies. As depicted in **Figure 1**, NREL is comprised of three main sites: 1) South Table Mountain (STM); 2) Denver West Office Park (DWOP); and 3) the National Wind Technology Center (NWTC). Other facilities include the Renewable Fuels and Lubricants (ReFUEL) Research Laboratory and Joyce Street facilities. Details regarding NREL's mission and research programs are available on the NREL website at: http://www.nrel.gov.

The 305-acre NWTC is located in northwest Jefferson County, Colorado, approximately 16 miles northwest of Denver. The site is south of Colorado State Highway 128 and directly east of aggregate mining and processing facilities on the east side of Colorado State Highway 93 between Golden and Boulder, Colorado.

There are currently seven major buildings located on the NWTC site that house research and administrative functions and include:

- Administration Building, Building 251;
- Structural Testing Laboratory (STL), Building 254;
- Test Preparation Building (Quonset Hut), Building 260;
- 2.5 MW Dynamometer Test Facility, Building 255;
- 5.0 MW Dynamometer Test Facility, Building 258;
- Distributed Energy Resources Test Facility (DERTF), Building H-1; and,
- Blade Test Facility, Building 252.

All seven major buildings are located in the Research and Support Facilities area on the northern portion of the site along the main east-west road (West 119th Ave).

Several smaller access control, support, and testing facilities are also located on the NWTC site. These include the Site Entrance Building (SEB) or Guard Post, the electrical switchgear buildings, several trailers, and several data sheds. Currently, the total area of all buildings at the NWTC is approximately 1.3 acres.

The NWTC's existing turbine test sites currently support four megawatt (MW)-scale turbines ranging in output from 1.5 to 3 MW, three mid-scale turbines, ranging from 100 kilowatt (kW) to 600 kW, and nine small wind turbines ranging in size from 1 kW to 8 kW.

In 2002, DOE released a final Site-Wide EA for the NWTC (DOE/EA-1378) evaluating the potential impacts of site operations and short-term and long-term improvements. A Finding of No Significant Impact (FONSI) was signed by DOE on May 31, 2002.

The subject of this Site-Wide EA includes the proposed action discussed below which would support DOE's mission in the Research & Development of energy efficiency and renewable energy technologies by providing enhanced research and support capabilities to adequately continue state-of-the-art wind energy research. The mission of EERE's Wind Energy Program is to help the United States attain the substantial economic, environmental, and energy security benefits likely to result from expanding the domestic and worldwide use of wind energy by fostering a world-class domestic wind industry. The program focuses on research, testing and field verification work needed by U.S. industry to fully develop advanced, affordable, reliable wind energy technologies, and on coordination with partners and

stakeholders to overcome barriers to wind energy implementation. EERE's principal research to accomplish this goal is conducted at the NWTC.

PROPOSED ACTION AND ALTERNATIVES

The following presents a summary of the Proposed Action and No Action alternative descriptions for the current draft Environmental Assessment.

Proposed Action

Under the Proposed Action, DOE proposes to improve the site and operations within the current 305-acre NWTC site. New buildings and additions to existing buildings are proposed at the NWTC site, as well as infrastructure upgrades to roads, electrical power, water supply, and sewer lines. This proposed action would include adding multiple turbines with associated meteorological towers, access roads, data sheds, and infrastructure. New wind turbines would vary in size from small generating capacity (up to 100 kW), to mid-range (up to 1 MW), to large utility-scale (1-5 MW) turbine installations. Future facility construction, research, development and testing proposed for the NWTC is dependent on changing federal budgets and priorities. The details provided in this assessment are the best estimates that can be made at this time. **Figure 2** presents proposed improvements at the site.

New Construction

The Proposed Action for new construction would provide for additional facilitates at the NWTC, as described below.

Wind Turbine Component Research and Testing Facility. DOE would construct a 40,000 square foot facility that would be located west of Building 251. The facility is envisioned as a comprehensive R&D laboratory that would address advanced capabilities in the wind industry.

Grid Storage Test Capabilities. DOE would construct MW-Scale Energy Storage Test Platform areas, south of 119th Avenue and at the north end of Row 3. Grid integration testing would provide the capability to perform comprehensive MW-scale grid integration tests by interconnecting dynamometers, turbines, solar systems, and other devices to a grid simulator and energy storage devices. Both mobile and permanent energy storage test facilities would be developed to house and test innovative energy storage devices.

Staging and Maintenance Warehouse. DOE would construct a warehouse up to 40,000 square feet, west of the Building H-1 in the northwest corner of the site. This facility would be used to support indoor staging of test projects and maintenance of equipment.

Modifications of Existing Buildings. Modification of existing infrastructure includes upgrades to the Administration Building 251, STL Building 254, DERTF Building H-1, and 2.5 MW Dynamometer Building 255. Other modifications such as adding a cool roof to an existing building and expansion of buildings to accommodate new research and operations may be required.

Wind Turbines and Meteorological Towers

The Proposed Action would provide additional wind turbines and modify the number of existing field test sites and associated infrastructure to potentially include any combination of up to 7 (including the 4 currently onsite) large utility-scale wind turbines (1 to 5 MW), up to 7 (including the 3 currently onsite) mid-scale turbines (each rated from 100 to 1 MW), and up to 20 (including the 9 currently onsite) small wind turbines (each rated from 1 W to 100 kW). Under the Proposed Action, up to a total of 30 meteorological towers (and associated infrastructure) would be installed onsite, including the 19 that currently exist. **Figure 2** presents proposed improvements at the site.

Currently, approximately 22 test sites are configured on the NWTC property. Under the Proposed Action, some test sites could be combined to create larger test sites that would support utility-scale turbines, or subdivided to create more numerous smaller test sites to accommodate small and mid-scale turbines. It is not anticipated that the maximum number of turbines would be present onsite at one time, since turbines are erected for testing purposes, and then removed when testing is completed.

Infrastructure Upgrades

Electrical. The current NWTC electrical generation capacity is 11.2 MW. Turbine operations are being curtailed to stay below an existing 10 MW limit in accordance with Xcel Energy requirements. Assuming wind technology development continues its current trend toward larger turbines, the projected maximum NWTC electrical generation capacity for the 5- to 10-year timeframe is estimated to increase up to 50 MW as additional turbines are added and smaller turbines are replaced with larger units.

To accommodate an increase to 50 MW, the existing site electrical infrastructure would need to be upgraded to add an additional 40 MW of generation capacity. NREL would work with a local utility provider for the design and installation of an on-site substation to increase the site-generated power from distribution voltage (13.2kV) to transmission voltage (115kV). Then, power generated at the NWTC would be connected via overhead transmission lines to interconnect with existing transmission lines and a local utility provider's switchyard or substation.

Other Infrastructure Upgrades. Other upgrades to the facility would include drinking water system upgrades, fire suppression system upgrades, sanitary waste upgrades, road improvements, and data/telecommunications improvements.

Routine Technical Tasks for Research and Site Maintenance Activities. These tasks include loading equipment, preparing for tests, moving parts, installing and removing turbines, monitoring, cleaning facilities and equipment, maintaining landscape features, snowplowing, performing pest management, and maintaining buildings and infrastructure.

Development of a Reasonable Range Of Alternatives

Under the No Action Alternative, NREL would continue current operations and activities at NWTC.

Figure 1. Vicinity Map

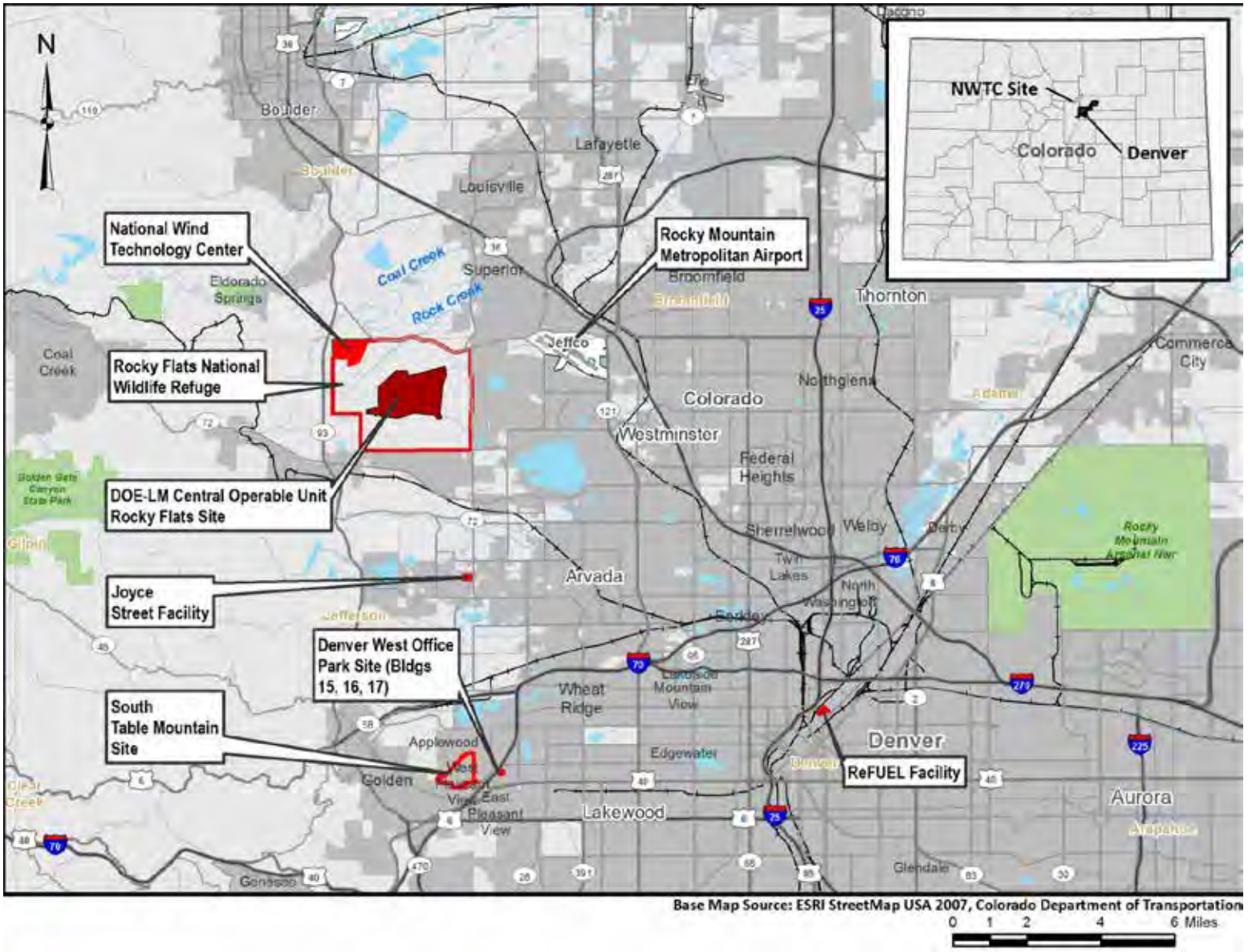
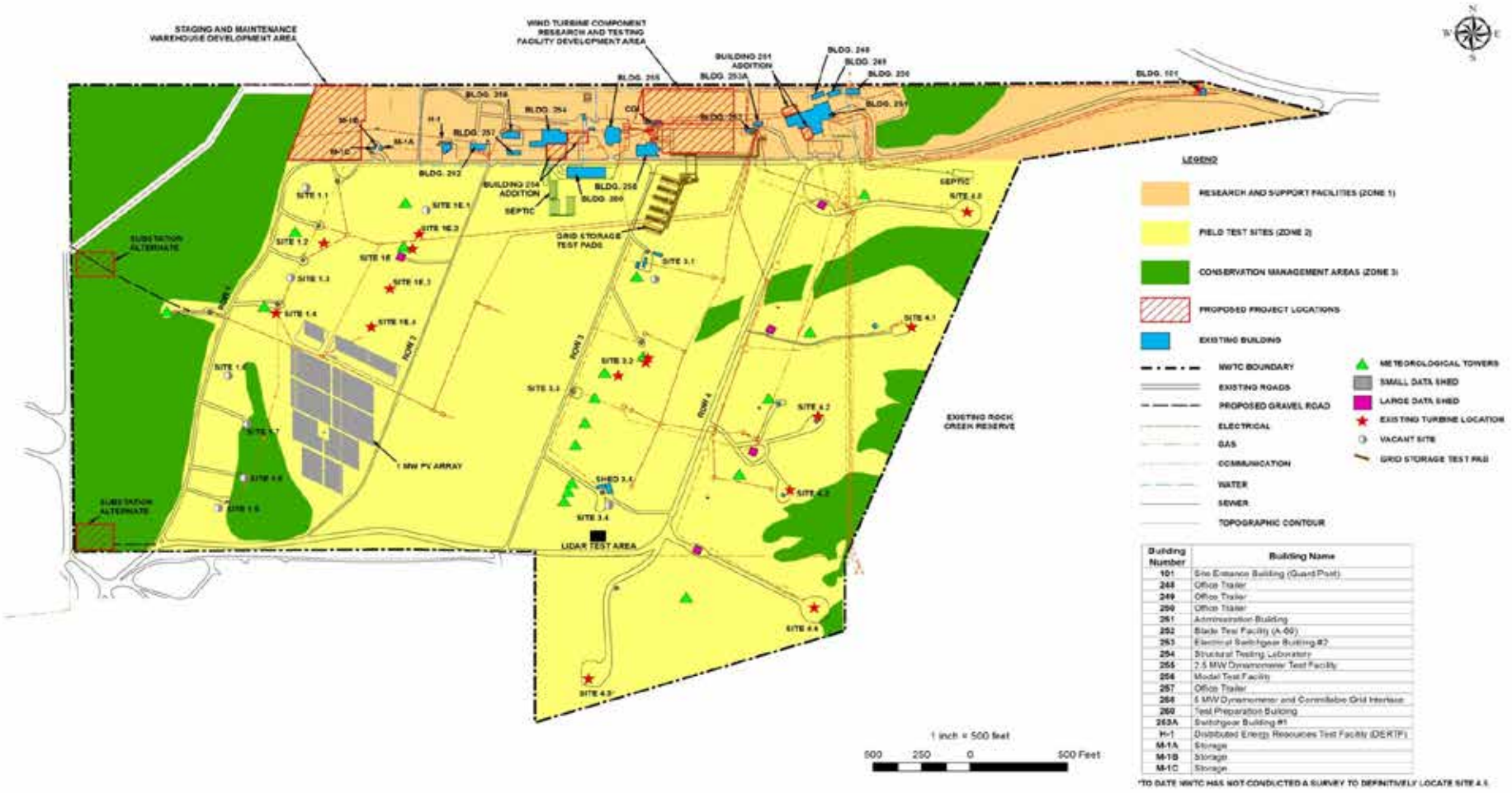


Figure 2. Proposed Improvements



Building Number	Building Name
101	Site Entrance Building (Guard Post)
248	Office Trailer
249	Office Trailer
250	Office Trailer
251	Administration Building
252	Blade Test Facility (A-60)
253	Electrical Switchgear Building #2
254	Structural Testing Laboratory
255	2.5 MW Dynamometer Test Facility
256	Model Test Facility
257	Office Trailer
258	5 MW Dynamometer and Controllable Grid Interface
259	Test Preparation Building
253A	Switchgear Building #1
H-1	Distributed Energy Resources Test Facility (DERTF)
M-1A	Storage
M-1B	Storage
M-1C	Storage

*TO DATE NWTC HAS NOT CONDUCTED A SURVEY TO DEFINITIVELY LOCATE SITE 4.5

Figure 3. Conservation Management Areas within NWTC Boundaries

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Colorado Field Office
P.O. Box 25486, DFC (65412)
Denver, Colorado 80225-0486

IN REPLY REFER TO:
ES/CO: Preble's, Orchid, CBP / JeffCo / DOE – National Wind Technology Center
TAILS: 06E24000-2014-I-0051, CPA-0011
DOE/EA-1914

JAN 15 2014

Amy L. Van Dercook
NEPA Documents Manager
U.S. Department of Energy
Golden Field Office
15013 Denver West Parkway
Golden, Colorado 80401

Dear Ms. Van Dercook:

Thank you for your letter to the U.S. Fish and Wildlife Service (Service) dated October 22, 2013, regarding the U.S. Department of Energy's (DOE) proposed **Improvements at the National Wind Technology Center** in Jefferson County, Colorado (Latitude: 39.910197°; Longitude: -105.228084°). We received your letter on October 24, 2013, and Craig Hansen of the Colorado Field Office discussed this project with you by telephone on December 6, 2013. We appreciate your flexibility and patience during our review as my office deals with the effects of the sequester and the Federal government's recent shutdown.

The DOE's proposed action at the National Wind Technology Center includes:

- The construction of new or modification of existing facilities, including the construction of two new 40,000-suare foot (0.9-acre) buildings;
- The installation of additional wind turbines, as follows:
  - Up to 7 large, utility-scale wind turbines (1 to 5 megawatts (MW) each);
  - Up to 7 mid-scale turbines (100 to 1 MW each); and
  - Up to 20 small wind turbines (1 watt to 100 kilowatts each);
- The installation of up to 30 meteorological towers and associated infrastructure; and
- Electrical facility and other infrastructure upgrades.

You requested concurrence with your determination that the proposed project is not likely to adversely affect the following federally listed species:

- The federally threatened Preble's meadow jumping mouse, or Preble's (*Zapus hudsonius preblei*) and approximately 0.5 acre of its federally designated critical habitat along Rock

Creek in Jefferson County (Critical Habitat Unit 6, Rocky Flats Site, Jefferson County and Broomfield Counties, 75 FR 78474).

You also requested concurrence with your determination that the proposed project will have no effect on the following federally listed species:

- The federally threatened Ute ladies'-tresses orchid, or orchid (*Spiranthes diluvialis*);
- The federally threatened Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*); and
- The federally threatened Pawnee montane skipper, or skipper (*Hesperia leonardus montana*).

You also determined that the proposed project area does not provide suitable habitats for the following federally listed species found primarily in Nebraska, but that may be affected by depletions of water from the South Platte River and its tributaries in Colorado:

- The federally threatened Western prairie fringed orchid (*Platanthera praeclara*);
- The federally endangered Pallid sturgeon (*Scaphirhynchus albus*);
- The federally endangered Least tern (*Sternula antillarum*);
- The federally threatened Piping plover (*Charadrius melodus*); and
- The federally endangered Whooping crane (*Grus americana*).

In response to your request, we provide the following comments regarding:

1. Guidance for wind energy projects;
2. Federally listed species;
3. Migratory birds; and
4. State species of special concern in Colorado.

The Service provides recommendations for threatened and endangered species under the authority of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*). Protective measures for migratory birds are provided under the authority of the Migratory Bird Treaty Act of 1918 (MBTA), as amended (16 U.S.C. 703 *et seq.*), and the Bald and Golden Eagle Protection Act of 1940 (BGEPA), as amended (16 U.S.C. 668 *et seq.*). Wetlands receive protection under Executive Orders 11990 and 11988, and section 404 of the Clean Water Act of 1972 (33 U.S.C. 1251 *et seq.*). Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*) and the Fish and Wildlife Act (16 U.S.C. 742 *et seq.*).

1. Guidance for Wind Energy Projects

The Service's Region 6, Mountain-Prairie Region has developed three guidance memorandums for proposed wind energy projects in eight states, including Colorado (see Enclosures). These memorandums include Region 6 recommendations for components of an Eagle Conservation Plan; a Region 6 outline for development of a Bird and Bat Conservation Strategy; and Region 6 buffer recommendations for Golden Eagles. The outlines were jointly developed between the

Wyoming Ecological Services (ES) Field Office and the Region 6 Migratory Bird Management Office, with some involvement from the Region 6 ES Division.

The Region 6 recommendations for components of an Eagle Conservation Plan are designed to be compatible with the national USFWS Eagle Conservation Plan Guidance (USFWS April, 2013). The Region 6 outline for development of a Bird and Bat Conservation Strategy was designed to be compatible with the national USFWS Land-Based Wind Energy Guidelines (USFWS March 2012). In both cases, these memorandums provide additional guidance not provided in the corresponding national guidance documents. These guidance memorandums were developed by Region 6 to help facilitate and improve Service interactions with wind energy developers and their consultants, as well as with other federal agencies. The Service's intent is that this effort will help wind energy developers better understand what the Service expects in plans they submit to the Service for review.

2. Federally Threatened and Endangered Species

Preble's meadow jumping mouse

Based on the information that you provided, the Service concurs with your determination that the proposed project is not likely to adversely affect the Preble's or adversely affect its designated critical habitat along Rock Creek, Unit 6 (Rocky Flats Site). We base this determination largely on the following information that you provided or available in our files:

- The DOE will not disturb ground within 2,500 feet (0.5 mile) of or within the Preble's habitats and designated critical habitat, at Rock Creek;
- Previous trapping surveys at the National Wind Technology Center failed to capture jumping mice; and

Therefore, potential effects to the Preble's from the proposed project would be extremely unlikely to occur and insignificant such that they are not likely to adversely affect the subspecies. Additionally, the DOE will protect the Preble's habitats and critical habitats at Rock Creek by designating them as a National Renewal Energy Laboratory (NREL) conservation management area.

Ute ladies'-tresses orchid, Colorado butterfly plant, and Pawnee montane skipper

Based on the information that you provided, the Service agrees with your determination that the proposed project is not likely to impact the orchid, the Colorado butterfly plant, or the skipper. We base this determination largely on the following information that you provided or available in our files:

- The proposed project area lacks suitable habitat for these species;
- Previous surveys within the proposed project area failed to identify the orchid or the Colorado butterfly plant; and
- The proposed project area is not within the skipper's known occupied range and lacks the skipper's preferred host plants and decomposing, Pikes Peak granite soils.

Should project plans change, or if the distribution of federally listed species changes, the Service may reconsider this determination for the Preble's, the orchid, and the Colorado butterfly plant. Please contact the Service if new information suggests that the proposed project may impact listed or proposed species in a manner or to an extent not previously considered as additional consultation under the ESA may be required.

Because species distributions and habitat conditions change over time, this clearance is valid for one year from the date of this letter. If work has not commenced within one year, please contact our office at the above letterhead address to request an extension and reference TAILS project code 06E24000-2014-I-0051, CPA-0011.

Effects of Colorado Water Depletions on Platte River Species in Nebraska

Based on the information that you provided in your October 22, 2013, letter, we cannot agree with your determination that the proposed project will not adversely affect the aforementioned federally listed species or designated critical habitats that occur along the Platte River in Nebraska. After several recent discussions between you and Sandy Vana-Miller of my staff, and Sandy's review of additional, water-related information that you subsequently provided, DOE should request initiation of formal section 7 consultation by official letter to the Service's Colorado Field Office. Complete submission packets for formal consultation on water-related projects with depletions to the Platte River system should include: a complete project description including water use; the origins of the water to be used; and the nature and estimated amount of water use under build-out conditions.

For further information on Platte River ESA consultations, please visit our website at the following address: http://www.fws.gov/platteriver. Please contact Sandy Vana-Miller of the Colorado Field Office at (303) 236–4748 for additional questions regarding the proposed project and Platte River system depletive issues.

3. Migratory Birds and Bald and Golden Eagles

Activities associated with development often include the removal of vegetation, underground burrows, or other structures used by migratory birds and eagles for nesting, roosting, perching, or foraging. Disturbed agricultural areas often provide foraging or ground nesting habitats for several migratory birds, such as the mountain plover (*Charadrius montanus*) or the burrowing owl (*Athene cunicularia*), and their conversion to residential or commercial developments may reduce or fragment available habitats. Therefore, we highlight the relevance of the MBTA and BGEPA to your project and provide recommendations intended to limit your project's impacts on migratory birds and eagles.

The Migratory Bird Treaty Act (MBTA):

The MBTA protects migratory birds, nests, and eggs from possession, sale, purchase, barter, transport, import, export, and take. Under the MBTA, it is unlawful unless permitted by regulations to pursue, hunt, take, capture, kill, or attempt to pursue, hunt, take, capture, or kill any migratory birds by any means or in any manner. The MBTA applies to 1,007 species of migratory birds identified in 50 CFR. § 10.13 and "take" is defined in 50 CFR § 10.12. The

MBTA does not require intent to be proven, there is no incidental take statement, and the ESA does not absolve individuals or companies from liability under the MBTA. Unless permitted by the Service, the MBTA prohibits any intentional or unintentional activity that results in the take of migratory birds. Although the MBTA does not protect the habitats of migratory birds, activities that affect habitats and result in take of migratory birds do violate the MBTA.

The Bald and Golden Eagle Protection Act (BGEPA):

The BGEPA prohibits individuals and companies from knowingly, or with wanton disregard for the consequences of the Act, taking any bald or golden eagles or their body parts, nests, chicks, or eggs, which includes collection, molestation, disturbance, or killing. The BGEPA affords eagles additional protections beyond those provided by the MBTA by making it unlawful to "disturb" eagles. "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, injury to an eagle or decreases its productivity or results in nest abandonment due to interference with breeding, feeding, or sheltering behaviors. A permitting process provides limited exceptions to the BGEPA's prohibitions and the Service has issued regulations concerning the permit procedures in 50 CFR Part 22.

Removing nests, destroying nests, or causing nest abandonment may constitute a violation of the MBTA and BGEPA. Removal of any active migratory bird nest or nest tree is prohibited. For golden eagles, permits for inactive nests are restricted to activities involving resource extraction for human health and safety. No permits will be issued for any active nest of any migratory bird species, unless removal of the active nest is necessary for reasons of human health and safety. Therefore, if nesting migratory birds are present within or near the project area, timing of activities is a significant consideration and should be addressed in the early phases of project planning. Nest manipulation is not allowed without a permit. If a permit cannot be issued, your project may need to be modified to ensure that take of any migratory bird, eagle, young, eggs, or nests will not occur.

Recommendations for migratory birds and eagles:

To minimize impacts to migratory birds, the Service recommends that construction occur outside the typical breeding season for migratory birds. Although the provisions of the MBTA apply year-round, most nesting activity occurs between April 1 and July 15. However, some migratory birds nest outside of this loosely defined period. If proposed activities must occur during the nesting season, or at any other time that may result in the take of migratory birds or eagles, the Service recommends that qualified biologists conduct pre-work field surveys of the affected habitats or structures, during the nesting season, to verify the presence or absence of migratory birds and eagles. Contact the Service's Colorado Field Office at the letterhead address for guidance if project activities may affect birds or nests.

The Colorado Parks and Wildlife's "Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors" (2008) can be found online at: http://bit.ly/WXJYEh. We recommend reviewing these guidelines and incorporating the seasonal and buffer restrictions into your project design to avoid and minimize impacts to raptors and other migratory birds protected by the MBTA.

The Service has developed interim guidelines for the siting, construction, operation, and decommissioning of communication or other towers (USFWS 2000), which also can be found online (go to http://1.usa.gov/1cPlaYs). We recommend that towers or other structures be self-supporting (without guy wires), unlit, and less than 200 feet tall in order to minimize risks to migratory birds protected by the MBTA and BGEPA (USFWS 2000, p. 1). Additionally, our guidelines explain that towers should be sited in existing "antenna farms" whenever possible and should not be sited in or near wetlands, other known bird concentration areas, or in known migratory or daily movement flyways (USFWS 2000, pp. 1–2).

Towers and guy wires are aboveground obstacles to birds in flight and increase the potential for fatal collisions between the structure and migratory birds. As outlined in our guidelines, towers should be self-supporting without guy wires. Larger footprints are preferred to the use of guy wires, but if guy wires must be used, the wires should be marked clearly with bird flight diverters that are inspected and replaced regularly.

Additionally, towers that are over 200 feet tall with lights are significant, aboveground obstacles to birds in flight. Structures and guy wires increase the potential for fatal collisions between the structure and migratory birds. The Service provides these guidelines to help reduce avian collisions at towers and minimize the effects of towers and supporting facilities on migratory birds or other natural resources:

http://www.fws.gov/habitatconservation/communicationtowers.html

If towers require hazardous obstruction lighting, we recommend using the minimum amount of pilot warning and obstruction avoidance strobe lighting required by the Federal Aviation Administration (FAA) in order to reduce the attraction to night-migrating birds. White and red strobe lights operating at the minimum allowable intensity are far less attractive to migratory birds than continuous or pulsating incandescent red or white lights (Gehring *et al.* 2009, p. 512).

It is not possible to absolve individuals, companies, or agencies from liability under the MBTA or BGEPA, even if they implement the guidelines or similar protective measures at their facilities. However, the Service's Office of Law Enforcement focuses its resources on investigating and prosecuting individuals and companies that take migratory birds without identifying and implementing all reasonable prudent and effective measures to avoid that take. It remains the applicant's responsibility to minimize the effects of their projects on migratory birds and other resources. For more information on MBTA and BGEPA regulations and their relevance to your project, please contact Craig Hansen of the Colorado Field Office at (303) 236–4749.

4. State Species of Special Concern

Our comments address federally listed species and migratory birds. Please contact Colorado Parks and Wildlife (CPW) at (303) 297–1192 regarding any State species of special designation in Colorado that are not federally listed and that may occur within your project area. For example, the black-tailed prairie dog (*Cynomys ludovicianus*) frequents disturbed, agricultural fields and may occur within the proposed project area. The black-tailed prairie dog is a State

species of special concern in Colorado. Due to their important value to the prairie ecosystem and the many species that rely on them, we strongly encourage the conservation of prairie dogs.

To avoid and minimize impacts to prairie dogs or their dependent species, we recommend conducting preconstruction surveys for prairie dogs and their associated species. Design the project to avoid disturbing active colonies. If the project cannot avoid active colonies, relocate prairie dogs or consider donating them to a black-footed ferret or raptor recovery program. Contact CPW for more information on the regulations and guidelines that address the capture, transportation, and relocation of prairie dogs in Colorado.

We appreciate the opportunity to work with the DOE on the proposed improvements at the National Wind Technology Center. If the Service can be of any additional assistance, please contact Craig Hansen of the Colorado Field Office by telephone at (303) 236–4749. Thank you for your concern for the Preble's, the orchid, the Colorado butterfly plant, the black-tailed prairie dog, and other natural resources.

Sincerely,

Susan C. Linner
Colorado Field Supervisor

Enclosures (3): Outline for a Bird and Bat Conservation Strategy – Wind Energy Projects
Outline and Components of an Eagle Conservation Plan for Wind Development
Region 6 Recommendations for Avoidance and Minimization of Impacts to Golden Eagles at Wind Energy Facilities

cc: USFWS, Colorado Field Office, C. Hansen, S. Vana-Miller
DOE, National Renewable Energy Laboratory, Tom Ryon

References Cited:

Gehring, J., Kerlinger, P., & Manville, A. M. (2009). Communication towers, lights, and birds: successful methods of reducing the frequency of avian collisions. Ecological Applications, 19(2), 505-514.

USFWS, United States Fish and Wildlife Service (2000). Interim guidelines for recommendations on communications tower siting, construction, operation, and decommissioning. Retrieved October 9, 2012, from http://www.fws.gov/habitatconservation/communicationtowers.html.

U.S. Fish and Wildlife Service, Region 6, Mountain-Prairie Region

Outline for a Bird and Bat Conservation Strategy: Wind Energy Projects

A Bird and Bat Conservation Strategy (BBCS) is a life-of-a-project framework for identifying and implementing actions to conserve birds and bats during wind energy project planning, construction, operation, maintenance, and decommissioning. It is the responsibility of wind energy project developers and operators to effectively assess project-related impacts to birds, bats and their habitats, and to work to avoid and minimize those impacts.

A wind project BBCS should be updated regularly as new information, including monitoring of project impacts and technical advancements, becomes available. A BBCS is a strategy for assessing impacts, avoiding/minimizing impacts, guiding current actions, and planning future impact assessments and actions to conserve birds and bats. It provides reference to project history and previous impact assessments and actions. A BBCS contains the studies, analyses, and reasoning leading to project-specific decisions and implementation of actions. The 2012 U.S. Fish and Wildlife Service (USFWS) Land-Based Wind Energy Guidelines (WEG) provides comprehensive guidance on the process for addressing bird and bat conservation at all stages of wind energy development.

Decisions made through the BBCS framework include determining if there is a need to develop other bird and bat conservation plans such as an Eagle Conservation Plan (2013 USFWS Eagle Conservation Plan Guidance) or Habitat Conservation Plan (Endangered Species Act, section 10(a)(1)(B). Specific surveys needed to support those plans may be most effectively conducted in tandem with surveys to develop the BBCS.

Wind energy projects currently in operation which have not been planned, developed, or operated following a BBCS framework, will, at a minimum, need to supplement assessments of impacts to birds and bats with Post-Construction Assessments and Adaptive Management Studies, working closely with the USFWS.

The following outline is provided by USFWS Region 6 as a guide for developing and organizing a BBCS.

Outline

I. Statement of Purpose
Identify how the BBCS functions as a strategy to address bird and bat conservation during all project phases.

II. Regulatory Framework

A. Fish and Wildlife Laws, Regulations, and Policies
Include the language provided and do not reference USFWS law enforcement or prosecutorial discretion in the BBCS.

1. Migratory Bird Treaty Act (MBTA)
The MBTA is the cornerstone of migratory bird conservation and protection in the United States. The MBTA implements four treaties that provide for international protection of migratory birds. It is a strict liability statute, meaning that proof of intent, knowledge, or negligence is not an element of an MBTA violation. The statute's language is clear that actions resulting in a "taking" or possession (permanent or temporary) of a protected species, in the absence of a USFWS permit or regulatory authorization, are a violation. The MBTA states, "Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill ... possess, offer for sale, sell ... purchase ... ship, export, import ...transport or cause to be transported... any migratory bird, any part, nest, or eggs of any such bird ..." 16 U.S.C. 703. The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" 50 CFR 10.12. The USFWS maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines.

2. Bald and Golden Eagle Protection Act (Eagle Act)
Under authority of the Eagle Act, 16 U.S.C. 668–668d, bald eagles and golden eagles are afforded additional legal protection. The Eagle Act prohibits the take, sale, purchase, barter, offer of sale, purchase, or barter, transport, export or import, at any time or in any manner of any bald or golden eagle, alive or dead, or any part, nest, or egg thereof, 16 U.S.C. 668. The Eagle Act also defines take to include "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb," 16 U.S.C. 668c, and includes criminal and civil penalties for violating the statute. See 16 U.S.C. 668. The term "disturb" is defined as agitating or bothering an eagle to a degree that causes, or is likely to cause, injury to an eagle, or either a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior, 50 CFR 22.3.

3. Endangered Species Act (ESA)
The ESA directs the USFWS to identify and protect endangered and threatened species and their critical habitat, and to provide a means to conserve their ecosystems. Among its other provisions, the ESA requires the USFWS to assess civil and criminal penalties for violations of the Act or its regulations. Section 9 of the ESA prohibits take of federally-listed species. Take is defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" 16 U.S.C. 1532. The term "harm" includes significant habitat alteration which kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering, 50 CFR 17.3. Projects involving Federal lands, funding or authorizations will require consultation between the Federal agency and the USFWS, pursuant to section 7 of the ESA. Projects without a

Federal nexus should work directly with USFWS to avoid adversely impacting listed species and their critical habitats.

B. Other Federal, State, County, Local and Tribal Laws, Regulations, and Policies

III. Project Description

Provide descriptions and maps of all project elements (e.g., roads, power lines, met towers) during all phases of pre-construction, construction, operation, maintenance, and decommissioning. Describe and provide maps of the project impact area (inside and outside project area boundary) where the project may potentially impact birds, bats and their habitats..

IV. Project History of Bird and Bat Presence, and Risk Assessments

A. Preliminary Site Evaluation (WEG Tier 1)

1. Site Description

Describe proposed wind energy site(s) within the broader geographic landscape of bird and bat distribution, use, and habitats.

2. Decision to Abandon Site(s) or Select Site(s) for Additional Assessments in WEG Tier 2

Describe evaluations of sites by answering questions in WEG Tier 1, Chapter 2: (1) Are species or habitats of concern present? (2) Does the landscape contain areas precluded by law or areas that are designated as sensitive? (3) Are there critical areas of wildlife congregation? (4) Is there potential to fragment large intact habitats for species that are sensitive to habitat fragmentation? Based on the answers to these questions, describe the decision to abandon sites or identify project modifications to effectively avoid and minimize potential adverse impacts.

B. Site-specific Characterization and Decisions (WEG Tier 2)

Continue landscape-scale assessments and include site reconnaissance evaluations.

1. Site Description

Provide additional site information obtained through more detailed Tier 2 assessment.

2. Evaluation and Decisions

(a) Abandon Site or Advance to Field Surveys to Support a BBCS

Describe evaluations of sites by answering the four questions from WEG Tier 1, plus questions from WEG Tier 2, Chapter 3: (5) Are plant communities or vegetation habitats of conservation concern present? (6) What species of birds and bats are likely to use the proposed site? (7) Is there potential for significant adverse impacts to those species? If there is a high probability of significant adverse impacts that cannot be avoided or minimized, the site should be abandoned.

(b) Determine Need for Other Bird or Bat Conservation Plans

Describe determination of need, and reference field surveys, for an Eagle Conservation Plan) or Habitat Conservation Plan.

C. Field Studies to Document Wildlife and Habitat, and Predict Project Impacts (WEG Tier 3)

Describe the goals, methods, results, analyses and conclusions of field studies, and include maps to assess the presence of, and project risks to, birds and bats and their habitats. Describe potential project impacts by answering the seven questions from WEG Tier 1 and Tier 2, plus questions

from WEG Tier 3, Chapter 4: (8) What are the distributions, abundance, behaviors and site-use of birds and bats, and what project elements expose these species to risk? (9) What are the potential risks to individuals and local populations of birds and bats and their habitats? (10) How can impacts to birds and bats be avoided and minimized? (11) What studies should be initiated and continued post-construction to evaluate predictions of impacts to birds and bats? Describe the level of scientific rigor of studies, and coordination and sharing of data with USFWS field offices.

1. Bird and Bat Status Assessments
   Describe how assessment studies were of sufficient duration and intensity to ensure adequate data were collected to accurately characterize bird and bat use of the area.

   (a) Bird and Bat Species Presence
      (i) Species Presence by Season
      (ii) Species of Concern (WEG, p. 63)
      (iii) Species of Habitat Fragmentation Concern (WEG, p. 63)

   (b) Bird and Bat Habitats
      Describe, quantify, and map.

   (c) Bird and Bat Use Patterns
      Describe, quantify and map survey data (e.g., from point counts, acoustic surveys, and migration surveys).

   (d) Baseline (Pre-construction) Habitat Management
      Describe the management of habitat at the proposed site prior to construction.

2. Bird and Bat Risk Assessment and Decisions Based on Assessments
   Describe assessment methods and assumptions.

   (a) Project Risk Assessment

      (i) Direct Impacts:
         Describe direct project impacts on birds and bats (e.g., wind turbine collisions, powerline electrocutions and collisions, vehicle collisions, barotrauma, disturbance, displacement, behavioral changes, and habitat loss, degradation and fragmentation).

      (ii) Indirect Impacts
         Describe indirect project impacts on birds and bats (e.g., loss of population vigor, attraction to modified habitats, and increased exposure to predation).

      (iii) Cumulative Impacts

   (b) Risk Assessment Decisions

      (i) Decision Criteria to either Abandon Site or Advance Project

      (ii) Decision of Need for Other Bird and Bat Conservation Plans
         Describe decision to develop other plans such an Eagle Conservation Plan, Habitat Conservation Plan, Candidate Conservation Plan with Assurances, or a plan to address state-managed species.

V. Conservation Measures to Avoid and Minimize Adverse Impacts (during project construction, operation, maintenance, and decommissioning)
Describe conservation measures and when and how each measure will be applied. Some measures will apply to all project phases, but other measures will only apply to specific phases of the project (e.g., construction versus operation). See WEG Chapter 7 for examples. While the following topics in the outline should all be included, the organization of this section may be modified (e.g., conservation measures may be organized by project phase, project elements, or category of conservation action).

A. Measures to Avoid/Minimize Direct Impacts

1. Fatalities

2. Disturbance/Displacement/Behavioral Changes

(a) Nest/Roost/Hibernacula Management
Describe how impacts to nests and nesting attempts will be avoided or minimized during all phases of the project. For example, constructing outside the breeding season or using nest buffers may be appropriate during construction, but measures to discourage or prevent birds from nesting in a sub-station may be needed during operation.

(b) Management of Other Habitat-use Areas (e.g., Foraging Areas)

3. Habitat Loss/Degradation/Fragmentation

B. Measures to Avoid/Minimize Indirect Impacts
For example, address measures to avoid loss of population vigor and increased exposure to predation.

C. Measures to Offset and/or Compensate for Habitat-Related Impacts

D. Measures to Avoid and Minimize Other Identified Project-Specific Risks

VI. Post-construction Studies to Estimate Impacts (WEG Tier 4)
Provide assessments of ongoing project risks to birds and bats and the effectiveness of conservation measures. Describe study methods and the level of survey effort (i.e., how many of each survey type was conducted, over what time period and seasons, and location and geographic coverage).

A. Carcass Surveys

B. Nest/Roost/Hibernacula Surveys

C. Habitat Surveys

D. Other Surveys
A need for surveys, such as point counts, acoustic surveys, mist net surveys, may be identified through measuring project impacts.

VII. Other Post-construction Studies and Adaptive Management (WEG Tier 5)
Describe adaptive management studies which may (1) be planned during development of the BBCS via measuring impacts during post-construction and the discovery that conservation measures are not adequate to avoid and minimize impacts, or may (2) address unplanned or unforeseen impacts. Describe the actions taken during the following steps.

A. Evaluate need for action (1) based on assessing effectiveness of conservation measures through post-construction monitoring of impacts, or (2) as determined by unforeseen impacts or circumstances.

B. Identify potential technical/operational option(s) to avoid and minimize impacts (e.g., via scientific literature or industry innovation).

C. Present technical/operational option(s) to agency/authority for review to determine if it merits field testing or application. If, after review, field testing or application is not merited, go to step B. If field testing or application is merited, go to step D.

D. Field test or apply technical/operational option(s), with agency/authority concurrence of methods, in settings which will not increase adverse impacts to birds and bats nor will result in impacts exceeding those allowable in permits or other project-related plans.

E. Evaluate and report effectiveness of technical/operational option(s) with review by agency/authority. If ineffective, go to step B. If effective go to step F.

F. Apply effective avoidance and minimization measures.

G. Monitor effectiveness (update post-construction monitoring in BBCS, if necessary, with agency/authority review).

H. Update BBCS Section on Conservation Measures, return to step A to evaluate need for further action.

VIII. Project Permits Addressing Birds and Bats

Identify need for permits. For example, migratory bird permits would be required for active nest relocation, temporary possession, depredation, salvage/disposal, and scientific collection.

A. Bird and Bat Permits
Identify permits needed for project construction, operation, and/or maintenance.

B. Agency and Process for Permit Issuance
Identify the responsive agency and processes to apply for and comply with permits.

IX. Reporting Formats and Schedule

Describe formats and schedule for reporting data and study results to responsive agencies.

A. Preconstruction Survey Data

B. Operation/Post-construction Monitoring

C. Adaptive Management

D. Permits

X. Personnel Training

Describe process and curriculum for providing personnel and contractors with education about wildlife laws; processes to follow upon finding injured birds, bats or carcasses; and actions they can take to avoid impacts to birds and bats.

XI. Contacts/Key Resources

A. List of Contacts and Key Resources

B. Coordination Processes
Who/when/where a company should initiate contact and under what circumstances.

XII. References and Literature Cited

XIII. Appendices

A. Baseline Survey Reports

B. Post Construction Reports

1. Carcass Monitoring
2. Nest/Roost/Hibernacula Surveys
3. Habitat Surveys
4. Other Surveys: For example, point counts, acoustic surveys, mist net surveys

C. Adaptive Management Studies

D. Other Plans Guiding Bird and Bat Conservation (e.g., ECP)

E. Permits Related to Birds and Bats

U.S. Fish and Wildlife Service, Region 6, Mountain-Prairie Region

Final Outline and Components of an Eagle Conservation Plan (ECP) for Wind Development: Recommendations from USFWS Region 6

Purpose and Expectations:

The U.S. Fish and Wildlife Service (USFWS) Eagle Conservation Plan Guidance, Module 1, Land-based Wind Energy , Version 2 (ECPG)[1] provides specific in-depth guidance for developing an Eagle Conservation Plan (ECP) for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities. The ECP describes and documents how the project developer and/or operator intends to comply with the regulatory requirements for programmatic eagle take permits and the associated NEPA process by avoiding and minimizing the risk of taking eagles by evaluating possible alternatives in siting, configuration, construction, and operation of wind projects. The ECP should provide detailed information on siting, configuration, construction, and operational alternatives that avoid and minimize eagle take to the point where any remaining take is unavoidable and, if required, mitigates that remaining take to meet the statutory preservation standard. An ECP provides support for an application for a programmatic eagle take permit.

This Region 6 document provides recommendations, in an outline format, for developing and organizing the content of an ECP, and includes additional details on topics that should be addressed in an ECP. This guidance applies equally to both bald and golden eagles. While developing an ECP and applying for a programmatic eagle take permit is voluntary, take of eagles under the Bald and Golden Eagle Protection Act is prohibited without a permit; therefore, we encourage developers/operators of wind projects that may take eagles to develop an ECP and apply for a programmatic eagle take permit. Throughout the process of developing an ECP there should be regular communication between the project developer and/or operator and USFWS personnel (Ecological Services and Migratory Bird Management Offices). This can include emails, conference calls, and meetings involving review of survey data, review and editing of draft documents, joint development of avoidance and minimization measures, review and discussion on model runs, joint work on calculations for compensatory mitigation when required, etc.

[1] Available at http://www.fws.gov/windenergy/PDF/Eagle%20Conservation%20Plan%20Guidance-Module%201.pdf

ECP Outline Recommendations:

I. Introduction and Purpose: Include an explanation of the relationship between the ECP and other related documents, such as NEPA reviews for the project (EA or EIS), Bird and Bat Conservation Strategy (BBCS), etc.

II. Regulatory Framework

A. Laws and Regulations- Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA) – Use applicable default language taken from the USFWS Wind Energy Guidelines (WEG; USFWS 2012, pp. 2-3)

B. State or Tribal Wildlife laws and other Federal laws that apply

III. Project Description

A. Describe all project components, including structures and infrastructure (wind turbines, roads, buildings, met towers, distribution and transmission lines, substations, etc.).

B. Provide a map of project area with project area boundary delineated.

C. Provide a map of topographic relief for the project area.

D. Provide a map of proposed final wind turbine layout, roads, distribution and transmission lines, substations, buildings, met towers (permanent), etc.

E. Provide a map of vegetation classes and aquatic features for the project, including a summary table with information on the acreage or linear miles of each class or feature present and how many acres/miles will be lost or degraded by project development.

IV. Initial Site Assessment (ECPG Stage 1)

A. Brief summary of available sources reviewed for the project site relative to eagles, including reports, publications, GIS maps, agency files, species experts, on-line databases, and initial site visit(s).

B. Were alternate sites considered/evaluated, and if so what criteria were used to compare sites?

C. Address all questions in ECPG Appendix B on page 51. Clearly identify the process used to address these questions. Based on the responses to these questions develop a map that categorizes eagle risk for all sites initially considered for development.

D. Categorize Eagle Risk for Stage 1 (ECPG Appendix B) using ECPG criteria on pp. 25-26.

V. Site-specific Surveys and Assessment (ECPG Stage 2): This section should address the questions in ECPG Appendix C, page 53.

A. Eagle Use

1. Thoroughly describe what types of eagle-use surveys were conducted, the survey protocols used, the number of surveys completed, and when surveys were conducted (years, seasonal coverage, time of day, etc.). Survey types may include, but are not limited to, eagle point count surveys, flight paths, migration monitoring, behavioral studies, and telemetry. If any survey protocols changed during these surveys, explain the changes and provide a rationale for them. If survey types and protocols differed from Appendix C in the ECPG, describe what the differences were and provide a rationale.

2. Include a map of points used for eagle use surveys and an estimate of the percentage of the project area and project footprint they cover.

3. Provide results and thorough details on all pre-construction site-specific surveys that were conducted by year and/or season. Summarize survey results in the ECP. If annual monitoring reports are available for the project, they may be included in an Appendix.

4. Provide results from any other field work to identify migration corridors, roost sites, foraging areas, wintering areas, etc., not mentioned above.

B. Eagle Nests

1. Describe what is known about eagle nesting in the project area prior to any project-related surveys; include a map showing the locations of all historic eagle nests.

2. Thoroughly describe all raptor/eagle nest surveys conducted (i.e. aerial, ground searches, etc.), including methodology, timing and frequency of the surveys; provide a map of the area searched for nests (i.e., how far out from the project area and project footprint did you survey for nests); describe condition of all eagle nests, provide photographs of eagle nest sites, provide outcomes for each eagle nest by species (i.e., tending, occupancy, productivity, and nest success); and provide project-area mean inter-nest distance for eagles by species (if calculated, provide methods used for that calculation).

C. Eagle Prey Base Assessment

1. Thoroughly describe methodologies/protocols used to assess the eagle prey base (especially areas with concentrated prey resources).

2. Provide map(s) indicating areas with concentrated prey resources (e.g., prairie dog towns, leks, ungulate wintering/parturition areas, etc.) in relation to proposed final turbine layout. Map rivers, lakes and reservoirs where bald eagles forage on fish and waterfowl, and map areas of open water available during winter, if any.

3. Describe potential anthropogenic sources of eagle prey for the project area including cattle or sheep grazing operations, road kill carcasses on roads, gut piles from hunting seasons, etc.

D. Eagle Risk Categorization for Stage 2

1. Describe how the eagle use, eagle nest, and eagle prey base assessment data were used to assess the eagle risk category. Use ECPG criteria on pgs. 25-26.

VI. Avoidance and Minimization of Risks in Project Siting (ECPG Stage 4)

A. Project Planning/Design Phase: site selection

1. Were alternative sites considered for development and was there consideration for reducing eagle/raptor/migratory bird risk in this process?

2. Were wind turbines removed and/or relocated from the initial project design, and if so, why?

3. Were any project roads, power lines, or buildings removed or relocated from the initial project design, and if so, why?

4. Document all key adjustments made to the initial project design, why they were made, what information was used to make changes, and any subsequent draft designs. Thorough descriptions should accompany any maps.

5. Were the USFWS Region 6 Recommendations for Avoidance and Minimization of Impacts to Golden Eagles at Wind Energy Facilities (April, 2013) followed in the project design phase? If not, provide a rationale.

VII. Predicting Eagle Fatalities (ECPG Stage 3)

A. Describe the methods and assumptions used. If these differ from Appendix D in the ECPG, describe the differences and provide a rationale.

1. Provide all input data used.

2. Present results from Eagle Modeling by Eagle Species

a. USFWS eagle fatality model

b. Outcomes from other models (if any)

B. Other Eagle Risk Assessment

1. Disturbance/Displacement Assessment

2. Assessment of Project-level Take: Complete this analysis consistent with ECPG Appendix F.

3. Local Area Population (LAP) Analysis

4. Cumulative Impacts Analysis – Comprehensive assessment of known factors impacting eagles, eagle habitat, prey base, etc., within the sphere of the LAP. This includes known eagle mortality from all other factors within the LAP, including existing wind facilities, power lines, poisoning, etc. Proponent will need to work jointly with USFWS on this section. Refer to ECPG Appendix F.

C. Eagle Risk Categorization for Stage 3. Use ECPG criteria on pp. 25-26.

VIII. Additional Avoidance and Minimization of Risks, ACP's, and Compensatory Mitigation (ECPG Stage 4)

A. Construction Phase Best Management Practices (all that apply from USFWS 2012, WEG Chapter 7)

B. Operational Phase

1. Best Management Practices (Including, at a minimum, those from USFWS 2012, WEG Chapter 7 which apply to eagles)

2. Experimental Advanced Conservation Practices, per ECPG Appendix E.

C. Compensatory Mitigation

1. Calculations of needed mitigation for your project using Appendix G of ECPG; thoroughly describe calculations that were used to generate results.

2. Present a plan for the implementation of compensatory mitigation, including the type of compensatory mitigation that will be implemented. How was the type of compensatory mitigation being proposed actually selected? The plan should demonstrate the project developer's/operator's ability to complete it. Where will the compensatory mitigation be completed relative to relevant Local Area Population, Bird Conservation Regions (ECPG pg. 38), Eagle Management Units (ECPG pg. 39), etc.? What is the expected life of the compensatory mitigation action(s)?

3. Effectiveness monitoring: describe monitoring approach, duration, etc.

4. Adaptive Management, including commitments to change operations in response to monitoring outcomes as applicable. (See ECPG pg. 28 and ECPG Appendix A)

IX. Calibration and Updating of the Fatality Prediction and Continued Risk Assessment (ECPG Stage 5)

A. Post-construction monitoring (eagle/avian surveys)

1. Describe the methodology/protocols to be used for carcass surveys for eagles/migratory birds (including searcher efficiency trials and carcass persistence trials). These will be developed jointly by the developer/operator and the USFWS per ECPG Appendix H.

Note: General considerations for design of the fatality monitoring program include:

- Kunz et al. (2007). Assessing impacts of wind-energy development on nocturnally active birds and bats: a guidance document. Journal of Wildlife Management 71: 2449-2486.
- Strickland et al. (2011). Studying Wind Energy/Wildlife Interactions: a Guidance Document. Prepared for the National Wind Coordinating Collaborative, Washington, D.C., USA, and relevant points from USFWS WEG pp. 35-37.

2. Surveys of eagle/raptor nests (occupancy, productivity, and success)

- Describe methods to be used, number of years surveys will be conducted, area to be surveyed, etc.

3. Disturbance Monitoring: Document any post-construction monitoring of eagle nesting territories and communal roost sites to evaluate disturbance effects. (See ECPG Appendix H, pg. 98). Provide details of the protocols and methods to be used for such monitoring.

4. Describe eagle use/migratory bird surveys that will be conducted post-construction. Provide methodology, timing and frequency of survey effort, location of survey points,

percent of area that will be surveyed, number of surveys, etc. If such surveys will not be conducted, provide a rationale.

5. If there will be an incidental (i.e., informal) wildlife monitoring system established, describe the system, including personnel that will implement it, data forms to be used, how the reporting process will work, and how conflicts with informal monitoring and formal carcass surveys will be avoided.

X. Permits

A. For USFWS programmatic eagle take permits, conditions will be provided by USFWS.

B. Other USFWS Permit Types: Other Migratory Bird Treaty Act (MBTA) permits may be required for project management. These include, but are not limited to, nest relocation, temporary possession, depredation, salvage/disposal, and scientific collection.

1. Identify MBTA permit types the project is likely to apply for. Also describe the process which will be used to obtain and comply with all necessary MBTA take permits for the project.

2. Other State or Tribal wildlife permits

XI. References/Literature Cited

What not to include in your ECP:

-Literature review or summary of effects of wind turbines on eagles/migratory birds/wildlife

-Comparisons of predicted eagle take at your project with other on-line wind energy facilities

Region 6 Recommendations for Avoidance and Minimization of Impacts to Golden Eagles at Wind Energy Facilities, April 11, 2013

The following recommendations were developed through a joint effort between the Migratory Bird Management and Ecological Services Programs in the Region 6 Regional Office and Wyoming Ecological Services Field Office in Cheyenne, Wyoming. The document includes our joint recommendations to avoid and minimize impacts to golden eagles (GOEA) at: (a) recently occupied nests, (b) unoccupied nests, (c) areas of concentrated prey resources, and (d) other project-specific eagle activity areas. Our goal for avoiding and minimizing impacts is to contribute to maintaining stable or increasing breeding populations of eagles by recommending conservation measures that will maintain GOEA breeding territories and by minimizing impacts to other important eagle use areas (e.g., eagle nests, foraging areas, and communal roosts; 50 CFR 22.3). Currently, a sub-team of the Eagle Technical Assistance Team is developing recommendations for addressing activities near eagle nests, but their recommendations may not be available for several months or longer (they intend to use a peer review process). In developing our recommendations, we are aware that our approach could be more or less stringent than the recommendations ultimately developed by the Eagle Technical Assistance Team, but we have strived to use the best available science.

RECOMMENDATIONS

I. Occupied Nests – Use the ½ mean inter-nest distance (MIND) buffer for the project area.

II. Unoccupied (Historic) Nests – No turbines will be constructed within 0.5-mile (800-meters) of any unoccupied (historic) nest. In addition, all turbines between 0.5-mile and 1.0 mile (1,600-meters) of any unoccupied nest will be curtailed during each year starting 15 January until 1 May, unless adequate nest surveys demonstrate that the nests are unoccupied. Also, if the nest becomes occupied, turbines will be curtailed between the 0.5-mile and the ½-MIND during the breeding season until the young fledge or the nest becomes unoccupied.

III. Areas of Concentrated Prey Resources – Recommend turbines not be constructed in areas of concentrated prey resources unless it can be demonstrated that they do not overlap or are not immediately adjacent to other important eagle use areas, and where sufficient data are available to confirm that the concentrated prey resources are not in project-specific eagle activity areas.

IV. Other Project-Specific Eagle Activity Areas – Focus on areas where there is an intersection of geographic relief (e.g., cliff features used for nesting, ridge features used for migration, rims used for orthographic lift) and documented project-specific eagle activity areas.

DESCRIPTION OF RECOMMENDATIONS

A. Occupied Nests

An occupied nest is a nest used for breeding in the current year by a pair of eagles. Presence of an adult, eggs, or young, freshly molted feathers or plucked down, or current year's mutes (whitewash) suggest site occupancy. In years when food resources are scarce, it is not uncommon for a pair of eagles to occupy a nest yet never lay eggs; such nests are considered occupied (Eagle Conservation Plan Guidance [ECPG[1]] 2012, p. 32). For purposes of these recommendations, we define occupied GOEA nests as nest sites that were occupied at least once during the last five years or last five years of field surveys. Because GOEAs will often use the same nest in multiple years (Kochert and Steenhof 2012), there is a high likelihood that these nests could be occupied again during the life of the project. Nests form the center of activity during the breeding season and are often centers of activity during the non-breeding season as well (Marzluff et al. 1997). Buffering or otherwise protecting eagle nests should substantially decrease the probability of lethal take, as well as disturbance take, of eagles. Other raptors using the same nesting habitats as GOEA (e.g., prairie falcon) will also benefit from protection of GOEA nest sites.

Use the ½ mean inter-nest distance (MIND) buffer for the project area.

The size of the ½-MIND buffer is based on an average distance among all occupied nests within a given year, and approximates the average territory size. Eagle pairs that nest within one-half the mean project-area inter-nest distance are potentially susceptible to disturbance take and blade strike mortality, as these pairs and offspring may use the project footprint (ECPG, p. 12). The ECPG recommends using the ½-MIND to delineate territories and associated breeding eagles at risk of mortality or disturbance (p. 12). Lacking other agency policy recommendations, guidance and regulations, our recommendation is to apply the ½-MIND risk evaluation method described in the ECPG as an avoidance buffer to maintain eagle nesting territories. Hence, using the ½-MIND for a buffer recommendation is a further application of the initial risk assessment approach described in the ECPG. The ½-MIND can be adjusted if site-specific data (e.g., telemetry, prey analysis, other data) are adequate to suggest the buffer should be larger/smaller/non-circular.

B. Unoccupied (Historic) Nests

We define unoccupied GOEA nests as those nests not selected by raptors for use in the current nesting season (ECPG 2012, p. 33). For purposes of these recommendations, we define unoccupied GOEA nests as nest sites that were not occupied during the last five years or last five years of field surveys. It should be noted that occupied nests can be incorrectly assigned as unoccupied if the nests are not repeatedly surveyed during the same nesting season. Even if a nest was unoccupied in one or more years, it is still possible that eagles could reuse that nest in future years (Kochert and Steenhof 2012), especially since the intervals between nest reuse can be lengthy (Kochert and Steenhof 2012, Slater et al. 2013). Given that the anticipated life of a wind project is 30 years (though repowering could extend that indefinitely) it is likely that some

[1] The reference is to internal version 2.0 from March 2012 that has not been released to the public.

unoccupied nests will become occupied during the life of the project. In addition, nests usually occur in areas of historical eagle use (due to topographic features and prey resources) and represent areas where eagles are expected to return in the future.

No turbines will be constructed within 0.5-mile (800-meters) of any unoccupied (historic) nest. In addition, all turbines between 0.5-mile and 1.0 mile (1,600-meters) of any unoccupied nest will be curtailed during each year starting 15 January until 1 May, unless adequate nest surveys demonstrate that the nests are unoccupied.

Further, if the nest becomes occupied, turbines will be curtailed between the 0.5-mile and the ½-MIND during the breeding season until the young fledge or the nest becomes unoccupied.

C. Areas of Concentrated Prey Resources

Protection buffers for prey base areas likely used by GOEA. These areas typically receive use by GOEA during the nesting season, migration, and during wintering (so potentially year-round).

Recommend turbines not be constructed in areas of concentrated prey resources unless it can be demonstrated that they do not overlap or are not immediately adjacent to other important eagle use areas, and where sufficient data are available to confirm that the concentrated prey resources are not in areas of project-specific eagle activity areas.

D. Other Project-Specific Eagle Activity Areas

Apply protections (e.g., buffers) for other project-specific eagle activity areas identified by survey data (e.g., 800-meter point counts) (these are different than "important eagle use areas" defined in regulations and the ECPG). Although project-specific, certain areas (e.g., topographic relief creating uplifts, migration corridors, perch sites) are typically used by eagles; therefore, it is appropriate to identify these and provide buffer recommendations for them.

Focus on areas where there is an intersection of geographic relief (e.g., cliff features used for nesting, ridge features used for migration, rims used for orthographic lift) and documented project-specific eagle activity areas.

Identify specific locations where the project-specific eagle activity areas intersect topographic and/or geographic features used by eagles and provide recommendations for a buffer where there is overlap. Recommended buffers for geographic features would vary based on the value/use of the geologic feature to eagles, with those having greater value/use by eagles receiving larger buffers. For this option, avoidance and minimization is site-specific, with custom-designed buffers for eagle activity areas based on project-specific geography and documented eagle use of those features.

From:	Van Dercook, Amy
To:	"Vana-Miller, Sandy"
Subject:	RE: Review of your BA/request for formal consultation, NWTC, Jan. 15, 2014, letter
Date:	Wednesday, February 05, 2014 1:12:00 PM
Attachments:	2013.1.15 USFWS_updated signed formal consultation letter.pdf

Please add these responses to your comments (below) to the Jan 15, 2014 letter, as an amendment:

1. Pg. 2 of BA – Add, "For 2024, the projected usage would be 1,076,000 gallons (3.3 acre feet) per year (which will be in the second increment of PRRIP)."

2. Pg. 4 of BA – Strike the sentence, "The USFWS intends to require, as a condition of any approval, that DOE fulfill the responsibilities required of Program participants in Colorado, which includes participation in the South Platte Water Related Activities Program, Inc. (SPWRAP)." per USFWS comment below.

3. Pg. 4 of BA – Strike the sentence, "We are requesting concurrence from your office on our effects determination."

4. Pg. 4 of BA – Change "USFWS" to "DOE" in 1st paragraph, last sentence.

Thank you for the pre-review. These responses are shown in red in the attached letter. We appreciate your attention to our project.

Thank you,
Amy

Amy Van Dercook, P.G.
U.S. Department of Energy | Golden Field Office
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Phone: 720.356.1666 | Mobile: 720.233.5392
Email: amy.vandercook@go.doe.gov

From: Vana-Miller, Sandy [mailto:sandy_vana-miller@fws.gov]
Sent: Monday, February 03, 2014 11:57 AM
To: Van Dercook, Amy
Subject: Review of your BA/request for formal consultation, NWTC, Jan. 15, 2014, letter

Amy, I was able to take a look at your BA. I have the following comments.

1. pg. 2 of BA - you described projected growth/anticipated water use "over the next 10 years", but then provided an amount for year 2020 (less than 10 yr.). Seems the amount should be calculated for build-out in 2024? (which will be in the second increment of PRRIP).

2. pg. 4, first full paragraph - incorrect to say that DOE participates in SPWRAP as it is not available to federal agencies, only the development of MOAs. Also, discretionary Federal authority has nothing to do with FWS for the NWTC; DOE has the authority, etc.

3. You incorrectly requested concurrence from FWS; under the Program's PBO, it was determined that water use greater than 0.1 af/yr is an adverse effect, which is why you are requesting formal consultation. The FWS will issue a biological opinion to DOE, rather than concur/not concur with a request for informal consultation.

Thanks; its fine with me if you submit, by email, any clarifying information for this project/my comments above. Sandy

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Sandy L. Vana-Miller
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Department of Energy
Golden Field Office
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January 15, 2014

Susan Linner, Colorado Field Supervisor
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P.O. Box 25486
Denver Federal Center
(MS 65412)
Denver, Colorado 80225

SUBJECT: BIOLOGICAL ASSESSMENT & REQUEST FOR FORMAL SECTION 7 CONSULTATION - PROPOSED IMPROVEMENTS FOR THE DEPARTMENT OF ENERGY'S NATIONAL WIND TECHNOLOGY CENTER AT THE NATIONAL RENEWABLE ENERGY LABORATORY, GOLDEN, CO (DOE/EA-1914)

Dear Ms. Linner:

Thank you for your letter to the U.S. Department of Energy (DOE) dated January 15, 2014, regarding the effects of Colorado water depletions on Platte River species in Nebraska.

This letter contains the Biological Assessment addressing potential impacts from the continued operations and proposed action at DOE's National Wind Technology Center (NWTC) in Jefferson County, Colorado on federally-listed species in Nebraska. With this submission, we are requesting initiation of Formal Consultation under Section 7(a) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA), concerning the whooping crane (*Grus americana*), interior least tern (*Sternula antillarum*), northern Great Plains population of the piping plover (*Charadrius melodus*), pallid sturgeon (*Scaphirhynchus albus*) (collectively referred to as the target species), and designated critical habitat of the whooping crane. We further request initiation of Formal Consultation for the western prairie fringed orchid (*Platanthera praeclara)*. We have determined that the Project is not likely to adversely affect the American burying beetle (*Nicrophorus americanus*) and will have no effect on the Eskimo curlew (*Numenius borealis*).

The proposed action would include continued operations as well as modifications and improvements within the existing site, as detailed in Attachment I. Specifically, the proposed action would include construction of new (or modification of existing) buildings, installation of additional turbines and meteorological towers, and expanding power capacity. Each of these would take place on the existing property. The proposed action is being evaluated via the NEPA process, with details presented in the draft Site-Wide Environmental Assessment of the National Renewable Energy Laboratory's (NREL) NWTC, Golden, CO (DOE/EA-1914).

The proposed action would result in some amount of continuing historic and new depletions to the South Platte River associated with site operations and maintenance activities (including drinking water), construction/dust suppression, and onsite fire suppression activities. Currently, there are no water wells onsite, and the NWTC does not use groundwater or surface water to meet its needs. Rather, water is purchased from and trucked to the site by A-1 Discount Water Supplier, who obtains the water from the City of Boulder in Boulder County, Colorado. A-1 Discount Water has a filling station directly adjacent to the City of Boulder's bulk supply station at the Municipal Service Center. Boulder receives water from a combination of Front Range and western slope sources: Arapahoe Glacier and Silver Lake Reservoir (40%), Barker Reservoir (40%) and the Colorado River (20%) via the Colorado-Big Thompson Trans basin Diversion Project. Water from Arapahoe Glacier and Barker Reservoir is piped to the Betasso Water Plant. Water from the Colorado River is piped to Boulder Reservoir through the Boulder Feeder Canal. The City of Boulder is a member of South Platte Water Related Activities Program, Inc. (SPWRAP). Continued operations and projected growth over the next 10 years are anticipated to increase the onsite workforce from 159 to 300 people (14 people per year). Estimated water usage for 2013, 2014, and 2020 (the duration of the current Platte River Recovery Implementation Program) are shown below:

- For 2013, the current water use is 614,500 gallons (1.89 acre-feet) per year.
- For 2014, the projected usage would be 667,000 gallons 2014 (2.05 acre feet) per year.
- For 2020, the projected usage would be 937,000 gallons (2.88 acre feet) per year.
- For 2024, the projected usage would be 1,076,000 gallons (3.3 acre feet) per year (which will be in the second increment of PRRIP).

The Platte River Recovery Implementation Program (PRRIP), established in 2006, is implementing actions designed to assist in the conservation and recovery of the target species and their associated habitats along the central and lower Platte River in Nebraska through a basin-wide cooperative approach agreed to by the States of Colorado, Nebraska, and Wyoming and the U.S. Department of the Interior [Program, I.A.1.]. The Program addresses the adverse impacts of existing and certain new water related activities on the Platte target species and associated habitats, and provides ESA compliance[1] for effects to the target species and whooping crane critical habitat from such activities including avoidance of any prohibited take of such species. [Program, I.A.2 & footnote 2.]. The State of Colorado is in compliance with its obligations under the Program.

For Federal actions and projects participating in the Program, the Platte River Recovery Implementation Program Final Environmental Impact Statement (FEIS) and the June 16, 2006 programmatic biological opinion (PBO) serve as the description of the environmental baseline and environmental consequences for the effects of the Federal actions on the listed target species, whooping crane critical habitat, and other listed species in the central and lower Platte River addressed in the PBO. These documents are hereby incorporated into this Biological Assessment by this reference.

[1] "ESA Compliance" means: (1) serving as the reasonable and prudent alternative to offset the effects of water-related activities that FWS found were likely to cause jeopardy to one or more of the target species or to adversely modify critical habitat before the Program was in place; (2) providing offsetting measures to avoid the likelihood of jeopardy to one or more of the target species or adverse modification of critical habitat in the Platte River basin for new or existing water-related activities evaluated under the ESA after the Program was in place; and (3) avoiding any prohibited take of target species in the Platte River basin.

Table II-1 of the PBO (pages 21-23) contains a list of species and critical habitat in the action area, their status, and the Service's determination of the effects of the Federal action analyzed in the PBO. The Service determined in the PBO that the continued operation of existing and certain new water-related activities may adversely affect but would not likely jeopardize the continued existence of the endangered whooping crane, interior least tern, and pallid sturgeon, or the threatened northern Great Plains population of the piping plover. Further, the Service found that the continued operation of existing and certain new water-related activities may adversely affect but would not likely jeopardize the threatened bald eagle and western prairie fringed orchid associated with the central and lower reaches of the Platte River in Nebraska, and was not likely to destroy or adversely modify designated critical habitat for the whooping crane. The bald eagle was subsequently removed from the federal endangered species list on August 8, 2007.

The Service also determined that the PBO Federal Action would have no effect to the endangered Eskimo curlew. There has not been a confirmed sighting since 1926 and this species is believed to be extirpated in Nebraska. Lastly, the Service determined that the PBO Federal Action, including the continued operation of existing and certain new water-related activities, was not likely to adversely affect the endangered American burying beetle.

The above-described annual water use for 2013 site operations at the NWTC qualify as an "existing water related activity" because they reflect the effects of a surface water or hydrologically connected groundwater activity implemented on or before July 1, 1997, within the intent and coverage of the Program. [Program, I.A. footnote 3]. The estimated onsite water usage for 2013 is 614,500 gallons (1.89 acre feet).

Under the proposed action, projected water use to 2020 qualifies as new water related activities because such operations constitute a new surface water or hydrologically connected groundwater activity which may affect the quantity or timing of water reaching the associated habitats of the target species implemented after July 1, 1997. [Program, I.A. footnote 3]. The estimated maximum increase in new water use is 322,500 gallons (0.99 acre-feet) in 2020. The continued operations and proposed action at the NWTC conform to the following criteria in Section H of Colorado's Plan for Future Depletions [Program, Attachment 5, Section 9]:

1. The continued operations and proposed action are operated on behalf of Colorado water users;

2. The continued operations and proposed action do not involve construction of a major on-stream reservoir located on the mainstem of the South Platte River anywhere downstream of Denver, Colorado;

3. The continued operations and proposed action are not a hydropower diversion/return project diverting water including sediments from the mainstem of the South Platte River anywhere downstream of Denver and returning clear water to the South Platte River.

4. The continued operations and proposed action do not cause the average annual water supply to serve Colorado's population increase from Wastewater Exchange/Reuse and Native South Platte Flows to exceed 98,010 acre feet during the February-July period.

Accordingly, the impacts of the continued operations and proposed action to the target species, whooping crane critical habitat, and other listed species in the central and lower Platte River addressed in the PBO are covered and offset by operation of Colorado's Future Depletions Plan as part of the PRRIP.

DOE intends to rely on the provisions of the Program to provide ESA compliance for potential impacts to the target species and whooping crane critical habitat. ~~The USFWS intends to require, as a condition of any approval, that DOE fulfill the responsibilities required of Program participants in Colorado, which includes participation in the South Platte Water Related Activities Program, Inc. (SPWRAP).~~ The DOE ~~USFWS~~ also intends to retain discretionary Federal authority for the Project, consistent with applicable regulations and Program provisions, in case re-initiation of Section 7 consultation is required.

This letter addresses consultation on all listed species and designated critical habitat, including the referenced Platte River target species and whooping crane critical habitat. Potential impacts from construction and operation of the proposed action to any other federally-listed threatened or endangered species and designated critical habitats will be addressed within the applicable biological opinion prepared by the Service, in accordance with the ESA.

~~We are requesting concurrence from your office on our effects determination.~~ If USFWS has any concerns or would like additional information please contact me via e-mail at amy.vandercook@go.doe.gov or by phone at 720-356-1666. In addition, you may mail comments to:

Department of Energy-Golden Field Office
c/o Amy Van Dercook
15013 Denver West Parkway
Golden, Colorado 80401

Please provide acknowledgement of this request and help with streamlining the consultation process to assist us in moving the consultation process forward. DOE will include this correspondence in an appendix to the EA.

Sincerely,

Amy L. Van Dercook, P.G.
NEPA Document Manager
U.S. Department of Energy-Golden Field Office

Attachment I- Project Description
Figures 1 & 2

ATTACHMENT I

SITE BACKGROUND AND DESCRIPTION

The National Renewable Energy Laboratory (NREL) is the premier DOE national laboratory dedicated to the research, development, and deployment of renewable energy and energy efficiency technologies. As depicted in **Figure 1**, NREL is comprised of three main sites: 1) South Table Mountain (STM); 2) Denver West Office Park (DWOP); and 3) the National Wind Technology Center (NWTC). Other facilities include the Renewable Fuels and Lubricants (ReFUEL) Research Laboratory and Joyce Street facilities. Details regarding NREL's mission and research programs are available on the NREL website at: http://www.nrel.gov.

The 305-acre NWTC is located in northwest Jefferson County, Colorado, approximately 16 miles northwest of Denver. The site is south of Colorado State Highway 128 and directly east of aggregate mining and processing facilities on the east side of Colorado State Highway 93 between Golden and Boulder, Colorado.

There are currently seven major buildings located on the NWTC site that house research and administrative functions and include:

- Administration Building, Building 251;
- Structural Testing Laboratory (STL), Building 254;
- Test Preparation Building (Quonset Hut), Building 260;
- 2.5 MW Dynamometer Test Facility, Building 255;
- 5.0 MW Dynamometer Test Facility, Building 258;
- Distributed Energy Resources Test Facility (DERTF), Building H-1; and,
- Blade Test Facility, Building 252.

All seven major buildings are located in the Research and Support Facilities area on the northern portion of the site along the main east-west road (West 119th Ave).

Several smaller access control, support, and testing facilities are also located on the NWTC site. These include the Site Entrance Building (SEB) or Guard Post, the electrical switchgear buildings, several trailers, and several data sheds. Currently, the total area of all buildings at the NWTC is approximately 1.3 acres.

The NWTC's existing turbine test sites currently support four megawatt (MW)-scale turbines ranging in output from 1.5 to 3 MW, three mid-scale turbines, ranging from 100 kilowatt (kW) to 600 kW, and nine small wind turbines ranging in size from 1 kW to 8 kW.

In 2002, DOE released a final Site-Wide EA for the NWTC (DOE/EA-1378) evaluating the potential impacts of site operations and short-term and long-term improvements. A Finding of No Significant Impact (FONSI) was signed by DOE on May 31, 2002.

The subject of this Site-Wide EA includes the proposed action discussed below which would support DOE's mission in the Research & Development of energy efficiency and renewable energy technologies

by providing enhanced research and support capabilities to adequately continue state-of-the-art wind energy research. The mission of EERE's Wind Energy Program is to help the United States attain the substantial economic, environmental, and energy security benefits likely to result from expanding the domestic and worldwide use of wind energy by fostering a world-class domestic wind industry. The program focuses on research, testing and field verification work needed by U.S. industry to fully develop advanced, affordable, reliable wind energy technologies, and on coordination with partners and stakeholders to overcome barriers to wind energy implementation. EERE's principal research to accomplish this goal is conducted at the NWTC.

PROPOSED ACTION AND ALTERNATIVES

The following presents a summary of the Proposed Action and No Action alternative descriptions for the current draft Environmental Assessment.

Proposed Action

Under the Proposed Action, DOE proposes to improve the site and operations within the current 305-acre NWTC site. New buildings and additions to existing buildings are proposed at the NWTC site, as well as infrastructure upgrades to roads, electrical power, water supply, and sewer lines. This proposed action would include adding multiple turbines with associated meteorological towers, access roads, data sheds, and infrastructure. New wind turbines would vary in size from small generating capacity (up to 100 kW), to mid-range (up to 1 MW), to large utility-scale (1-5 MW) turbine installations. Future facility construction, research, development and testing proposed for the NWTC is dependent on changing federal budgets and priorities. The details provided in this assessment are the best estimates that can be made at this time. **Figure 2** presents proposed improvements at the site.

New Construction

The Proposed Action for new construction would provide for additional facilitates at the NWTC, as described below.

Wind Turbine Component Research and Testing Facility. DOE would construct a 40,000 square foot facility that would be located west of Building 251. The facility is envisioned as a comprehensive R&D laboratory that would address advanced capabilities in the wind industry.

Grid Storage Test Capabilities. DOE would construct MW-Scale Energy Storage Test Platform areas, south of 119th Avenue and at the north end of Row 3. Grid integration testing would provide the capability to perform comprehensive MW-scale grid integration tests by interconnecting dynamometers, turbines, solar systems, and other devices to a grid simulator and energy storage devices. Both mobile and permanent energy storage test facilities would be developed to house and test innovative energy storage devices.

Staging and Maintenance Warehouse. DOE would construct a warehouse up to 40,000 square feet, west of the Building H-1 in the northwest corner of the site. This facility would be used to support indoor staging of test projects and maintenance of equipment.

Modifications of Existing Buildings. Modification of existing infrastructure includes upgrades to the Administration Building 251, STL Building 254, DERTF Building H-1, and 2.5 MW Dynamometer

Building 255. Other modifications such as adding a cool roof to an existing building and expansion of buildings to accommodate new research and operations may be required.

Wind Turbines and Meteorological Towers

The Proposed Action would provide additional wind turbines and modify the number of existing field test sites and associated infrastructure to potentially include any combination of up to 7 (including the 4 currently onsite) large utility-scale wind turbines (1 to 5 MW), up to 7 (including the 3 currently onsite) mid-scale turbines (each rated from 100 to 1 MW), and up to 20 (including the 9 currently onsite) small wind turbines (each rated from 1 W to 100 kW). Under the Proposed Action, up to a total of 30 meteorological towers (and associated infrastructure) would be installed onsite, including the 19 that currently exist. **Figure 2** presents proposed improvements at the site.

Currently, approximately 22 test sites are configured on the NWTC property. Under the Proposed Action, some test sites could be combined to create larger test sites that would support utility-scale turbines, or subdivided to create more numerous smaller test sites to accommodate small and mid-scale turbines. It is not anticipated that the maximum number of turbines would be present onsite at one time, since turbines are erected for testing purposes, and then removed when testing is completed.

Infrastructure Upgrades

Electrical. The current NWTC electrical generation capacity is 11.2 MW. Turbine operations are being curtailed to stay below an existing 10 MW limit in accordance with Xcel Energy requirements. Assuming wind technology development continues its current trend toward larger turbines, the projected maximum NWTC electrical generation capacity for the 5- to 10-year timeframe is estimated to increase up to 50 MW as additional turbines are added and smaller turbines are replaced with larger units.

To accommodate an increase to 50 MW, the existing site electrical infrastructure would need to be upgraded to add an additional 40 MW of generation capacity. NREL would work with a local utility provider for the design and installation of an on-site substation to increase the site-generated power from distribution voltage (13.2kV) to transmission voltage (115kV). Then, power generated at the NWTC would be connected via overhead transmission lines to interconnect with existing transmission lines and a local utility provider's switchyard or substation.

Other Infrastructure Upgrades. Other upgrades to the facility would include drinking water system upgrades, fire suppression system upgrades, sanitary waste upgrades, road improvements, and data/telecommunications improvements.

Routine Technical Tasks for Research and Site Maintenance Activities. These tasks include loading equipment, preparing for tests, moving parts, installing and removing turbines, monitoring, cleaning facilities and equipment, maintaining landscape features, snowplowing, performing pest management, and maintaining buildings and infrastructure.

Development of a Reasonable Range Of Alternatives

Under the No Action Alternative, NREL would continue current operations and activities at NWTC.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Colorado Field Office
P.O. Box 25486, DFC (65412)
Denver, Colorado 80225-0486

IN REPLY REFER TO:
ES/CO: DOE-NWTC / PRRIP
TAILS: 06E24000-2014-F-0248

APR 25 2014

Ms. Amy Van Dercook, P.G.
U.S. Department of Energy - Golden Field Office
15013 Denver West Parkway
Golden, Colorado 80401

Dear Ms. Van Dercook:

This final biological opinion is provided in response to your January 15, 2014, request to initiate formal consultation pursuant to section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA). The January 15, 2014, letter/BA described the effects of the Department of Energy's (DOE) continued operations and proposed improvements for the National Wind Technology Center (NWTC) (Project) at the National Renewable Energy Laboratory (NREL) (DOE/EA-1914), on federally listed species and designated critical habitat associated with the Platte River in Nebraska. Your January 15, 2014, letter/BA made no determination on the effects the proposed action may have on listed species/critical habitat in Colorado; therefore, this opinion will not address any listed species in Colorado.

The Federal Action reviewed in this biological opinion is the continued operations and proposed improvements at DOE's NWTC in Jefferson County, Colorado. The Project would include construction of new (or modification of existing) buildings, installation of additional turbines and meteorological towers, and expanding power capacity; all of which would take place on the existing DOE property. Under the Project, there would be continued water use associated with site operations and maintenance activities (e.g., drinking water); for the proposed construction/dust suppression; and for onsite fire suppression activities. DOE does not have any water wells onsite nor groundwater or surface water to meet these needs; consequently, it purchases water that comes from the City of Boulder (Boulder), a member of the South Platte Water Related Activities Program, Inc. (SPWRAP).

BACKGROUND

On June 16, 2006, the U.S. Fish and Wildlife Service (Service) issued a programmatic biological opinion (PBO) for the PRRIP and water-related activities[1] affecting flow volume

[1] The term "water-related activities" means activities and aspects of activities which (1) occur in the Platte River final basin upstream of the confluence of the Loup River with the Platte River; and (2) may affect Platte River flow quantity or timing, including, but not limited to, water diversion, storage and use activities, and land use

and timing in the central and lower reaches of the Platte River in Nebraska. The action area for the PBO included the Platte River basin upstream of the confluence with the Loup River in Nebraska, and the mainstem of the Platte River downstream of the Loup River confluence.

The Federal Action addressed by the PBO included the following:

> 1) funding and implementation of the PRRIP for 13 years, the anticipated first stage of the PRRIP; and
>
> 2) continued operation of existing and certain new water-related activities[2] including, but not limited to, Reclamation and Service projects that are (or may become) dependent on the PRRIP for ESA compliance during the first 13-year stage of the PRRIP for their effects on the target species[3], whooping crane critical habitat, and other federally listed species[4] that rely on central and lower Platte River habitats.

The PBO established a two-tiered consultation process for future federal actions on existing and new water-related activities subject to section 7(a)(2) of the ESA, with issuance of the PBO being Tier 1 and all subsequent site-specific project analyses constituting Tier 2 consultations covered by the PBO. Under this tiered consultation process, the Service will produce tiered biological opinions when it is determined that future federal actions are "likely to adversely affect" federally listed species and/or designated critical habitat in the PRRIP action area and the project is covered by the PBO. If necessary, the biological opinions will also consider potential effects to other listed species and critical habitat affected by the Federal Action that were not within the scope of the Tier 1 PBO (e.g., direct or indirect effects to listed species occurring outside of the PRRIP action area).

Although the water depletive effects of this Federal Action to central and lower Platte River species have been addressed in the PBO, when "no effect" or "may affect" but "not likely to adversely affect" determinations are made on a site-specific basis for the target species in Nebraska, the Service will review these determinations and provide written concurrence where appropriate. Upon receipt of written concurrence, section 7(a)(2) consultation will be considered completed for those federal actions.

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activities. Changes in temperature and sediment transport will be considered impacts of a "water related activity" to the extent that such changes are caused by activities affecting flow quantity or timing. Impacts of "water related activities" do not include those components of land use activities or discharges of pollutants that do not affect flow quantity or timing.

[2] "Existing water related activities" include surface water or hydrologically connected groundwater activities implemented on or before July 1, 1997. "New water-related activities" include new surface water or hydrologically connected groundwater activities including both new projects and expansion of existing projects, both those subject to and not subject to section 7(a)(2) of the ESA, which may affect the quantity or timing of water reaching the associated habitats and which are implemented after July 1, 1997.

[3] The "target species" are the endangered whooping crane (*Grus americana*), the interior least tern (*Sternula antillarum*), the pallid sturgeon (*Scaphirynchus albus*), and the threatened northern Great Plains population of the piping plover (*Charadrius melodus*).

[4] Other listed species present in the central and lower Platte River include the western prairie fringed orchid (*Platanthera praeclara*) and American burying beetle (*Nicrophorus americanus*).

Water-related activities requiring federal approval will be reviewed by the Service to determine if: (1) those activities comply with the definition of existing water-related activities and/or (2) proposed new water-related activities are covered by the applicable state's or the federal depletions plan. The Service has determined that the Project meets the above criteria and, therefore, this Tier 2 biological opinion regarding the effects of the Project on the target species, whooping crane critical habitat, and the western prairie fringed orchid in the central and lower Platte River can tier from the June 16, 2006 PBO.

CONSULTATION HISTORY

Table II-1 of the PBO (pages 21-23) contains a list of species and critical habitat in the action area, their status, and the Service's determination of the effects of the Federal Action analyzed in the PBO.

The Service determined in the Tier 1 PBO that the Federal Action, including the continued operation of existing and certain new water-related activities, may adversely affect but would not likely jeopardize the continued existence of the federally endangered whooping crane, interior least tern, and pallid sturgeon, or the federally threatened northern Great Plains population of the piping plover, western prairie fringed orchid, and bald eagle in the central and lower Platte River. Further, the Service determined that the Federal Action, including the continued operation of existing and certain new water-related activities, was not likely to destroy or adversely modify designated critical habitat for the whooping crane. The bald eagle was subsequently removed from the federal endangered species list on August 8, 2007. Bald eagles continue to be protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. For more information on bald eagles, see the Service's webpage at: http://www.fws.gov/midwest/eagle/recovery/biologue.html

The Service also determined that the PBO Federal Action would have no effect to the endangered Eskimo curlew. There has not been a confirmed sighting since 1926 and this species is believed to be extirpated in Nebraska. Lastly, the Service determined that the PBO Federal Action, including the continued operation of existing and certain new water-related activities, was not likely to adversely affect the endangered American burying beetle.

The effects of the continued operation of existing and certain new water-related activities on the remaining species and critical habitats listed in Table II-1 of the PBO were beyond the scope of the PBO and were not considered.

In an October 22, 2013, letter to the Service, you requested concurrence on your determination that the Project will not adversely affect the federally listed species or designated critical habitat associated with the Platte River in Nebraska. The Service responded in a letter dated January 15, 2014, that we do not agree with this determination and recommended that you request initiation of formal section 7 consultation by letter to this office. Also in this January 15, 2014, letter, the Service provided concurrence on DOE's determinations that the Project is not likely to adversely affect the Preble's meadow jumping

mouse (*Zapus hudsonius preblei*) or its designated critical habitat along Rock Creek, Unit 6 (Rocky Flats Site); and is not likely to impact the Ute ladies'-tresses orchid (*Spiranthes diluvialis*), Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*), and Pawnee montane skipper (*Hesperia leonardus montana*) in Colorado.

The Service has reviewed the information contained in the BA, which was submitted by your office on January 15, 2014. Clarifying information for the Project BA was requested and received in this office on February 5, 2014.

We concur with your determinations of "likely to adversely affect" for the endangered whooping crane, interior least tern, pallid sturgeon, the threatened northern Great Plains population of the piping plover, and the western prairie fringed orchid in the central and lower Platte River in Nebraska. We also concur with your determination of "likely to adversely affect" for designated whooping crane critical habitat in Nebraska.

This office also concurs with your determination of "not likely to adversely affect" for the endangered American burying beetle in Nebraska.

SCOPE OF THE TIER 2 BIOLOGICAL OPINION

The Project is a component of "the continued operation of existing and certain new water-related activities" needing a federal action evaluated in the Tier 1 PBO, and flow-related effects of the Federal Action are consistent with the scope and the determination of effects in the June 16, 2006 PBO. Because Boulder has elected to participate in the PRRIP through membership in the SPWRAP, ESA compliance for flow-related effects to federally listed endangered and threatened species and designated critical habitat from the Project is provided to the extent described in the Tier 1 PBO.

This biological opinion applies to the Project's effects to listed endangered and threatened species and designated critical habitat as described in the PBO for the first thirteen years of the PRRIP (i.e., the anticipated duration of the first PRRIP increment).

DESCRIPTION OF THE FEDERAL ACTION

The Federal Action is DOE's need for the continued operation of and proposed improvements to DOE's NWTC at the NREL in northwest Jefferson County. The 305-acre NWTC is located approximately 16 miles northwest of Denver; south of Colorado State Highway 128 and directly east of aggregate mining and processing facilities on the east side of Colorado State Highway 93, between the Town of Golden and Boulder.

The NREL is comprised of three main sites: South Table Mountain, the Denver West Office Park, and the NWTC. Other facilities include the Renewable Fuels and Lubricants Research Laboratory and Joyce Street facilities. There are currently seven major buildings located on the NWTC site that house research and administrative functions; all are located in the

Research and Support Facilities area on the northern portion of the site along the main east-west road (West 119th Ave). The NWTC's existing turbine test sites currently support four megawatt (MW)-scale turbines ranging in output from 1.5 to 3 MW, three mid-scale turbines, ranging from 100 kilowatt (kW) to 600 kW, and nine small wind turbines ranging in size from 1 kW to 8 kW.

The NREL is the premier DOE national laboratory dedicated to the research, development, and deployment of renewable energy and energy efficiency technologies. The Project would support DOE's mission by providing enhanced research and support capabilities to adequately continue state-of-the-art wind energy research. The Project would include construction of new or modification of existing buildings, installation of additional wind turbines and meteorological towers, and expanding power capacity; all of which would take place on the existing DOE property. Under the Project, there would be continued water use associated with site operations and maintenance activities, including drinking water; and new water use for the proposed construction/dust suppression and onsite fire suppression activities.

DOE does not have any water wells onsite and the NWTC does not use groundwater or surface water to meet its needs. Instead, water is purchased from and trucked to the site by A-1 Discount Water Supplier, who obtains the water from Boulder. A-1 Discount Water has a filling station directly adjacent to Boulder's bulk supply station at the Municipal Service Center. Boulder receives water from a combination of Front Range and western slope sources: Arapahoe Glacier and Silver Lake Reservoir (40%), Barker Reservoir (40%), and the Colorado River (20%) via the Colorado-Big Thompson Transbasin Diversion Project. Water from Arapahoe Glacier and Barker Reservoir is piped to the Betasso Water Plant. Water from the Colorado River is piped to Boulder Reservoir through the Boulder Feeder Canal. As mentioned above, Boulder is a current member of SPWRAP.

Continued operations and projected growth over the next 10 years are anticipated to increase NWTC's onsite workforce from 159 to 300 people (14 additional people per year). Estimated current (2013) water usage and projected use in 2014 and 2024 (build-out) would be as follows: 614,500 gallons (1.89 acre-feet (af)) of water in 2013; 667,000 gallons (2.05 af) per year of water projected for 2014; and 1,076,000 gallons (3.3 af) per year projected at build-out in 2024. Consequently, water use from 2013 (current use) to 2020 (end of the PRRIP's first increment) would increase by 322,500 gallons (0.99 af); and water use from 2013 to 2024 (build-out) would increase by 1.41 af.

STATUS OF THE SPECIES / CRITICAL HABITAT

Species descriptions, life histories, population dynamics, status and distributions are fully described in the PBO on pages 76-156 for the whooping crane, interior least tern, piping plover, pallid sturgeon and western prairie fringed orchid, and whooping crane critical habitat and are hereby incorporated by reference. Climate change is not explicitly identified in the Tier 1 PBO as a potential threat, except for whooping crane and whooping crane critical habitat.

The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). "Climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19).

Changes in temperature and/or precipitation patterns will influence the status of the Platte River system. These changes may contribute to threats that have already been identified and discussed for interior least tern, piping plover, pallid sturgeon and western prairie fringed orchid in the Tier I PBO.

Since issuance of the Service's PBO, there have been no substantial changes in the status of the target species/critical habitat other than the bald eagle delisting previously mentioned.

ENVIRONMENTAL BASELINE

The Environmental Baseline sections for the Platte River and for the whooping crane, interior least tern, piping plover, pallid sturgeon and western prairie fringed orchid, and whooping crane critical habitat are described on pages 157 to 219 of the Tier 1 PBO, and are hereby incorporated by reference. The status of the Platte River system includes a discussion on the impact of climate change. The Tier 1 BO concluded that although climate change has been identified as a contributor to the baseline, human activities are the biggest influence on the baseline. For the first 13-year stage of the PRRIP, human activities are expected to continue to be the major influence on the functionality of the action area for listed species and critical habitat.

Since issuance of the Tier 1 PBO, there have been no substantial changes in the status of the target species/critical habitat in the action area other than the bald eagle delisting.

EFFECTS OF THE ACTION

The Tier 1 BO did not address climate change in the Effects of The Action section, as human activities (upstream storage, diversion, and distribution of the river's flow) are the most important drivers of change that adversely affect species habitat in the action area. Since issuance of the Tier 1 PBO, our analyses under the ESA include consideration of ongoing and projected changes in climate. In our analyses, we used our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change. Actions that are undertaken to improve the river ecology and habitats for listed species not

only address human activities, but also contribute to listed species and whooping crane critical habitat resiliency to climate change.

Based on our analysis of your BA for the Project, the Service concludes that the Federal Action will result in a combination of existing and new depletions to the Platte River system above the Loup River confluence. These depletions are associated with the current use of 1.89 af of water for ongoing site operations and maintenance; and beginning in 2014, an estimated 2.05 af per year for continued site operations, maintenance, and construction-related activities. At build-out (2024), water use at the NWTC would be 3.3 af per year, an increase of 1.41 af per year from the current water usage at the NWTC.

As both an existing and new water-related activity, we have determined that the flow-related adverse effects of the Project are consistent with those evaluated in the Tier 1 PBO for the whooping crane, interior least tern, piping plover, pallid sturgeon, western prairie fringed orchid, and whooping crane critical habitat, and these effects on flows are being addressed in conformance with the Colorado Plan for Future Depletions of the PRRIP.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local, or private (non-federal) actions that are reasonably certain to occur in the action area considered in this biological opinion. A non-federal action is "reasonably certain" to occur if the action requires the approval of a State or local resource or land-control agency, such agencies have approved the action, and the project is ready to proceed. Other indicators which may also support such a "reasonably certain to occur" determination include whether: a) the project sponsors provide assurance that the action will proceed; b) contracting has been initiated; c) State or local planning agencies indicate that grant of authority for the action is imminent; or d) where historic data have demonstrated an established trend, that trend may be forecast into the future as reasonably certain to occur. These indicators must show more than the possibility that the non-federal project will occur; they must demonstrate with reasonable certainty that it will occur. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA and would be consulted on at a later time.

Cumulative effects are described on pages 194 to 300 of the Tier 1 PBO, and are hereby incorporated by reference. Since the Tier 1 PBO was issued, there have been no substantial changes in the status of cumulative effects.

CONCLUSION

The Service concludes that the Continued Operations and Proposed Improvements for the NWTC Project is consistent with the Tier 1 PBO for effects to listed species and critical habitat addressed in the Tier 1 PBO. After reviewing site specific information, including: 1) the scope of the Federal Action, 2) the environmental baseline, 3) the status of the whooping

crane, interior least tern, piping plover, pallid sturgeon, and the western prairie fringed orchid in the central and lower Platte River and their potential occurrence within the project area, as well as whooping crane critical habitat, 4) the effects of the Project, and 5) any cumulative effects, it is the Service's biological opinion that the Project, as described, is not likely to jeopardize the continued existence of the federally endangered whooping crane, interior least tern, and pallid sturgeon, or the federally threatened northern Great Plains population of the piping plover, or western prairie fringed orchid in the central and lower Platte River. The Federal Action is also not likely to destroy or adversely modify designated critical habitat for the whooping crane.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct, and applies to individual members of a listed species. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Sections 7(b)(4) and 7(o)(2) of ESA do not apply to the incidental take of federally listed plant species (e.g., Colorado butterfly plant, Ute ladies'-tresses orchid, and western prairie fringed orchid). However, limited protection of listed plants from take is provided to the extent that ESA prohibits the removal and reduction to possession of federally listed endangered plants or the malicious damage of such plants on non-federal areas in violation of state law or regulation or in the course of any violation of a state criminal trespass law. Such laws vary from state to state.

The Department of the Interior, acting through the Service and Bureau of Reclamation, is implementing all pertinent Reasonable and Prudent Measures and implementing Terms and Conditions stipulated in the Tier 1 PBO Incidental Take Statement (pages 309-326 of the PBO) which will minimize the anticipated incidental take of federally listed species. In instances where the amount or extent of incidental take outlined in the Tier 1 PBO is exceeded, or the amount or extent of incidental take for other listed species is exceeded, the specific PRRIP action(s) causing such take shall be subject to reinitiation expeditiously.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of ESA directs federal agencies to utilize their authorities to further the purposes of ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of an action on listed species or critical habitat, to help implement recovery plans, or to develop information. Conservation recommendations are provided in the PBO (pages 328-329) and are hereby incorporated by reference.

REINITIATION AND CLOSING STATEMENT

Any person or entity undertaking a water-related activity that receives federal funding or a federal authorization and which relies on the PRRIP as a component of its ESA compliance in section 7 consultation must agree: (1) to the inclusion in its federal funding or authorization documents of reopening authority, including reopening authority to accommodate reinitiation upon the circumstances described in Section IV.E. of the Program document, which addresses program termination; and (2) to request appropriate amendments from the federal action agency as needed to conform its funding or authorization to any PRRIP adjustments negotiated among the three states and the Department of the Interior, including specifically new requirements, if any, at the end of the first PRRIP increment and any subsequent PRRIP increments. The Service believes that the PRRIP should not provide ESA compliance for any water-related activity for which the funding or authorization document does not conform to any PRRIP adjustments (Program Document, section VI).

Reinitiation of consultation over the Continued Operations and Proposed Improvements for the NWTC Project will not be required at the end of the first 13-years of the PRRIP provided a subsequent Program increment or first increment Program extension is adopted pursuant to appropriate ESA and NEPA compliance procedures, and, for a subsequent increment, the effects of the Project are covered under a Tier 1 PBO for that increment addressing continued operation of previously consulted-on water-related activities.

This concludes formal consultation on the actions outlined in the January 15, 2014, request from the DOE. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the specific action(s) causing such take shall be subject to reinitiation expeditiously.

Requests for reinitiation, or questions regarding reinitiation should be directed to the Service's Colorado Field Office at the above address. If you have any questions regarding this consultation, please contact Sandy Vana-Miller of my staff at (303) 236-4748.

Sincerely,

ACTING FOR

Susan C. Linner
Colorado Field Supervisor

ec: FWSR6/WTR, T. Econopouly
FWSR6/ES/NE, M. Rabbe
FWSR6/ES/LK, S. Vana-Miller

LITERATURE CITED

IPCC. 2007. *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K., and A. Reisinger (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

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U.S. Fish and Wildlife Service. 2006. Biological opinion on the Platte River Recovery Implementation Program.

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

July 17, 2013

Oglala Sioux Tribe
Bryan Brewer, Sr., President
PO Box 419
Pine Ridge, SD 57770

SUBJECT: INITIATION OF SECTION 106 CONSULTATION PROCESS FOR THE SITE-WIDE ENVIRONMENTAL ASSESSMENT AT THE DEPARTMENT OF ENERGY'S NATIONAL WIND TECHNOLOGY CENTER AT THE NATIONAL RENEWABLE ENERGY LABORATORY IN GOLDEN, CO (DOE/EA-1914)

Dear Mr. Brewer:

The U.S. Department of Energy (DOE) is completing a Site-Wide Environmental Assessment (EA) of the National Wind Technology Center (NWTC) to include analysis of potential environmental impacts due to continued operations and future site development. A Notice of Scoping was sent to you to in October 2012. DOE requested that interested parties provide comments, during a 30-day public comment period, on the scope of the Proposed Action, at that time. The Proposed Action has been revised since the Notice of Scoping was posted. The revised Proposed Action is provided in **Attachment I**.

The EA is being prepared to meet the requirements of the National Environmental Policy Act (NEPA) of 1969. The EA will address the potential effects of the Proposed Action on the natural and human environment, including cultural resources. DOE is initiating consultation and requesting information your tribe may have on properties of traditional and cultural significance within the vicinity of the NWTC and any comments or concerns you have on the potential for this Proposed Action to affect those properties.

Three cultural resource surveys have been conducted at the NWTC since its establishment in the 1970s. These surveys identified five cultural resources: three historic sites and two historic isolated finds. All were recommended not eligible for National Register nomination. A letter, dated November 2, 2001, from DOE to the Colorado State Historical Preservation Office (SHPO) established that the NWTC had 100 percent survey coverage for cultural resources as a result of these three studies and that no cultural resources would be affected. The most recent survey identified a 6.5-acre area in the northwest portion of the NWTC as having a higher potential for prehistoric archaeological resources and recommended further inspection should ground-disturbing activity become a possibility in that area. There are no activities proposed in the 6.5-acre area for this Proposed Action. If any unexpected discoveries are made during the implementation of the Proposed Action, construction would cease and NWTC personnel would follow procedures to contact their "on call" local archaeological consulting firm.

The Area of Potential Effect (APE) for this Proposed Action was established by completing a viewshed analysis for historic properties around the NWTC within a two-mile radius from the highest proposed wind turbine. A review of Colorado Office of Archaeology and Historic Preservation's database indicates 20 sites within a two mile radius. Of those, two are listed on the National Register of Historic Places (NRHP), eight are eligible for the NRHP, and ten are unevaluated. Five of these sites are not within the viewshed, three are partially within it, and 12 are fully within the viewshed. These sites are summarized in the table below.

Table 1. Eligibility of National Registry of Historic Properties within a Two Mile Radius

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Per the regulations of the Advisory Council on Historic Preservation at 36 CFR Sections 800.2(c)(5) and 800.4(a)(3), DOE is inviting your tribe to participate in the consultation process. This information is being requested to aid in the preparation of the EA and to meet our obligations under Section 106 of the National Historic Preservation Act and the Native American Graves Protection and Repatriation Act of 1990. Specifically, I am requesting information you may have on properties of traditional religious and cultural significance within the vicinity of the Proposed Action and any comments or concerns you have on the potential for this Proposed Action to affect those properties. If you have any such information, require additional information, or have any questions or comments about the Proposed Action, please contact me via e-mail at amy.vandercook@go.doe.gov or contact me by phone at 720-356-1666. In addition, you may mail comments to:

Department of Energy-Golden Field Office
c/o Amy Van Dercook
1617 Cole Boulevard
Golden, Colorado 80401-3393

Please provide your response to this inquiry within 30 days of the receipt of this letter to assist us in moving the process forward. If a reply is not received within 30 days, then DOE will assume that you have no issues, questions or concerns related to the Proposed Action.

DOE will address issues and include copies of all correspondence with your tribe in an appendix to the EA. A Notice of Availability will be sent to you to notify you when the Draft EA has been posted for review and commenting. At this time, we anticipate a 30-day public comment period for this Proposed Action.

The DOE Golden Field Office welcomes your input throughout our NEPA Process.

Sincerely,

Amy L. Van Dercook, P.G.
NEPA Document Manager
U.S. Department of Energy, Golden Field Office

Attachment I – Proposed Action
Figures 1 & 2

ATTACHMENT I

SITE BACKGROUND AND DESCRIPTION

The National Renewable Energy Laboratory (NREL) is the premier DOE national laboratory dedicated to the research, development, and deployment of renewable energy and energy efficiency technologies. As depicted in **Figure 1**, NREL is comprised of three main sites: 1) South Table Mountain (STM); 2) Denver West Office Park (DWOP); and 3) the National Wind Technology Center (NWTC). Other facilities include the Renewable Fuels and Lubricants (ReFUEL) Research Laboratory and Joyce Street facilities. Details regarding NREL's mission and research programs are available on the NREL website at: http://www.nrel.gov.

The 305-acre NWTC is located in northwest Jefferson County, Colorado, approximately 16 miles northwest of Denver. The site is south of Colorado State Highway 128 and directly east of aggregate mining and processing facilities on the east side of Colorado State Highway 93 between Golden and Boulder, Colorado.

There are currently seven major buildings located on the NWTC site that house research and administrative functions and include:

- Administration Building, Building 251;
- Structural Testing Laboratory (STL), Building 254;
- Test Preparation Building (Quonset Hut), Building 260;
- 2.5 MW Dynamometer Test Facility, Building 255;
- 5.0 MW Dynamometer Test Facility, Building 258;
- Distributed Energy Resources Test Facility (DERTF), Building H-1; and,
- Blade Test Facility, Building 252.

All seven major buildings are located in the Research and Support Facilities area on the northern portion of the site along the main east-west road (West 119th Ave).

Several smaller access control, support, and testing facilities are also located on the NWTC site. These include the Site Entrance Building (SEB) or Guard Post, the electrical switchgear buildings, several trailers, and several data sheds. Currently, the total area of all buildings at the NWTC is approximately 1.3 acres.

The NWTC's existing turbine test sites currently support four megawatt (MW)-scale turbines ranging in output from 1.5 to 3 MW, three mid-scale turbines, ranging from 100 kilowatt (kW) to 600 kW, and nine small wind turbines ranging in size from 1 kW to 8 kW.

In 2002, DOE released a final Site-Wide EA for the NWTC (DOE/EA-1378) evaluating the potential impacts of site operations and short-term and long-term improvements. A Finding of No Significant Impact (FONSI) was signed by DOE on May 31, 2002.

The subject of this Site-Wide EA includes the proposed action discussed below which would support DOE's mission in the R&D of energy efficiency and renewable energy technologies by providing

enhanced research and support capabilities to adequately continue state-of-the-art wind energy research. The mission of EERE's Wind Energy Program is to help the United States attain the substantial economic, environmental, and energy security benefits likely to result from expanding the domestic and worldwide use of wind energy by fostering a world-class domestic wind industry. The program focuses on research, testing and field verification work needed by U.S. industry to fully develop advanced, affordable, reliable wind energy technologies, and on coordination with partners and stakeholders to overcome barriers to wind energy implementation. EERE's principal research to accomplish this goal is conducted at the NWTC.

PROPOSED ACTION AND ALTERNATIVES

The following presents a summary of the Proposed Action and No Action alternative descriptions.

Proposed Action

Under the Proposed Action, DOE proposes to improve the site and operations within the current 305-acre NWTC site. New buildings and additions to existing buildings are proposed at the NWTC site, as well as infrastructure upgrades to roads, electrical power, water supply, and sewer lines. This proposed action would include adding multiple turbines with associated meteorological towers, access roads, data sheds, and infrastructure. New wind turbines would vary in size from small generating capacity (up to 100 kW), to mid-range (up to 1 MW), to large utility-scale (1-5 MW) turbine installations. Future facility construction, research, development and testing proposed for the NWTC is dependent on changing federal budgets and priorities. The details provided in this assessment are the best estimates that can be made at this time. **Figure 2** presents proposed improvements at the site.

New Construction

The Proposed Action for new construction would provide for additional facilitates at the NWTC, as described below.

Wind Turbine Component Research and Testing Facility. DOE would construct a 40,000 square foot facility that would be located west of Building 251. The facility is envisioned as a comprehensive R&D laboratory that would address advanced capabilities in the wind industry.

Grid Storage Test Capabilities. DOE would construct MW-Scale Energy Storage Test Platform areas, south of 119th Avenue and at the north end of Row 3. Grid integration testing would provide the capability to perform comprehensive MW-scale grid integration tests by interconnecting dynamometers, turbines, solar systems, and other devices to a grid simulator and energy storage devices. Both mobile and permanent energy storage test facilities would be developed to house and test innovative energy storage devices.

Staging and Maintenance Warehouse. DOE would construct a warehouse up to 40,000 square feet, west of the DERTF in the northwest corner of the site. This facility would be used to support indoor staging of test projects and maintenance of equipment.

Modifications of Existing Buildings. Modification of existing infrastructure includes upgrades to the Administration Building 251, STL Building 254, DERTF Building H-1, and 2.5 MW Dynamometer Building 255. Other modifications such as adding a cool roof to an existing building and expansion of buildings to accommodate new research and operations may be required.

Wind Turbines

The Proposed Action would provide additional wind turbines and modify the number of existing field test sites and associated infrastructure to potentially include any combination of up to 7 (including the 4 currently onsite) large utility-scale wind turbines (1 to 5 MW), up to 7 (including the 3 currently onsite) mid-scale turbines (each rated from 100 to 1 MW), and up to 20 (including the 9 currently onsite) small wind turbines (each rated from 1 W to 100 kW). Under the Proposed Action, up to a total of 30 meteorological towers (and associated infrastructure) would be installed onsite, including the 19 that currently exist. These numbers would be considered totals, which include the existing turbines and meteorological towers. **Figure 2** presents proposed improvements at the site.

Currently, approximately 22 test sites are configured on the NWTC property. Under the Proposed Action, some test sites could be combined to create larger test sites that would support utility-scale turbines, or subdivided to create more numerous smaller test sites to accommodate small and mid-scale turbines. It is not anticipated that the total number of turbines would be present onsite at one time, since turbines are erected for testing purposes, and then removed when testing is completed.

Infrastructure Upgrades

Electrical. The current NWTC electrical generation capacity is 11.2 MW. Turbine operations are being curtailed to stay below an existing 10 MW limit in accordance with Xcel Energy requirements. Assuming wind technology development continues its current trend toward larger turbines, the projected maximum NWTC electrical generation capacity for the 5- to 10-year timeframe is estimated to increase up to 50 MW as additional turbines are added and smaller turbines are replaced with larger units.

To accommodate an increase to 50 MW, the existing site electrical infrastructure would need to be upgraded to add an additional 40 MW of generation capacity. NREL would work with Xcel Energy for the design and installation of an on-site substation to increase the site-generated power from distribution voltage (13.2kV) to transmission voltage (115kV). Then, power generated at the NWTC would be connected via overhead transmission lines to interconnect with existing Xcel Energy transmission lines or an Xcel switchyard or substation.

Other Infrastructure Upgrades. Other upgrades to the facility would include drinking water system upgrades, fire suppression system upgrades, sanitary waste upgrades, road improvements, data/telecommunications improvements.

Routine Technical Tasks for Research and Site Maintenance Activities. These tasks include loading equipment, preparing for tests, moving parts, installing and removing turbines, monitoring, cleaning facilities and equipment, maintaining landscape features, snowplowing, performing pest management, and maintaining buildings and infrastructure.

Development of a Reasonable Range Of Alternatives

Under the No Action Alternative, NREL would continue current operations and activities at NWTC.

Figure 1. Vicinity Map

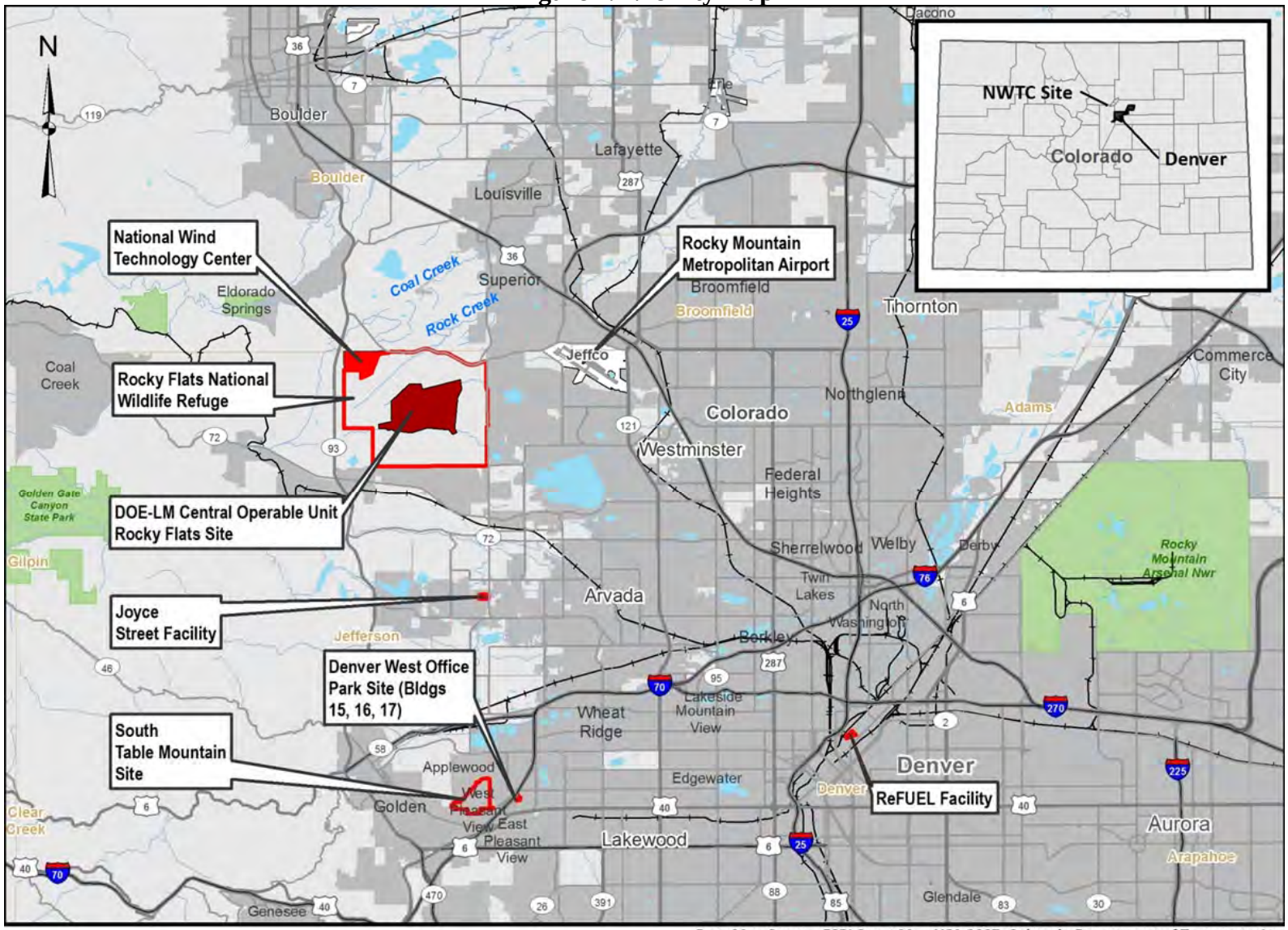
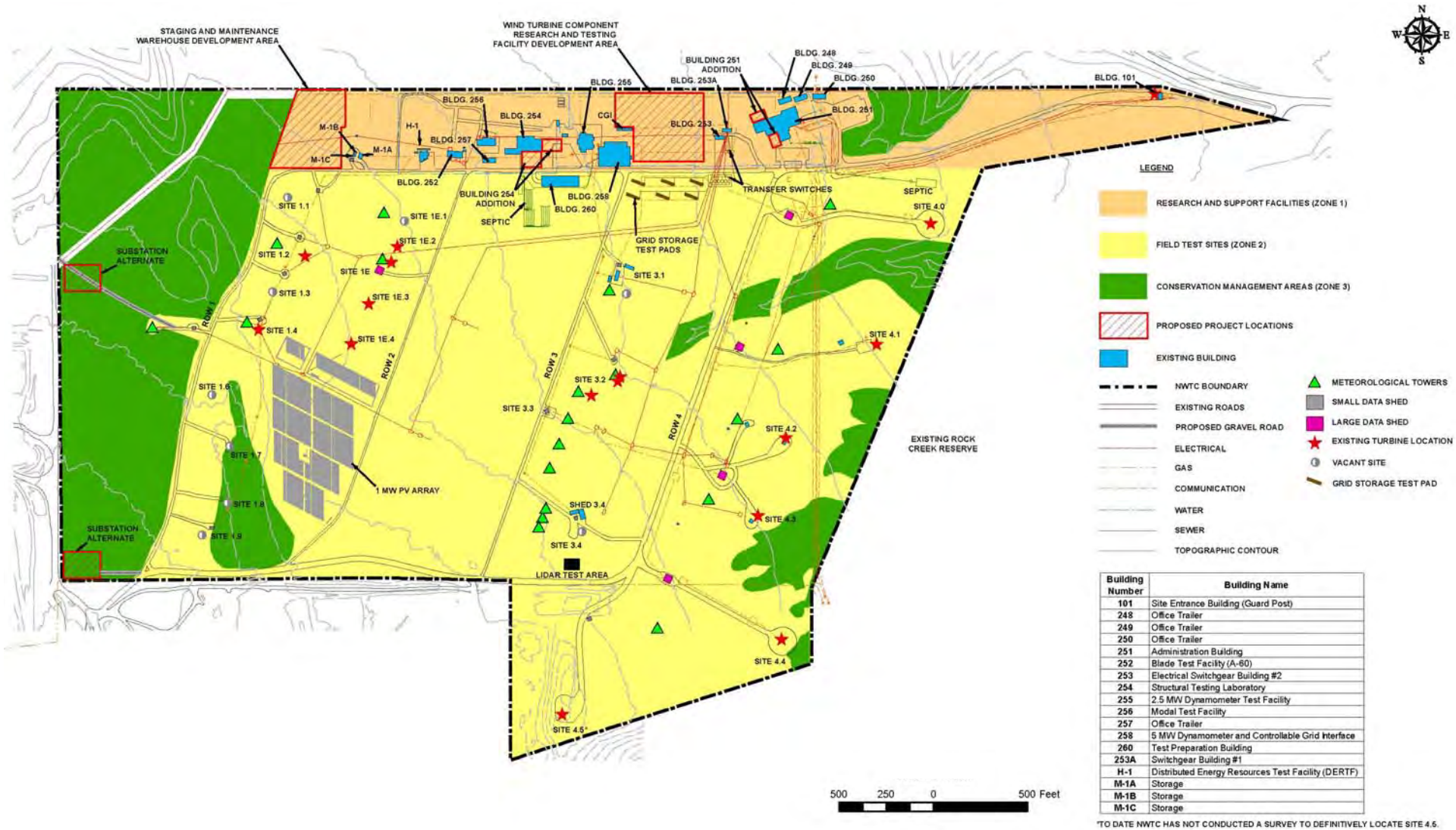


Figure 2. Proposed Improvements



Building Number	Building Name
101	Site Entrance Building (Guard Post)
248	Office Trailer
249	Office Trailer
250	Office Trailer
251	Administration Building
252	Blade Test Facility (A-60)
253	Electrical Switchgear Building #2
254	Structural Testing Laboratory
255	2.5 MW Dynamometer Test Facility
256	Modal Test Facility
257	Office Trailer
258	5 MW Dynamometer and Controllable Grid Interface
260	Test Preparation Building
253A	Switchgear Building #1
H-1	Distributed Energy Resources Test Facility (DERTF)
M-1A	Storage
M-1B	Storage
M-1C	Storage

*TO DATE NWTC HAS NOT CONDUCTED A SURVEY TO DEFINITIVELY LOCATE SITE 4.5.

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

July 17, 2013

Oglala Sioux Tribe
Wilmer Mesteth, THPO
PO Box 419
Pine Ridge, SD 57770

SUBJECT: INITIATION OF SECTION 106 CONSULTATION PROCESS FOR THE SITE-WIDE ENVIRONMENTAL ASSESSMENT AT THE DEPARTMENT OF ENERGY'S NATIONAL WIND TECHNOLOGY CENTER AT THE NATIONAL RENEWABLE ENERGY LABORATORY IN GOLDEN, CO (DOE/EA-1914)

Dear Mr. Mesteth:

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The EA is being prepared to meet the requirements of the National Environmental Policy Act (NEPA) of 1969. The EA will address the potential effects of the Proposed Action on the natural and human environment, including cultural resources. DOE is initiating consultation and requesting information your tribe may have on properties of traditional and cultural significance within the vicinity of the NWTC and any comments or concerns you have on the potential for this Proposed Action to affect those properties.

Three cultural resource surveys have been conducted at the NWTC since its establishment in the 1970s. These surveys identified five cultural resources: three historic sites and two historic isolated finds. All were recommended not eligible for National Register nomination. A letter, dated November 2, 2001, from DOE to the Colorado State Historical Preservation Office (SHPO) established that the NWTC had 100 percent survey coverage for cultural resources as a result of these three studies and that no cultural resources would be affected. The most recent survey identified a 6.5-acre area in the northwest portion of the NWTC as having a higher potential for prehistoric archaeological resources and recommended further inspection should ground-disturbing activity become a possibility in that area. There are no activities proposed in the 6.5-acre area for this Proposed Action. If any unexpected discoveries are made during the implementation of the Proposed Action, construction would cease and NWTC personnel would follow procedures to contact their "on call" local archaeological consulting firm.

The Area of Potential Effect (APE) for this Proposed Action was established by completing a viewshed analysis for historic properties around the NWTC within a two-mile radius from the highest proposed wind turbine. A review of Colorado Office of Archaeology and Historic Preservation's database indicates 20 sites within a two mile radius. Of those, two are listed on the National Register of Historic Places (NRHP), eight are eligible for the NRHP, and ten are unevaluated. Five of these sites are not within the viewshed, three are partially within it, and 12 are fully within the viewshed. These sites are summarized in the table below.

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Department of Energy-Golden Field Office
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Golden, Colorado 80401-3393

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The DOE Golden Field Office welcomes your input throughout our NEPA Process.

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Amy L. Van Dercook, P.G.
NEPA Document Manager
U.S. Department of Energy, Golden Field Office

Attachment I – Proposed Action
Figures 1 & 2

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

July 17, 2013

Southern Ute Tribe
Jimmy R. Newton, Jr., Chairperson
P.O. Box 737
Ingacio, CO 81137

SUBJECT: INITIATION OF SECTION 106 CONSULTATION PROCESS FOR THE SITE-WIDE ENVIRONMENTAL ASSESSMENT AT THE DEPARTMENT OF ENERGY'S NATIONAL WIND TECHNOLOGY CENTER AT THE NATIONAL RENEWABLE ENERGY LABORATORY IN GOLDEN, CO (DOE/EA-1914)

Dear Mr. Newton:

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The DOE Golden Field Office welcomes your input throughout our NEPA Process.

Sincerely,

Amy L. Van Dercook, P.G.
NEPA Document Manager
U.S. Department of Energy, Golden Field Office

Attachment I – Proposed Action
Figures 1 & 2

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

July 17, 2013

Ute Mountain Ute Tribal Council
Gary Hayes, Chairman
P.O. Box 248
Towaoc, CO 81334

SUBJECT: INITIATION OF SECTION 106 CONSULTATION PROCESS FOR THE SITE-WIDE ENVIRONMENTAL ASSESSMENT AT THE DEPARTMENT OF ENERGY'S NATIONAL WIND TECHNOLOGY CENTER AT THE NATIONAL RENEWABLE ENERGY LABORATORY IN GOLDEN, CO (DOE/EA-1914)

Dear Mr. Hayes:

The U.S. Department of Energy (DOE) is completing a Site-Wide Environmental Assessment (EA) of the National Wind Technology Center (NWTC) to include analysis of potential environmental impacts due to continued operations and future site development. A Notice of Scoping was sent to you to in October 2012. DOE requested that interested parties provide comments, during a 30-day public comment period, on the scope of the Proposed Action, at that time. The Proposed Action has been revised since the Notice of Scoping was posted. The revised Proposed Action is provided in **Attachment I**.

The EA is being prepared to meet the requirements of the National Environmental Policy Act (NEPA) of 1969. The EA will address the potential effects of the Proposed Action on the natural and human environment, including cultural resources. DOE is initiating consultation and requesting information your tribe may have on properties of traditional and cultural significance within the vicinity of the NWTC and any comments or concerns you have on the potential for this Proposed Action to affect those properties.

Three cultural resource surveys have been conducted at the NWTC since its establishment in the 1970s. These surveys identified five cultural resources: three historic sites and two historic isolated finds. All were recommended not eligible for National Register nomination. A letter, dated November 2, 2001, from DOE to the Colorado State Historical Preservation Office (SHPO) established that the NWTC had 100 percent survey coverage for cultural resources as a result of these three studies and that no cultural resources would be affected. The most recent survey identified a 6.5-acre area in the northwest portion of the NWTC as having a higher potential for prehistoric archaeological resources and recommended further inspection should ground-disturbing activity become a possibility in that area. There are no activities proposed in the 6.5-acre area for this Proposed Action. If any unexpected discoveries are made during the implementation of the Proposed Action, construction would cease and NWTC personnel would follow procedures to contact their "on call" local archaeological consulting firm.

The Area of Potential Effect (APE) for this Proposed Action was established by completing a viewshed analysis for historic properties around the NWTC within a two-mile radius from the highest proposed wind turbine. A review of Colorado Office of Archaeology and Historic Preservation's database indicates 20 sites within a two mile radius. Of those, two are listed on the National Register of Historic Places (NRHP), eight are eligible for the NRHP, and ten are unevaluated. Five of these sites are not within the viewshed, three are partially within it, and 12 are fully within the viewshed. These sites are summarized in the table below.

Table 1. Eligibility of National Registry of Historic Properties within a Two Mile Radius

Site Number	Eligibility	Visible	Site Description
5JF318.7	Eligible - official	partial	South Boulder Diversion Canal
5JF318.8	Eligible - official	partial	South Boulder Diversion Canal
5JF475	Unevaluated	Yes	cairn
5JF476	Unevaluated	Yes	cairn
5JF478	Unevaluated	Yes	cairn
5JF479	Unevaluated	Yes	cairn
5JF1014	Listed	Yes	Rocky Flats Plant-Demolished
5JF1227	Listed	Yes	Rocky Flats Plant-Demolished
5JF2431	Eligible - field	No	stone circles
5JF2432	Unevaluated	Yes	cairns
5JF2435	Unevaluated	Yes	rubble mound
5BL3139	Unevaluated	No	historic foundation
5BL3140	Unevaluated	No	mine
5BL3141	Eligible - field	partial	McKenzie Ditch
5BL3142	Eligible - field	No	Eggleston Reservoir Filler Ditch #3
5BL3144	Eligible - field	Yes	historic foundation
5BL3145	Eligible - field	Yes	Eggleston Reservoir Filler Ditch #4
5BL3153	Eligible - field	Yes	stone circles
5BL3428	Unevaluated	Yes	homestead
5BL4102	Unevaluated	No	historic features

Per the regulations of the Advisory Council on Historic Preservation at 36 CFR Sections 800.2(c)(5) and 800.4(a)(3), DOE is inviting your tribe to participate in the consultation process. This information is being requested to aid in the preparation of the EA and to meet our obligations under Section 106 of the National Historic Preservation Act and the Native American Graves Protection and Repatriation Act of 1990. Specifically, I am requesting information you may have on properties of traditional religious and cultural significance within the vicinity of the Proposed Action and any comments or concerns you have on the potential for this Proposed Action to affect those properties. If you have any such information, require additional information, or have any questions or comments about the Proposed Action, please contact me via e-mail at amy.vandercook@go.doe.gov or contact me by phone at 720-356-1666. In addition, you may mail comments to:

Department of Energy-Golden Field Office
c/o Amy Van Dercook
1617 Cole Boulevard
Golden, Colorado 80401-3393

Please provide your response to this inquiry within 30 days of the receipt of this letter to assist us in moving the process forward. If a reply is not received within 30 days, then DOE will assume that you have no issues, questions or concerns related to the Proposed Action.

DOE will address issues and include copies of all correspondence with your tribe in an appendix to the EA. A Notice of Availability will be sent to you to notify you when the Draft EA has been posted for review and commenting. At this time, we anticipate a 30-day public comment period for this Proposed Action.

The DOE Golden Field Office welcomes your input throughout our NEPA Process.

Sincerely,

Amy L. Van Dercook, P.G.
NEPA Document Manager
U.S. Department of Energy, Golden Field Office

Attachment I – Proposed Action
Figures 1 & 2

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

July 17, 2013

Ute Mountain Ute Tribe
Mr. Terry Knight, THPO
PO Box 468
Towaoc, CO 81334

SUBJECT: INITIATION OF SECTION 106 CONSULTATION PROCESS FOR THE SITE-WIDE ENVIRONMENTAL ASSESSMENT AT THE DEPARTMENT OF ENERGY'S NATIONAL WIND TECHNOLOGY CENTER AT THE NATIONAL RENEWABLE ENERGY LABORATORY IN GOLDEN, CO (DOE/EA-1914)

Dear Mr. Knight:

The U.S. Department of Energy (DOE) is completing a Site-Wide Environmental Assessment (EA) of the National Wind Technology Center (NWTC) to include analysis of potential environmental impacts due to continued operations and future site development. A Notice of Scoping was sent to you to in October 2012. DOE requested that interested parties provide comments, during a 30-day public comment period, on the scope of the Proposed Action, at that time. The Proposed Action has been revised since the Notice of Scoping was posted. The revised Proposed Action is provided in **Attachment I**.

The EA is being prepared to meet the requirements of the National Environmental Policy Act (NEPA) of 1969. The EA will address the potential effects of the Proposed Action on the natural and human environment, including cultural resources. DOE is initiating consultation and requesting information your tribe may have on properties of traditional and cultural significance within the vicinity of the NWTC and any comments or concerns you have on the potential for this Proposed Action to affect those properties.

Three cultural resource surveys have been conducted at the NWTC since its establishment in the 1970s. These surveys identified five cultural resources: three historic sites and two historic isolated finds. All were recommended not eligible for National Register nomination. A letter, dated November 2, 2001, from DOE to the Colorado State Historical Preservation Office (SHPO) established that the NWTC had 100 percent survey coverage for cultural resources as a result of these three studies and that no cultural resources would be affected. The most recent survey identified a 6.5-acre area in the northwest portion of the NWTC as having a higher potential for prehistoric archaeological resources and recommended further inspection should ground-disturbing activity become a possibility in that area. There are no activities proposed in the 6.5-acre area for this Proposed Action. If any unexpected discoveries are made during the implementation of the Proposed Action, construction would cease and NWTC personnel would follow procedures to contact their "on call" local archaeological consulting firm.

The Area of Potential Effect (APE) for this Proposed Action was established by completing a viewshed analysis for historic properties around the NWTC within a two-mile radius from the highest proposed wind turbine. A review of Colorado Office of Archaeology and Historic Preservation's database indicates 20 sites within a two mile radius. Of those, two are listed on the National Register of Historic Places (NRHP), eight are eligible for the NRHP, and ten are unevaluated. Five of these sites are not within the viewshed, three are partially within it, and 12 are fully within the viewshed. These sites are summarized in the table below.

Table 1. Eligibility of National Registry of Historic Properties within a Two Mile Radius

Site Number	Eligibility	Visible	Site Description
5JF318.7	Eligible - official	partial	South Boulder Diversion Canal
5JF318.8	Eligible - official	partial	South Boulder Diversion Canal
5JF475	Unevaluated	Yes	cairn
5JF476	Unevaluated	Yes	cairn
5JF478	Unevaluated	Yes	cairn
5JF479	Unevaluated	Yes	cairn
5JF1014	Listed	Yes	Rocky Flats Plant-Demolished
5JF1227	Listed	Yes	Rocky Flats Plant-Demolished
5JF2431	Eligible - field	No	stone circles
5JF2432	Unevaluated	Yes	cairns
5JF2435	Unevaluated	Yes	rubble mound
5BL3139	Unevaluated	No	historic foundation
5BL3140	Unevaluated	No	mine
5BL3141	Eligible - field	partial	McKenzie Ditch
5BL3142	Eligible - field	No	Eggleston Reservoir Filler Ditch #3
5BL3144	Eligible - field	Yes	historic foundation
5BL3145	Eligible - field	Yes	Eggleston Reservoir Filler Ditch #4
5BL3153	Eligible - field	Yes	stone circles
5BL3428	Unevaluated	Yes	homestead
5BL4102	Unevaluated	No	historic features

Per the regulations of the Advisory Council on Historic Preservation at 36 CFR Sections 800.2(c)(5) and 800.4(a)(3), DOE is inviting your tribe to participate in the consultation process. This information is being requested to aid in the preparation of the EA and to meet our obligations under Section 106 of the National Historic Preservation Act and the Native American Graves Protection and Repatriation Act of 1990. Specifically, I am requesting information you may have on properties of traditional religious and cultural significance within the vicinity of the Proposed Action and any comments or concerns you have on the potential for this Proposed Action to affect those properties. If you have any such information, require additional information, or have any questions or comments about the Proposed Action, please contact me via e-mail at amy.vandercook@go.doe.gov or contact me by phone at 720-356-1666. In addition, you may mail comments to:

Department of Energy-Golden Field Office
c/o Amy Van Dercook
1617 Cole Boulevard
Golden, Colorado 80401-3393

Please provide your response to this inquiry within 30 days of the receipt of this letter to assist us in moving the process forward. If a reply is not received within 30 days, then DOE will assume that you have no issues, questions or concerns related to the Proposed Action.

DOE will address issues and include copies of all correspondence with your tribe in an appendix to the EA. A Notice of Availability will be sent to you to notify you when the Draft EA has been posted for review and commenting. At this time, we anticipate a 30-day public comment period for this Proposed Action.

The DOE Golden Field Office welcomes your input throughout our NEPA Process.

Sincerely,

Amy L. Van Dercook, P.G.
NEPA Document Manager
U.S. Department of Energy, Golden Field Office

Attachment I – Proposed Action
Figures 1 & 2

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

July 17, 2013

Ute Indian Tribe
Irene Cuch, Chairperson
P.O. Box 190
Ft. Duchesne, UT 84026

SUBJECT: INITIATION OF SECTION 106 CONSULTATION PROCESS FOR THE SITE-WIDE ENVIRONMENTAL ASSESSMENT AT THE DEPARTMENT OF ENERGY'S NATIONAL WIND TECHNOLOGY CENTER AT THE NATIONAL RENEWABLE ENERGY LABORATORY IN GOLDEN, CO (DOE/EA-1914)

Dear Ms. Cuch:

The U.S. Department of Energy (DOE) is completing a Site-Wide Environmental Assessment (EA) of the National Wind Technology Center (NWTC) to include analysis of potential environmental impacts due to continued operations and future site development. A Notice of Scoping was sent to you to in October 2012. DOE requested that interested parties provide comments, during a 30-day public comment period, on the scope of the Proposed Action, at that time. The Proposed Action has been revised since the Notice of Scoping was posted. The revised Proposed Action is provided in **Attachment I**.

The EA is being prepared to meet the requirements of the National Environmental Policy Act (NEPA) of 1969. The EA will address the potential effects of the Proposed Action on the natural and human environment, including cultural resources. DOE is initiating consultation and requesting information your tribe may have on properties of traditional and cultural significance within the vicinity of the NWTC and any comments or concerns you have on the potential for this Proposed Action to affect those properties.

Three cultural resource surveys have been conducted at the NWTC since its establishment in the 1970s. These surveys identified five cultural resources: three historic sites and two historic isolated finds. All were recommended not eligible for National Register nomination. A letter, dated November 2, 2001, from DOE to the Colorado State Historical Preservation Office (SHPO) established that the NWTC had 100 percent survey coverage for cultural resources as a result of these three studies and that no cultural resources would be affected. The most recent survey identified a 6.5-acre area in the northwest portion of the NWTC as having a higher potential for prehistoric archaeological resources and recommended further inspection should ground-disturbing activity become a possibility in that area. There are no activities proposed in the 6.5-acre area for this Proposed Action. If any unexpected discoveries are made during the implementation of the Proposed Action, construction would cease and NWTC personnel would follow procedures to contact their "on call" local archaeological consulting firm.

The Area of Potential Effect (APE) for this Proposed Action was established by completing a viewshed analysis for historic properties around the NWTC within a two-mile radius from the highest proposed wind turbine. A review of Colorado Office of Archaeology and Historic Preservation's database indicates 20 sites within a two mile radius. Of those, two are listed on the National Register of Historic Places (NRHP), eight are eligible for the NRHP, and ten are unevaluated. Five of these sites are not within the viewshed, three are partially within it, and 12 are fully within the viewshed. These sites are summarized in the table below.

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5JF476	Unevaluated	Yes	cairn
5JF478	Unevaluated	Yes	cairn
5JF479	Unevaluated	Yes	cairn
5JF1014	Listed	Yes	Rocky Flats Plant-Demolished
5JF1227	Listed	Yes	Rocky Flats Plant-Demolished
5JF2431	Eligible - field	No	stone circles
5JF2432	Unevaluated	Yes	cairns
5JF2435	Unevaluated	Yes	rubble mound
5BL3139	Unevaluated	No	historic foundation
5BL3140	Unevaluated	No	mine
5BL3141	Eligible - field	partial	McKenzie Ditch
5BL3142	Eligible - field	No	Eggleston Reservoir Filler Ditch #3
5BL3144	Eligible - field	Yes	historic foundation
5BL3145	Eligible - field	Yes	Eggleston Reservoir Filler Ditch #4
5BL3153	Eligible - field	Yes	stone circles
5BL3428	Unevaluated	Yes	homestead
5BL4102	Unevaluated	No	historic features

Per the regulations of the Advisory Council on Historic Preservation at 36 CFR Sections 800.2(c)(5) and 800.4(a)(3), DOE is inviting your tribe to participate in the consultation process. This information is being requested to aid in the preparation of the EA and to meet our obligations under Section 106 of the National Historic Preservation Act and the Native American Graves Protection and Repatriation Act of 1990. Specifically, I am requesting information you may have on properties of traditional religious and cultural significance within the vicinity of the Proposed Action and any comments or concerns you have on the potential for this Proposed Action to affect those properties. If you have any such information, require additional information, or have any questions or comments about the Proposed Action, please contact me via e-mail at amy.vandercook@go.doe.gov or contact me by phone at 720-356-1666. In addition, you may mail comments to:

Department of Energy-Golden Field Office
c/o Amy Van Dercook
1617 Cole Boulevard
Golden, Colorado 80401-3393

Please provide your response to this inquiry within 30 days of the receipt of this letter to assist us in moving the process forward. If a reply is not received within 30 days, then DOE will assume that you have no issues, questions or concerns related to the Proposed Action.

DOE will address issues and include copies of all correspondence with your tribe in an appendix to the EA. A Notice of Availability will be sent to you to notify you when the Draft EA has been posted for review and commenting. At this time, we anticipate a 30-day public comment period for this Proposed Action.

The DOE Golden Field Office welcomes your input throughout our NEPA Process.

Sincerely,

Amy L. Van Dercook, P.G.
NEPA Document Manager
U.S. Department of Energy, Golden Field Office

Attachment I – Proposed Action
Figures 1 & 2

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393
August 21, 2013

Edward C. Nichols
State Historic Preservation Officer
History Colorado, Civic Center Plaza
1560 Broadway
Suite 400
Denver, CO 80202

SUBJECT: INITIATION OF THE SECTION 106 CONSULTATION FOR PROPOSED IMPROVEMENTS AT THE DEPARTMENT OF ENERGY'S NATIONAL WIND TECHNOLOGY CENTER AT THE NATIONAL RENEWABLE ENERGY LABORATORY IN GOLDEN, CO (DOE/EA-1914)

Dear Mr. Nichols:

The U.S. Department of Energy (DOE) is initiating consultation pursuant to Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, and its associated implementing regulations codified at 36 CFR Part 800 while also coordinating with your office as required under the National Environmental Policy Act (NEPA) for the proposed improvements to DOE's National Wind Technology Center (NWTC). The NWTC is located in Jefferson County, Colorado.

Background
Most recently, the operation of the NWTC was analyzed by DOE pursuant to NEPA in an EA document entitled *Final Site-Wide Environmental Assessment of National Renewable Energy Laboratory's National Wind Technology Center (DOE/EA-1378) May 2002* (available at http://www.eere.energy.gov/golden/NREL_Enviro_NEPA.aspx). DOE issued a Finding of No Significant Impact (FONSI) for the EA, which determined that the NWTC could be operated and improved without significant impacts.

During the EA process, DOE consulted with various agencies and stakeholders, including your office, as documented by a letter dated January 1, 2002. Your office concurred with DOE's determination that no historic properties onsite would be affected by the 2002 Proposed Action.

DOE is currently preparing a Site-Wide Environmental Assessment (EA) of the continued operation and future site development of the NWTC. A Notice of Scoping was sent to your office in October 2012. DOE requested that interested parties provide comments, during a 30-day public comment period, on any potential issues or impacts of implementing the Proposed Action, at that time. Due to input received during the scoping period, the Proposed Action description has been revised. A revised **Proposed Action** is located in **Attachment I**.

Undertaking
The Proposed Action at the NWTC meets the definition of an undertaking as defined in 36 CFR 800.16(y).

NWTC Property
As presented in the 2002 NWTC EA, three cultural resource surveys have been conducted at the NWTC since its establishment in the 1970s. These surveys identified five cultural resources: three historic sites and two historic isolated finds. All were recommended not eligible for National Register nomination. A letter, dated November 2, 2001, from DOE to your office established that the NWTC had 100 percent survey coverage for cultural resources as a result of these three studies and that no cultural resources would be affected. The most recent survey identified a 6.5-acre area in the northwest portion of the NWTC as having a higher potential for prehistoric archaeological resources and recommended further inspection should ground-disturbing activity become a possibility in that area. There are no activities proposed in the 6.5-acre area for this Proposed Action. If any unexpected discoveries are made during the implementation of the Proposed Action, construction would cease and NWTC personnel would follow procedures to contact their "on call" local archaeological consulting firm.

Area of Potential Effect
The Area of Potential Effect (APE) for this Proposed Action was established by completing a viewshed analysis for historic properties around the NWTC within a two-mile radius from the highest proposed wind turbine. The viewshed analysis for historic properties around the NWTC was conducted from a point in the center of Row 4 at an elevation of 574 feet above the ground surface (**Figure 3, Attachment I**). Row 4 is typically where the utility-scale turbines are located. The elevation represents the height of a 5 MW turbine from the ground to the tip of the rotor blade at the highest point of rotation to simulate the rotor sweep of the largest proposed wind turbine.

Identification of Historic Properties within APE
A review of the Colorado Office of Archaeology and Historic Preservation's Compass database indicates there are 18 sites within the two mile radius. Of those, one is listed on the National Register of Historic Places (NRHP), seven are eligible for the NRHP, and 10 are unevaluated. Five of these sites are not within the viewshed, two are partially within it, and 11 are within the viewshed. Information concerning these sites is summarized in **Table 1**.

Table 1. Eligibility of National Registry of Historic Properties within a Two Mile Radius

Site Number	Eligibility	Visible	Site Description
5JF318.7 5JF318.8	Eligible - official	partial	South Boulder Diversion Canal
5JF475	Unevaluated	Yes	cairn
5JF476	Unevaluated	Yes	cairn
5JF478	Unevaluated	Yes	cairn
5JF479	Unevaluated	Yes	cairn
5JF1014 5JF 1227	Listed	Yes	Rocky Flats Plant (This has been demolished and restored to native grassland; however, Rocky Flats is still NRHP-listed. This site has two site numbers.)
5JF2431	Eligible - field	No	stone circles
5JF2432	Unevaluated	Yes	cairns
5JF2435	Unevaluated	Yes	rubble mound
5BL3139	Unevaluated	No	historic foundation
5BL3140	Unevaluated	No	mine
5BL3141	Eligible - field	partial	McKenzie Ditch
5BL3142	Eligible - field	No	Eggleston Reservoir Filler Ditch #3
5BL3144	Eligible - field	Yes	historic foundation
5BL3145	Eligible - field	Yes	Eggleston Reservoir Filler Ditch #4
5BL3153	Eligible - field	Yes	stone circles
5BL3428	Unevaluated	Yes	homestead
5BL4102	Unevaluated	No	historic features

Per 36 CFR 800.4, DOE is required to identify all properties listed, or eligible for listing in the NRHP which may be affected by the proposed undertaking. The only site within the proposed APE that is currently listed on the National Register is the former Rocky Flats Plant, located southeast of the NWTC. The former plant has been demolished and the area has been restored to prairie grasslands.

Assessment of Historic Properties Affected

No direct or indirect cultural resource impacts are anticipated from the new construction of facilities and infrastructure improvements on- or off-site.

No direct impacts from the construction and operation of turbines and meteorological towers are anticipated; however, indirect visual impacts on historical sites within the APE were identified. Therefore, a photographic simulation was prepared to assess any impacts.

The NWTC is characterized by buildings and facilities in the northern portion of the site and meteorological towers and wind turbines interspersed among natural conditions throughout the rest of the site. The majority of the site is undeveloped and retains a natural feel. The dominant visual features at the NWTC are the wind turbines and meteorological towers. **Figure 4-1, Attachment II** presents a location map showing three vantage points, where photographs were taken. Photographs are provided

in the **Photographic Log, Attachment II**. As a conservative approach, the vantage points are approximately one mile (or less) from the NWTC property line. **Figures 4-2** to **4-4** present photographs of the existing conditions found at the NWTC from surrounding representative vantage points that would be typical of the views expected near the NWTC. Vantage Point 1 is near the intersection of Hwy 93 and 128 looking south toward the NWTC from the Greenbelt Plateau Trailhead, Vantage Point 2 is from the west side of Hwy 93 looking east toward the NWTC from the Flatirons Vista Trail, and Vantage Point 3 is from Hwy 128 east of the site entrance looking west toward the NWTC. **Figures 4-5 to 4-7** present visual simulations of what the proposed turbines and meteorological towers would look like from different vantage points surrounding the NWTC. The proposed turbines and meteorological towers would be consistent with the existing turbines in the area and would not appreciably alter existing conditions.

Assessment of No Adverse Effect

All previously recorded historic properties and features identified within the APE would not be directly affected by any of the construction or operation activities of this undertaking including new construction, infrastructure, turbines and meteorological towers. No indirect effects are anticipated from new construction and infrastructure improvements. Indirect visual impacts from the turbines and meteorological towers have the potential to affect some historic properties; however, the structures appear consistent with the existing turbines in the area and would not appreciably alter existing conditions. In addition, it is not anticipated that the maximum number of turbines would be present onsite at one time, since turbines are erected for testing purposes, and then removed when testing is completed. Since the turbines are test articles and individually will only be up for a period of years, they are not considered permanent features.

DOE requests concurrence with a finding of no adverse effect for the proposed undertaking. Again, we appreciate your continued coordination regarding projects at NREL, and we look forward in the successful completion of the Section 106 process with your office. If you require additional information, or have any questions or comments about the Proposed Action, please contact me via e-mail at amy.vandercook@go.doe.gov or contact me by phone at 720-356-1666. In addition, you may mail comments to:

Department of Energy-Golden Field Office
c/o Amy Van Dercook
1617 Cole Boulevard
Golden, Colorado 80401-3393

The DOE Golden Field Office welcomes your input throughout our NEPA Process.

Sincerely,

Amy L. Van Dercook, P.G.
NEPA Document Manager
U.S. Department of Energy, Golden Field Office

cc: Jefferson County Historical Commission
Jefferson County Historical Society

Attachments

ATTACHMENT I

SITE BACKGROUND AND DESCRIPTION

The National Renewable Energy Laboratory (NREL) is the premier DOE national laboratory dedicated to the research, development, and deployment of renewable energy and energy efficiency technologies. As depicted in **Figure 1**, NREL is comprised of three main sites: 1) South Table Mountain (STM); 2) Denver West Office Park (DWOP); and 3) the National Wind Technology Center (NWTC). Other facilities include the Renewable Fuels and Lubricants (ReFUEL) Research Laboratory and Joyce Street facilities. Details regarding NREL's mission and research programs are available on the NREL website at: http://www.nrel.gov.

The 305-acre NWTC is located in northwest Jefferson County, Colorado, approximately 16 miles northwest of Denver. The site is south of Colorado State Highway 128 and directly east of aggregate mining and processing facilities on the east side of Colorado State Highway 93 between Golden and Boulder, Colorado.

There are currently seven major buildings located on the NWTC site that house research and administrative functions and include:

- Administration Building, Building 251;
- Structural Testing Laboratory (STL), Building 254;
- Test Preparation Building (Quonset Hut), Building 260;
- 2.5 MW Dynamometer Test Facility, Building 255;
- 5.0 MW Dynamometer Test Facility, Building 258;
- Distributed Energy Resources Test Facility (DERTF), Building H-1; and,
- Blade Test Facility, Building 252.

All seven major buildings are located in the Research and Support Facilities area on the northern portion of the site along the main east-west road (West 119th Ave).

Several smaller access control, support, and testing facilities are also located on the NWTC site. These include the Site Entrance Building (SEB) or Guard Post, the electrical switchgear buildings, several trailers, and several data sheds. Currently, the total area of all buildings at the NWTC is approximately 1.3 acres.

The NWTC's existing turbine test sites currently support four megawatt (MW)-scale turbines ranging in output from 1.5 to 3 MW, three mid-scale turbines, ranging from 100 kilowatt (kW) to 600 kW, and nine small wind turbines ranging in size from 1 kW to 8 kW.

In 2002, DOE released a final Site-Wide EA for the NWTC (DOE/EA-1378) evaluating the potential impacts of site operations and short-term and long-term improvements. A Finding of No Significant Impact (FONSI) was signed by DOE on May 31, 2002.

The subject of this Site-Wide EA includes the proposed action discussed below which would support DOE's mission in the Research & Development of energy efficiency and renewable energy technologies by providing enhanced research and support capabilities to adequately continue state-of-the-art wind energy research. The mission of EERE's Wind Energy Program is to help the United States attain the substantial economic, environmental, and energy security

benefits likely to result from expanding the domestic and worldwide use of wind energy by fostering a world-class domestic wind industry. The program focuses on research, testing and field verification work needed by U.S. industry to fully develop advanced, affordable, reliable wind energy technologies, and on coordination with partners and stakeholders to overcome barriers to wind energy implementation. EERE's principal research to accomplish this goal is conducted at the NWTC.

PROPOSED ACTION AND ALTERNATIVES

The following presents a summary of the Proposed Action and No Action alternative descriptions for the current draft Environmental Assessment.

Proposed Action

Under the Proposed Action, DOE proposes to improve the site and operations within the current 305-acre NWTC site. New buildings and additions to existing buildings are proposed at the NWTC site, as well as infrastructure upgrades to roads, electrical power, water supply, and sewer lines. This proposed action would include adding multiple turbines with associated meteorological towers, access roads, data sheds, and infrastructure. New wind turbines would vary in size from small generating capacity (up to 100 kW), to mid-range (up to 1 MW), to large utility-scale (1-5 MW) turbine installations. Future facility construction, research, development and testing proposed for the NWTC is dependent on changing federal budgets and priorities. The details provided in this assessment are the best estimates that can be made at this time. **Figure 2** presents proposed improvements at the site.

New Construction

The Proposed Action for new construction would provide for additional facilitates at the NWTC, as described below.

Wind Turbine Component Research and Testing Facility. DOE would construct a 40,000 square foot facility that would be located west of Building 251. The facility is envisioned as a comprehensive R&D laboratory that would address advanced capabilities in the wind industry.

Grid Storage Test Capabilities. DOE would construct MW-Scale Energy Storage Test Platform areas, south of 119th Avenue and at the north end of Row 3. Grid integration testing would provide the capability to perform comprehensive MW-scale grid integration tests by interconnecting dynamometers, turbines, solar systems, and other devices to a grid simulator and energy storage devices. Both mobile and permanent energy storage test facilities would be developed to house and test innovative energy storage devices.

Staging and Maintenance Warehouse. DOE would construct a warehouse up to 40,000 square feet, west of the Building H-1 in the northwest corner of the site. This facility would be used to support indoor staging of test projects and maintenance of equipment.

Modifications of Existing Buildings. Modification of existing infrastructure includes upgrades to the Administration Building 251, STL Building 254, DERTF Building H-1, and 2.5 MW Dynamometer Building 255. Other modifications such as adding a cool roof to an existing building and expansion of buildings to accommodate new research and operations may be required.

Wind Turbines and Meteorological Towers

The Proposed Action would provide additional wind turbines and modify the number of existing field test sites and associated infrastructure to potentially include any combination of up to 7 (including the 4 currently onsite) large utility-scale wind turbines (1 to 5 MW), up to 7 (including the 3 currently onsite) mid-scale turbines (each rated from 100 to 1 MW), and up to 20 (including the 9 currently onsite) small wind turbines (each rated from 1 W to 100 kW). Under the Proposed Action, up to a total of 30 meteorological towers (and associated infrastructure) would be installed onsite, including the 19 that currently exist. **Figure 2** presents proposed improvements at the site.

Currently, approximately 22 test sites are configured on the NWTC property. Under the Proposed Action, some test sites could be combined to create larger test sites that would support utility-scale turbines, or subdivided to create more numerous smaller test sites to accommodate small and mid-scale turbines. It is not anticipated that the maximum number of turbines would be present onsite at one time, since turbines are erected for testing purposes, and then removed when testing is completed.

Infrastructure Upgrades

Electrical. The current NWTC electrical generation capacity is 11.2 MW. Turbine operations are being curtailed to stay below an existing 10 MW limit in accordance with Xcel Energy requirements. Assuming wind technology development continues its current trend toward larger turbines, the projected maximum NWTC electrical generation capacity for the 5- to 10-year timeframe is estimated to increase up to 50 MW as additional turbines are added and smaller turbines are replaced with larger units.

To accommodate an increase to 50 MW, the existing site electrical infrastructure would need to be upgraded to add an additional 40 MW of generation capacity. NREL would work with Xcel Energy for the design and installation of an on-site substation to increase the site-generated power from distribution voltage (13.2kV) to transmission voltage (115kV). Then, power generated at the NWTC would be connected via overhead transmission lines to interconnect with existing Xcel Energy transmission lines or an Xcel switchyard or substation.

Other Infrastructure Upgrades. Other upgrades to the facility would include drinking water system upgrades, fire suppression system upgrades, sanitary waste upgrades, road improvements, and data/telecommunications improvements.

Routine Technical Tasks for Research and Site Maintenance Activities. These tasks include loading equipment, preparing for tests, moving parts, installing and removing turbines, monitoring, cleaning facilities and equipment, maintaining landscape features, snowplowing, performing pest management, and maintaining buildings and infrastructure.

Development of a Reasonable Range Of Alternatives

Under the No Action Alternative, NREL would continue current operations and activities at NWTC.

Figure 1. Vicinity Map

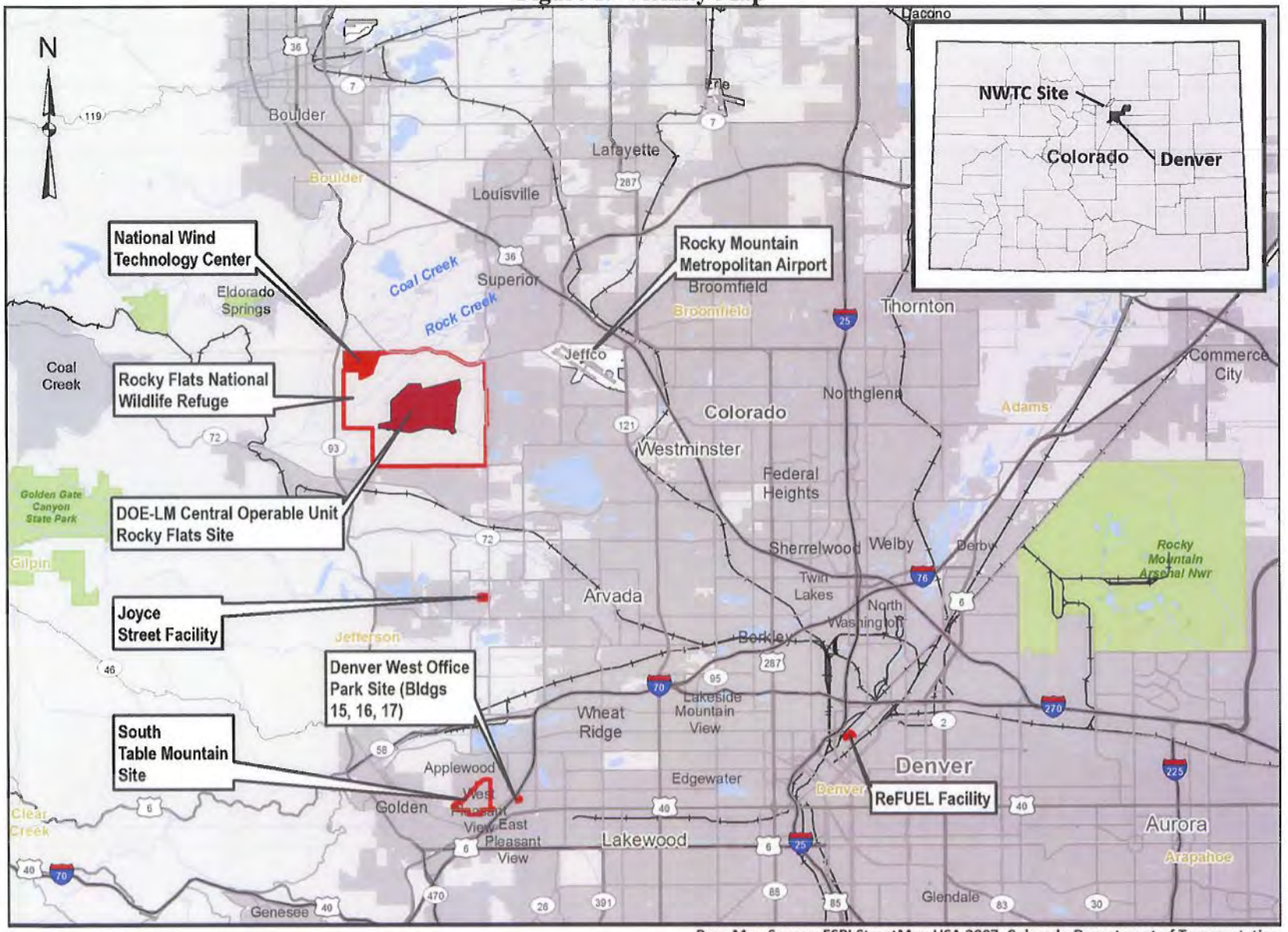
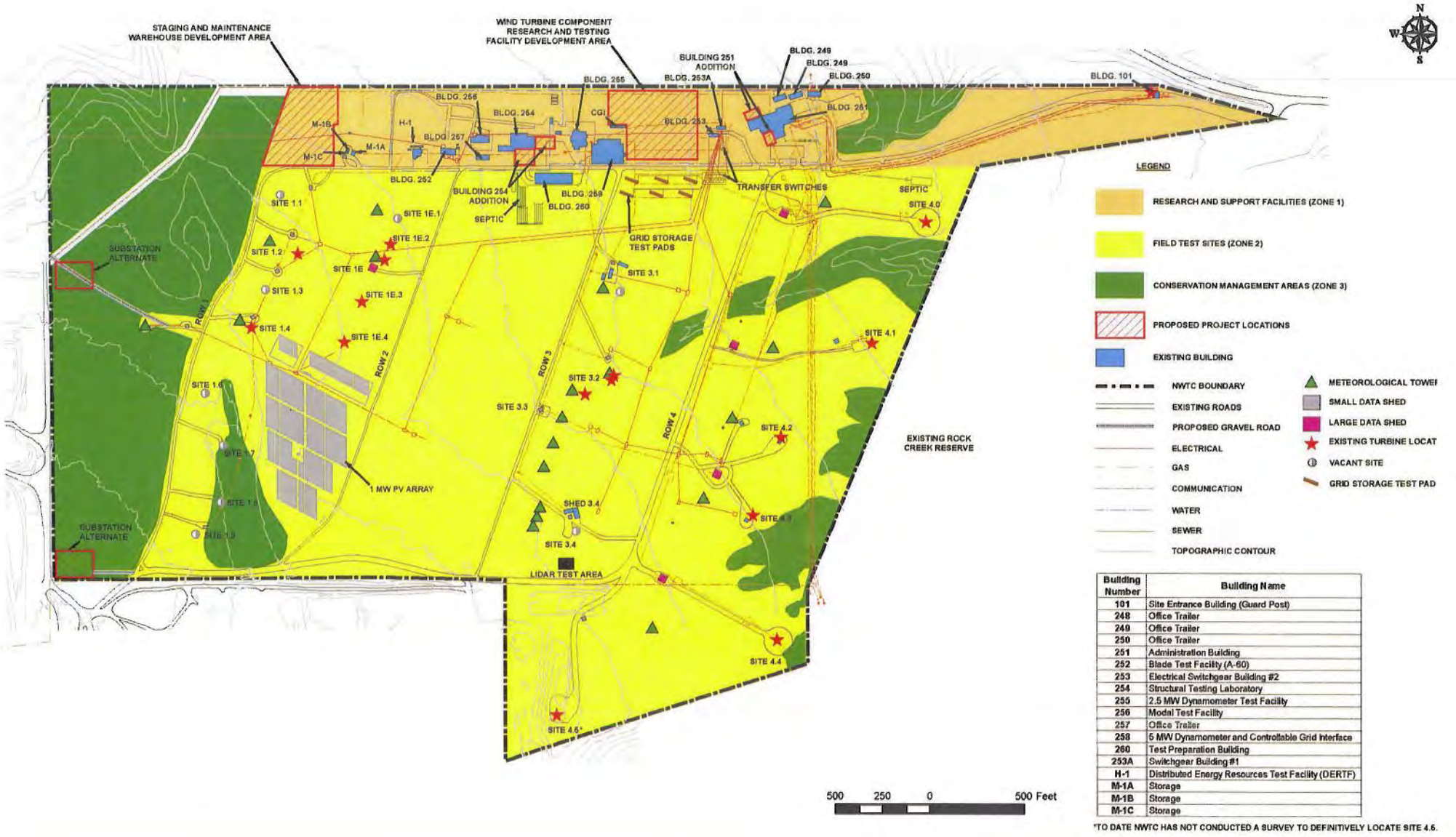


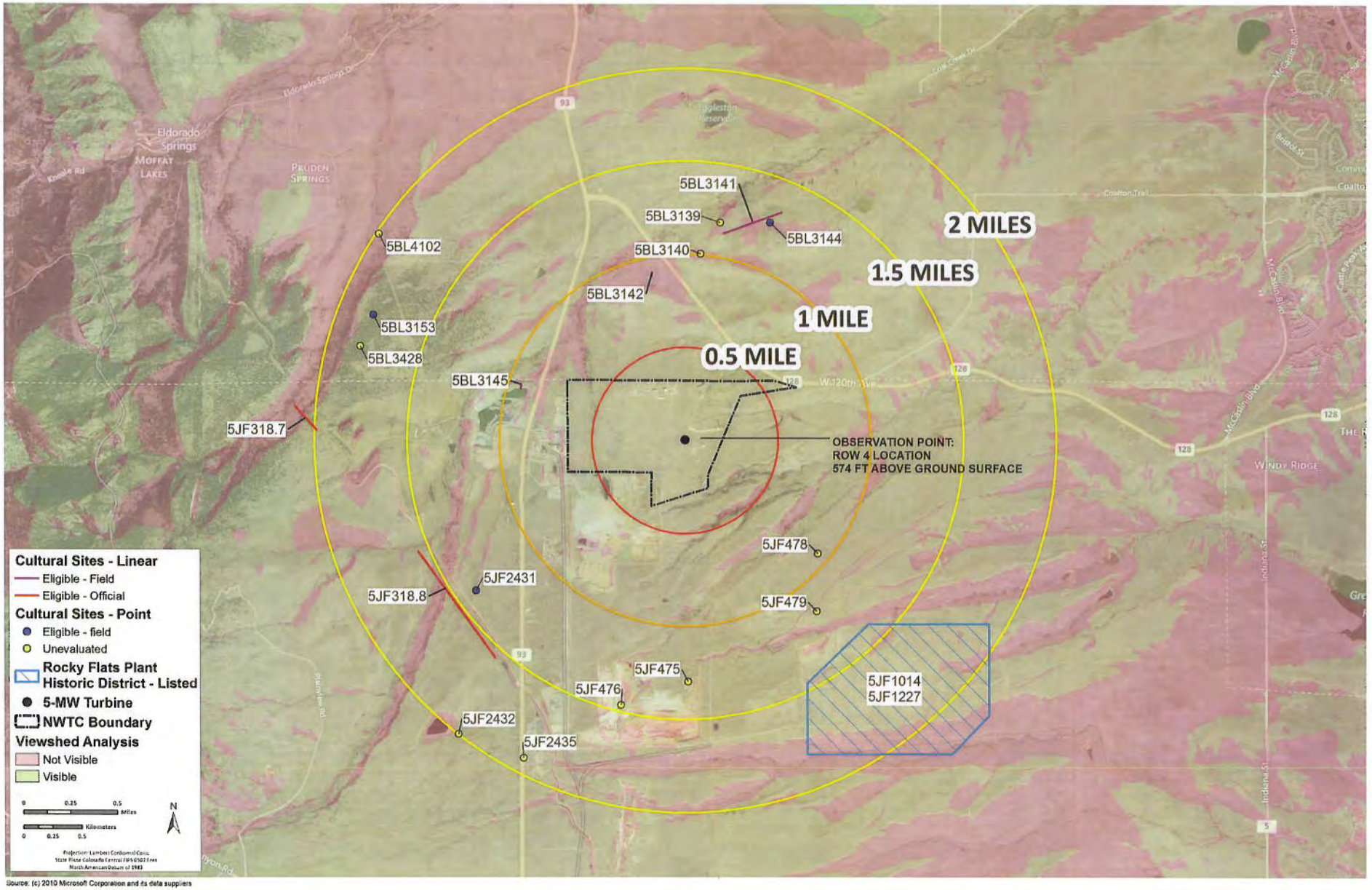
Figure 2. Proposed Improvements



Building Number	Building Name
101	Site Entrance Building (Guard Post)
248	Office Trailer
249	Office Trailer
250	Office Trailer
251	Administration Building
252	Blade Test Facility (A-60)
253	Electrical Switchgear Building #2
254	Structural Testing Laboratory
255	2.5 MW Dynamometer Test Facility
256	Modal Test Facility
257	Office Trailer
258	5 MW Dynamometer and Controllable Grid Interface
260	Test Preparation Building
253A	Switchgear Building #1
H-1	Distributed Energy Resources Test Facility (DERTF)
M-1A	Storage
M-1B	Storage
M-1C	Storage

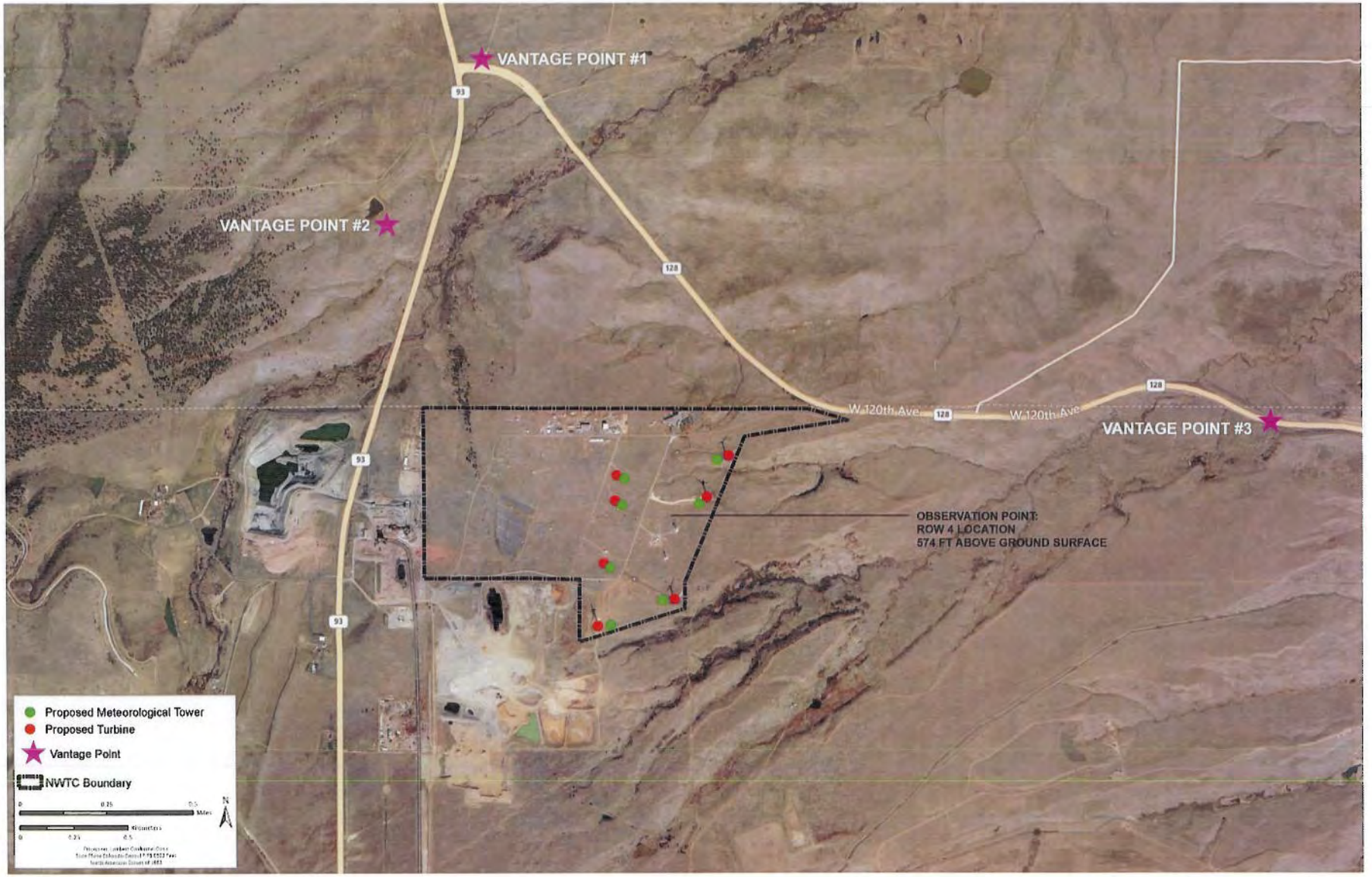
*TO DATE NWTC HAS NOT CONDUCTED A SURVEY TO DEFINITIVELY LOCATE SITE 4.5.

Figure 3. Viewshed Analysis



ATTACHMENT II

Figure 4-1. Location Map of Vantage Points



Source: (c) 2010 Microsoft Corporation and its data suppliers

Figure 4-2. View of the NWTC from the Greenbelt Plateau Trailhead (Vantage Point 1).

Figure 4-3. View of the NWTC from the Flatirons Vista Trail (Vantage Point 2).

Figure 4-4. View of the NWTC from Hwy 128 west of the site entrance (Vantage Point 3).

Figure 4-5. Photosimulation of proposed turbines and associated meteorological towers from Greenbelt Plateau Trailhead (Vantage Point 1).

Figure 4-6. Photosimulation of proposed turbines and associated meteorological towers from Flatirons Vista Trail (Vantage Point 2).

Figure 4-7. Photosimulation of proposed turbines and associated meteorological towers from Hwy 128 west of the site entrance (Vantage Point 3).

HISTORY Colorado

September 9, 2013

Amy L. Van Dercook
NEPA Document Manager
U. S. Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, CO 80401-3393

Re: Initiation of the Section 106 Consultation for the Proposed Improvements at the Department of Energy's National Wind Technology Center at the National Renewable Laboratory in Golden, Colorado (DOE/EA-1914) (CHS #64586)

Dear Ms. Van Dercook:

Thank you for your correspondence dated August 21, 2013 (received by our office on August 27, 2013) regarding the subject undertaking.

Based on the documentation provided which addresses both your responsibilities under the National Historic Preservation Act and the National Environmental Policy Act, we concur with your determination that the proposed undertaking will result in no adverse effect per 36 CFR 800.5(b).

Please remember that the consultation process does involve other consulting parties such as local governments and Tribes, which as stipulated in 36 CFR 800.3 are required to be notified of the undertaking. Additional information provided by the local government, Tribes or other consulting parties may cause our office to re-evaluate our comments and recommendations. This letter does not end the 30-day review period provided to other consulting parties and we recommend that you include the Boulder County Historic Preservation Advisory Board (c/o Denise Grimm, Land Use Department, P.O. Box 471, Boulder, CO 80306) to the list of consulting parties, if not already included.

Should unidentified archaeological resources be discovered in the course of the project, work must be interrupted until the resources have been evaluated in terms of the National Register of Historic Places eligibility criteria (36 CFR 60.4) in consultation with our office.

Thank you for the opportunity to comment. If we may be of further assistance, please contact Mark Tobias, Section 106 Compliance Manager, at (303) 866-4674 or mark.tobias@state.co.us.

Sincerely,

for Edward C. Nichols
State Historic Preservation Officer
ECN/MAT

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APPENDIX G

DRAFT EA NOTICE OF AVAILABILITY
AND
COMMENT LETTERS AND RESPONSES

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NOTICE OF AVAILABILITY

The U.S. Department of Energy (DOE) has prepared a draft Environmental Assessment (EA) to analyze and describe the potential environmental impacts associated with the proposed action at the:

National Wind Technology Center (DOE/EA-1914) - Jefferson County, Colorado

The DOE is proposing to make future improvements to the National Wind Technology Center (NWTC) site in Golden, Colorado at the National Renewable Energy Laboratory (NREL). Interested persons are invited to submit written comments on the draft Environmental Assessment (EA) for consideration by DOE by **February 15, 2014**. All comments received will be considered in preparation of the final EA. A decision on whether to proceed with the proposed action will be made by DOE after the completion of the final EA. The draft EA is available for review at the Standley Lake Public Library and on the DOE Golden Field Office and NREL websites:

http://www.eere.energy.gov/golden/NREL_DEA.aspx
http://www.nrel.gov/ehsq/environmental_protection.html

Please direct any written questions or comments to: NREL NEPA Comments, National Renewable Energy Laboratory, EHS Office (MS RSF 040), 15013 Denver West Parkway, Golden, Colorado 80401 or by email to NREL.NEPA.Comments@nrel.gov or by fax to 303-630-2114. In addition, interested persons are invited to attend an informational meeting from 5:30 PM to 7:30 PM on January 22, 2014 at the Rocky Mountain Metropolitan Airport, 2nd floor, Mount Evans conference room, 11755 Airport Way, Broomfield, CO.

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National Renewable Energy Laboratory
15013 Denver West Parkway - MS RSF 040
Golden, Colorado 80401

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National Renewable Energy Laboratory
15013 Denver West Parkway - MS RSF 040
Golden, Colorado 80401

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Public Reading Room - NREL DRAFT Environmental Assessments (EAs) and Notice of Scoping/Availability

Below are electronic versions of Golden Field Office Reading Room documents that were created after November 1, 1996, per the requirements of the Electronic Freedom of Information Act Amendment of 1996. Most documents are available in Adobe Acrobat Portable Document Format (PDF). Download Acrobat Reader.

Site-Wide Environmental Assessment of U.S. Department of Energy's South Table Mountain Campus at the National Renewable Energy Laboratory, Golden, Colorado (DOE/EA-1968)

- November 8, 2013 Notice of Public Scoping (PDF 1.0 MB)

Draft Site-Wide Environmental Assessment Department of Energy's National Wind Technology Center in Golden, Colorado at the National Renewable Energy Laboratory (DOE/EA-1914)

- DRAFT Environmental Assessment, January 13, 2014 (PDF 12.2 MB)
- DRAFT Environmental Assessment Appendices, January 13, 2014 (PDF 12.2 MB)

Printable Version

AFFIDAVIT OF PUBLICATION

CAMERA

State of Colorado
County of Boulder

I, the undersigned agent, do solemnly swear that the CAMERA is a daily newspaper printed, in whole or in part, and published in the City of Boulder, County of Boulder, State of Colorado, and which has general circulation therein and in parts of Boulder and Broomfield counties; that said newspaper has been continuously and uninterruptedly published for a period of more than six months next prior to the first publication of the annexed legal notice of advertisement, that said newspaper has been admitted to the United States mails as second-class matter under the provisions of the Act of March 3, 1879, or any, amendments thereof, and that said newspaper is a daily newspaper duly qualified for publishing legal notices and advertisements within the meaning of the laws of the State of Colorado; that a copy of each number of said newspaper, in which said notice of advertisement was published, was transmitted by mail or carrier to each of the subscribers of said newspaper, according to the accustomed mode of business in this office.

The annexed legal notice or advertisement was published in the regular and entire edition of said daily newspaper once; and that one publication of said notice was in the issue of said newspaper dated **January 15, 2014.**

Shayla Najera
Agent

Subscribed and sworn to before me this **15th** day of **January, 2014** in the County of Boulder, State of Colorado.

Melissa L Najera
Notary Public
My commission expires 12/11/2014

ACCOUNT #:5073406
AD #5609187
FEE: $260.60

MELISSA L. NAJERA NOTARY PUBLIC STATE OF COLORADO

LEGAL NOTICE

NOTICE OF AVAILABILITY
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Golden, Colorado 80401

or by email to NREL.NEPA.Comments@nrel.gov or by fax to 303-630-2114.

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Published in the Camera on January 15, 2014 - 5609187

AFFIDAVIT OF PUBLICATION

Colorado Hometown Weekly

State of Colorado
County of Boulder, County of Weld

I, the undersigned agent, do solemnly swear that the Colorado Hometown Weekly; is a weekly newspaper published in the County of Boulder and County of Weld, State of Colorado, and has general circulation therein; that said newspaper has been published continuously and uninterrupted in said County of Boulder and County of Weld for a period of more than fifty-two consecutive weeks next prior to the first publication of the annexed legal notice or advertisement' that said newspaper has been admitted to the United States mails as second-class matter under provisions of the Act of March 3, 1879, and amendments thereto; and that said newspaper is duly qualified for publishing legal notices and advertisements within the meaning of the laws of the State of Colorado;

That the attached legal notice or advertisement was published in the regular and entire issue of the Colorado Home Weekly for a period of one advertisement in said issue dated **January 15, 2014**.

Shaylat Najera
Agent

Subscribed and sworn to before me, this **15th** day of **January, 2014** in the County of Boulder, State of Colorado.

Melissa L Najera
Notary Public
My commission expires 12/11/2014

Account #5073406
Ad #5609194
Fee $74.40

MELISSA L. NAJERA NOTARY PUBLIC STATE OF COLORADO

LEGAL NOTICE
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Published: Colorado Hometown Weekly on Jan. 15, 2014-Ad #5609194

The Denver Newspaper Agency

PUBLISHER'S AFFIDAVIT

City and County of Denver)
State of Colorado)
)

The undersigned Jean Birch being first duly sworn under oath, states and affirms as follows:

1. **He/she is the legal Advertising Reviewer of the Denver Newspaper Agency, publisher of *The Denver Post* and *Your Hub*.**
2. ***The Denver Post* and Your *Hub* are newspapers of general circulation that have been published continuously and without interruption for at least fifty-two weeks in Denver County and meet the legal requisites for a legal newspaper under Colo. Rev. Stat. 24-70-103.**
3. **The notice that is attached hereto is a true copy, published in *The Denver Post* on the following date(s):**

January 15, 2014

Jean Birch

Signature

Subscribed and sworn to before me this _13_ day of ___March___, 2014.

Cheryl L Schmid

Notary Public

CHERYL L. SCHMID
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20094029973
MY COMMISSION EXPIRES SEPTEMBER 14, 2017

(SEAL)

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Proof of Publication
THE GOLDEN TRANSCRIPT

110 N. Rubey Drive Suite 120 Golden, CO 80401

1. I, G. (Jerry) Healey am the agent of The Golden Transcript, newspaper printed and published in the city of Golden, County of Jefferson and State of Colorado, and has personal knowledge of all the facts set forth in this affidavit;

2. That the said newspaper is printed and published once each week on Thursday, and that it has a general circulation in the City of Golden and in the County of Jefferson and elsewhere, delivered by carriers or transmitted by mail to each of the subscribers of said paper, according to the accustomed mode of business in this office;

3. That the said newspaper was established and has been printed and published in the said City of Golden and the County of Jefferson uninterrupted and continuously during a period of at least 52 consecutive weeks next prior to the first Issue there-of containing said publication, a copy of which is hereto attached;

4. That the said newspaper is a weekly newspaper of general circulation, and is printed and published in whole or in part in the City of Golden and the said County of Jefferson in which said publication is required by law to be published, a copy of which is hereunto attached;

5. That the said newspaper is a weekly newspaper qualified to publish legal notices, as defined by the Statutes of the State of Colorado;

6. That said newspaper had, prior to January 1, 1936, and has ever since that date, been admitted to the United States mail as second class matter under the provisions of the Act of March 3, 1979, or any amendments thereto;

7. That the said annexed publication was published in the regular and entire edition of the Golden Transcript, a duly qualified weekly newspaper for that purpose, within the terms and means of the Statutes of the State of Colorado;

8. That the said annexed publication is a full, true, and correct copy of the original which was regularly published in each of the regular and entire issues of the Golden Transcript, a legally qualified paper for that purpose, once each week, on the same day of each week, for **3** successive weeks, by **--- 1 ---** Insertions, and that the first publication thereof was in the **January 16, 2014;**

and that the last publication was in the **January 16, 2014.**

Subscribed and sworn to before me this **16th day of January 2014.**

for the Golden Transcript
State of Colorado
Jefferson County)ss

Notary Public, Notary Public, 9137 S . Ridgeline Blvd., No. 210
Highlands Ranch, Colorado 80129

My Commission
Expires 6.11.16

LEGAL NOTICE

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Legal Notice No.: 21649
First Publication: January 16, 2014
Last Publication: January 16, 2014
Publisher: Golden Transcript

		Dec 2013 NWTC Mailing List - FINAL					
	Organization	**Name**	**Address 1**	**Address 2**	**City**	**State**	**Zip**
Boulder County	Ms. Cindy Domenico	Boulder County Commissioner		PO Box 471	Boulder	CO	80306
Boulder County	Ms. Deb Gardner	Boulder County Commissioner		PO Box 471	Boulder	CO	80306
Boulder County	Ms. Elise Jones	Boulder County Commissioner		PO Box 471	Boulder	CO	80306
Boulder County		Boulder County Parks and Open Space		5201 St. Vrain Rd.	Longmont	CO	80503
Boulder County		Boulder Planning Department		PO Box 471	Boulder	CO	80306
Boulder County	Ms. Kacey French	Open Space & Mountain Parks Department		PO Box 471	Boulder	CO	80306
Boulder County	Ms. Denise Grimm	Boulder Land Use Department		PO Box 471	Boulder	CO	80306
Boulder County	Mr. Will Keeley	Open Space & Mountain Parks Department		PO Box 471	Boulder	CO	80306
Boulder County		Boulder County Sheriff's Office		5600 Flatiron Pkwy	Boulder	CO	80301
Broomfield		Broomfield City and County Manager		One DesCombes Drive	Broomfield	CO	80020
Broomfield		Broomfield Open Space & Trails		One DesCombes Drive	Broomfield	CO	80020
Broomfield		Broomfield Planning Department		One DesCombes Drive	Broomfield	CO	80020
Broomfield	Mayor	City and County of Broomfield		One DesCombes Drive	Broomfield	CO	80020
City of Boulder		Boulder City Manager	Municipal Building	1777 Broadway, 2nd Floor	Boulder	CO	80306
City of Boulder	Mayor	City of Boulder	City Council Office	PO Box 791	Boulder	CO	80306
City of Boulder		Open Space & Mountain Parks		66 South Cherryvale Rd.	Boulder	CO	80303
City of Superior	Ms. Beth Moyski	Town of Superior	Town Hall	124 E. Coal Creek Dr.	Superior	CO	80027
District		Rocky Mountain Fire District	Chief	1803 S. Foothills Hwy., Ste. 120	Boulder	CO	80303
Boulder County		Boulder Valley Conservation District		9595 Nelson Road, Box D	Longmont	CO	80501
Federal		Bureau of Land Management	Colorado State Office	2850 Younfield Street	Lakewood	CO	80215
Federal		FAA, Northwest Mountain Region	Airports Division, ANM-600	1601 Lind Avenue, SW, Suite 315	Renton	WA	98057-3356
Federal		FAA, Northwest Mountain Region	Denver Airports District Office	26805 E. 68th Avenue, Suite 224	Denver	CO	80249-6361
Federal		Fish & Wildlife Service	Susan Linner, Colorado Field Supervisor	PO Box 25486-DFC (65412)	Denver	CO	80225
Federal		Fish & Wildlife Service	Sandy Vana-Miller				
Federal		Fish & Wildlife Service	Kevin Kritz, Migratory Birds and State Programs	PO Box 25486, Denver Federal Center	Denver	CO	80225-0486
		Fish & Wildlife Service	Peter Plage	PO Box 25486, Denver Federal Center	Denver	CO	80225-0486

		Dec 2013 NWTC Mailing List - FINAL					
	Organization	**Name**	**Address 1**	**Address 2**	**City**	**State**	**Zip**
Federal		Jefferson Conservation District	c/o USDA-NRCS Metro Offi	PO Box 25426, Denver Federal Center	Denver	CO	80225-0426
Federal		NEPA Compliance, 8WMEA	EPA Region VIII	999 18th Street	Denver	CO	80202-2466
Federal		Office of Congressman Ed Perlmutter		12600 W. Colfax Ave., Ste. B400	Lakewood	CO	80215
Federal		Office of Congressman Jared Polis		4770 Baseline Rd, #220	Boulder	CO	80303
Federal		Office of Senator Mark Udall		999 18th St., North Tower, Suite 1525	Denver	CO	80202
Federal		Office of Senator Michael Bennet		2300 15th St., Suite 450	Denver	CO	80202
Federal	Mr. John Page	U.S. Wind Turbine Evaluations	Federal Aviation Administration	800 Independence Ave, SW, Room 400 East	Washington	DC	20591
Federal	Mr. Terry McKee	US Army Corps of Engineers,	Omaha District	9307 S. Wadsworth Blvd.	Littleton	CO	80128-6901
Federal	Mr. Gregory Davis	US EPA - Region VIII	Stormwater Coordinator; EPR-EP	1595 Wynkoop St.	Denver	CO	80202-1129
Federal		US EPA - Region VIII	Ecosystem Protection	1595 Wynkoop St.	Denver	CO	80202-2405
Federal		US EPA - Region VIII	NEPA Compliance, 8EPR-N	1595 Wynkoop St.	Denver	CO	80202-1129
Jefferson County		Jefferson County	Div. of Highways and Transportation	100 Jefferson County Pkwy, Ste. 3500	Golden	CO	80419-3500
Jefferson County	Mr. Casey Tighe	Jefferson County Commissioner		100 Jefferson County Parkway	Golden	CO	80419
Jefferson County	Mr. Donald Rosier	Jefferson County Commissioner		100 Jefferson County Parkway	Golden	CO	80419
Jefferson County	Ms. Faye Griffin	Jefferson County Commissioner		100 Jefferson County Parkway	Golden	CO	80419
Jefferson County		Jefferson County Department of Health	Environmental Health Division	1801 19th St.	Golden	CO	80401
Jefferson County		Jefferson County Development & Transportation	Director	100 Jefferson County Parkway	Golden	CO	80419
Jefferson County		Jefferson County Emergency Management		800 Jefferson County Pkwy	Golden	CO	80419
Jefferson County		Jefferson County Open Space	Director	700 Jefferson County Pkwy., Ste. 100	Golden	CO	80419-5540
Jefferson County		Jefferson County Planning & Zoning	Planning and Engineering Mgr.	100 Jefferson County Pkwy, Suite. 3550	Golden	CO	80419-3500
Jefferson County		Jefferson County Road & Bridge	Director	21401 Golden Gate Canyon Rd.	Golden	CO	80403
Jefferson County		Jefferson County Transportation and Engineering	Director	100 Jefferson County Parkway	Golden	CO	80419
Jefferson County		Jefferson County Sherriff's Office		200 Jefferson County Parkway	Golden	CO	80401
Jefferson County	Mr. Kevin McCaskey	Jefferson Economic Council	President & CEO	1667 Cole Blvd., Suite 400	Golden	CO	80401
State		Air Pollution Control Division	Division Director	4300 Cherry Creek Drive South	Denver	CO	80246-1530
State		Colo. Coop. Fish & Wildlife Research Unit	Director	201 JVK Wagar Building, 1484	Fort Collins	CO	80523-1484
State		Colorado Coop Fish & Wildlife Unit	Dept. Fishery and Wildlife Biology	201 Wagner Building, CSU	Fort Collins	CO	80523-1484
State		Colorado Dept. of Agriculture	Conservation Services Division	700 Kiping Street, Suite 4000	Lakewood	CO	80215
State		Colorado Dept. of Natural Resources	Executive Director's Office	1313 Sherman Street, Room 718	Denver	CO	80203

		Dec 2013 NWTC Mailing List - FINAL					
	Organization	**Name**	**Address 1**	**Address 2**	**City**	**State**	**Zip**
State		Colorado Division of Wildlife	State Raptor Biologist	6060 Broadway	Denver	CO	80216
State		Colorado Division of Wildlife	Director	6060 Broadway	Denver	CO	80216
State		Colorado Geological Survey		1313 Sherman Street, Rm 715	Denver	CO	80203
State		Colorado State Forest Service	Boulder County Office	936 Lefthand Canyon Drive	Boulder	CO	80302-9341
State		Colorado State Forest Service	Golden District Office	1504 Quaker Street	Golden	CO	80401-2956
State		Colorado State Land Board		1313 Sherman Street, Rm 621	Denver	CO	80203
State		Colorado State Patrol	District 6 Commander	1096 McIntyre Street	Golden	CO	80401
State		Division of Water Resources	State Engineer	1313 Sherman St., Rm 818	Denver	CO	80203
State		Governor's Energy Office	T.J. Deora, Director	1580 Logan Street, Suite 100	Denver	CO	80203
State		Haz. Materials & Waste Mgm't Div.	Division Director	4300 Cherry Creek Drive South	Denver	CO	80246-1530
State		Office of State Representative Max Tyler	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Representative Cheri Gerou	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Representative KC Becker	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Representative Tracy Kraft-Tharp	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Representative Dianne Primavera	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Senator Dan Gibbs	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Senator Rachel Zenzinger	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		Office of State Senator Vickie Marble	Colorado State Capitol	200 East Colfax	Denver	CO	80203
State		State Historic Preservation Office		1300 Broadway	Denver	CO	80203
State		State of Colorado	Governor John Hickenlooper	136 State Capitol	Denver	CO	80203-1792
State		Water Quality Control Division	Division Director	4300 Cherry Creek Drive South	Denver	CO	80246-1530
State		Wildfire Mitigation Coordinator/Special Project Forester	Colorado State Forest Service, Wildfire Mitigation	9769 West 119th Drive	Broomfield	CO	80221
Tribal		Oglala Sioux Tribe		PO Box 2070	Pine Ridge	SD	57770
Tribal		Southern Ute Tribe		P.O. Box 737	Ingacio	CO	81137
Tribal		Ute Indian Tribe		P.O. Box 190	Ft. Duchesne	UT	84026
Tribal		Ute Mountain Ute Tribal Council		PO Box JJ	Towaoc	CO	81334
State		Colo Dept of Transportation	Environmental Programs Branch, NEPA Mgr.	4201 East Arkansas Ave	Denver	CO	80222
Special District		Regional Transportation District	Senior Service Planner/Scheduler, North Team	1600 Blake St.	Denver	CO	80202
Special District		Regional Transportation District	Senior Service Planner/Scheduler, West Team	1600 Blake St.	Denver	CO	80202
Boulder County		Boulder County Transportation Department		P.O. Box 471	Boulder	CO	80306
Other	Art Kwerneland	Xcel Energy		1800 Larimer St, Suite 1000	Denver	CO	80202
other	Howard Kiyota	Xcel Energy		1800 Larimer St, Suite 1400	Denver	CO	80202
Other	Marty Martinez	Xcel Energy		18201 West 10th Ave	Golden	CO	80401

		Dec 2013 NWTC Mailing List - FINAL					
	Organization	**Name**	**Address 1**	**Address 2**	**City**	**State**	**Zip**
Other	Steven T. Brown	Director of Land Management		10170 Church Ranch Way, Suite 200	Westminster	CO	80021
Other	David Bird	Colorado Division of Reclamation, Mining, and Safety	Department of Natural Resources	1313 Sherman St., Room 215	Denver	CO	80203
Other	Mike Dixon, Ph.D.	Division of Refuge Planning	U.S. Fish and Wildlife Service	P.O. Box 25486, DFC	Denver	CO	80225
DOE	Simon Lipstein, Attorney	DOE, Office of Legal Services	Denver Federal Center, Bldg 55	P.O. Box 25547	Denver	CO	80225-0547
City of Arvada		City of Arvada	Water Transmission and Di	6701 Indiana Street	Arvada	CO	80007
Jefferson County	Kenneth Maenpa	Airport Manager	Rocky Mountain Metropoli	11755 Airport Way	Broomfield	CO	80021

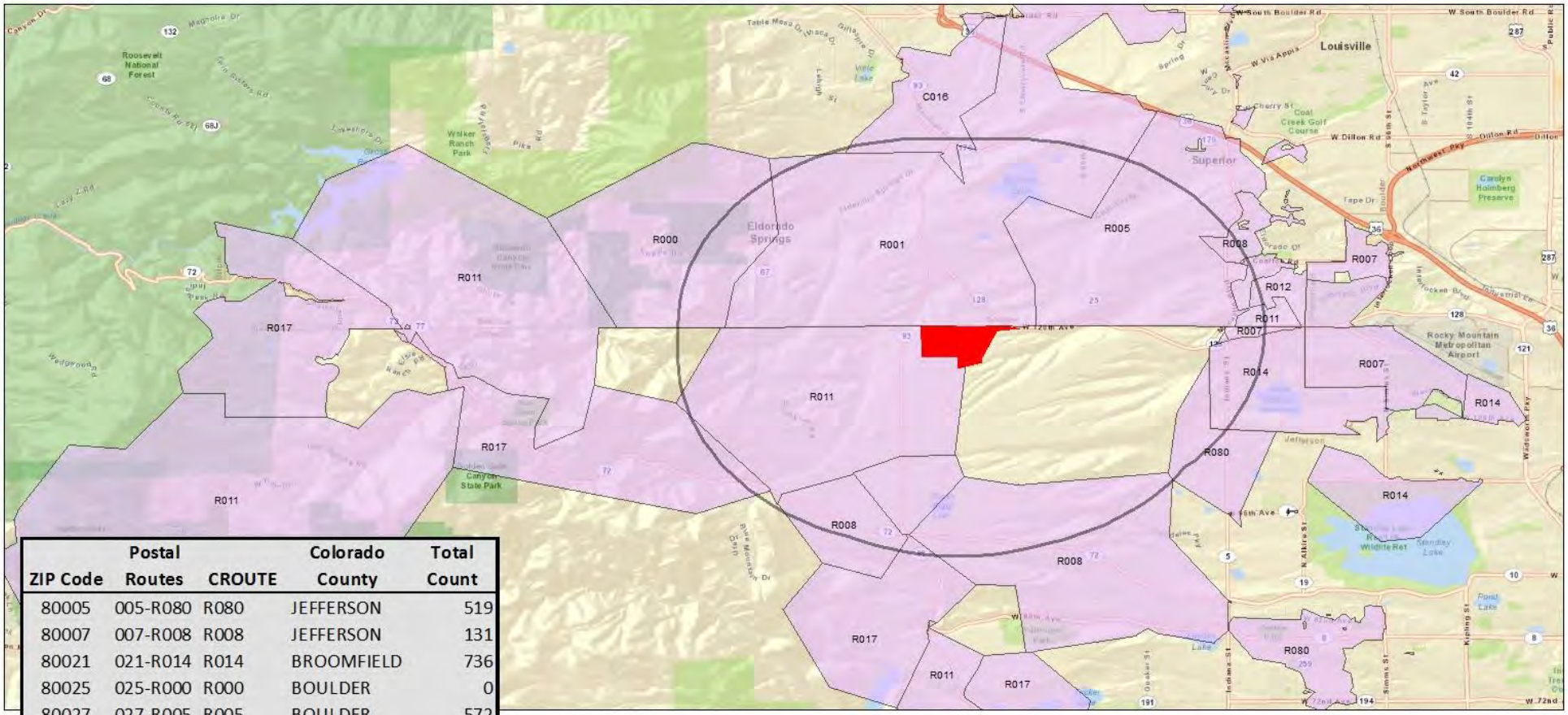
Name	Org	Address 1	Address 2	City	State	Zip
Mr. Michael Fry	Director of Conservation Advocacy	American Bird Conservancy	1731 Connecticut Avenue, NW	Washington	DC	20009
	Nature Conservancy	Colorado Field Office	2424 Spruce Street	Boulder	CO	80302
Ms. Vickie Patton	General Counsel	Environmental Defense Fund	2060 Broadway, Suite 300	Boulder	CO	80302
Mr. Erich Pica	President	Friends of the Earth	1100 15th Street, NW, 11th Floor	Washington	DC	20005
Mr. Terry Rich	Partners In Flight	National Coordinator	1387 S. Vinnell Way	Boise	ID	83709
Mr. Jerry R. Pardilla	Executive Director	National Tribal Environmental Council	4520 Montgomery Boulevard, NE, Ste. 3	Albuquerque	NM	87109
Mr. David Goldstein	Energy Program Director	Natural Resources Defense Council	111 Sutter Street, 20th Floor	San Francisco	CA	94104
	Friends of the Foothills	P.O. Box 17164 Golden, CO 80402.	PO Box 17164	Golden	CO	80402
Mr. Douglas Larson	Executive Director	Western Interstate Energy Board	1600 Broadway, Suite 1700	Denver	CO	80202
Ms. Penny Anderson	Energy Program	Western Resource Advocates	2260 Baseline Road, Suite 200	Boulder	CO	80302-7740
	Audubon Colorado		1536 Wynkoop St., Ste. 302	Denver	CO	80202
Mr. Joshua Ruschhaupt	Sierra Club Rocky Mountain Chapter		1536 Wynkoop St. 4th Floor	Denver	CO	80202
	Colorado Wildlife Federation		1410 Grant Street, Ste. C-313	Denver	CO	80203
David Anderson	Director and Chief Scientist	Colorado Natural Heritage Program	Colorado State University, 1475 Campus Delivery	Ft. Collins	CO	80523-1475
Bethany Gravell	Executive Director	Center for Native Ecosystems	1536 Wynkoop St.	Denver	CO	80202
	National Wildlife Federation	Rocky Mountain Regional Center	2995 Baseline Rd., Suite 300	Boulder	CO	80303
	colorado environmental coalition	Denver Office	1536 Wynkoop St., #5C	Denver	CO	80202
	Jeffco Open Space Foundation, Inc.	5855 Wadsworth Bypass	Building A, Suite 100	Arvada	CO	80003
Rachael Bray, AECOM	Denver International Airport	8500 Pena Blvd.	AOB 7th FLoor	Denver	CO	80249-6340
Eric Cosmos		3624 Huron Peak Ave		Superior	CO	80027
Mike Chiropolos		mikechiropolos@gmail.com				

Zip Code	Postal Route	County	Count
80005	R080	Jefferson	519
80007	R008	Jefferson	131
80021	R007	Jefferson	799
80021	R014	Broomfield	736
80025	R000	Boulder	0
80027	R005	Boulder	572
80027	R008	Boulder	474
80027	R011	Boulder	487
80027	R012	Boulder	572
80303	R001	Boulder	400
80305	C016	Boulder	465
80403	R011	Jefferson	422
80403	R017	Jefferson	528
			6105 Total

2013 Rocky Flats Trustee Council							
Name	**Organization**	**Address 1**	**Address 2**	**City**	**State**	**Zip**	
Gary Baughman	Rocky Flats Natural Resource Trustee Council	Colorado Department of Public Health and Environment	HMWMD-B2,4300 Cherry Creek Drive South	Denver	CO	80246-1530	
Scott Surovchak	Rocky Flats Natural Resource Trustee Representative	Department of Energy-Legacy Management	11025 Dover St., Suite 1000	Westminster	CO	80021-5573	scott.surovchak@lm.doe.gov
David Lucus	Rocky Flats Natural Resource Trustee Representative	U.S. Fish & Wildlife Service	Building 121	Commerce City	CO	80022-1748	david_c_lucas@fws.gov
Daniel S. Miller	Rocky Flats Natural Resource Trustee Representative	Colorado Dept. of Law, Natural Resources and Environment Section	1300 Broadway, 7th Floor	Denver	CO	80203	dan.miller@state.co.us
Bob Randall	Rocky Flats Natural Resource Trustee Representative	Colorado Dept. of Natural Resources, Executive Director's Office	1313 Sherman Street, Room 718	Denver	CO	80203	

Newpapers						
Boulder Daily Camera	P.O. Box 591	Boulder	CO	80306	http://www.dailycamera.com/	Boulder Cty & surrounding area
Colorado Hometown Weekly	3400 Industrial Lane, Suite 2	Broomfield	CO	80020	http://www.coloradohometownweekly.com/	Erie, Lafayette, Louisville
The Denver Post	101 W. Colfax Ave.	Denver	CO	80202-5	http://www.denverpost.com/	Denver metro
Golden Transcript	110 N. Rubey Dr., Suite 120	Golden	CO	80403	http://www.newsroom@milehighnews.com	Golden area

Postal Routes for NWTC SWEA NOA



ZIP Code	Postal Routes	CROUTE	Colorado County	Total Count
80005	005-R080	R080	JEFFERSON	519
80007	007-R008	R008	JEFFERSON	131
80021	021-R014	R014	BROOMFIELD	736
80025	025-R000	R000	BOULDER	0
80027	027-R005	R005	BOULDER	572
80027	027-R008	R008	BOULDER	474
80027	027-R011	R011	BOULDER	487
80303	303-R001	R001	BOULDER	400
80305	305-C016	C016	BOULDER	465
80403	403-R011	R011	JEFFERSON	422
80403	403-R017	R017	JEFFERSON	528
80021	021-R007	R007	JEFFERSON	799
80027	027-R012	R012	BOULDER	572
			Grand Total	**6105**

Legend

- NWTC Boundary
- Three Mile Radius
- Selected Postal Routes

Notes: Map Background from ESRI Street Map World 2D
Postal Routes = last 3 digits of zip codes and postal codes
Postal Route Data provided by Market Maps, Inc.

N

12/05/2013

Van Dercook, Amy

From: Van Dercook, Amy
Sent: Monday, January 13, 2014 12:21 PM
To: 'lilyfishpond@gmail.com'; 'NREL.NEPA.Comments@nrel.gov'
Subject: RE: draft Environmental Assessment comments

Thank you for the email. The draft Environmental Assessment has not been posted yet, as the public comment period officially starts on Wednesday (1/15/14). If you have additional comments after your review, the comment period is open through 2/15/14.

Thanks,
Amy Van Dercook, P.G.
U.S. Department of Energy | Golden Field Office
15013 Denver West Parkwy, Golden, CO 80401
Phone: 720.356.1666 | Mobile: 720.233.5392
Email: amy.vandercook@go.doe.gov

From: Roberta R [mailto:lilyfishpond@gmail.com]
Sent: Monday, January 13, 2014 8:33 AM
To: NREL.NEPA.Comments@nrel.gov
Subject: draft Environmental Assessment comments

Dear NREL NEPA,

A.1 I received your postcard with the two links and spent at least an hour perusing them; I found the second of the two links easier to read. I find your efforts all in all quite impressive and I am proud to live nearby.

I could not find specific notes of improvements to windmills, such as location to avoid bird/bat flight, modification of design to protect birds and bats including modification of color to avoid attraction, such as changing from white to grey or purple. Can you reply please in simple terms what is being done (or not neccessary to be changed) by return email?

I still see white windmills on my way to work in Boulder on 93 near 128 (NWTC). I know that larger blades and lack of latticework is beneficial, and I do see a range of sizes. I also know that some "windmills" being designed do not utilize blades and am curious if you are using some of those.

Again I would like to reiterate that I am delighted by the big picture!

Thank you very much for your time and consideration.
Sincerely,

Roberta Richardson
11647 Brook Road
Golden

Van Dercook, Amy

From: Van Dercook, Amy
Sent: Monday, January 13, 2014 12:20 PM
To: 'Dixon, Michael'; 'nrel.nepa.comments@nrel.gov'
Subject: RE: NOA for NWTC EA

Thank you for the email. The draft Environmental Assessment has not been posted yet, as the public comment period officially starts on Wednesday (1/15/14). If you have additional comments after your review, the comment period is open through 2/15/14.

Thanks,
Amy Van Dercook, P.G.
U.S. Department of Energy | Golden Field Office
15013 Denver West Parkwy, Golden, CO 80401
Phone: 720.356.1666 | Mobile: 720.233.5392
Email: amy.vandercook@go.doe.gov

From: Dixon, Michael [mailto:michael_d_dixon@fws.gov]
Sent: Monday, January 13, 2014 12:14 PM
To: nrel.nepa.comments@nrel.gov
Subject: NOA for NWTC EA

B.1 I received a postcard NOA regarding a draft environmental assessment for the NWTC. However, there is no draft EA available at either of the included websites - only a scoping notice. Is the EA available electronically through other avenues?

/|\^._.^/|\ /|\^._.^/|\ /|\^._.^/|\

Mike Dixon, Ph.D. | Wildlife Biologist | U.S. Fish & Wildlife Service - Mountain-Prairie Region | Migratory Birds Program (Detailee) | 134 Union Boulevard, Lakewood, CO 80226 | 303-236-8132 | *Veritas vincit*

Van Dercook, Amy

From: Roberta R <lilyfishpond@gmail.com>
Sent: Monday, January 20, 2014 6:50 AM
To: NREL.NEPA.Comments@nrel.gov
Subject: Environmental Assessment Comment

Dear Ms. Van Dercook PG,

C.1 I will not be able to attend the public meeting for this issue, but would very much like to request officially as a public comment, that the wind energy research be expanded to include more variety of wind energy capture options sited to avoid clash with winged wildlife (birds, bats) transitory patterns, some with mechanisms other than twirling blades/oars, such as some barrel designs that I have seen in articles. Also white and yellow have

C.2 been scientifically observed to attract wildlife, whereas grey and purple not so much, so I further request that you begin to utilize this knowledge to protect our local wildlife, as your website states that you are very conscientious about those concerns.

Please note that I have previously enquired recently about your existing or previous experiments so as not to request something that you may already have covered in your research, being the foremost governmental research facility to my knowledge in the U.S.A. My questions were not answered, therefore I must couch my request in ignorance other than what I have visually observed from highways 93 and 128, passing your facility when traveling. I also sent you all a link to an article regarding usage of color dealing with avian fatalities about a year, perhaps 18 months ago, and have seen no change. I am very supportive of wind energy expansion, along with solar and kinetic and want nothing to stand in its way!

To summarize my public comment on your Environmental Assessment, please explore and utilize the utmost safety in siting your windmills, in use of color of said windmills, and of alternate wind capture designs to protect our wildlife as much as possible throughout your research.

Thank you very much for your kind consideration,

Roberta Richardson
11647 Brook Road
Golden, CO 80403

Van Dercook, Amy

From: gretchen framel <gretfram@gmail.com>
Sent: Sunday, January 26, 2014 9:52 PM
To: NREL.NEPA.Comments@nrel.gov
Subject: National Wind Center

To whom it may concern,

D.1 I am in favor of the Environmental Assessment and if approved, an expansion of the National Wind Center Site.

Always a proponent of renewable energy along with my husband Curtis Framel, a former DOE employee, I would love to see the center continue it's research and make a difference in new technologies with wind.

I drive Hwy 93 daily on my way to and from work, The Wind Center is my favorite landmark to see and to remember my husband as he found his life path crossing with those from the wind center and his DOE comrades who work there and in Golden.

Thank you for the opportunity to comment and best of luck with the expansion.

Regards,

Gretchen Framel
11846 Crescent Park Dr
Golden, CO 80403

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Rocky Mountain Arsenal National Wildlife Refuge
6550 Gateway Road, Bldg. 121
Commerce City, Colorado 80022-4358
Telephone (303) 289-0232 Fax (303) 289-0579

January 30, 2014

NREL NEPA Comments
National Renewable Energy Laboratory
EHS Office, M.S. RSF 103
15013 Denver West Parkway
Golden, CO 80401
nrel.nepa.comments@nrel.gov

Re: Draft Site-Wide Environmental Assessment, Department of Energy's National Wind Technology Center, Golden, Colorado (DOE/EA-1914)

The Rocky Flats National Wildlife Refuge (Refuge) was authorized by the Rocky Flats National Wildlife Refuge Act of 2001 (Public Law 107-107, 115 Stat. 1382) and was officially established in 2007. The Refuge has a long and positive relationship with the Department of Energy (DOE) and we appreciate the opportunity to comment on your draft environmental assessment (EA).

- We recommend that maps contained in the EA show the location of Refuge lands bordering the NWTC (specifically Figures 1-2 and 2-1). Section 2.3 describes alternatives considered but eliminated and discusses possible expansion of the existing site into these lands. In December 2011, the U.S. Fish and Wildlife Service (Service) received a comment from the Golden Field Office on a draft environmental assessment regarding the Refuge expressing interest in expansion of the NWTC into these lands. The Refuge's response at the time was that Congress intended for these adjacent parcels to be a part of the Refuge (see the Rocky Flats Amendment Act of 2006, Public Law 109-163, 119 Stat. 3540). Further, Congress directed that DOE transfer administrative jurisdiction over these parcels to the Department of the Interior so that they could be included in the Refuge. *(Id.)* The Service's response to DOE's 2011 comment stated it had no intention of asking Congress to change this designation. Any expansion into these parcels would also conflict with Congress' direction and provision of funding to acquire private mineral interests on these lands in order to facilitate their inclusion in the Refuge, and the intentions of the Rocky Flats Natural Resource Damage Trustee Council, which executed this Congressional direction, to conserve these lands into the future.

E.1

- In January 2013, the Refuge expanded to include 623-acres of Section 16. Figure 2-3 should be updated to show this as Refuge ownership. Section 16 is currently displayed on this map as owned by the State Land Board.

E.2

- The Plainview Option 2 (a 1.6 mile north/south utility corridor) is proposed as crossing the adjacent lands that Congress had designated for addition to the Refuge, and that will be added to

the Refuge soon. This corridor crosses important grassland bird habitat and is not compatible with Congress' intent that these lands be added to and conserved as part of the Refuge. As a result, this corridor will not be permitted by Refuge. Similarly, the proposed connection for domestic water to the City of Arvada water supply, which as proposed also crosses lands that will be added to the Refuge soon, will not be permitted.

E.3

- The Preble's meadow jumping mouse (*Zapus hudsonius preblei*) has been found in wetlands and shrubland communities adjacent to the Rock Creek drainage. In 2010, the U.S. Fish and Wildlife Service designated approximately 1,108 acres at the Rocky Flats site as designated critical habitat for the mouse. This includes portions of the Short Ear, Plum, Mahonia, Snowberry and Lindsay Branches of Rock Creek. Conservation of this species at the site is a priority for the Refuge.

E.4

- Section 3.9.3.4 describes possible impacts to mammals, including bats. Literature has expanded significantly regarding bat fatalities at wind farms since the mid-2000s and should be updated in the EA. We also recommend that information specific to the little brown bat (*Myotis lucifugus*) be included in this EA. The little brown bat was once considered a common bat species. However, emerging evidence demonstrates sharp decline due to the rapidly spreading white-nose syndrome.

E.5

- Table 3-24 identifies the Gunnison's prairie dog as a federal candidate species. On November 14, 2013, the U.S. Fish and Wildlife Service completed a 12-month status review and determined that protecting the Gunnison's prairie dog under the Endangered Species Act is not warranted at this time.

E.6

Thank you and I can be contacted at (303) 289-0350 with any questions.

Sincerely,

David Lucas
Refuge Manager

cc: Mike Dixon, USFWS Conservation Planning

Van Dercook, Amy

From: Brian Elliott <belliott@tda.com>
Sent: Tuesday, February 11, 2014 8:31 PM
To: NREL.NEPA.Comments@nrel.gov
Subject: Comment - towers / digital TV idea

F.1 With all of the tall structures and towers would it be possible to install a digital tv repeater to provide Denver channels to areas such as Superior? Previously (many years ago) there was a consideration of using Eldorado Mountain, but the tower was opposed by the public, I believe mainly for scenic reasons. Your location is almost identical to the location of the eldorado Mountain tower, and if you are going to build very high structures, like the ones you have, it seems that it would make sense to take advantage of it. Areas in Superior are only served by Wyoming stations due to the hill along highway 128. This could potentially be a source of revenue if the tower is rented to the broadcasters for use as a transmitter / repeater.

Sincerely,

Brian Elliott
Superior

City of Boulder
Open Space & Mountain Parks Department
P.O. Box 791, Boulder, CO 80306; 303-441-3440

MEMORANDUM

To: NREL NEPA Comments
National Renewable Energy Laboratory
EHS Office (MS RSF 040)

From: Kacey French, Environmental Planner
Will Keeley, Wildlife Ecologist

Date: February 14, 2013

Re: City of Boulder OSMP Comments on Draft Environmental Assessment for the National Wind Technology Center (DOE/EA-1914)

Thank you for the opportunity to review and comment on the draft Environmental Assessment (EA) to analyze and describe the potential environmental impacts associated with the proposed expansion of the National Wind Technology Center (NWTC). The City of Boulder is committed to sustainability, reducing green house gases and exploring energy alternatives; and recognizes the significance of the NWTC in preparing America for a clean energy future. The city also owns lands managed as Open Space and Mountain Parks (OSMP) adjacent to and nearby the proposed development. City staff has identified several issues we suggest be addressed in the final EA. We have the following comments:

General Comments

G.1 Throughout the draft EA the neighboring land ownership is referenced incorrectly. The City of Boulder, OSMP lands and trailheads are consistently and incorrectly referred to as Boulder County Open Space. The Greenbelt Plateau and Flatirons Vista Trailheads are owned and maintained by the City of Boulder. Attachment A includes a map showing the correct land ownership. We request that land ownership references be corrected throughout for the final EA.

G.2 Given the proximity of the proposed activity to Boulder County we recommend that the Department of Energy DOE consider local plans, policies, and planning criteria of the jurisdictions which have lands adjacent to the NWTC, rather than only Jefferson County. Such policies are relevant to the assessment of potential environmental impacts from the proposed improvement and ongoing operations at the NWTC. Pages 21 and 22 of the EA list only Jefferson County plans. The relevant Boulder County and City of Boulder Plans should also be listed. These include but are not limited to:

- The Boulder Valley Comprehensive Plan

- The City of Boulder Open Space and Mountain Parks Grassland Ecosystem Management Plan
- The City of Boulder, Open Space and Mountain Parks Visitor Master Plan
- The City of Boulder, Open Space and Mountain Parks Marshall Mesa-Southern Grassland Trail Study Area Plan

G.3 In addition, it is unclear how the EA has been informed by adjacent land owners/jurisdictions plans and policies, and specifically how said plans and policies aided DOE in their assessment of the potential environmental impact from the proposed improvements.

Visual Impacts Comments

G.4 The City of Boulder has a number of trails which afford a view of the project area. The draft EA proposes a considerable increase in the number of turbines and other structures (e.g. meteorological towers) that could be constructed, and it is likely that some or all of these would be visible to visitors on neighboring City of Boulder open space. The increase in size and number of turbines will have an effect upon the aesthetics of the visitor experience. The nature of this effect does not appear to be explored in the EA. More information in the final EA about the location of the turbines relative to patterns of visitor use could shed light on the nature of these impacts and ways that effects, if any, could be mitigated.

Wildlife Comments

G.5 The adjacent City of Boulder open space to the north is the largest block of unfragmented grassland habitat managed by the city, and is identified in the City Council approved Grassland Ecosystem Management Plan as a Grassland Preserve. Grassland Preserves are considered the best opportunity on OSMP lands to conserve prairie dogs and their associated species, including raptors. In most cases, prairie dogs will be allowed to persist without removal. Inactive, previously occupied colonies within Grassland Preserves could serve as relocation receiving sites.

The prairie dog colonies in this area are frequently used by a variety of raptors, both migrating and resident, including Burrowing Owls, Ferruginous Hawks, Golden Eagles, Bald Eagles, Red-tailed Hawks and others. Although topographic features separate the NREL facility somewhat from these grasslands, it is very possible that foraging raptors may fly over the wind facility or attempt to forage within its area. It is also likely that as populations of prairie dogs in the surrounding area, including those on the wildlife refuge, recover from the plague (2008), foraging raptors will fly over or attempt to use the habitat in the NREL. With the increase in the number and size of the turbines we estimate the risk of raptor collision and mortality is considerably increased. The draft EA however concludes that there is little to no risk of raptor mortalities even though anecdotal evidence, i.e. dead raptors found by employees, indicated a risk to raptors. The EA does not appear to contain information in support of the conclusion that the proposed action will have only a negligible impact on raptors using the area—including adjacent Open Space and Mountain Parks. The Final EA should include more information to support this conclusion, and include a commitment to monitoring the effect of the proposed

G.6 action upon raptor populations including thresholds of mortality and management responses if those thresholds are exceeded. We also recommend that the impact of the proposed action on

bats be closely monitored and adaptive management of the facility should be outlined in the event the increase in turbines substantially increases bat mortality.

G.7 Of special concern is the potential for eagle fatalities. A pair of Bald Eagles nests 2.5 miles from the wind facility, and often forages in areas adjacent to the facility. The average home range for Bald Eagles in similar habitats is 22km (Garrett et al. 1993). The draft EA's conclusion that there will be no impacts to the nesting bald eagle 2.5 miles from the proposed action does not appear to be well supported by the literature. In addition, a high concentration of nesting Golden Eagles in the cliffs to the west spend much of their foraging time hunting prairie dogs in colonies in this area. As a result, we believe that consultation with US Fish and Wildlife Service (FWS) is necessary, and would be useful and beneficial to address what appears to be a significantly increased risk of eagle fatalities. We request that the correspondence with FWS be included in the final EA.

G.8 The draft EA estimates the disturbance and loss of habitat using the footprint of the proposed development and footings of the turbines. However, given the size of the rotors and meteorological towers with associated guy wires, it would be more accurate to estimate the disturbance and loss of habitat using the diameter of the rotors and diameter of the meteorological towers and guy wires. It may be that the entirety of area 2 will be lost as potential raptor foraging habitat due to the number and size of turbine blades and associated meteorological towers and guy wires that would need to be avoided. Because the draft EA does not accurately or realistically estimate the disturbance and loss of habitat, we suggest that a new estimate be calculated using the diameter of the turbine rotors and diameter of the meteorological towers and associated guy wires.

G.9 The guy wires from the meteorological towers appear to be a substantial cause of mortality for birds (according to Table 3-22), however no mitigating measures were identified in the draft EA. Although BMPs are mentioned throughout the wildlife section, no specific BMPs are outlined. We suggest that the specific BMPs be identified in the final EA, including any BMPs that exist for guy wires. For example, is it possible to make the wires more conspicuous to birds to mitigate the rate of collisions?

G.10 The results of the ***Avian Use of the NWTC – Fixed Point Survey*** notes the presence of Grasshopper Sparrows. They are also present in the adjacent OSMP grasslands to the north. Research from Johnson (2013) indicates that Grasshopper Sparrows are more sensitive to turbines than other grassland bird species (they avoid turbines up to distances of 200 meters). Grasshopper Sparrows are considered a management indicator species in OSMP's Grassland Ecosystem Management Plan (2010) and their populations have declined 65% in the last 40 years (Butcher et al. 2008). Therefore, we are concerned about the effects of the proposed action on populations of Grasshopper Sparrows on OSMP and the NWTC. Please outline BMPs in the Final EA to mitigate the impacts of the proposed action on Grasshopper Sparrows and other sensitive ground-nesting birds.

G.11 The results of the ***Bird and Bat Mortality Surveys*** indicate high bat fatalities in sites 4.1 and 4.4. The draft EA does not provide details on the proposed locations of the new turbines. Given the variability of fatalities from site to site more information about the location of the proposed turbines such as areas to avoid and operational mitigating measures should be included in the final EA. One of the referenced studies found 11 bat carcasses in one year, 5 of them were

identified as Hoary bats. Hoary bats have been observed foraging above tree-tops in the forested
G.12 areas on OSMP property approximately 3 km from the NWTC, and a water source, which could be used by bats, is 300m from the proposed site. Recent evidence suggests that bats, particularly tree bats like Hoary bats, are severely affected by the presence of wind turbines (Arnett et al. 2008, Ellison et al. 2012). Some researchers believe these species may actually be attracted to wind turbines, especially when migrating or mating, and conclude that wind turbines are a substantial cause of mortality. In another year, 13 carcasses were found by surveyors in the NWTC, incorporating the probability of detecting a carcass the number was corrected to 18. These fatalities were caused by the two largest turbines. Given the increase in size and number of utility-scale turbines in the proposed action, it seems the turbines would have more than a negligible impact. We suggest analyzing and including alternatives that incorporate daily or seasonal use cycles of the turbines to minimize impact to bats in the final EA. In addition, bat
G.13 fatalities due to barotrauma are a known occurrence and have been documented in many studies. As such, this cause of mortality should be considered a cumulative impact with direct collisions and should be addressed in the final EA.

The section on ***Burrowing owl:*** Although the draft EA states that Burrowing Owls have not
G.14 been sighted on the NWTC, two pairs nest on adjacent OSMP grasslands (one nest is 1.5 km from the boundary with the NWTC and other is 2.6 km from the boundary). Increasing the number of turbines has the potential to affect this state-threatened species' use of OSMP grasslands as well as impact their dispersal patterns and ultimate survival. It is quite possible that recently fledged and / or adult Burrowing Owls will use the NWTC. Therefore, the Final EA should include mitigation such as BMPs to protect Burrowing Owls from deleterious effects of the proposed action.

The section on ***Wetlands*** (pg 122) should include BMPs or describe sanitary / storm water
G.15 management. The proposed action would include installation of a new leach field. However, no BMPs are described to mitigate the potential effects of the leach field on an OSMP pond adjacent to the northeast corner of the NWTC. This pond supports northern leopard frogs (a state sensitive species) and provides critical over-wintering habitat for this species. The BMPs included in the final EA should mitigate deleterious effects to this pond from construction activities, and installation of a new leach field which could affect water quality. Semlitsch and Bodie (2003) recommended protecting a buffer zone of 290m around wetlands in order to avoid deleterious effects of human activities on ranid populations. If the proposed action is approved, perhaps it would be beneficial to test water quality in select areas on the NWTC and in adjacent wetland sites before and after the contraction is complete to assess water quality impacts.

In summary, the impacts of the proposed action on wildlife communities may be underestimated. In the Final EA, it would be beneficial to include specific Best Management Practices such as protecting wetlands from surface runoff during construction activities, initiating turbine draw down events to coincide with known times / seasons of high raptor and bat use of the area, and outline options to make guy wires more conspicuous.

Please contact us if you have any questions.

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Literature Cited

Arnett, E.B. et al. 2008.Patterns of bat fatalities at wind energy facilities in North America. Journal of Wildlife Management 72: 61-78.

Butcher, G. S., D. K. Niven, and J. R. Sauer. 2008. Forty-year Decline of Grassland Birds in North America. Presentation at Partners in Flight 4th International Conference, McAllen, TX.

Ellison, L.E., 2012, Bats and wind energy—A literature synthesis and annotated bibliography: U.S. Geological Survey Open-File Report 2012–1110, 57 p.

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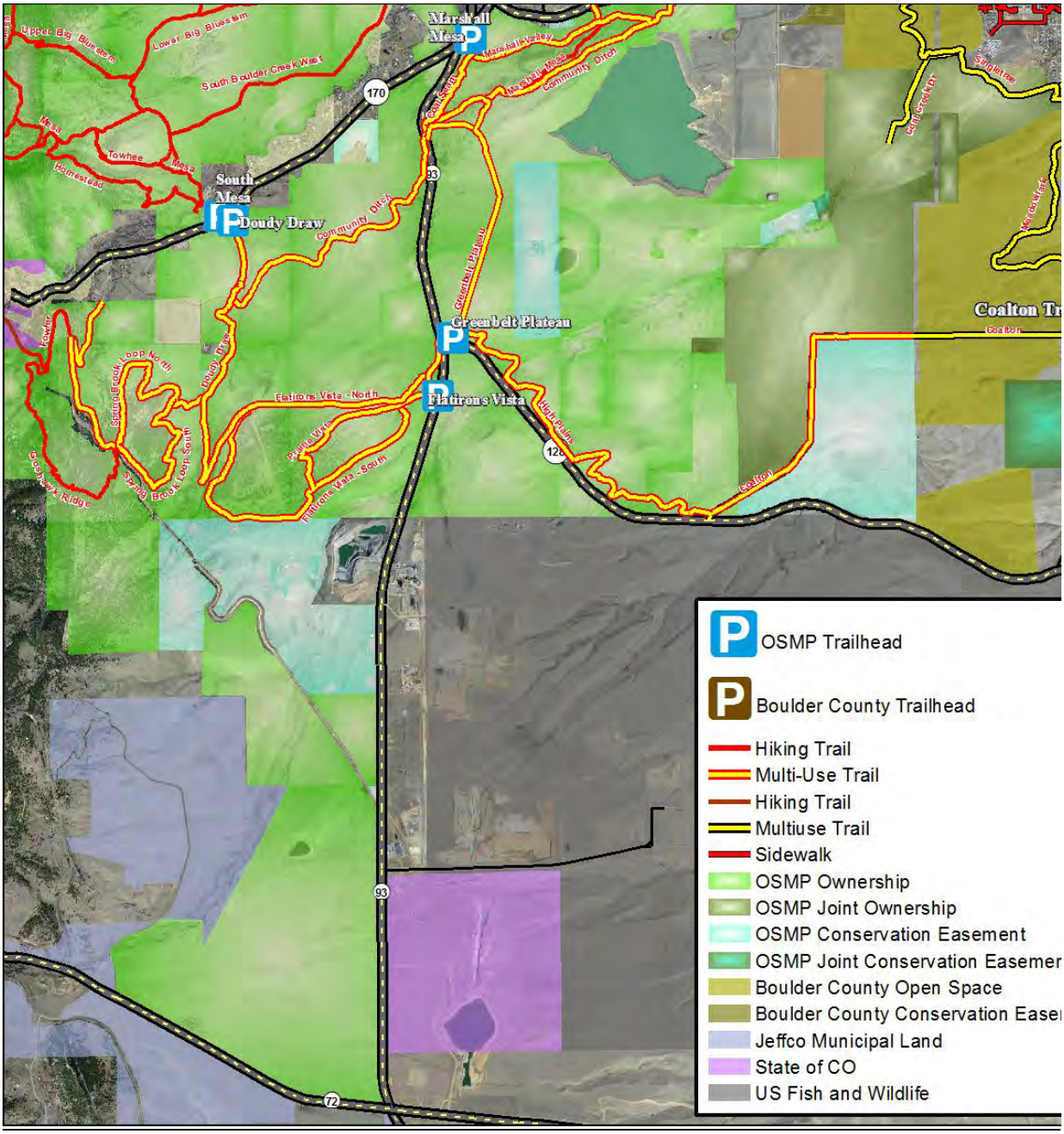
Semlitsch R.D. and J.R. Bodie. 2003. Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles. Conservation Biology 17: 1219-1228.

Attachment A: Map of Land Ownership



Van Dercook, Amy

From: Dean <deanlancstr@aol.com>
Sent: Friday, February 14, 2014 9:56 PM
To: nrel.nepa.comments@nrel.gov
Subject: Comments: NWTC Site-Wide Environmental Assessment 2014 Draft

February 14, 2014
Comments on National Wind Technology Center Site-Wide Environmental Assessment 2014 Draft

H.1 This draft is a disservice to the public - 192 pages of repetition, and unimportant details - like the fact that you have to change light bulbs from time to time (line 904). It reads like a list of what you want for Christmas, and why you really need each item.

H.2 In my email to you November 28, 2012, in response to your scoping request, I pointed out that the NWTC should not have been located downwind of Eldorado Canyon. Winds there can't be used for testing for wind farm conditions (line 571). You now say that is desirable for testing for extreme conditions (lines 567 - 568). But where do you test for normal conditions? This is your principle research site (line 554). How can data from here be extrapolated to apply to real world wind farms if you don't have data from them? The data currently available from them is not for tall turbines (lines 1347-1349). To say you will get that data from here, assumes you already know all there is to know about how the two sets of data are related. That isn't research - that is wishful thinking.

H.3 We see that you have been running tests with meteorological towers that weren't tall enough (line 842 [443 ft. vs. 459 ft.]). Putting in taller ones now, still assumes you can take readings here and develop wind inflow models for normal wind farm sites (lines 1438 - 1445). Research into normal site inflow needs to be done (lines 1449-1450), but this isn't the place for that (lines 567 - 572).

References to IEC and 100 acres of undisturbed wind flow (line 1421), assume that all is already known, that air smooths out fast (please remember my original references to mountain waves, gravity waves, downslope, rotor waves and eddy currents), and that measuring in acres is appropriate. (Linear measurements are needed).

Is this best described by my references to looking for your car keys indoors because the light is better? (Choosing a site near Golden so you can go to lunch without a 90 mile drive from where wind turbines are actually used?)

H.4 Adding wind turbines taller than the Washington Monument will be an eyesore. That should be all that needs to be said - but you always plan to proceed no matter what - so I will make other observations.

Saying taller turbines (line 2635) will look like the existing ones (lines 2638 - 2639) is like saying a six foot rabbit looks like ordinary rabbits.

H.5 Lines 1762 - 1763 "... *consistent with surrounding open space* ...". So a field with wind turbines 574 feet tall turning in the wind, is the same ("consistent" - of the same quality) as an empty meadow?

H.6 Lines 2551 - 2552 lay the ground work for the argument that since you got away with putting ugly wind turbines on the land, you now have the right to put more and larger ones there. Repeated "Finding of No Significant Impact"s, side steps the original intent of Environmental Impact Statements.

Lines 5470-5473 "*The Proposed Action would involve the use of lands where these values have already been compromised by facility development and operations, so any losses would be incremental and minor and off-set by the potential for the Proposed Action to improve energy efficiency and harness renewable energy resources.* "

Again, you made it look bad, so you claim the right to make it look worse. Will that ever end? The "potential" to improve energy efficiency and harness renewable energy, if there is any, should be pursued by private enterprise - not government - in a capitalist economy. (Or are you changing us to something else?)

Dean Lancaster, 75 Skyline Dr, Golden CO 80403

RESPONSES TO COMMENTS ON THE DRAFT EA

Eight comment letters or e-mails (A through H) were received following release of the draft EA for public comment. Responses to each comment letter or e-mail are presented below. Some comments resulted in changes to the text in the final EA as noted in the responses.

A. Private citizen, e-mail received January 13, 2014

A.1 I received your postcard with the two links and spent at least an hour perusing them; I found the second of the two links easier to read. I find your efforts all in all quite impressive and I am proud to live nearby.

Response: The draft Environmental Assessment will be posted at the beginning of the public comment period on Wednesday, January 15, 2014. If you have additional comments after your review, the comment period is open through February 15, 2014.

B. Private citizen, e-mail received January 13, 2014

B.1 I received a postcard NOA regarding a draft environmental assessment for the NWTC. However, there is no draft EA available at either of the included websites.

Response: The draft Environmental Assessment will be posted at the beginning of the public comment period on Wednesday, January 15, 2014. If you have additional comments after your review, the comment period is open through February 15, 2014.

C. Private citizen, e-mail received January 20, 2014

C.1 I would very much like to request officially as a public comment, that the wind energy research be expanded to include more variety of wind energy capture options sited to avoid clash with winged wildlife (birds, bats) transitory patterns, some with mechanisms other than twirling blades/oars, such as some barrel designs that I have seen in articles.

Response: As noted in **Section 1.4.2** of the EA, the NWTC is a research site that works closely with industry to test wind turbine designs. Designs are driven by the research needs of our industry partners. Currently, DOE and NWTC personnel use a variety of agreements to solicit competitive research and development agreements. As industry develops new designs, such as vertical-axis wind turbines, the NWTC site may be utilized for testing alternatives to conventional horizontal-axis turbines. Avian impacts would be monitored during periodic surveys.

C.2 Also white and yellow have been scientifically observed to attract wildlife, whereas grey and purple not so much, so I further request that you begin to utilize this knowledge to protect our local wildlife, as your website states that you are very conscientious about those concerns.

Response: Research is inconclusive at this time on what role color plays in attracting insects to wind turbines. A recent study concluded: "However, it should be made clear that modifying turbine colour alone may not be enough to mitigate the problem of wildlife–turbine interaction and that further research into other aspects such as thermal generation is needed" (Long et al. 2011). DOE and NREL keep abreast of recent studies and will continue to monitor research in this area.

D. Private citizen, e-mail received January 26, 2014

D.1 I am in favor of the Environmental Assessment and if approved, an expansion of the National Wind Center Site.

Response: The comment is noted.

E. United States Department of the Interior, Fish and Wildlife Service, David Lucas, Rocky Flats National Wildlife Refuge Manager, letter dated January 30, 2014

E.1 We recommend that maps contained in the EA show the location of Refuge lands bordering the NWTC (specifically Figures 1-2 and 2-1).

Response: **Figure 1-2** and **Figure 2-1** are site maps showing existing facilities and proposed facilities, respectively, at the NWTC. Surrounding land use, including the location of refuge lands bordering the NWTC, is presented in **Figure 2-3** (see response to comment E.2 below). A reference to **Figure 2-3** has been added in Chapter 1 under the description of existing facilities.

E.2 In January 2013, the Refuge expanded to include 623-acres of Section 16. Figure 2-3 should be updated to show this as Refuge ownership. Section 16 is currently displayed on this map as owned by the State Land Board.

Response: **Figure 2-3** has been revised to show the Section 16 parcel as part of the Rocky Flats National Wildlife Refuge.

E.3 The Plainview Option 2 (a 1.6 mile north/south utility corridor) is proposed as crossing the adjacent lands that Congress had designated for addition to the Refuge, and that will be added to the Refuge soon. This corridor crosses important grassland bird habitat and is not compatible with Congress' intent that these lands be added to and conserved as part of the Refuge. As a result, this corridor will not be permitted by Refuge. Similarly, the proposed connection for domestic water to the City of Arvada water supply, which as proposed also crosses lands that will be added to the Refuge soon, will not be permitted.

Response: As noted in **Section 2.1.3** of the EA, the options for increasing transmission capacity have not yet been characterized in detail and feasibility studies are not complete. However, conceptual drawings show a potential transmission line corridor within the right-of-way and east of the existing Denver & Rio Grande Western Railroad rail spur, which runs west of the lands adjacent to the Refuge. **Figure 2-3** has been revised accordingly. Likewise, the proposed connection for the domestic water line from the City of Arvada has been corrected on **Figure 2-3** to show it entering the southwest corner of the NWTC within the railroad right-or-way.

E.4 The Preble's meadow jumping mouse (*Zapus hudsonius preblei*) has been found in wetlands and shrubland communities adjacent to the Rock Creek drainage. In 2010, the U.S. Fish and Wildlife Service designated approximately 1,108 acres at the Rocky Flats site as designated critical habitat for the mouse. This includes portions of the Short Ear, Plum, Mahonia, Snowberry and Linsday branches of Rock Creek. Conservation of this species is a priority for the Refuge.

Response: Thank you for your comment. As noted in **Section 3.9.3.5** of the EA, the Preble's mouse has not been detected on the NWTC, but critical habitat has been designated in the southeast corner of the site 394 feet either side of the Plum Branch tributary of Rock Creek (see **Figure 3-10**). This area is protected from further building and development as a conservation

management area. Conservation commitments are documented in NREL Procedure 6-2.21, *Natural Resource Conservation* (NREL 2012g). DOE looks forward to working with the Fish and Wildlife Service in the future to ensure conservation of the Preble's mouse and its habitat.

E.5 Section 3.9.4 describes possible impacts to mammals, including bats. Literature has expanded significantly regarding bat fatalities at wind farms since the mid-2000s and should be updated in the EA. We also recommend that information specific to the little brown bat (*Myotis lucifugus*) be included in the EA. The little brown bat was once considered a common bat species. However, emerging evidence demonstrates sharp decline due to the rapidly spreading white-nose syndrome.

Response: The description of impacts to bats in **Section 3.9.4** has been updated with new references, including information regarding the little brown bat.

E.6 Table 3-24 identifies the Gunnison's prairie dog as a federal candidate species. On November 14, 2013, the U.S. Fish and Wildlife Service completed a 12-month status review and determined that protecting the Gunnison's prairie dog under the Endangered Species Act is not warranted at this time.

Response: **Table 3-24**, which lists federally and state-protected and sensitive species found in Jefferson and Boulder Counties, has been revised to delete the Gunnison's prairie dog.

F. Private citizen, e-mail received February 11, 2014

F.1 With all the tall structures would it be possible to install a digital TV repeater to provide Denver channels to areas such as Superior? Areas in Superior are only served by Wyoming stations due to the hill along highway 128. This could potentially be a source of revenue if the tower is rented to broadcasters for use as a transmitter/repeater.

Response: Thank you for the comment. This is not part of the Proposed Action or the mission of DOE.

G. City of Boulder, Open Space and Mountain Parks Department, Kacey French, Open Space Planner, and Will Keeley, Wildlife Ecologist, letter received February 14, 2014

G.1 Throughout the draft EA the neighboring land ownership is referenced incorrectly. The City of Boulder, OSMP lands and trailheads are consistently and incorrectly referred to as Boulder County Open Space. The Greenbelt Plateau and Flatirons Vista Trailheads are owned and maintained by the City of Boulder. We request that land ownership references be corrected throughout for the final EA.

Response: The text of the final EA has been revised to refer to adjacent OSMP property as City of Boulder Open Space and Mountain Parks (OSMP) lands and the trailheads are referred to as owned and maintained by the City of Boulder.

G.2 Given the proximity of the proposed activity to Boulder County we recommend that the Department of Energy consider local plans, policies, and planning criteria of the jurisdictions which have lands adjacent to the NWTC, rather than only Jefferson County. Such policies are relevant to the assessment of potential environmental impacts from the proposed improvement and ongoing operations at the NWTC. Pages 21 and 22 of the EA list only Jefferson County plans. The relevant Boulder County and City of Boulder Plans should also be listed.

Response: The list of plans considered in the assessment of potential environmental impacts has been expanded to include those relevant plans from the City of Boulder and other local jurisdictions (see **Section 1.4.6**).

G.3 In addition, it is unclear how the EA has been informed by adjacent land owners/jurisdictions plans and policies, and specifically how said plans and policies aided DOE in their assessment of the potential environmental impact from the proposed improvements.

Response: **Section 3.1** of the EA reviewed existing land uses at the NWTC project site and those of surrounding jurisdictions, including City of Boulder OSMP lands, the Rocky Flats National Wildlife Refuge, industrial areas along Hwy 93, Jefferson County open space, and the surrounding municipalities of Arvada, Westminster, Superior, and Boulder, as derived from applicable land use plans and policies. The analysis concluded that the proposed development at the NWTC would not have an impact on land uses in surrounding areas and would be consistent with surrounding open space and industrial land uses.

G.4 The City of Boulder has a number of trails which afford a view of the project area. The draft EA proposes a considerable increase in the number of turbines and other structures (e.g. meteorological towers) that could be constructed, and it is likely that some or all of these would be visible to visitors on neighboring City of Boulder open space. The increase in size and number of turbines will have an effect upon the aesthetics of the visitor experience. The nature of this effect does not appear to be explored in the EA. More information in the final EA about the location of the turbines relative to patterns of visitor use could shed light on the nature of these impacts and ways that effects, if any, could be mitigated.

Response: The evaluation criteria for the visual analysis in **Section 3.5.3.1** of the EA took into consideration how different the landscape would look following construction, how clearly viewers would be able to see any changes, and how sensitive viewers would likely be to the changes in the views. The analysis was supported by a viewshed analysis that included photographs of the existing turbines and meteorological towers taken from several vantage points surrounding the NWTC (**Figures 3-2** to **3-4**), including the closest City of Boulder OSMP trails and trailheads. These photographs were compared with visual simulations of what the proposed additional turbines and meteorological towers would look like from the same vantage points (**Figures 3-6 to 3-8**). The analysis concluded that the proposed turbines would be consistent with the existing turbines in the area and would not appreciably alter the visual landscape compared to existing conditions.

G.5 The adjacent City of Boulder open space to the north is the largest block of unfragmented grassland habitat managed by the city, and is identified in the City Council approved Grassland Ecosystem Management Plan as a Grassland Preserve. Although topographic features separate the NREL facility somewhat from these grasslands, it is very possible that foraging raptors may fly over the wind facility or attempt to forage within its area. The draft EA however concludes that there is little to no risk of raptor mortalities even though anecdotal evidence, i.e. dead raptors found by employees, indicated a risk to raptors. The EA does not appear to contain information in support of the conclusion that the proposed action will have only a negligible impact on raptors using the area—including adjacent Open Space and Mountain Parks.

Response: Given the relative abundance of raptors in the vicinity of the NWTC, 378 observations in the most recent fixed-point raptor migration survey, the evidence supports the conclusions in the EA. Formal mortality studies in 2003, 2010, and 2011 found no raptor carcasses while

incidental observations by NWTC personnel provided anecdotal evidence of only three raptor mortalities, since 2008.

G.6 The Final EA should include more information to support this conclusion, and include a commitment to monitoring the effect of the proposed action upon raptor populations including thresholds of mortality and management responses if those thresholds are exceeded. We also recommend that the impact of the proposed action on bats be closely monitored and adaptive management of the facility should be outlined in the event the increase in turbines substantially increases bat mortality.

Response: **Section 4.6.6** regarding DOE and NREL committed measures for wildlife has been revised to include a statement that NREL will periodically assess and monitor wildlife site use and mortality and employ adaptive management principles, as necessary. Furthermore, NREL procedures in the Natural Resource Conservation Program require coordination with the NREL Environmental Health and Safety office prior to initiation of projects where raptors are present or may potentially be present (NREL 2012g).

G.7 A pair of Bald Eagles nests 2.5 miles from the wind facility, and often forages in areas adjacent to the facility. The draft EA's conclusion that there will be no impacts to the nesting bald eagle 2.5 miles from the proposed action does not appear to be well supported by the literature. As a result, we believe that consultation with US Fish and Wildlife Service (FWS) is necessary, and would be useful and beneficial to address what appears to be a significantly increased risk of eagle fatalities. We request that the correspondence with FWS be included in the final EA.

Response: On October 22, 2013, DOE initiated informal consultation with the U.S. Fish and Wildlife Service, Region 6 Mountain-Prairie Region, for compliance with Section 7 of the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Area. The Service included in their January 15 response letter certain recommendations for migratory birds and eagles, including the Region 6 Outline for a Bird and Bat Conservation Strategy for Wind Energy Projects. A copy of the consultation letter and the Service's response is found in **Appendix F** of the Final EA. DOE and NREL consult with the USFWS and consider USFWS regional guidance in the operation of the NWTC. Applicable BMPs in USFWS regional guidance are incorporated in the NREL procedures and in the committed measures.

G.8 The draft EA estimates the disturbance and loss of habitat using the footprint of the proposed development and footings of the turbines. However, given the size of the rotors and meteorological towers with associated guy wires, it would be more accurate to estimate the disturbance and loss of habitat using the diameter of the rotors and diameter of the meteorological towers and guy wires. Because the draft EA does not accurately or realistically estimate the disturbance and loss of habitat, we suggest that a new estimate be calculated using the diameter of the turbine rotors and diameter of the meteorological towers and associated guy wires.

Response: Direct habitat loss is properly assessed by the affect the Proposed Action would have on nesting and foraging habitat as measured on the ground. The suggestion to estimate disturbance by loss of airspace is not a valid methodology. The NWTC is not an island of habitat surrounded by development, rather the NWTC is surrounded by suitable wildlife habitat.

G.9 The guy wires from the meteorological towers appear to be a substantial cause of mortality for birds (according to Table 3-22), however no mitigating measures were identified in the draft EA.

Although BMPs are mentioned throughout the wildlife section, no specific BMPs are outlined. We suggest that the specific BMPs be identified in the final EA, including any BMPs that exist for guy wires.

Response*:* During the 2010 to 2011 avian monitoring and mortality study, mortality surveys were conducted in the vicinity of the major structures (meteorological towers including guy wires and wind turbines) to determine the level of fatalities that can be attributed to NWTC facilities. A total of five avian carcasses were detected, but no raptor mortalities were observed on site during this survey, and no carcasses were found on search plots off the NWTC site. The study concluded that bird mortality associated with the site appears to be minor (Tetra Tech 2011a, 2011b). Incidental observations by NWTC personnel from 2001 to 2014 found a maximum of five avian carcasses in a single year. It is important to note that the NWTC is a research facility, not a wind farm. Nevertheless, studies will continue to evaluate bird and bat site use and mortality with the addition of new structures.

G.10 The results of the ***Avian Use of the NWTC – Fixed Point Survey*** notes the presence of Grasshopper Sparrows. They are also present in the adjacent OSMP grasslands to the north. Grasshopper Sparrows are considered a management indicator species in OSMP's Grassland Ecosystem Management Plan (2010) and their populations have declined 65% in the last 40 years (Butcher et al. 2008). Therefore, we are concerned about the effects of the proposed action on populations of Grasshopper Sparrows on OSMP and the NWTC. Please outline BMPs in the Final EA to mitigate the impacts of the proposed action on Grasshopper Sparrows and other sensitive ground-nesting birds.

Response: Appendix D of the OSMP's Grassland Ecosystem Management Plan establishes the indicator ratings for the grasshopper sparrow target species on OSMP lands and states "the failure to detect birds in otherwise intact habitat blocks [greater than 100 hectares] would indicate stresses acting on the targets." Avian monitoring surveys on the NWTC found the grasshopper sparrow among the most numerous non-raptors observed during point count surveys with observation rates of 1.61 birds/20 minutes. The grasshopper sparrow is a ground-nesting bird that is protected by BMPs established in NREL procedures that require ground-nesting bird surveys be conducted before commencing off road activities or construction. In addition, potential impacts to wildlife will continue to be monitored.

G.11 The results of the Bird and Bat Mortality Surveys indicate high bat fatalities in sites 4.1 and 4.4. The draft EA does not provide details on the proposed locations of the new turbines. Given the variability of fatalities from site to site more information about the location of the proposed turbines such as areas to avoid and operational mitigating measures should be included in the final EA.

Response: Although the exact locations of new test turbine installations are not specified in the EA, **Figure 2-1** shows the locations of existing and vacant test sites in the four parallel rows aligned north to south. The Proposed Action only includes the addition of up to three additional utility-scale wind turbines, up to four additional mid-scale turbines, and up to 11 additional small wind turbines. It is also important to note that the NWTC is a research facility, not a wind farm, and that wind turbines at the NWTC only operate intermittently under a specific research schedule, including during high wind conditions. As described in Section 1.2.3, the NWTC's location near the mouth of Eldorado Canyon was specifically chosen for testing the performance of individual wind turbines and their components under a wide range of operating conditions. Studies will continue to evaluate bird and bat site use and mortality with the addition of new structures.

G.12 One of the referenced studies found 11 bat carcasses in one year, 5 of them were identified as Hoary bats. Hoary bats have been observed foraging above tree-tops in the forested areas on OSMP property approximately 3 km from the NWTC, and a water source, which could be used by bats, is 300m from the proposed site. Given the increase in size and number of utility-scale turbines in the proposed action, it seems the turbines would have more than a negligible impact. We suggest analyzing and including alternatives that incorporate daily or seasonal use cycles of the turbines to minimize impact to bats in the final EA.

Response: The Proposed Action only includes the addition of up to three additional utility-scale wind turbines. The wind turbines at the NWTC are operated intermittently under a variety of wind conditions, including extreme wind conditions, as described above. .

G.13 In addition, bat fatalities due to barotrauma are a known occurrence and have been documented in many studies. As such, this cause of mortality should be considered a cumulative impact with direct collisions and should be addressed in the final EA.

Response: The literature review for bats has been updated in the final EA to include the latest studies of bat occurrence and mortality near wind farms. A recent study suggested that traumatic injury is the major cause of bat fatalities at wind energy facilities and that barotrauma contributed to only a small fraction of bat mortalities (Rollins et al. 2012). The cumulative impacts section for biological resources has been revised to include additional discussion on cumulative impacts on birds and bats.

G14. Although the draft EA states that Burrowing Owls have not been sighted on the NWTC, two pairs nest on adjacent OSMP grasslands (one nest is 1.5 km from the boundary with the NWTC and other is 2.6 km from the boundary). Increasing the number of turbines has the potential to affect this state-threatened species' use of OSMP grasslands as well as impact their dispersal patterns and ultimate survival. It is quite possible that recently fledged and /or adult Burrowing Owls will use the NWTC. Therefore, the Final EA should include mitigation such as BMPs to protect Burrowing Owls from deleterious effects of the proposed action.

Response: Burrowing owls have not been observed on the NWTC. If they were found during future monitoring, DOE would coordinate with Colorado Parks and Wildlife to establish a suitable buffer zone to protect individual owls during construction and operational activities. In addition, BMPs, such as nesting bird surveys, are regularly performed at the NWTC that would identify any burrowing owls.

G.15 The section on Wetlands (pg 122) should include BMPs or describe sanitary / storm water management. The proposed action would include installation of a new leach field. However, no BMPs are described to mitigate the potential effects of the leach field on an OSMP pond adjacent to the northeast corner of the NWTC. This pond supports northern leopard frogs (a state sensitive species) and provides critical over-wintering habitat for this species.

Response: The pond on City of Boulder OSMP lands is north of a conservation management area in the northeast corner of the NWTC. This conservation management area protects a seep wetland and an emergent wetland (see **Figure 3-10**). NREL's Natural Resource Conservation Procedure (NREL 2012f) contains commitments which require a higher level of review before any land disturbance in this area. However, any additional leach fields would be located south of the proposed buildings shown in **Figure 2-1** and would be situated away from the northeast corner of the NWTC. The proposed future construction of any new leach field would comply with all requirements of state and county regulations.

H. Private citizen, e-mail received February 14, 2014

H.1 This draft is a disservice to the public - 192 pages of repetition, and unimportant details - like the fact that you have to change light bulbs from time to time (line 904).

Response: The comment is noted.

H.2 The NWTC should not have been located downwind of Eldorado Canyon. Winds there can't be used for testing for wind farm conditions (line 571). You now say that is desirable for testing for extreme conditions (lines 567 - 568). But where do you test for normal conditions? This is your principle research site (line 554). How can data from here be extrapolated to apply to real world wind farms if you don't have data from them?

Response: As described in **Section 1.2.3**, the NWTC is a research facility whose location near the mouth of Eldorado Canyon was specifically chosen for testing the performance of individual wind turbines and their components under a wide range of operating conditions, including intermittent, extreme high-wind conditions, and not normal operating conditions. Periods of relatively calm winds that occur during the spring and summer months (May through September) are used for installation and instrumentation of new prototype machines.

H.3 We see that you have been running tests with meteorological towers that weren't tall enough (line 842 [443 ft. vs. 459 ft.]). Putting in taller ones now, still assumes you can take readings here and develop wind inflow models for normal wind farm sites (lines 1438 - 1445). Research into normal site inflow needs to be done (lines 1449-1450), but this isn't the place for that (lines 567 - 572).

Response: The purpose for installing taller meteorological towers, as described in **Section 2.1.2** (line 1346), is to conduct research on wind and turbulence profiles for new, larger turbines that would be tested at the NWTC. New turbines would be tested under a variety of wind conditions (see response to comment H.2.)

H.4 Adding wind turbines taller than the Washington Monument will be an eyesore. That should be all that needs to be said - but you always plan to proceed no matter what - so I will make other observations. Saying taller turbines (line 2635) will look like the existing ones (lines 2638 - 2639) is like saying a six foot rabbit looks like ordinary rabbits.

Response: The visual analysis in **Section 3.5.3** compared existing conditions with visual simulations of the proposed additional turbines and meteorological towers and concluded that the proposed turbines would be consistent with the existing turbines in the area and would not appreciably alter the visual landscape compared to existing conditions.

H.5 Lines 1762 - 1763 "... consistent with surrounding open space ...". So a field with wind turbines 574 feet tall turning in the wind, is the same ("consistent" - of the same quality) as an empty meadow?

Response: The land use impacts were analyzed using the evaluation criteria described in **Section 3.1.3.1**.

H.6 Lines 2551 - 2552 lay the ground work for the argument that since you got away with putting ugly wind turbines on the land, you now have the right to put more and larger ones there.

Repeated "Finding of No Significant Impact"s, side steps the original intent of Environmental Impact Statements.

Response: The comment is noted. The visual resource impacts were analyzed using the evaluation criteria described in **Section 3.5.3.1** and a viewshed analysis that took into consideration how different the landscape would look following construction, how clearly viewers would be able to see any changes, and how sensitive viewers would likely be to the changes in the views. The analysis was supported by a viewshed analysis that included photographs of the existing turbines and meteorological towers taken from several vantage points surrounding the NWTC (**Figures 3-2** to **3-4**)**.** In addition, DOE consulted with the SHPO regarding visual impacts on historic resources within a two-mile radius of the NWTC. The SHPO reviewed the viewshed analysis and concurred with DOE's determination that the proposed undertaking would not result in an adverse effect on historic properties.

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