DOE/EA 1378

Final
Site-Wide Environmental Assessment of National Renewable Energy Laboratory's National Wind Technology Center

May 2002

U.S. Department of Energy
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, CO 80401 - 3393

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

May 31, 2002

DOE/EA 1378

FINDING OF NO SIGNIFICANT IMPACT

For the

NATIONAL WIND TECHNOLOGY CENTER

Site Operations and Short-Term and Long-Term Improvement Programs

Golden, Colorado

AGENCY: Department of Energy, Golden Field Office

ACTION: Finding of No Significant Impact

SUMMARY: The Department of Energy (DOE) conducted a Site-Wide Environmental Assessment (EA) of the National Wind Technology Center (NWTC) to evaluate potential impacts of site operations and short-term and long-term improvement programs.

DOE's Office of Energy Efficiency and Renewable Energy (EERE) leads the national research effort to develop clean, competitive, and reliable renewable energy and power delivery technologies for the 21st century. 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 wind energy technologies, and on coordination with partners and stakeholders to overcome barriers to wind energy implementation. EERE's principal research vehicle to accomplish this goal is the NWTC.

The program of improvements addressed in the EA includes existing and new permanent physical improvements to the site including buildings, equipment, utilities, and other infrastructure. The program also includes existing and new activities that do not require permanent facilities or infrastructure, such as research programs, facility operations, management practices and maintenance activities. The components of the Proposed Action are divided into Short-Term (2002-2006) and Long-Term (2007-2021) implementation periods.

The schedule for implementation of the site improvements is dependent on federal budgeting decisions and fluctuating priorities, therefore the Proposed Action cannot be specific with respect to actual construction schedules. In addition, certain site planning and architectural details are tentative and subject to modification. Thus, the EA employs a "bounding analysis" approach for evaluating environmental impacts that could result from an array of development options within a conceptually defined site "buildout" scenario. The purpose of this approach is to promote a comprehensive assessment of potential impacts from future site use and development.

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All discussions and findings related to this site and the proposed action are contained in the attached Final EA and appendices. The Final EA is hereby incorporated by reference.

COPIES OF THE FINAL EA ARE AVAILABLE FROM:

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DETERMINATION:

Based on the information in the Final EA, DOE determines that site operations and proposed short-term and long-term improvements do not constitute a major Federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act. Therefore, the preparation of an Environmental Impact Statement is not required, and DOE is issuing this Finding of No Significant Impact.

Issued in Golden, Colorado, 31st day of MAY, 2002.

John Kersten
Acting Manager, Golden Field Office

DOE/EA 1378

FINAL

Site-Wide Environmental Assessment of National Renewable Energy Laboratory's National Wind Technology Center

May 2002

U.S. DEPARTMENT OF ENERGY
GOLDEN FIELD OFFICE
NATIONAL RENEWABLE ENERGY LABORATORY
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LIST OF ACRONYMS

APEN	Air Pollution Emission Notice
ART	Advanced Research Turbine
AST	Aboveground Storage Tank
USACE	United States Army Corps of Engineers
BA	Biological Assessment
CAQCC	Colorado Air Quality Control Commission
CAQCD	Colorado Air Quality Control Division
CART	Controls Advanced Wind Turbine
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CESQG	Conditionally Exempt Small Quantity Generator
CFR	Code of Federal Register
CO	Carbon Monoxide
COE	U.S. Army Corps of Engineers
dB	Decibel
dBA	Decibles, Ambient Level
DER	Distributed Energy Resources
DERTF	Distributed Energy Resources Test Facility
DOE	Department of Energy
DOE GO	Department of Energy, Golden Field Office
DRCOG	Denver Regional Council of Governments
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act
ESA	Environmental Species Act
ES&H	Environmental Safety and Health
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
EA	Environmental Assessment
EIS	Environmental Impact Statement
FY	Fiscal Year
HAP	Hazardous Air Pollutant
HPTB	Hybrid Power Test Bed
HVAC	Heating, Ventilation, and Air Conditioning
IT	Information Technology
IUF	Industrial Users Facility
kW	Kilowatt
kV	Kilovolt
LEED	Leadership in Energy and Environmental Design
LOS	Level of Service
MCL	Maximum Contaminant Level
mg/L	Micrograms per Liter
MOU	Memorandum of Understanding
mph	Miles Per Hour
MPO	Metropolitan Planning Organization
MW	Megawatt
NAAQS	National Ambient Air Quality Standards

NASA	National Aerospace and Science Administration
NEPA	National Environmental Policy Act
NOx	Oxides of Nitrogen
NREL	National Renewable Energy Laboratory
NWTC	National Wind Technology Center
OAHP	Office of Archeology and Historic Preservation
OSHA	Occupational Safety and Health Administration
PM-10	Particulate Matter of 10 microns or less
PSCo	Public Service of Colorado (aka: Xcel Energy and New Century Energies)
PSD	Prevention of Significant Deterioration
PV	Photovoltaic
PVC	Polyvinyl Chloride
RFETS	Rocky Flats Environmental Technology Site
RTD	Regional Transportation District
RTP	Regional Transportation Plan
SARA	Superfund Amendments and Reauthorization Act
SERI	Solar Energy Research Institute
SHPO	State Historic Preservation Officer
SOx	Oxide of Sulfur
SO_2	Sulfer Dioxide
TIP	Transportation Improvement Plan
TPY	Tons Per Year
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VFD	Variable Frequency Drive
VOC	Volatile Organic Compounds

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S. SUMMARY

S.1 INTRODUCTION

In accordance with the Energy Reorganization Act of 1974 (42 U.S.C. 5801), the U.S. Department of Energy (DOE) established the Solar Energy Research Institute (SERI) in 1977. SERI was designated as a national laboratory and became the National Renewable Energy Laboratory (NREL) in 1991. NREL was established to support DOE's mission to research and develop energy efficiency and renewable energy technologies. Among other responsibilities, NREL operates the National Wind Technology Center (NWTC) located in Jefferson County, Colorado. The NWTC is a federally-owned, contractor-operated site.

In accordance with the DOE National Environmental Policy Act (NEPA) regulations, DOE is required to evaluate existing Site-Wide Environmental Assessments (EA) every five years to determine whether the Site-Wide EA adequately addresses current agency plans, functions, programs and resource utilization. A Site-Wide EA for the NWTC was published in 1996 (DOE-EA-1127). DOE has determined that a new comprehensive EA should be prepared for the site to address new site development proposals and changes in the regional environment.

DOE is the lead agency for this EA, and other federal, state, and local agencies and the public have been invited to participate in the environmental documentation process.

S.1.1 Purpose and Need

The purpose of the Proposed Action is to support DOE's mission in the research and development of energy efficiency and renewable energy technologies. Alternative energy technology research is needed to improve technology designs, improve power generation efficiencies, increase economic competitiveness, and fully characterize and minimize environmental impacts from various technologies. The Proposed Action would provide and maintain enhanced facilities and infrastructure that would adequately support the site purpose of state-of-the-art alternative energy research, development, and demonstration.

S.1.2 Project Site, Proposed Action and Alternatives

The NWTC is composed of 280 acres managed by DOE's Golden Field Office and NREL. An additional 25 acres has been designated for inclusion within the NWTC by the National Defense Authorization Act for Fiscal Year 2002. The EA considers management of and potential impacts to the entire 305 acres.

The 305-acre NWTC is located in northwest Jefferson County, Colorado, approximately 16 miles northwest of Denver. The site is located in the Rocky Flats Environmental Technology Site (RFETS) buffer zone.

The Proposed Action consists of short-term and long-term site improvements and activities that would enhance the NWTC's role and capabilities as a world-class research facility focused on wind energy generation technology and other energy efficiency and renewable energy alternatives. These improvements and activities include: facility and research area modification and construction; infrastructure improvements; and site activities and routine maintenance. For purposes of long-term, site-wide environmental review, the long-term scenarios include "bounding analysis" assumptions to represent likely site "buildout" conditions.

Given the intent of this Site-Wide EA, scoping input, and preliminary impact findings, the only alternative to the Proposed Action analyzed in this EA is the No Action Alternative.

S.1.3 Characteristics of a Site-Wide Environmental Assessment

This document is a "Site-Wide Environmental Assessment" similar to the document NREL prepared for the project site in 1996. DOE defines a Site-Wide environmental document as follows:

> "A broad-scope Environmental Impact Statement (EIS) or EA that is *programmatic* in nature and identifies and assesses the individual and cumulative impacts of ongoing and reasonably foreseeable future actions at a DOE site." (10CFR Part 1021)

This programmatic environmental document acts as an analytical superstructure for subsequent and more detailed analyses, as necessary. At the NWTC, the document will serve as a planning tool that aids decisions about future use and development of the site.

If new issues arise in the future, NREL will prepare subsequent environmental reviews or documents (EISs/EAs) that would incorporate this programmatic document and would be focused only on those issues that have not been adequately addressed. If new proposals or conditions would have no effects beyond those analyzed in the programmatic document, no new NEPA document would be necessary.

S.1.4 Organization and Content of the Environmental Assessment

This EA is organized in a manner consistent with NEPA and DOE's NEPA Implementing Regulations including the specific guidelines for Site-Wide EAs. The EA has seven Chapters:

Summary
Chapter 1 Introduction
Chapter 2 Proposed Action and Alternatives
Chapter 3 Affected Environment
Chapter 4 Environmental Consequences and Mitigation Measures
Chapter 5 Comments on the Draft EA and Responses
Chapter 6 List of Preparers
Chapter 7 Bibliography and References
Appendixes

S.2 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

S.2.1 Summary of Scoping Process, Input, and Impact Issues

A scoping letter was prepared and distributed to an extensive list of agencies, organizations and members of the public on June 13, 2001. The scoping letter for the Proposed Action identified the following environmental topics to be addressed in the EA:

Land Use, Planning, Socioeconomics and Public Policy
Traffic and Circulation

Air Quality and Noise
Visual Quality/Aesthetics
Water Resources
Soils and Geology
Biological Resources
Cultural Resources
Waste Management
Public Facilities, Services and Utilities
Energy

The following specific issues were raised during the scoping process:

- Wildfire: current and future values at risk, protection efforts, mitigation of risk, and vegetative fuels;
- The presence of on-site and off-site endangered species, especially Preble's Meadow Jumping Mouse populations, habitat and related protections;
- The presence of tallgrass prairie and related protections;
- Conservation management planning: purpose, focus and responsibilities;
- Gas line alignments and related impacts on conservation management areas;
- Bird strikes from turbine blades;
- Wind monitoring data for emergency response teams;
- Site access and safety at the Highway 128/site access road intersection;
- Visual access for the public from viewing areas;
- Aircraft safety caused by potential interference with Jefferson County Airport height restrictions and navigational and communication equipment;
- Status of the site relative to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the National Priority List; and
- Potential conflicts of the proposed action relative to mineral leases and associated agreements.

The specific issues listed above are addressed in this EA along with issues raised during the Draft EA comment period (see Section 1.5.3 and Chapter 5).

The following alternatives were defined prior to the scoping period and were mentioned in the scoping letter:

- New Site Alternative;
- Off-Site Improvements Alternative;
- Site Development Configuration Alternatives; and
- Reduced Development Intensity Alternative

No additional alternatives were raised during the scoping period or during the Draft EA comments period (see Section 1.5.3 and Chapter 5).

The No Action Alternative is the only alternative addressed in this EA. Other alternatives were eliminated from further analysis. The rationales for elimination of these alternatives are presented in Chapter 1.

S.2.2 Description and Comparison of Environmental Consequences

The following discussion summarizes findings of this EA and compares the impacts of the Proposed Action with those of the No Action Alternative.

Implementation of the Proposed Action, which includes short-term and long-term improvements, would not result in significant impacts to the environment. This finding has been made because the future improvements and activities included in the Proposed Action do not substantially deviate from existing conditions, and because NREL has an extensive set of existing programs, policies and practices intended to avoid, minimize and mitigate potential impacts at the NWTC. NREL's environmental commitments are described in Chapter 1 and mentioned, where applicable, in Chapters 3 and 4.

The direct, indirect, secondary and cumulative impacts of the Proposed Action are discussed throughout Chapter 4 of this EA. None of these impacts are considered significant, and mitigation measures beyond existing NREL commitments are neither required nor recommended, with the following exception related to Option 1 for the gas pipeline route.

If Option 1 for the gas pipeline route is selected, the following measures are required to minimize potential impacts to the Preble's Meadow Jumping Mouse (Preble's):

- A Biological Assessment (BA), as defined by the Endangered Species Act (ESA), will be prepared to fully evaluate potential effects from the pipeline and determine whether the construction will adversely affect Preble's;
- Initiate formal consultation with the U.S. Fish and Wildlife Service (USFWS) to obtain a Biological Opinion and Incidental Take Statement if effects to Preble's are determined to be adverse;
- Determine conservation measures through consultation with the USFWS to minimize the possibility of adversely affecting Preble's and the possibility of incidental take occurring. Measures may include but not be limited to:

    - Minimize the pipeline corridor width through the riparian habitat to the trench cut and a minimal swath for equipment passage and overburden storage;
    - Conduct a three-night trapping survey at the site of the proposed pipeline crossing immediately before any ground disturbance to capture and remove Preble's from the area; and
    - Maintain compliance with applicable permit stipulations regarding erosion control and impact minimization.

Option 2 would not impact Preble's habitat. DOE has selected Option 2 as the preferred alternative for the gas pipeline.

Comparison of Proposed Action to No Action Alternative

The vast majority of impacts created by short-term and long-term activities that would be implemented under the Proposed Action would be avoided if the No Action Alternative were selected as the preferred alternative. However, none of the impacts of the Proposed Action are considered significant, and the No Action Alternative would eliminate the beneficial impacts that could be expected from increased investment in energy efficiency and renewable energy technology and related research.

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1. INTRODUCTION

In accordance with the Energy Reorganization Act of 1974 (42 U.S.C. 5801), the U.S. Department of Energy (DOE) established the Solar Energy Research Institute (SERI) in 1977. SERI was designated as a national laboratory and became the NREL in 1991. The National Renewable Energy Laboratory (NREL) was established to support DOE's mission to research and develop energy efficiency and renewable energy technologies. Among other responsibilities, NREL oversees the NWTC located in Jefferson County, Colorado. The NWTC is a federally owned, contractor-operated site.

In accordance with the DOE NEPA regulations, DOE is required to evaluate the existing Site-Wide EA every five years to determine whether the Site-Wide EA adequately addresses current agency plans, functions, programs and resource utilization. A Site-Wide EA for the NWTC was published in 1996 (DOE-EA-1127). DOE has determined that a new comprehensive EA should be prepared for the site to address new site development proposals and changes in the regional environment.

In compliance with the NEPA (42 U.S.C. 4321) and DOE's NEPA implementing regulations (10 CFR section 1021.330), this Site-Wide EA examines the potential environmental impacts of site operations, a short-term and long-term program of improvements at the NWTC, and a No Action alternative.

DOE is the lead agency for this EA, and other federal, state, and local agencies and the public have been invited to participate in the environmental documentation process.

1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to support DOE's mission in the research and development of energy efficiency and renewable energy technologies. DOE's Office of Energy Efficiency and Renewable Energy (EERE) leads the national research effort to develop clean, competitive, and reliable renewable energy and power delivery technologies for the 21st century. The program supports research and development of clean, reliable renewable energy technologies. The goal of the program is to improve the Nation's overall economic strength and competitiveness, energy security, and environmental health through the development of clean, competitive, and reliable power technologies.

Alternative energy technology research is needed to improve technical designs, improve power generation efficiencies, increase economic competitiveness, and fully characterize and minimize environmental impacts from various technologies. The EERE research and development program focus areas include, but are not limited to, bioenergy, wind, hydrogen, hydropower, geothermal, and solar energy technologies. NWTC is EERE's and the Nation's principal research site for wind power and distributed energy resources.

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 wind energy technologies, and on coordination with partners and

stakeholders to overcome barriers to wind energy implementation. EERE's principal research vehicle to accomplish this goal is the NWTC.

NREL's Distributed Energy Resources (DER) Center and Distributed Power Program supports the development of technologies and policies that enable distributed generation (e.g., photovoltaic, wind, fuel cells, and microturbines), storage, and direct load control technologies to be integrated into the electric system. Through a collaboration of the national laboratories and industry partners, DOE's Distributed Power Program is pursuing activities in the following three areas: 1) strategic research, 2) system integration, and 3) mitigation of regulatory and institutional barriers.

Distributed power is modular electric generation or storage located near the point of use. Distributed systems include biomass-based generators, combustion turbines, concentrating solar power and photovoltaic systems, fuel cells, wind turbines, microturbines, engines/ generator sets, and storage and control technologies. Distributed resources can either be grid-connected or operate independently of the grid. Those connected to the grid are typically interfaced at the distribution system. In contrast to large, central-station power plants, distributed power systems typically range from less than a kilowatt (kW) to tens of megawatts (MW) in size.

A prime and unique function of NWTC is its interaction with and use by the American wind industry clients/partners in the Industrial User Facility and other test sites. As a part of the fulfillment of the Wind Program's mission to promote and facilitate commercialization of wind energy technologies, joint projects are conducted with various industrial partners and groups.

The Proposed Action would provide and maintain enhanced facilities and infrastructure that would adequately support the site purpose of state-of-the-art alternative energy research. Specific purposes and needs for key improvements are summarized as follows:

- New or enhanced Structural Blade Testing Facility, Dynamometer Test Facility and test pad facilities are needed for research involving larger, state-of-the-art turbines (a dynamometer is an instrument used to measure mechanical power).
- New or enhanced hybrid power and independent power facilities that are designed for a full range of DER research are needed to allow testing of advanced technologies. These technologies include photovoltaic, wind, fuel cell, micro-turbine, concentrated solar power, storage, combined heat and power, modular biomass, and others.
- New or upgraded office facilities, utilities, security improvements, and other necessary infrastructure are needed to allow for greater flexibility and efficiency of research configurations, alternatives, and testing possibilities.

1.2 SITE DESCRIPTION

1.2.1 Site Background and History

The 305-acre NWTC is located in northwest Jefferson County, Colorado, approximately 16 miles northwest of Denver. The site is south of Highway 128 and directly east of aggregate mining and processing facilities on the east side of Highway 93 between Golden and Boulder, Colorado. The Boulder/Jefferson County line is the site's northern boundary line. A regional location map is presented in Figure 1-1. A local setting map is presented in Figure 1-2. A site map is presented in Figure 1-3.

Since the mid-1970's, DOE has conducted wind research and development activities at the NWTC, formerly the Wind Energy Test Center, which is located within the legal boundaries of the buffer zone of the RFETS. Although the entire RFETS, including the buffer zone, is currently designated under CERCLA, the buffer zone was managed as a "no activity zone" during the production years of The Rocky Flats Nuclear Weapons Plant. The mission of the NTWC is different than the mission at RFETS. Since 1993, DOE's Golden Field Office has managed the NWTC for wind, alternative, and renewable energy research, while the remainder of the RFETS continues to be managed by DOE's Rocky Flats Field Office as an environmental closure site. DOE/NREL will continue to manage the NWTC as an energy efficiency and renewable energy, research, development and testing site after RFETS is closed.

In Fiscal Year 1994 (FY94), NREL renovated Building 251 and installed a site-wide electrical grid. At that time, there were turbines on the site that continued to operate for specific research purposes. The Industrial User Facility (IUF) building was completed in FY96, providing 11,000 square feet of space that is used by the wind program and industry to assemble and test wind turbines and components. FY97 brought the installation of the Advanced Research Turbine (ART) and the Hybrid Power Test Bed (HPTB). Several NWTC facilities and infrastructure upgrades were made in FY98, including an emergency power generator, water system enhancements, access road safety improvements, and the site's main electrical switchgear. In FY99 the 2.5 MW dynamometer facilities and lab were completed. The Controls Advanced Wind Turbine (CART) was installed in FY00.

A piece of land of about 25 acres, located in the southeast corner of the NWTC, was recently designated for inclusion within the NWTC by the National Defense Authorization Act for Fiscal Year 2002 (see Figure 1-3). This property was previously part of the NWTC. Two test sites and unimproved roads are located on this land.

NWTC is primarily used for wind energy research, development and testing, and is the only facility of its type in the United States. The NWTC's unique facilities support wind turbine design, development, testing and certification. Fundamental research is also conducted on turbine aerodynamic and mechanical behavior, as well as turbine interaction with atmospheric conditions.

In addition, the site supports NREL's research in the areas of hybrid power technologies and distributed energy resources. NWTC supports the development and validation of information, data, and testing standards associated with distributed generation equipment and its interconnections with the public utility grid. Hybrid and distributed energy systems that combine various traditional and renewable energy technologies also are tested, as are various distributed energy devices and systems.

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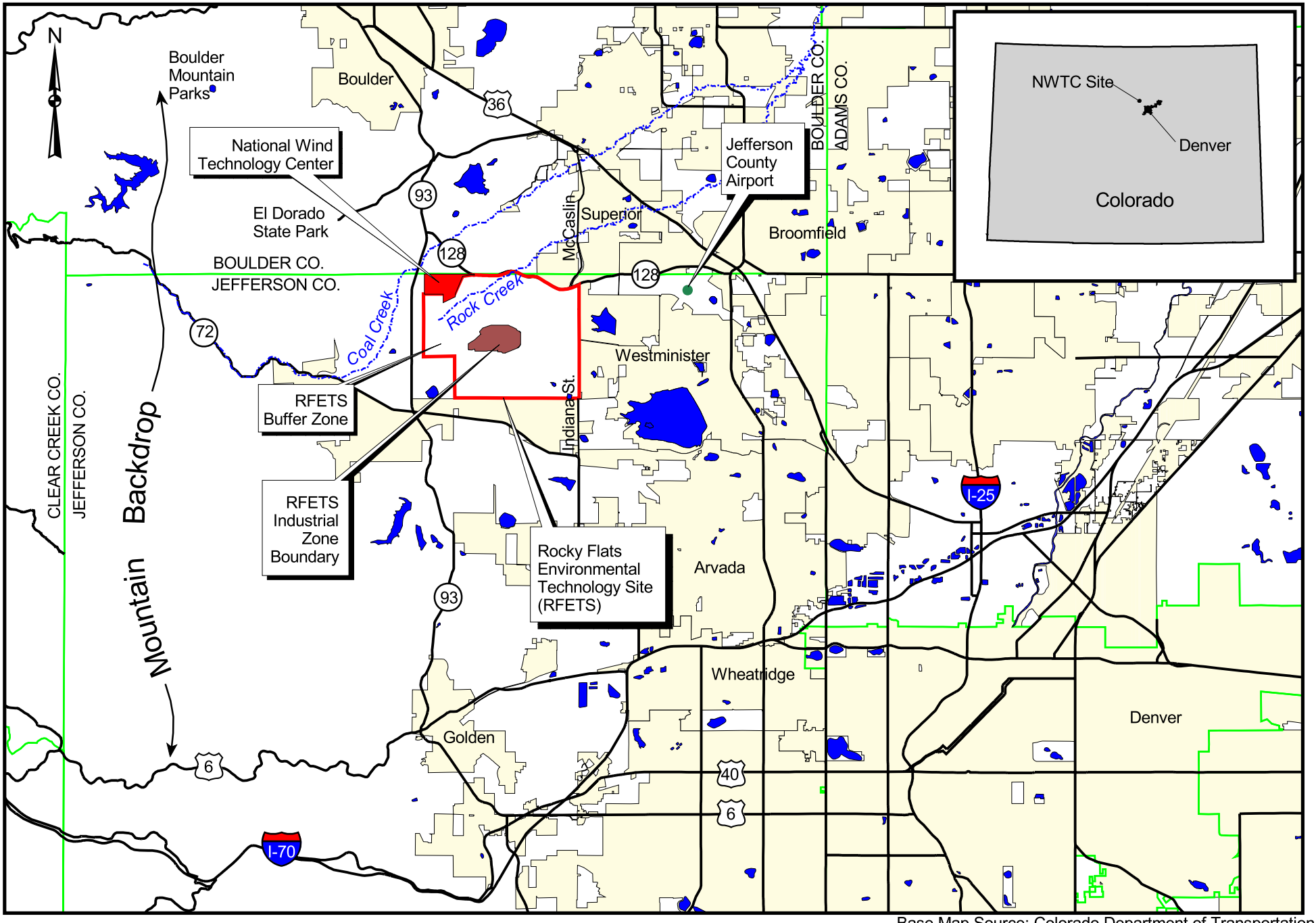

Base Map Source: Colorado Department of Transportation

2 0 2 4 Miles

Figure 1-1 Regional Location Map

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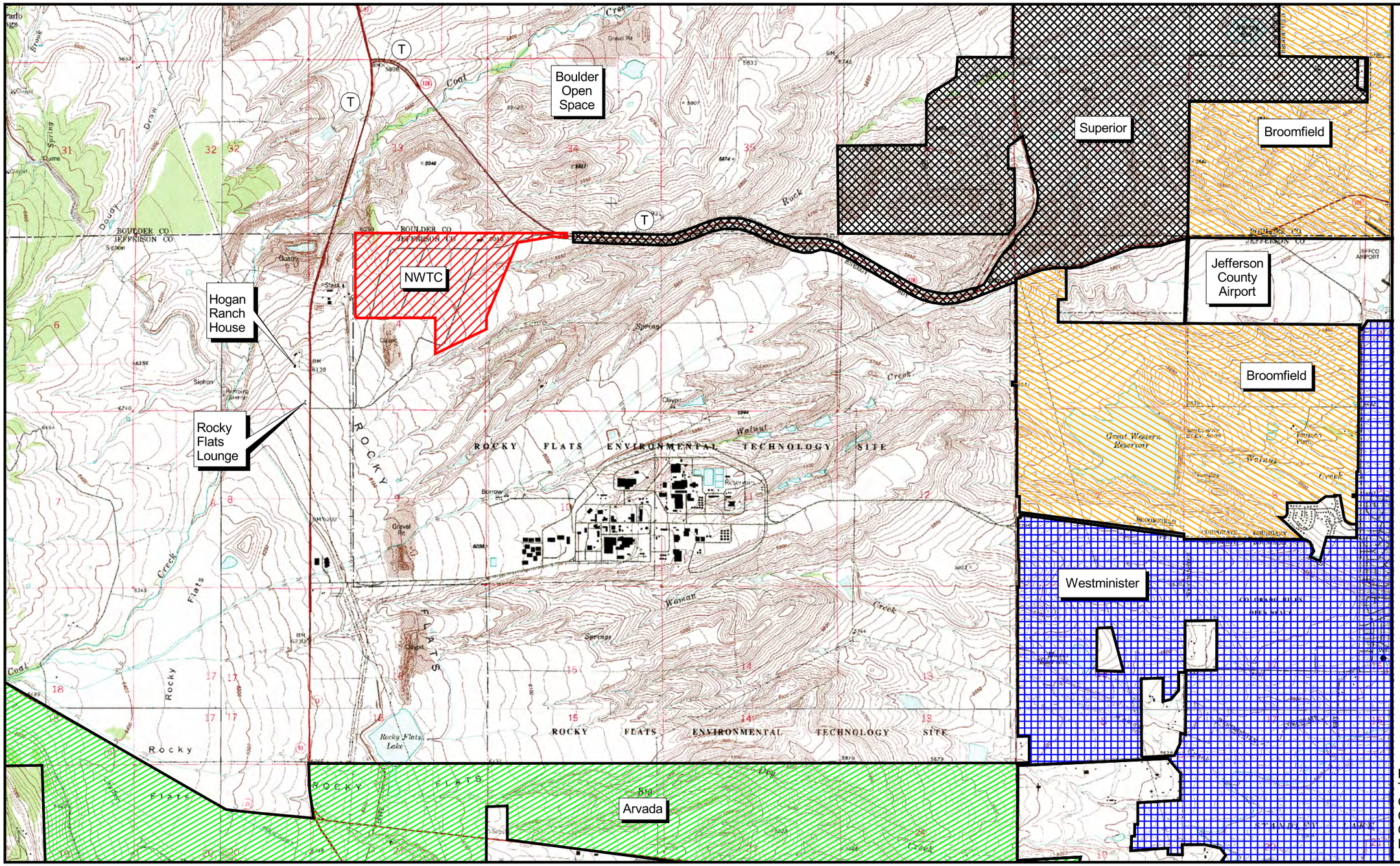

Figure 1-2
Local Setting Map

LEGEND

City Limits
- Arvada
- Broomfield
- Enclave
- Superior
- Westminister
- National Wind Technology Center
- (T) Trailhead

N
W E
S

2000 0 2000 Feet

Base Map Source: USGS 1:24,000 Topographic Maps - Eldorado Springs, Golden, Louisville, Ralston Buttes, Colorado, 1994
City Limits Source: Colorado Department of Transportation, 2000

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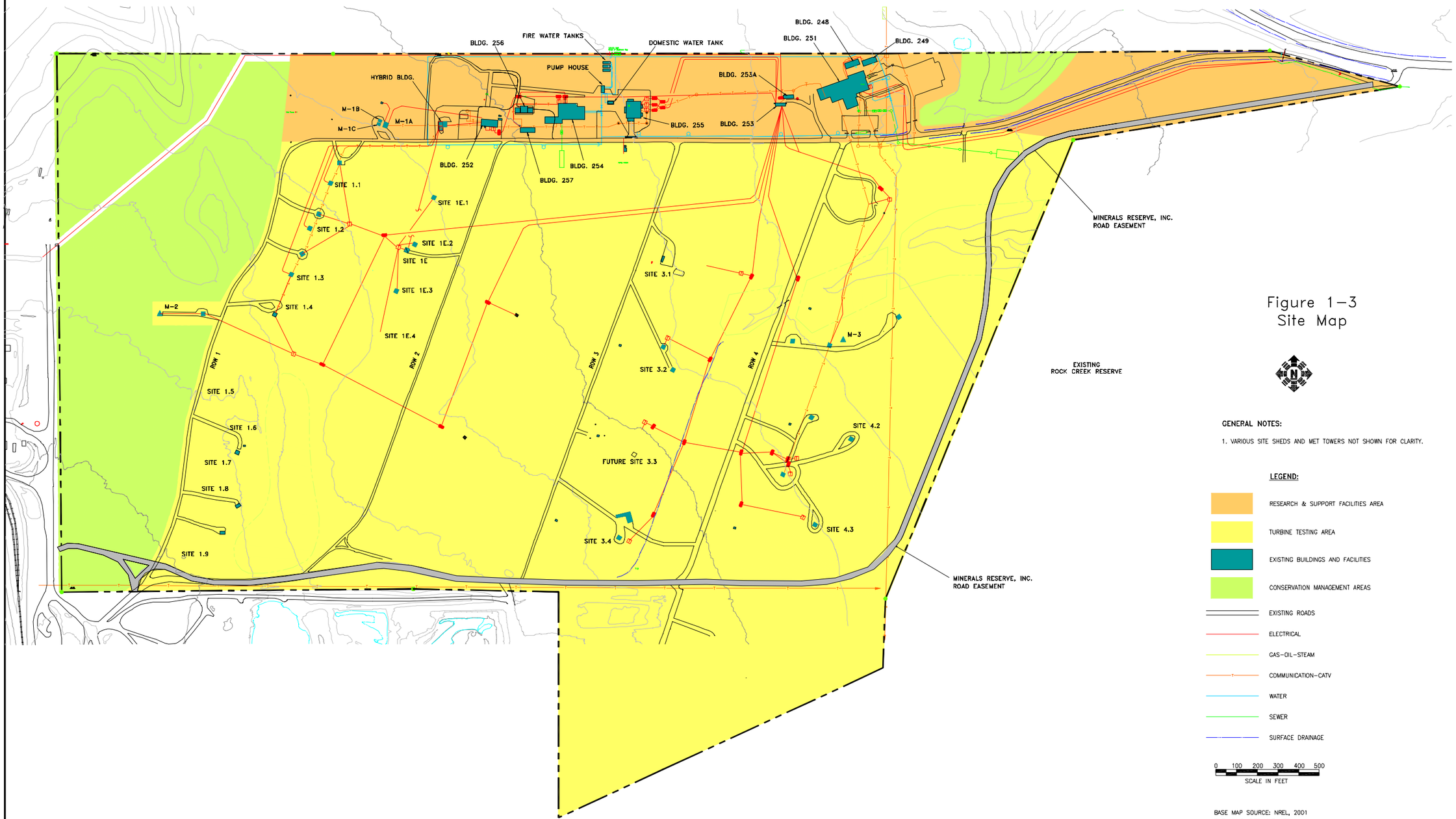

Figure 1–3
Site Map

GENERAL NOTES:

1. VARIOUS SITE SHEDS AND MET TOWERS NOT SHOWN FOR CLARITY.

LEGEND:

- RESEARCH & SUPPORT FACILITIES AREA
- TURBINE TESTING AREA
- EXISTING BUILDINGS AND FACILITIES
- CONSERVATION MANAGEMENT AREAS
- EXISTING ROADS
- ELECTRICAL
- GAS–OIL–STEAM
- COMMUNICATION–CATV
- WATER
- SEWER
- SURFACE DRAINAGE

0 100 200 300 400 500
SCALE IN FEET

BASE MAP SOURCE: NREL, 2001
FILE NAME: SITE MAP NEW.dwg
DATE: 5/09/02

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Wind turbines and other energy generating facilities at the NWTC have and will continue to contribute power to the local electrical distribution system as a natural byproduct of the research and testing activities on-site. The amount of power produced varies depending upon research activity and hardware type. As larger machines in the multi-megawatt class are tested, these power contributions may be substantial. Currently, DOE has no power purchase agreement in place to receive credit for this energy production, but a power purchase agreement with the local utility company may be negotiated in the future.

The site, at the mouth of Eldorado Canyon, was selected because of intermittent, extreme high-wind characteristics that are favorable to research. These characteristics do not support the objective of full-time wind power generation because of the periods of calm winds between high wind events. The NWTC is not a wind farm or a dedicated renewable energy generation facility, and no short-term or long-term plans exist to convert the site to serve this purpose.

1.2.2 Description of the Existing Facilities

The following discussion summarizes key aspects of the site, facilities and operations. Figure 1-3 presents existing site conditions.

Buildings: There are currently six buildings and numerous smaller support and testing facilities located on the NWTC site. The six primary buildings are located in the facility development area on the northern portion of the site between the site boundary and the primary access road (West 119th Avenue).

Turbines and Test Sites: There are currently 21 turbine test sites available. Of those 21 sites, between 12 and 15 generally contain operational turbines or other test equipment; five of the turbines are larger than 100 kW. Turbine test sites are described in Chapter 2.

Conservation Area and Open Space: Conservation management areas have been designated within site boundaries to protect the site's natural resources and prevent development within critical wind corridors. Approximately 60 acres have been set aside for this purpose.

Infrastructure: A site-wide electric network provides power to buildings and a majority of the test sites. Natural gas lines follow Highway 93, but do not serve the site. There is no potable water line to the NWTC. Treated domestic water is trucked to the site, stored in tanks, then distributed to the two primary site buildings (IUF and Building 251) via underground piping. Sanitary wastewater disposal is provided by on-site septic and leach field systems. Water for fire protection is trucked to the site and stored in tanks separate from the domestic water tanks. Water for fire protection is piped underground through an independent system within the Research and Support Facilities area. Standard hydrants are located so as to provide sufficient fire protection. The existing utility infrastructure and road system on the site is presented in Figure 1-3.

In 1995, DOE and Western Aggregates, Inc. signed a Memorandum of Understanding (MOU) that granted a road easement to Western Aggregates, Inc. across the southern and eastern portions of the NWTC. LaFarge now owns and operates the aggregate mining plant. A LaFarge subsidiary, Minerals Reserve, Inc., holds the access road easement. LaFarge is one of two adjacent aggregate mining and processing facilities located south and west of NWTC. Access to the road easement would provide LaFarge with an alternate route for industrial traffic from its plant to Highway 128. DOE granted this easement in exchange for a 20-year

moratorium on mining activities on the NWTC site, where mineral rights are privately owned and leased by Minerals Reserve, Inc. The 20-year moratorium will begin on the date that Western Aggregates, Inc. obtains final approval to commence mining operations from all relevant permitting authorities. To date, Minerals Reserve, Inc. has not fulfilled county and state conditions required to begin activities under the lease on the NWTC site, including the completion of tallgrass prairie and hydrological studies. Consequently, construction and use of a road within this easement is not considered in this analysis. Any proposal by Minerals Reserve, Inc. to develop/use the road easement would be subject to a separate NEPA analysis when a formal proposal is submitted for DOE consideration.

1.2.3 Site Planning Process, Decision Protocol and Environmental Management Commitments

Formal strategic and annual planning processes are in effect at NREL that establish work tasks and direct site development decisions in pursuit of the NREL mission. These planning and decision-making processes are coordinated and integrated so that all necessary information is available for consideration, and that the information flows from one element of the planning process to another in the proper sequence. Elements of this formal planning process interact in continuous feedback and improvement loops and include:

- An *Institutional Plan* that sets forth the organization's mission, critical outcomes, and performance objectives, and identifies specific activities and resources (e.g., staff, facilities) necessary to achieve the objectives. The Institutional Plan is revised annually and includes specific environmental, safety, and health (ES&H) objectives and resource needs.
- An NREL *One-Year Plan* that translates the NREL mission defined in the Institutional Plan into specific work tasks, including research activities and site development, to be completed each fiscal year. Coordinated Annual Operating Plans (AOPs) are developed by each internal organization (e.g., technology program, science and technology center, and operations support office) in support of the One-Year Plan. The AOPs identify specific performance objectives, work tasks, and resource requirements for that organization for the fiscal year.
- A *Capital Plan* having a five-year outlook that establishes resource and budget requirements for major projects (e.g., facility construction, infrastructure development, major equipment acquisitions).
- A *Site Development Plan* that captures the results of planning processes that identify, evaluate, and address opportunities and limitations of the NREL's existing land and facilities. The Plan's objective is to maximize the potential of NREL sites, while meeting the near-term and long-term facility and siting needs of the technology programs.
- NREL *Policies and Procedures Manual* that includes NREL's ES&H Policies. The most directly related policies are as follows:

  2-1 Integrated Safety Management
  6-1 Environment, Safety, and Health
  6-2 Environment Management
  6-3 Property Protection
  6-4 Worker Safety and Health
  6-5 Occupational Medicine
  6-6 Risk Assessment

The site has been divided into geographic zones to provide general guidance for site development. These zones designate locations for specific facility types and land uses such as buildings, turbines, roads, open spaces and other site features. Conceptual design and architectural guidance is used to address site development compatibility and visual quality issues.

Engineering requirements and limitations on new facility development exist to protect wind energy corridors and address aviation standards. These requirements and limitations address horizontal and vertical barrier parameters (heights and widths of structures in key locations).

NREL's Site Operations Office implements a formal design review process for all construction proposals for both new facilities and test sites, and modifications to those that currently exist.

The following discussion elaborates on Policies 6-2 and 6-6 and other environmental commitments at the NWTC.

Policy 6-2

Policy 6-2 Environmental Management sets forth NREL's environmental policy statement, general rules, responsibilities, related policies, and laboratory level procedures. Policy 6-2 establishes NREL's general rules for environmental protection as follows:

> "NREL manages and operates this DOE site consistent with the following ongoing environmental protection goals to fulfill research objectives and to maintain good stewardship of the public land.
>
> 1. To maintain and enhance the environment on NREL's sites through restoration or other means which foster the preservation of native ecosystems.
> 2. To protect natural, historical, and archaeological resources.
> 3. To promote and preserve native ecosystems.
> 4. To incorporate pollution prevention practices in research and support activities.
> 5. To apply sustainability concepts to design and operation of facilities.
> 6. To continually improve the effectiveness of NREL's environmental management implementing programs.
> 7. To achieve a reputation in the public and regulatory community as a leader in environmental excellence through consistently high performance and open, responsive communications."

The general rules also address "environmental hazard identification." At the NWTC, new or substantially modified activities are evaluated in accordance with NREL Policy 6-6 Risk Assessment.

Policy 6-6

NREL Policy 6-6 Risk Assessment establishes a process that identifies hazards presented by planned research and support activities and facilities. The process then identifies controls necessary to maintain the risk presented by those hazards at an acceptable level. Environmental considerations are an integral part of this process, including application of NEPA requirements. The following hazards are specifically referenced:

a. Emissions to air
b. Releases to surface water, including storm drains
c. Wastewater releases
d. Improper waste management
e. Contamination/releases to land
f. Impacts on communities
g. Use of raw materials and natural resources
h. Impacts to wildlife or vegetation
i. Erosion or contamination of storm water
j. Contamination of groundwater
k. Life-cycle impacts

The goals of Policy 6-6 are to address and prevent off-site impacts and proactively manage on-site activities to minimize any risks to safety, health and the environment.

Controls identified as necessary during *Hazard Identification Reviews* incorporate the requirements found in numerous and specific ES&H implementing programs. These programs are listed in Appendix A.

Other Environmental Commitments

NREL's environmental programs and policies are, in part, based on a series of regulations and recent Executive Orders on "Greening the Government." Key Executive Orders include:

- Executive Order 13148, Leadership in Environmental Management
- Executive Order 13101, Waste Prevention, Recycling, and Federal Acquisition
- Executive Order 13123, Efficient Energy Management

In response to these and other initiatives, DOE and NREL have committed to manage environmentally sensitive areas on the NWTC site for conservation purposes by establishing Conservation Management Areas (see Figure 1-3) and implementing the Sustainable NREL initiative.

Conservation Management Areas and Natural Resource Conservation Program

The Conservation Management Areas will provide continued protection of the site's unique natural resources. NREL will manage the site to minimize disturbance in these areas and will implement protection measures if disturbance occurs. The NREL conservation management areas will be one component of a new program for the NWTC that is currently under development. This program will be called the *Natural Resource Conservation Program,* which will unify these efforts and those associated with designated utility corridors and other adopted measures intended to avoid or minimize impacts on natural resources.

Key NREL commitments to be included in the future Natural Resource Conservation Program include:

- No-Build Zones, including the following:

  - The westernmost portion of the site (66 acres west of the Row 1 road, excluding the area containing existing facilities (Met Tower M-2 and associated data shed)); this area

has been set aside because development in this area could alter the wind regime and optimization of wind turbine testing;
- Ephemeral drainage in the Rock Creek watershed located at the eastern site boundary and traversing a portion of the site in a generally east to west direction;
- Hillside seep and ephemeral drainage east of Building 251;
- Land within the defined xeric tallgrass prairie plant community in the southwest corner of the site, between Rows 1 and 2 (see Figure 3-4 Vegetation Map).

These areas are formally designated as portions of the site on which building would not occur, with two exceptions:

1. As the xeric tallgrass prairie is in the active turbine testing area, it is not reasonable to preclude all development on portions of the site inhabited by this plant community. However, development on the xeric tallgrass prairie would be minimized. Any test sites and access roadways on the xeric tallgrass prairie would be carefully planned, and appropriate protection measures would be implemented. Examples of measures to protect tallgrass prairie include special tallgrass prairie seed mixes to be used for revegetation and provisions for watering during revegetation.
2. Certain existing, dedicated above ground and underground utility corridors, including the Mineral Reserves, Inc. road easement, pass through Conservation Management Areas.

- Goals are established to protect and enhance the natural resources on the site using watershed and ecosystem perspectives. The site is managed to preserve and enhance plant species and community diversity, preserve wildlife habitat, and maintain surface water quality and flow volumes.
- On-site environmental monitoring at NWTC is performed on an as-needed basis, and may include monitoring of off-site control areas. Although there is no routine environmental monitoring performed at NWTC, an occasion may arise for which monitoring of one or more environmental media is warranted, either in a localized area on-site or on a site-wide scale. This could include one or more of a variety of environmental media; for example, surface water, groundwater, air, soil, wildlife, or vegetation. There is currently an avian monitoring program underway at the site.
- Appropriate mitigation measures are implemented for any disturbance to Conservation Management Areas, utility corridors or the xeric tallgrass prairie area. These measures would be designed on a case-by-case basis, but could include measures designed to address storm water discharge, erosion, sediment depositions, or revegetation. Examples of measures to protect tallgrass prairie include special tallgrass prairie seed mixes to be used for revegetation and provisions for watering during revegetation.
- Vegetation management at NWTC is currently conducted on a site-wide basis with the objectives of controlling weeds, preserving species diversity, and maintaining ecosystem health to the maximum extent possible. This site-based vegetation management approach would continue, and would support the goal of preservation of plant species and community health in Conservation Management Areas. One component of the vegetation management program is integrated weed management, which incorporates a variety of weed control strategies. Techniques used at the site include such measures as: mechanical controls (e.g., mowing), cultural controls (e.g., minimizing vehicles being driven off established roadways),a variety of chemical controls (e.g., ground treatment with 4-wheel drive vehicles or backpack application, or helicopter application for large areas), and restoration activities such as revegetation after soil disturbance. Revegetation following soil disturbance would be done using a native seed mix specifically designed for NWTC based on plants that

naturally occur on the site. Landscaping materials would consist of low-water use plants, with an emphasis on plants native to the region. Additional landscaping practices are discussed in the "Beneficial Landscaping" section below.

- Wind corridor protection to ensure new development outside the 66-acre Conservation Management Area does not compromise the site's the wind regime and optimization of wind turbine testing. Many years of wind characteristics are documented at the NWTC, including wind direction and annual average wind speed. Prototype and commercial wind turbines are often tested at the NWTC to measure performance characteristics for certification. To continue this testing and research, it is important that the wind regime at the site not be changed by buildings or manmade disturbances in a way that would invalidate any sites for certification testing. Generally, a site must have adequate upwind clearance from significant structures that may alter the smooth wind flow. To maintain upwind clearance with the prevailing winds from the west, NREL has developed the following recommendations and guidelines:

    - Potential interference with the wind regime across the test sites is a limiting factor in siting proposed NWTC facilities.
    - No structures should be erected upwind of Row 1 (66 acre Conservation Management Area).
    - A thorough analysis of all new development proposals should be performed to establish the wind impact of the specific proposed building.

- Consistent with Executive Order 13148 (Greening the Government Through Leadership in Environmental Management), NREL is implementing environmentally and economically beneficial landscaping practices whenever feasible. The principles of this type of landscaping focus on using regionally native plants for landscaping, promoting construction practices that minimize adverse effects on the natural habitat, preventing pollution, and implementing water and energy efficient practices.
- Should any evidence of archaeological resources be discovered during construction at the NWTC, NREL is committed to stopping the work in the vicinity until a qualified archaeologist can completely evaluate the significance of the find according to criteria established by the National Register of Historic Places.

Sustainable NREL

Based on the following definition of "sustainable" and NREL's Mission and Vision Statements, "Sustainable NREL" brings together NREL's commitments into a unified strategy.

> *Sustainable* \se-'sta-ne-bel\, adj. - minimal use of resources (energy, materials, water, etc.) and maximum value received from resources used, while balancing environmental, economic, and human impacts.

NREL Mission

> To develop renewable energy and energy efficiency technologies and practices, advance related science and engineering, and transfer knowledge and innovations to address the Nation's energy and environmental goals.

NREL Vision

> NREL will be the world's preeminent institution for advancing innovative renewable energy and energy efficiency technologies from concept to adoption. By partnering with our stakeholders, we will support a sustainable energy future for the nation and the world. In achieving this next level of excellence, NREL will set the standard for others.

Sustainable NREL is:

- An initiative to help NREL become more sustainable in all its operations and a global model for sustainability.
- A management philosophy and corporate culture.
- A process of change.

In the future, Sustainable NREL envisions that NREL should be not only the preeminent laboratory in the world for research and development in all aspects of clean energy and energy efficiency, but should also demonstrate sustainable practices in all its operations.

Sustainable NREL's existing commitments include, but are not limited to, energy efficiency, comprehensive ES&H programs, recycling programs, the use of alternative-fueled NREL vehicles, participation in the Regional Transit District Eco-pass transit ridership incentive program, and Xcel Energy's Windsource electricity program.

NREL exemplifies sustainability in a research and development organization by maximizing efficient use of all resources, minimizing waste and pollution, and serving as a positive force in economic, environmental, and community responsibility.

NREL's energy commitments are comprehensive and include the following:

- NREL buildings are designed to exceed the minimum energy efficiency requirements for government facilities defined in Executive Orders, regulations, and DOE directives. In particular, NREL buildings are designed to exceed the minimum energy efficiency requirements as stated in Executive Order 13123 (Greening the Government Through Efficient Energy Management) which include a 30% reduction in energy use for offices and 20% reduction in energy use for laboratory buildings by 2005; and
- NREL buildings are designed to achieve sustainable design goals. The goal is to achieve a silver rating in the Green Building Rating System, V. 2.0, Leadership in Energy and Environmental Design (LEED), U.S. Green Building Council. The U.S. Green Building Council developed the LEED Green Building Rating System 2.0 for the DOE Energy Efficiency and Renewable Energy, Office of Building Technology, State, and Community Programs. The system is intended for use by commercial building project stakeholders or project team members as a guide for green and sustainable design. The rating system is composed of a specific set of criteria with associated point values. A silver rating is one step above "Certification" under this rating system, and requires a total of 33 to 38 points relative to a maximum of 69 possible points. For more information refer to the following web site: http://www.usgbc.org/.

The following standards, orders, and documents provide valuable guidance on energy efficiency and sustainability in building design:

- ASHRAE Standard 90.1;
- DOE Draft Order 430.2X;
- Code of Federal Regulations 10CFR435;

- Whole Building Design Guide, http://www.wbdg.org;
- Roadmap for Integrating Sustainable Design into Site-Level Operations, PNNL-13183, K. L. Peterson and J.A. Dorsey; and A Design Guide for Energy-Efficient Research Laboratories, http://ateam.lbl.gov/Design-Guide/.

All of the planning processes and commitments described in Section 1.2.3 were considered during the development of the proposed short-term and long-term actions described in Chapter 2.

1.3 CHARACTERISTICS OF A SITE-WIDE ENVIRONMENTAL ASSESSMENT

This document is a "Site-Wide Environmental Assessment" similar to the document NREL prepared for the project site in 1996. DOE defines a site-wide environmental document as follows:

> "A broad-scope EIS or EA that is *programmatic* in nature and identifies and assesses the individual and cumulative impacts of ongoing and reasonably foreseeable future actions at a DOE site." (10CFR Part 1021)

NEPA and other environmental regulations define the term "programmatic," and the application of programmatic environmental documents. In general, a programmatic document applies to a series of related projects and where the projects should be analyzed as an overall program. This approach is proper for analyzing a series of projects that are related either:

1. Geographically;
2. As logical parts in a chain of contemplated actions;
3. In connection with the issuance of rules, regulations, plans or other general criteria to govern the conduct of a continuing program; or
4. As individual activities carried out under the same authorizing statutory or regulatory authority and have generally similar environmental effects which can be mitigated in similar ways.

At the NWTC, the Proposed Action, as described in Chapter 2, is composed of improvements that are related geographically and are part of a series of interconnected actions to be implemented by NREL.

This Site-Wide EA provides an analytical superstructure for subsequent, more detailed analyses, as necessary. The document will serve as a planning tool that aids decisions about future development of the site. If new issues arise in the future, NREL will prepare subsequent environmental reviews or NEPA documents (EISs/EAs) that would incorporate the analyses from this programmatic document and would be focused only on those issues that have not been adequately addressed. If new proposals or conditions were to be determined by DOE, consistent with its regulations, to have no effects beyond those analyzed in the programmatic document, no new NEPA document would be necessary.

The Supplemental Analysis determines whether the Site-Wide EA remains adequate or a new Site-Wide NEPA document is required. NREL is scheduled to prepare the next Supplemental Analysis in 2007.

1.4 ORGANIZATION, CONTENT AND OBJECTIVES OF THIS ENVIRONMENTAL ASSESSMENT

This EA is organized in a manner consistent with NEPA and DOE's NEPA implementation guidelines, including the specific guidelines for Site-Wide EAs. The EA has eight sections. The first section is an Executive Summary. The organization, content and objectives of the EA's remaining chapters are as follows:

Chapter 1 Introduction presents the purpose and need for the program, describes the site, characterizes the purposes and objectives of a Site-Wide EA, summarizes the organization, content and objectives of this EA, sets forth future NEPA documentation protocol and checklists, and summarizes the scoping process and results.

Chapter 2 Proposed Action and Alternatives presents a detailed description of the short-term and long-term program of improvement on the site and describes the No Action Alternative.

Chapter 3 Affected Environment describes environmental baseline information about the site and surrounding area.

Chapter 4 Environmental Consequences and Mitigation Measures describes potential impacts of the Proposed Action and No Action alternatives, compares the impacts, presents required and recommended measures to reduce impacts, and makes "significance" findings.

Chapter 5 Comments on the Draft EA and Responses represents letters received by NREL after the Draft EA was circulated for public review, along with specific responses to each letter. This Final EA includes revisions to the Draft EA text that were necessary as a result of certain comments and responses.

Chapter 6 List of Preparers identifies the individuals who prepared the EA and their roles.

Chapter 7 Bibliography and References presents a listing of key documents and consultations that took place as part of the EA process.

1.5 SCOPING PROCESS AND RESULTS

A scoping letter was prepared and distributed to an extensive list of agencies, organizations and members of the public. This list included a comprehensive group of parties who have expressed interest in the site and site circumstances. Appendix C presents the scoping letter, a complete list of the scoping letter recipients, and a complete list of response letters that were received during the 30-day scoping period. The following discussions summarize the relevant input received during the scoping period that ended on July 18, 2001 and corresponding modifications to the Proposed Action.

1.5.1 Environmental Issues

The scoping letter for the Proposed Action identified the following environmental topics to be addressed in the EA:

Land Use, Planning, Socioeconomics and Public Policy
Traffic and Circulation

Air Quality and Noise
Visual Quality/Aesthetics
Water Resources
Soils and Geology
Biological Resources
Cultural Resources
Waste Management
Public Facilities, Services and Utilities
Energy

The following specific issues were raised during the scoping process and are addressed in this EA:

- Wildfire: current and future values at risk, protection efforts, mitigation of risk, and vegetative fuels;
- The presence of on-site and off-site endangered species, especially Preble's populations, habitat and related protections;
- The presence of tallgrass prairie and related protections;
- Conservation management planning: purpose, focus and responsibilities;
- Gas line alignments and related impacts on conservation management areas;
- Bird strikes from turbine blades;
- Wind monitoring data for emergency response teams;
- Site access and safety at the Highway 128/site access road intersection;
- Visual access for the public from viewing areas; and
- Aircraft safety caused by potential interference with Jefferson County Airport height restrictions and navigational and communication equipment;
- Status of the site relative to the CERCLA and the National Priority List, and;
- Potential conflicts of the Proposed Action relative to mineral leases and associated agreements.

1.5.2 Alternatives

The following alternatives were defined prior to the scoping period and were mentioned in the scoping letter:

- New Site Alternative;
- Off-Site Improvements Alternative;
- Site Development Configuration Alternatives;
- Reduced Development Intensity Alternative; and
- No Action Alternative.

No additional alternatives were raised during the scoping period.

At this time, the No Action Alternative is the only alternative addressed in the EA. The No Action Alternative would leave the site in its current configuration, add no new facilities or infrastructure, and maintain current levels of research, operation, and management.

Other alternatives raised prior to and during the scoping period were considered, but were eliminated from further analysis. The rationales for eliminating these alternatives is summarized as follows:

- New Site and Off-Site Improvements Alternative: not considered feasible because of the technical and cost implications associated with decentralized operations and site/infrastructure complications.
- Other Site Development Configuration Alternatives: not considered feasible because of the interrelated nature of the proposed facilities, site development constraints, and the inherent flexibility of the Proposed Action with respect to future facility footprints.
- Reduced Development Intensity Alternative: not considered feasible because it is inconsistent with the Proposed Action's purpose and need and the intent of preparing this Site-Wide EA.

1.5.3 Modifications Between Release of the Scoping Letter and Release of the Draft and Final EAs

The scoping letter identified the designation of a Conservation Management Area on the western side of the site as part of the Proposed Action. Historically, NREL has managed that area and several others (shown on Figure 2-1) as no-build zones with an emphasis on conservation management. As clarification, the Proposed Action actually includes ongoing management of the Conservation Management Areas rather than designation of those areas.

Since release of the Draft EA, NREL received five letters commenting on the Draft EA. Some of the comments in these letters and NREL's responses required revisions to the text of the Draft EA. Section 5 of this document presents those letters and NREL's responses. None of these changes alter the significance of the findings of the Draft EA.

In addition, other changes have been made within the document to improve clarity and accuracy. None of these changes alter the significance of the findings of the Draft EA.

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2. PROPOSED ACTION AND ALTERNATIVES

This Chapter of the Site-Wide EA describes the Proposed Action and No Action Alternatives. Other alternatives were considered prior to and during the scoping period. Those alternatives and the rationales for eliminating them from further consideration in this EA are described in Chapter 1.

As described in Chapter 1, Appendix A, and NREL's web site: http://www.nrel.gov/esh, NREL has made extensive management commitments to address environmental, safety and health issues associated with developing, operating and managing the NWTC. These commitments include implementing an environmental management policy and risk assessment policy to address and prevent off-site impacts and proactively manage on-site activities to minimize any risks to the environment, safety, and health. In support of these policies, NREL has a specific set of environmental management programs, numerous environment, safety and health (ES&H) programs, and specifically proposed measures to avoid or minimize ES&H impacts. These commitments are considered baseline conditions with respect to the short-term and long-term improvements described in this Chapter, the affected environment described in Chapter 3, and the impact analysis presented in Chapter 4. All Proposed Action components would be implemented consistent with these commitments.

2.1 PROPOSED ACTION

The Proposed Action is to operate the NWTC for alternative energy research with new and improved capability to support DOE's mission to research and develop renewable energy technologies. New construction would include permanent physical improvements to the site that involve buildings and equipment, utilities, and other infrastructure. The Proposed Action also includes activities that do not require permanent facilities or infrastructure, such as research programs, facility operations, management practices and maintenance activities.

The components of the Proposed Action are divided into two implementation periods:

1. Short-Term (2002-2006)
2. Long-Term (2007-2021)

The actual schedule for implementation of the site improvements is dependent on federal budgeting decisions and fluctuating priorities, therefore the Proposed Action cannot be specific with respect to actual construction schedules. In addition, certain site planning and architectural details are tentative and subject to modification. Consequently, those actions most likely to occur in the short-term implementation period are analyzed based on information available at this time, and the analyses recognize that some modifications would be expected.

The long-term wind research and distributed energy facility infrastructure improvements have been defined in less specific terms because of uncertainties in future funding and a lack of details available at this time. Therefore, this EA employs a "bounding analysis" approach to evaluating potential environmental impacts resulting from an array of potential development options within a conceptually defined site "buildout" scenario. This potential scenario may never occur, or it could change to involve more or less development. The purpose of this approach is to promote a comprehensive assessment of potential impacts from future site use and development.

2.1.1 Short-Term Components (2002-2006)

Improvements comprising the short-term component of the Proposed Action are listed below, followed by a more detailed description of each proposed improvement. Figure 2-1, *Proposed Site Improvements: Short-Term (2002-2006),* presents proposed short-term site improvements and facility characteristics. Appendix B presents technical information and references for further information about the wide range of wind turbine, solar, hybrid and other kinds of activities, facilities and equipment that might be used or tested at the NWTC.

Facility and Research Area Modification and Construction

- Expansion of the Structural Blade Testing Facility and/or Construction of a New Facility.
- Expansion of the Dynamometer Test Facility and/or Construction of a New Facility for Testing Larger Turbines.
- Installation of Three New Large (Megawatt-Class) Turbines, Additional Smaller Turbines and Associated Facilities.
- Installation of 20 Additional Test Sites.
- Construction of a Distributed Energy Resources Test Facility (DERTF).
  - Phase 1: Construction of a Systems Interconnection Test Lab.
  - Phase 2: Construction of a Hybrid and System Test Lab.
  - Construction of a DER Test Area.
- Installation of Several Large and Small Solar Dish/Converter Systems.
- Fuel Cell Thermal and Moisture Management Research.
- Installation of a 25kW Electrolyzer System.
- Renovation of the East Wing of Building 251 and 253A.
- Modification of Existing Facilities.

Infrastructure Improvements

- Upgrade the Existing Electrical Infrastructure.
- Extend Natural Gas Pipeline from Highway 93 to the Site.
- Upgrade and Extend Telecommunications Infrastructure.
- Upgrade Existing Domestic Water System.
- Upgrade Fire Protection System.
- Upgrade Sewage System.
- Upgrade and Modify On-Site Roads, Parking Areas, and Site Entrance.
- Implementation of Security Improvements and Modifications.

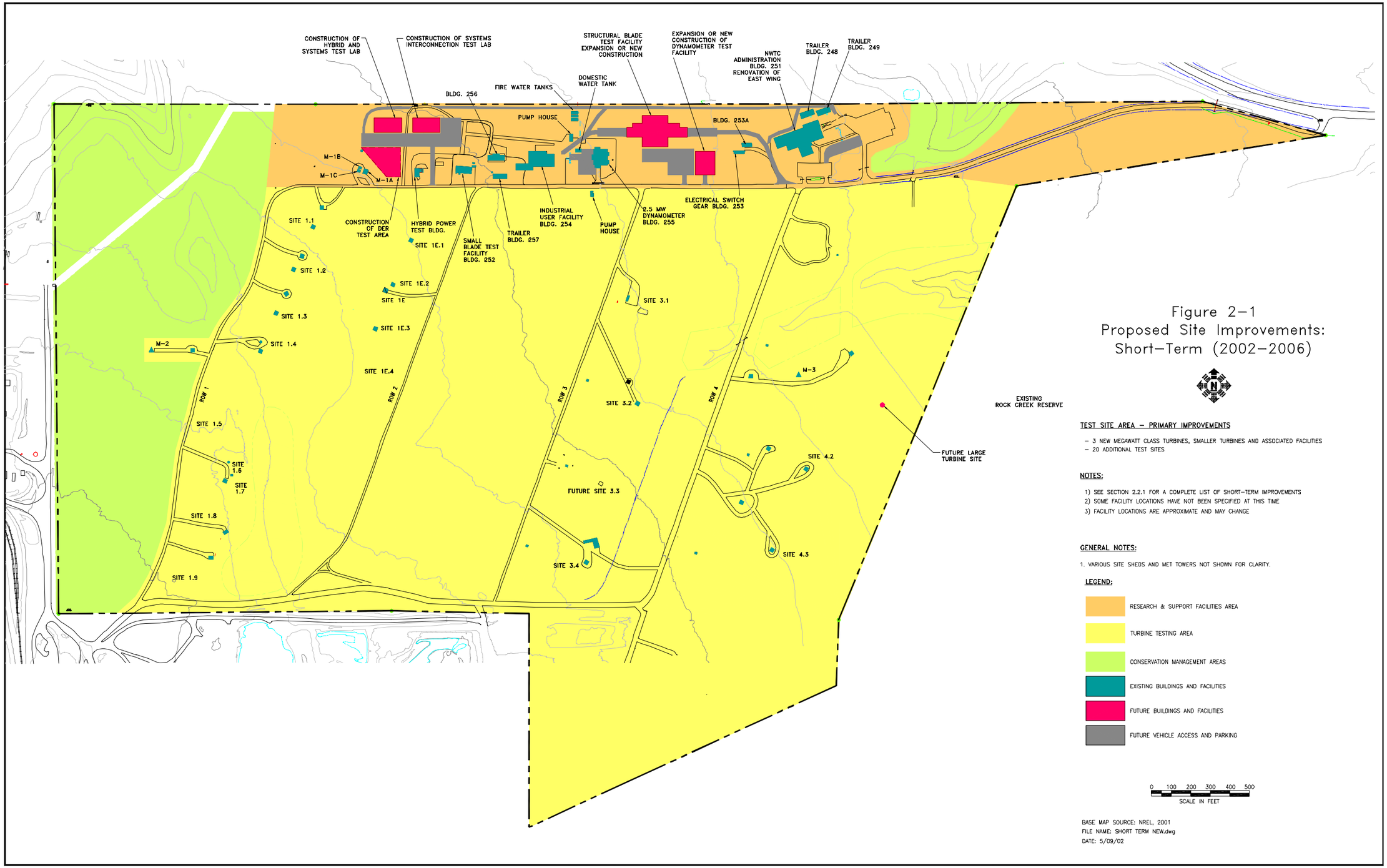

Figure 2–1
Proposed Site Improvements:
Short–Term (2002–2006)

TEST SITE AREA – PRIMARY IMPROVEMENTS

- 3 NEW MEGAWATT CLASS TURBINES, SMALLER TURBINES AND ASSOCIATED FACILITIES
- 20 ADDITIONAL TEST SITES

NOTES:

1) SEE SECTION 2.2.1 FOR A COMPLETE LIST OF SHORT–TERM IMPROVEMENTS
2) SOME FACILITY LOCATIONS HAVE NOT BEEN SPECIFIED AT THIS TIME
3) FACILITY LOCATIONS ARE APPROXIMATE AND MAY CHANGE

GENERAL NOTES:

1. VARIOUS SITE SHEDS AND MET TOWERS NOT SHOWN FOR CLARITY.

LEGEND:

- RESEARCH & SUPPORT FACILITIES AREA
- TURBINE TESTING AREA
- CONSERVATION MANAGEMENT AREAS
- EXISTING BUILDINGS AND FACILITIES
- FUTURE BUILDINGS AND FACILITIES
- FUTURE VEHICLE ACCESS AND PARKING

0 100 200 300 400 500
SCALE IN FEET

BASE MAP SOURCE: NREL, 2001
FILE NAME: SHORT TERM NEW.dwg
DATE: 5/09/02

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Site Activities and Routine Maintenance

- Office and Lab Work.
- Installing and Removing Wind Turbines, Distributed Generation Equipment, Meteorological Towers and Instrumentation, and Installation of the Necessary Infrastructure.
- Maintenance and Monitoring of Atmospheric and Wind Turbine Experiments, Distributed Generation Experiments, Tests and Certifications.
- On-site Environmental Monitoring.
- Upgrades to Site Amenities.
- Fuel Storage and Use.
- Routine Tasks.

The following discussions provide a detailed description of the short-term actions listed above.

Facility and Research Area Modification and Construction

- **Expansion of the Structural Blade Testing Facility or Construction of a New Facility.** This improvement would allow testing of larger blades, provide the capability of a wind tunnel, add approximately 5,000 square feet of office space, and add about 20,000 square feet of research area. The new blade test facility would provide the capability to test large wind turbine blades (up to approximately 231 feet (70 meters) in length).

  The facility would be either a freestanding building or a modification to the existing Industrial User Facility (IUF). The associated high-bay would be larger than the current IUF high-bay in order to accommodate larger blades. The facility would be designed for dual or multi-purpose use.

  The foot print area necessary, whether in a freestanding facility or a modification to the IUF for blade testing, would be approximately 25,000 square feet. Office space for approximately 20 to 25 staff would be provided.

  Electrical requirements for this facility could be accommodated within the current capacity of electrical service. However, modifications to the NWTC site electrical infrastructure would be required. The NWTC water system would have to be enlarged for fire protection and domestic water, and additional sewage disposal capacity would be needed.

- **Expansion of the Dynamometer Test Facility or Construction of a New Facility for Testing Larger Turbines**. This facility would be a larger version (8 to 10 MW capacity) of the existing 2.5 MW Dynamometer Test Facility constructed at the NWTC in 1999. It would contain equipment very similar but somewhat larger than the current facility. Examples of larger equipment to operate this new facility would be the variable frequency drive (VFD), AC motor, and speed reducing gearboxes. An 8 to 10 MW facility would be approximately 35 percent larger (physically) than the existing Dynamometer facility.

  The facility would include the ability to regenerate electrical power from test articles. This facility would be necessary to test the rotor/drive-train/generator components, as well as complete assemblies including the control electronics of the commercial utility megawatt-class machines prototyped and produced by the wind industry. The facility could also be used to test turbines (generators) designed for underwater use. An infrastructure upgrade

to support 10 MW of electrical power in addition to the current 10 MW capability would likely be installed prior to or concurrent with the installation of a new large MW Dynamometer.

- **Installation Of Three New Large (Megawatt-Class) Turbines, Additional Smaller Turbines and Associated Facilities.** Three megawatt-class turbines and additional smaller turbines and associated facilities would be constructed at the site.

  Table 2-1 compares these larger turbines with the largest existing turbines on the site at this time:

Table 2-1. Turbine Rotor Diameters and Hub Heights

Turbine	Rotor Diameter *		Hub Height	
	Feet	Meters	Feet	Meters
0.6 Megawatts ** (existing)	142	43	120	36
1.5 Megawatt	218-248	65-75	264	80
5.0 Megawatt	347-363	105-110	413-446	125-135

* Low wind-speed sites use larger rotors than high wind-speed sites. Any or all of these rotor diameters could be installed at the NWTC for experimental purposes.

** 0.6 Megawatts = 600 kilowatts

  Foundation types vary. Some of the larger ones could require excavations measuring about 75 feet (22.7 meters) on each side. The larger the turbine and blades, the greater the spacing required between turbines. For these megawatt-class turbines, a spacing of roughly 2,310 feet (700 meters) between turbines would be needed in the upwind direction. Precise spacing distance would be calculated based on the specific locations and turbines to be tested. Turbine field tests would require upgrades of the existing buried cable infrastructure and extension of that infrastructure to the prospective sites. The increased service capacity for megawatt-class turbines by themselves would not necessitate increasing service from Xcel Energy to the NWTC.

- **Installation of 20 Additional Test Sites.** This improvement would add additional test sites within the designated test site area. Installation of test sites involves utility service extensions, temporary heavy equipment access, and construction of foundations and pads for future use. These additional test sites would be added as necessary, and are likely to address various research requirements; therefore, they may not be identical or added simultaneously.

  A typical wind turbine test site is comprised of a turbine, one or more small test buildings to house equipment, and several ancillary towers for such things as meteorological equipment, video equipment, and lightning protection. Other supporting structures and equipment may be added as needed for specific research projects, such as equipment needed to test hybrid power or distributed energy technologies.

- **Construction of Distributed Energy Resources Test Facilities.** These improvements would provide buildings and a field test area to develop and validate information, data, and testing standards to strengthen NREL's core expertise and capabilities in several technical areas regarding the new Distributed Power Program within the new DER Center. In addition, the improvements would aid manufacturers of distributed generation equipment through cooperative testing of their systems for baseline comparisons to identify advances

in functional performance. Completing these improvements would enable NREL to enhance its position and expertise in this new energy arena.

Phase 1: Construction of a System Interconnection Test Lab. This improvement would create 10,000 square feet of space to enhance distributed energy research. The facility would allow the development and validation of interconnection standard testing methods and procedures, electrical details, safety standards, and grid compatibility.

Phase 2: Construction of a Hybrid and System Test Lab. This improvement would add another 10,000 square feet of space for distributed energy research adjacent to the proposed System Interconnection Test Lab. The facility would be focused on long-term performance, reliability, availability, fuel efficiency, and emissions of clean energy systems, and would involve testing of advanced design technologies. These systems would include technologies such as photovoltaic, wind, fuel cell, micro turbine, concentrated solar power, storage, combined heat and power, modular biomass, and other technologies in both generation independent and hybrid applications.

Requirements for each phase would include: approximately 10,000 square feet of space; a fire access lane and connection to the site fire protection system with possible upgrades; a domestic water system connection with possible upgrades; a natural gas line (at least intermediate pressure 55 (PSIG) to run turbines; a new sewage disposal system; telecommunication lines; electrical service; the capability for 1MW to 10 MW testing output back to the utility grid and/or load banks; approximately 15 parking spaces per building with a paved delivery area; and an access road to connect each building to the existing paved site road. It is expected that a hydrogen tank would be installed as an alternate fuel source at one of the buildings.

The facilities would be located north and west of the existing HPTB. Both DER buildings would be adjacent to one another. Building design would maximize energy efficiency, integration into NWTC architecture, and aesthetics.

It is expected that when Phase I is complete, 10 employees from the new DER Center would be housed in the building. Upon Phase II completion, an additional 10 employees would be housed in the Phase II building.

Expected routine work in these facilities would include conducting tests on electrical power generation and storage equipment. This testing may include, but is not limited to, high voltage testing, electrical surge testing, electrical islanding testing, equipment qualification testing, and performance and reliability testing.

Construction of a DER Test Area. This improvement would allow field testing of advanced design technologies including the following technologies, among others: photovoltaic, wind, fuel cell, micro-turbine, concentrated solar power, storage, combined heat and power, modular biomass, and other technologies in both generation independent and hybrid applications. It would most likely be located south and/or east of the DER buildings, and would provide space for distributed generation equipment test pads. The DER test area may also include typical electrical distribution equipment such as overhead lines, transformers, reclosers, sectionalizers, and capacitor banks. This equipment would be used to stimulate and test electrical distribution feeder configurations.

- **Installation of Several Large and Small Solar Dish/Converter Systems (Large Solar Dish/Converter System Short Term Testing).** This set of improvements would generate 2 to 2.5 kW of power each from concentrated sunlight and involve systems testing. Dish/converter systems require a converter (i.e. Stirling or concentrating PV) located at the point of focus of a parabolic-shaped concentrator.

  The program's current test facilities at NREL are limited to a small test site located adjacent to the High Flux Solar Furnace on the South Table Mountain site. The proposed NWTC location would provide additional space for performing short-term testing of large-scale systems and longer term testing of small-scale systems. The NWTC, with its high winds, is not compatible with long-term testing of large solar dish/converter systems. Several industry partners have expressed interest in deploying test systems at NREL.

  Dish location is flexible. The dishes could be located near existing buildings or within the test site area as long as the systems are not shadowed by each other or other structures. Dishes would not be located in any of the designated Conservation Management Areas.

  The maximum height of the solar facilities would be approximately 40 feet (12.12 meters).

- **Fuel Cell Thermal and Moisture Management Research and Testing.** This improvement would require 1,000 square feet of space to house fans, heaters, coolers, humidifiers, and dryers to test fuel cells for fuel cell thermal and moisture management projects. It may involve construction of a new facility or space allocation in an existing or modified existing facility. This project would allow testing of various thermal and/or moisture management designs and hardware for fuel cells to evaluate their effectiveness for improving the performance and efficiency of fuel cells for mobile and stationary applications. Prototype fuel cells would be tested.

  The project is needed to assess a key issue for thermal and moisture management in fuel cells for transportation and stationary applications. Without proper thermal and moisture management, fuel cell performance and efficiency could suffer. This research could provide a better understanding of the fuel cells for application in various programs, such as Transportation, Hydrogen, Photovoltaics, Wind, and Distributed Energy Resources.

  The potential fuel cells to be tested would range from about 5 kW to 55 kW. The work would also require a programmable electrical load for running fuel cells. Electricity requirements would be a conventional system with a potential draw of up to 20 kW. To run the fuel cells, hydrogen (from compressed cylinders or direct feed line from a hydrogen storage tank), or possibly other fuels such as ethanol or gasoline, would be used. Telecommunication, data, water and drainage improvements would also be needed. Ductwork to exhaust the emissions from the fuel cell (mostly water vapor) out of the building and hydrogen ventilation would be necessary.

- **Installation of a 25kW Electrolyzer (Renewable Energy-Hydrogen Hybrid Power) System.** An electrolyzer is a device to store energy in hydrogen. This activity would most likely be conducted at the Hybrid Test Facility or DER Test Area. Testing of an electrolyzer with wind and photovoltaic systems is proposed to assess the technical issues involved in using hydrogen as a storage medium for renewable energy systems, a key issue for

renewable energy generation. All renewable energy technology programs would benefit from a better understanding of the potential of hydrogen as a storage medium for intermittent energy generation systems.

- **Renovation of the East Wing of Building 251 and 253A**. This renovation would allow for all existing uses, while reallocating space for approximately 18 additional offices and a slight increase in space for the library. The office space would be a mixture of cubicles and enclosed offices. Additional library space would allow for storage of materials currently stored in temporary containers. There is insufficient office space in the existing facilities (Buildings 251 and 254) at the NWTC to house all of the research and support staff. Renovation of the east wing of Building 251 offers a viable alternative to constructing new buildings for offices. These offices are for staff members currently housed in trailers.

  The east wing was originally designed as laboratory and work shop space and therefore is not properly configured for office space. The infrastructure and building structural changes necessary are minimal since all of the current interior walls to be removed are non-load bearing, and there is sufficient electrical infrastructure to support any new loads. Heating, ventilation and air conditioning (HVAC) equipment would be the only major infrastructure necessary to adequately support the new offices.

  There is an option to renovate Building 253A (the former switchgear building that has been replaced) for the Facilities Building Technician and parts storage. The design also includes an option to make more wall space available in the electrical/mechanical rooms 116 and 115 for additional electric panels/terminations. The actual number and ratio of enclosed offices to cubicles would be determined by selection of options already designed during the scope and estimate phase. These options would be exercised at the time of the construction contract award.

- **Modification of Existing Facilities.** Existing facilities on the NWTC may be modified or expanded, including interior and exterior modifications or additions, to accommodate new research proposals or the supporting operations and activities.

Infrastructure Modifications and Improvements

The construction of new facilities and modification to existing facilities and research areas, and the need for technology upgrades, generates a series of infrastructure needs and proposed improvements. In addition to those noted in previous sections, the following infrastructure modifications and improvements are proposed:

- **Upgrade the Existing Electrical Infrastructure.** As the NWTC grows with new and larger research equipment being tested, the existing electrical system capacity would eventually become inadequate and a major electrical system upgrade would be necessary. This upgrade would require input from Xcel Energy to identify the closest adequate power source, likely power line route, required transmission line voltage, and required substation equipment. It is possible that the new electrical system upgrade transmission lines could enter the NWTC site at a different location from the existing transmission lines. It could then be routed to a different location from the existing underground utility corridor. All details concerning the electrical upgrade would be finalized during the design phase.

This increased capacity is necessary to install and test commercial turbines in the multi-megawatt utility-scale class and to support other on-site improvements. This capability would be necessary for integrated turbine tests, and to supply power and regenerative capacity for a proposed larger structural test facility and a larger dynamometer facility. It would also support other proposed improvements, such as the proposed DER facilities.

The increased capacity would most likely include increasing the service capacity of the overhead Xcel Energy feeder lines from Highway 93 to the NWTC property line. In addition, the buried 13.2 kV lines at the NWTC would have to be upgraded or replaced. Two infrastructure changes on NREL/NWTC property would be necessary.

The first change includes two options that may be implemented individually or in combination.

1. Option 1 would be to upgrade the current switchgear and buried 10 MVA cable coming into the existing switchgear building to 20 MVA. This option would likely require a 20-foot wide construction corridor and trenching from the west property line to Building 253 along the current buried cable path.

2. Option 2 would bring in a separate 10 MVA feeder line on the southern part of the NWTC property to feed the turbine sites from the separate line with different switchgear, or possibly a substation. This option would require new trenching across the southern part of NWTC property to install the switchgear or substation and connecting line to the existing turbine grid, as well as any new infrastructure installed for the new turbines.

The second change would be to add the buried electrical infrastructure, switches and transformers necessary at each of the new turbine locations on the NWTC to accommodate installation of the new machines and buildings such as a new Dynamometer.

Standby generator capacity would be evaluated with each new project proposal, and would be upgraded as needed.

- **Extend Natural Gas from Highway 93 to the Site.** This improvement involves two options for the alignment of a medium-pressure natural gas line to the NWTC site:

  1. Northern Option (Option 1) – 6,170 feet (1,869.5 meters) in length
  2. Southern Option (Option 2) – 7,050 feet (2,136.1 meters) in length

  As shown in Figure 2-2, *Proposed Options for the Natural Gas Line,* Option 1 would tap into the existing four-inch gas line located in a utility easement east of Highway 93 at a point just west of the site's southwestern corner. A new gas pressure regulating (REG) station would be added at or near the connection point. The alignment would follow Highway 93 north, turn east toward the site's western boundary, then follow an existing underground utility corridor in a northeasterly direction. The remainder of the alignment would follow an existing utility corridor along the site's northern boundary. The eastern terminus of the line for NWTC's purposes would be the connection to Building 251.
  Option 2, the Southern Route, is identical to Option 1 east of the point where both lines would meet the site's northern boundary. As shown in Figure 2-2, Option 2 would connect into the existing line south of the Option 1 connection point along Highway 93. The Option 2 alignment would head due east along an easement through open land on the LaFarge

aggregate processing site where it would then run along access roads and cross a railroad spur that serves the aggregate operations. The alignment turns north at the NWTC site's southwest corner and then roughly follows the most westerly access road (Row 1).

Xcel Energy, the local gas provider, has requested an easement across the site to Highway 128. Xcel would use the easement to install only the line needed by NWTC, and could use the easement to form a future service loop through the NWTC site. The pipeline is expected to be a medium pressure design using a polyethylene type piping material operating at a maximum operating pressure of 60 psig with a maximum standard metering pressure of 2 psig. A 20-foot wide construction easement would be required for the length of the pipeline route. Construction proposed for summer 2002 would terminate at Building 251.

This project would provide pipeline "stub-outs" for all of the major NWTC buildings. However, as funding becomes available, future projects would connect the existing buildings and convert electrical mechanical equipment to gas-fired equipment for space heating and domestic hot water usage. Future projects are expected to be served by the natural gas line and include conversions at:

- Building 251 space heating and domestic hot water to natural gas;
- Building 252 space heating to natural gas;
- Building 254 space heating and domestic hot water to natural gas;
- Building 255 space heating to natural gas; and
- Building 256 space heating to natural gas.

In addition, a natural gas vehicle fueling station would be constructed as funding becomes available.

The initial purpose of this pipeline is to support research activities involving micro turbines. Currently, propane is used for testing of micro turbines. If a natural gas line were installed, the micro turbines would operate on natural gas, although the capability to use propane on the NWTC site as a fuel in future research, operations, or vehicle applications may remain.

Upgrade and Extend Telecommunications Infrastructure. This improvement would involve installation of a copper and fiber optics spine to new or expanded facilities (e.g., Systems Interconnection Test Lab/Hybrid and Systems Test Lab, Large MW Dynamometer Test Facility, Large Structural Blade Test Facility) and test sites to support NWTC data and telecommunication requirements. A secure location would be developed to house additional network and telecommunications equipment.

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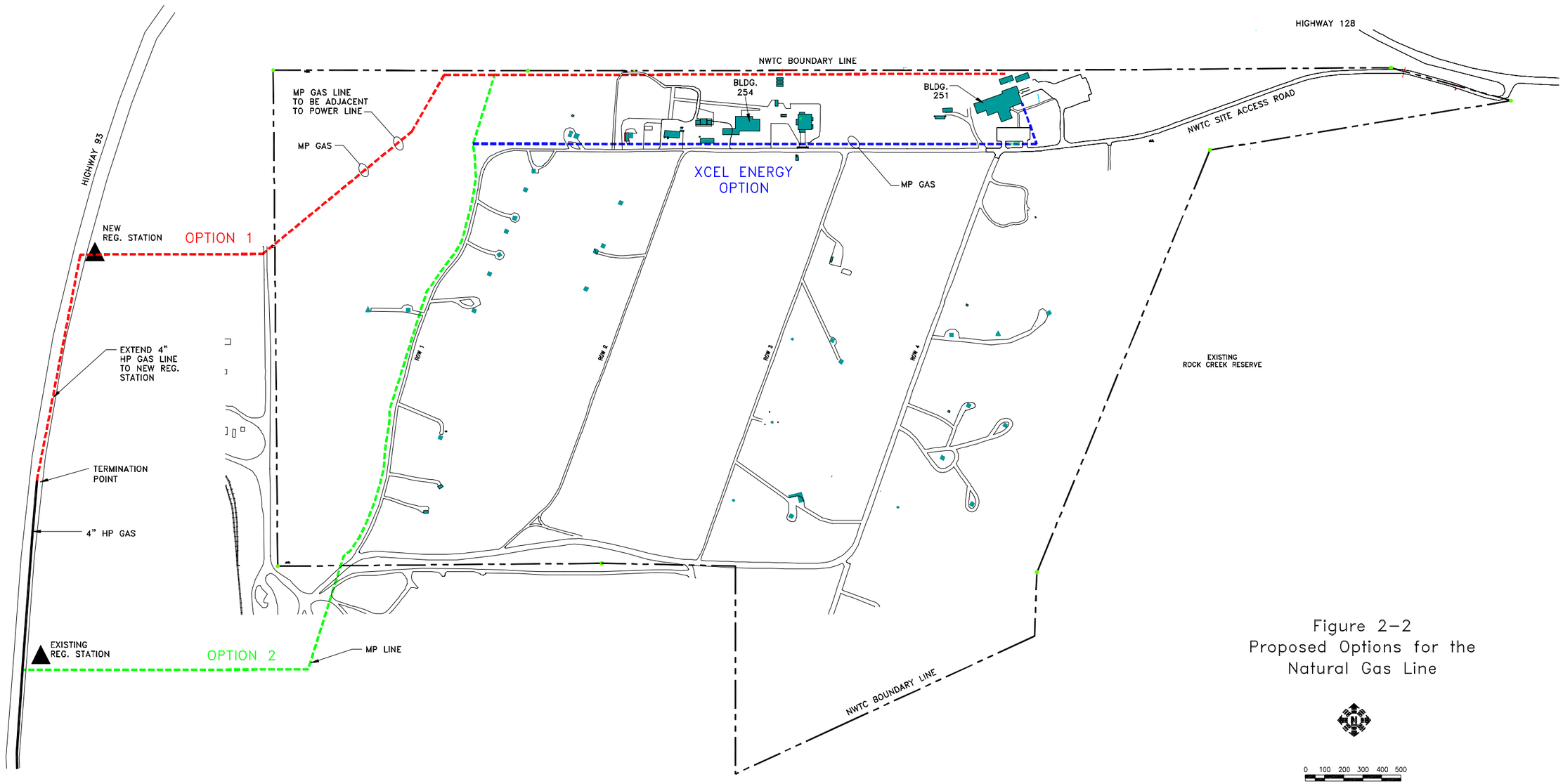

Figure 2–2
Proposed Options for the Natural Gas Line

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- **Upgrade Existing Domestic Water System.** The current water system involves delivery of water via truck and on-site storage. Proposed new facilities expected to require domestic water include the: Structural Blade Test Facility, Large MW Dynamometer Test Facility, System Interconnection Test Lab, and Hybrid and System Test Lab. These additional buildings, increased facility use and more on-site employees would require more frequent truck deliveries. Underground pipes would have to be installed from the domestic water loop to any new facilities requiring domestic water. It is also possible that additional tank storage capacity and associated equipment upgrades may be necessary. In certain circumstances, as in the case of a proposed facility outside the domestic water loop, an entirely new domestic water system would be installed.

- **Upgrade Sewage System.** Proposed new facilities are expected to require additional sewage disposal systems. The size of each septic tank and leach field would be based on maximum staffing and soil conditions surrounding each new facility site. Septic tank systems would be added as part of the following new facilities: Structural Blade Test Facility, Large MW Dynamometer Test facility, System Interconnection Test Lab, and Hybrid and System Test Lab.

- **Upgrade Fire Protection System.** The existing fire protection system is generally adequate for future buildings as identified. However, any new facilities would have to be connected to the fire protection system through underground piping, and additional fire hydrants would likely be needed, depending on final building locations. In addition, it is possible that additional tank storage would be required. Specific requirements would be identified during design of new facilities and projects. Development of test sites on the southern end of the site or facilities placed outside the fire protection loop may require installation of a new, separate fire protection system.

- **Upgrade and Modify On-Site Roads, Parking Areas, and Site Entrance.** On-site roads and parking areas would be resurfaced, upgraded, or modified in size or location, as necessary, to most effectively and safely support on-site activities. Access roads to new facilities and test sites would be installed. The site entrance at Highway 128 would be modified, as necessary, to provide safe site access and adequate traffic flow. This may include widening to provide additional acceleration and deceleration lanes on the highway, realignment of the on-site road or highway, widening of the on-site road, or other needed modifications. Any modifications to Hwy. 128 would be coordinated with the Colorado Department of Transportation.

- **Implementation of Security Improvements and Modifications.** Additional or modified site entrance protection improvements and perimeter protection improvements (fences) will be implemented, as necessary. These improvements and modifications would include: an approximately 10 foot (3 meters) by 16 foot (5 meters) guard station located immediately north of the current gate that would incorporate various renewable energy, energy efficiency features such as a trombe wall and a small (demonstration size) wind turbine. The trombe wall is a passive solar space heating feature.

Site Activities and Routine Maintenance

The following paragraphs document typical activities that are anticipated to occur routinely during the course of research and operations at the site. Many of these routine activities are currently ongoing and would continue at the same or an increased scale or frequency. Other activities listed below would be new.

- **Office and Lab Work.** Office-type work at computer workstations and activities associated with a variety of dry laboratory environments would be common. Destructive structural testing to failure of blades and blade components using hydraulic actuators and overhead cranes is a group of related indoor activities on-site. Also occurring indoors would be work at the 2.5 MW Dynamometer Facility, which involves testing of wind turbine components and integrated wind turbine drive trains. Other labs would conduct work on hybrid electrical systems using large electrical bus connections and computers. The work would involve power electronics design, assembly, bench testing, modal (vibration) instrumentation, calibration, and equipment maintenance. Some labs would be used for wind turbine component assembly. These components would then be tested within the labs or installed at one of the field test sites.

- **Installing and Removing Wind Turbines, Meteorological Towers and Instrumentation, and Installation of the Necessary Infrastructure.** Work at NWTC would require use of heavy equipment such as cranes, boom trucks, lifts, fork trucks, tractor-trailer trucks, backhoes, front-end loaders, flat bed trucks, as well as four-wheel drive pickup trucks. Installation and maintenance of meteorological instruments, towers, and turbines would be accomplished using lifts, boom trucks, and tower climbing equipment. Ancillary activities would include loading and unloading components, turbines, towers, and blades from trucks using hoisting and rigging equipment. Since only the main east-west road (West 119th Avenue) is paved, access to most of the active sites is over gravel roads. Other associated work, such as excavation for installation of concrete and electrical infrastructure, would require compaction, leveling and reseeding of the disturbed ground.

- **Installing, Testing, Monitoring, and Removing Distributed Generation Equipment and Installation of the Necessary Infrastructure.** Work at NWTC would require use of heavy equipment such as cranes, boom trucks, lifts, fork trucks, tractor-trailer trucks, backhoes, front-end loaders, flat bed trucks, as well as four-wheel drive pickup trucks. Other associated work, such as excavation for installation of concrete and electrical infrastructure, would require compaction, leveling and reseeding of the disturbed ground. Electricians, mechanical and electrical technicians, engineers, and management staff would monitor ongoing site research activities as required, and would perform necessary maintenance on equipment.

- **Maintenance and Monitoring of Atmospheric and Wind Turbine Experiments, Tests and Certifications**. Electricians, mechanical and electrical technicians, engineers, and management staff would monitor ongoing site research activities as required, and would perform necessary maintenance on equipment.

- **Site Amenities**. Site amenities would consist of improvements such as foot and bicycle trails, sidewalks, and outdoor gathering areas. These outdoor areas may include benches, tables, gazebos, or small recreation areas. Building 251 remains the primary administrative

building for the site and, as a result, would be the location of many staff and visitor amenities on the site. Other populated buildings would have outside gathering/amenity areas appropriate to staffing levels, as required. Wood fencing would be used to temporarily provide windbreaks and protect young trees as they mature into natural living windbreaks. Additionally, earth mounds and berms would be constructed to provide ground level protection from high winds. Sidewalks for pedestrian and bicycle traffic would be installed as needed.

- **Fuel Storage and Use.** On-site fuel storage and use could involve a variety of traditional and/or alternative fuels, such as propane, hydrogen, liquefied natural gas, ethanol, gasoline, diesel, biodiesel, and other diesel blends for research, site operations, and vehicle fueling. A Spill Prevention, Control and Countermeasures (SPCC) Plan is in place and will be updated as necessary for any additional fuels brought on site.

- **Routine Tasks.** This category of activities is comprised of tasks such as:

  - Cleaning facilities and equipment, both research and site operations;
  - Inspections and audits of systems, processes, and equipment;
  - Equipment maintenance;
  - Landscape maintenance (e.g. mowing, trimming, weeding, replacement of plants, upgrades, etc.);
  - System testing, preventive maintenance, repairs of systems and components;
  - Snowplowing;
  - Road maintenance;
  - Re-alignment of on-site roads, parking lots, and the site entrance at Highway 128, as needed, to maintain safe and adequate traffic flow;
  - Pest control, including control of such pests as rodents and insects;
  - Preventive maintenance including such items as changing air filters and testing diesel generators;
  - Corrective maintenance including such items as changing light bulbs, replacing leaking pump seals, resetting circuit breakers and performing minor repairs;
  - Troubleshooting malfunctioning items and systems related to facilities;
  - Coordinating outside subcontractors with such items as water testing, pest control, water deliveries, and crane inspections;
  - Providing historical information and technical recommendations concerning building and facility operations;
  - Maintenance, testing, upgrades, modifications, and additions to the fire protection system, including, but not limited to, installation of additional storage tanks, distribution piping and equipment, fire hydrants, and monitoring capability;
  - Maintenance, including water deliveries, testing, upgrades, modifications, and additions to the domestic water system including, but not limited to, additional storage tanks, additional distribution points (buildings), distribution piping and equipment, treatment equipment, and monitoring capability; and
  - Maintenance, testing, upgrades, modifications, and additions to wastewater handling capability at the site via individual sewage disposal systems including, but not limited to, new septic tanks, leach field additions and/or expansions, and other tasks.

2.1.2 Long-Term Components (2007-2021)

Long-term improvements are envisioned to take place beyond the 5-year time frame. Figure 2-3, *Proposed Site Improvements: Long-Term (2007-2021),* presents the proposed long-term site improvements plan. In keeping with the bounding analysis approach, more assumptions and fewer details are provided because these long-term actions are more speculative in nature. The facility construction, research, development, and testing currently planned for the NWTC is dependent on changing federal budgets and priorities, so actual schedules for the improvements may differ from those used in the impact assessment process. The schedule assumptions used in this assessment are the best estimates that can be made at this time, and are intended to generate maximized incremental and cumulative impact circumstances.

For purposes of long-term, site-wide environmental review, the following “bounding analysis” assumptions have been made to represent likely site “buildout” conditions.

- The portion of the site designated for permanent facilities is developed in a manner consistent with current land use designations.
- Only facilities and facility modifications presenting environmental consequences and risks approximately equivalent to existing facilities are added. No high-risk chemicals, processes or circumstances are added.
- Existing test sites are not converted to allow for additional permanent development.
- Conservation Management Areas remain conservation areas.
- Maximum building heights of 75 feet.
- 50,000 square feet of new laboratory, office and/or other support space (in addition to specific facilities discussed earlier in this chapter under short-term improvements).
- 300 total employees on-site.
- New on-site road connections and parking areas are constructed.
- Utility extensions are installed to new development site.
- No major, off-site road or utility services other than a permanent natural gas pipeline are implemented.
- Maximum individual turbine capacity is limited to 5 MW.
- No more than five large-scale (5 MW) turbines are located on the site at any one time.

Figure 2-3 presents a general representation of the area where buildings, parking areas, and other improvements would be located. Turbines and turbine test sites would be located south of this area.

2.2 NO ACTION

The No Action Alternative would leave the site in its current configuration, add no new facilities, and maintain current levels of research, operation and management activities.

This EA considers the existing site facilities and operations in 2001 to be the baseline condition for environmental impact analysis. This is a conservative approach because some of the improvements and operational parameters for the NWTC set forth in the 1996 EA were cleared under NEPA, but have not been constructed or fully implemented.

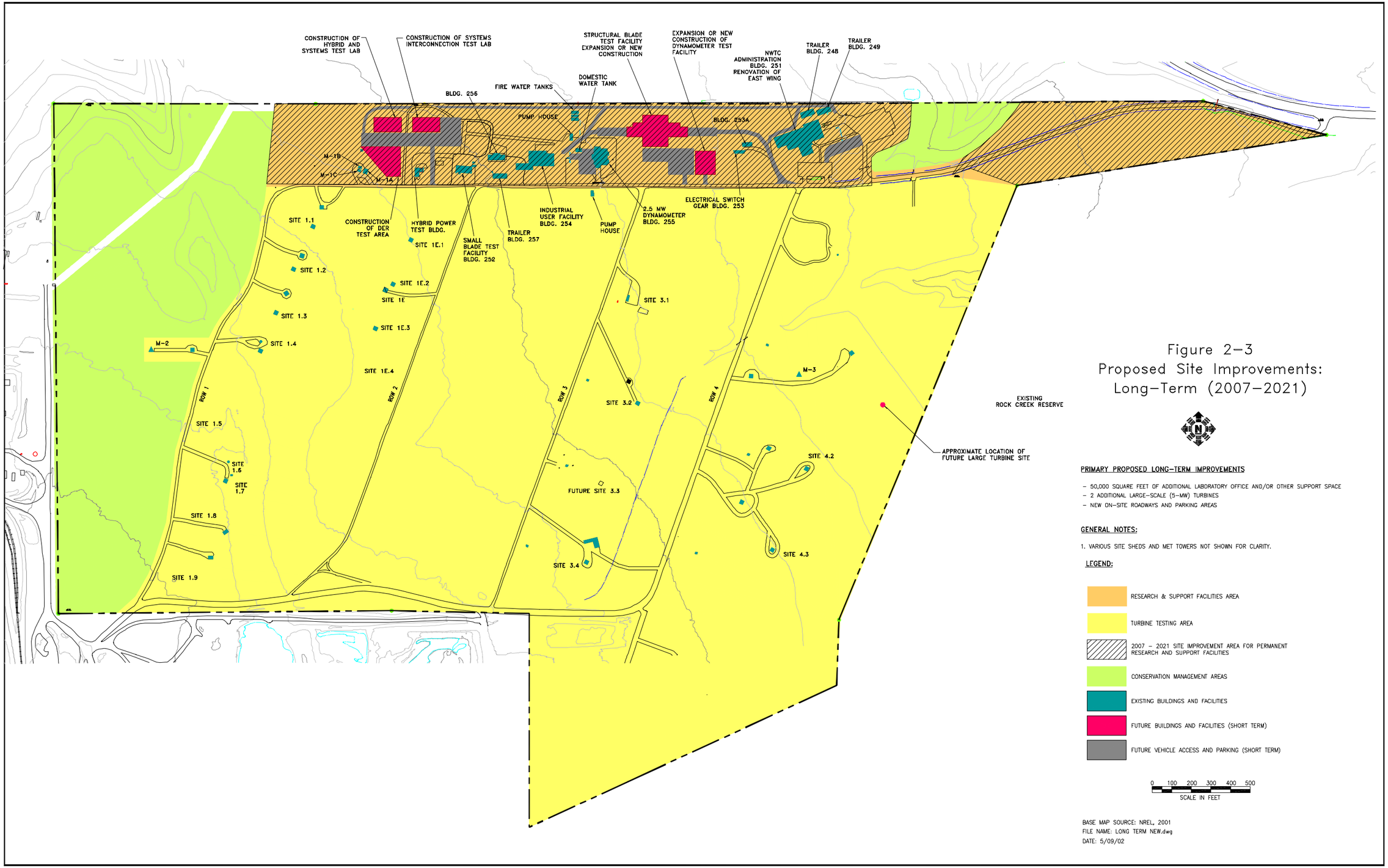

Figure 2–3
Proposed Site Improvements:
Long–Term (2007–2021)

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3. AFFECTED ENVIRONMENT

Chapter 3 of this Site-Wide EA describes the existing environmental, social, and economic conditions directly and indirectly related to the project site, site circumstances, and the Proposed Action.

3.1 LAND USE, PLANNING, PUBLIC POLICY, SOCIOECONOMICS

3.1.1 Existing Land Uses

Project Site

The NWTC is located within the northwest corner of the RFETS. The NWTC and RFETS are located in unincorporated Jefferson County. The NWTC's northern boundary is the Jefferson County/Boulder County line. Unincorporated portions of Jefferson County and the communities of Arvada, Westminster, Broomfield, and Superior are located east of RFETS (see Figure 1-2). Boulder County owns the land located north of Highway 128 and generally west of McCaslin Boulevard and the land between Highway 128 and the NWTC's northern border. The western limits of the Town of Superior include some parcels west of McCaslin Boulevard and north of Highway 128. The Town of Superior has also annexed the right of way for Highway 128 to a point immediately east of the NWTC access road intersection with Highway 128. The land immediately east of RFETS (east of Indiana Street) is within the City and County of Broomfield and City of Westminster (see Figure 1-2). Past annexations have changed jurisdictional boundaries further east and south in recent years. Some annexation efforts are still pending (Oglesby, 2001).

Land uses on the project site include research and development facilities, office buildings, and test sites. The largest structure is Building 251, which is the main office building on-site (see Chapter 1, Chapter 2 and Figure 1-3 for additional details about existing land uses). Photographs of the project site and vicinity are presented at the end of Chapter 3 as Figure 3-2.

The test site area is located south of the main site access road and occupies most of the site. Test sites are composed of utility connections, various foundations for meteorological and turbine towers, and associated equipment and facilities. Development on and around the test sites is temporary and may include small utility buildings, foundations for guy wires, and temporary and/or permanent access roads.

Surface rights at the NWTC are owned by DOE. Mineral rights are owned by private entities. The mineral rights for the western 160 acres of the site are owned by Rocky Mountain Fuel and apply to the extraction of coal, shale, oil, and natural gas. The mineral rights for the eastern 145 acres of the site are owned by the Spicer family and are currently leased by Mineral Reserves, Inc. (see Figure 3-1). Active aggregate mining and processing facilities are located to the south and west of the NWTC.

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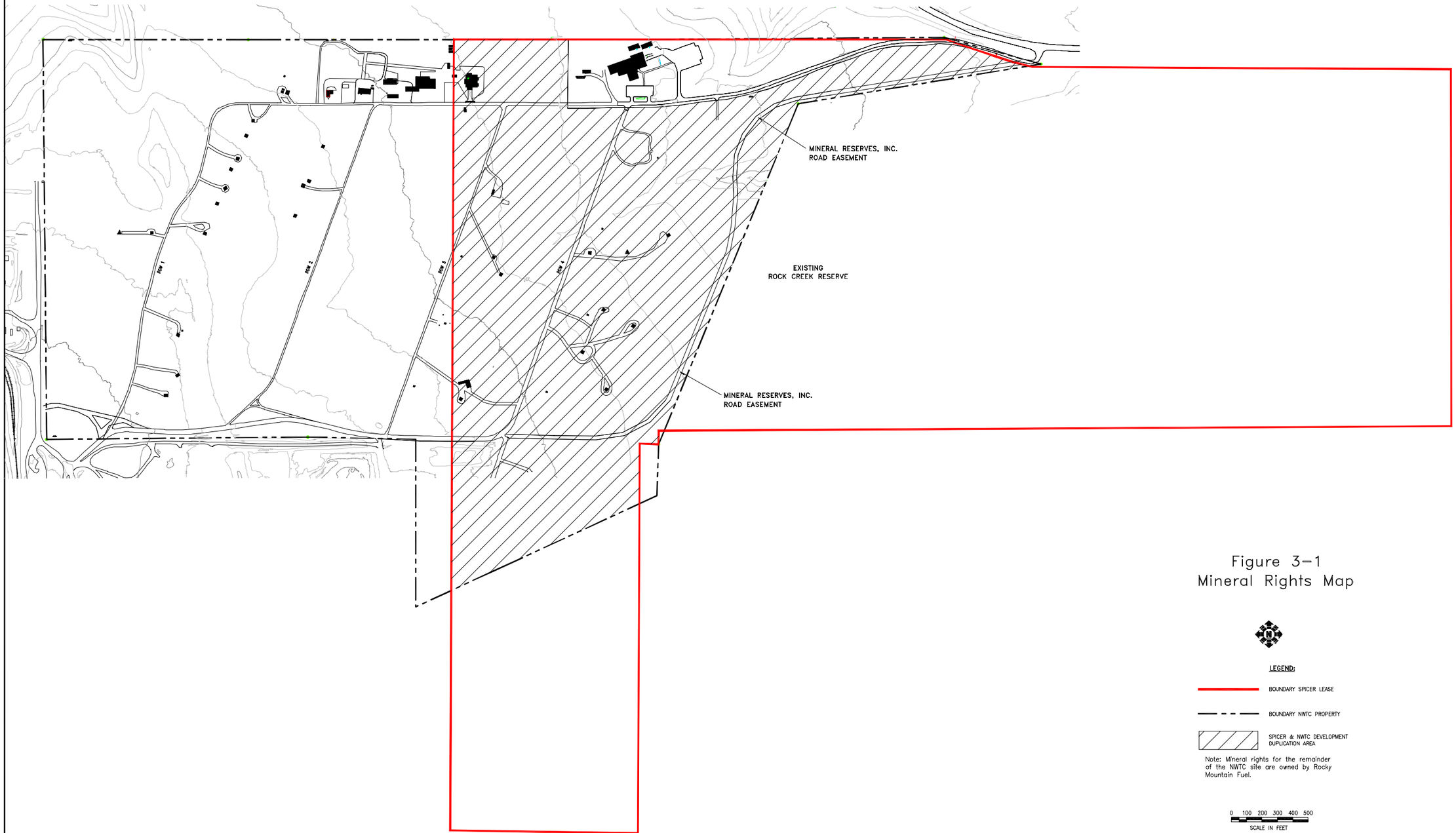

Figure 3–1
Mineral Rights Map

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A July 27, 1995 Utility Right-of-Way Grant of Easement and an MOU between Western Aggregates, Inc. and the DOE (Golden Field Office) created a 20-year moratorium on mining activities on the eastern 120 acres of the site. Via this agreement, DOE granted a road easement over which Mineral Reserves, Inc., as successor in interest to Western Aggregates, Inc. and a corporate affilitiate of LaFarge West, Inc., may construct, at no cost to DOE, a roadway connecting LaFarge facilities to Highway 128. The general location of the easement is shown in Figure 3-1.

The road to be placed in the easement is not described in the utility easement MOU. No road facility has been designed or proposed, and there is no short-term or long-term plan or schedule in place for use of this easement. Consequently, construction and use of a road within the easement is not considered in this analysis. Any proposal by Mineral Reserves, Inc. to develop/use the road easement would be subject to a separate NEPA analysis when a formal proposal is submitted for DOE consideration.

Surrounding Areas

Land uses on properties contiguous to the site include dedicated Boulder County and City of Boulder open space to the north, dedicated buffer lands of the RFETS and the recently designated National Wildlife Refuge to the east and south, and industrial uses (AMS Drilling and Blasting) to the west and aggregate mining to the southwest. Beyond the industrial and aggregate facilities and west of Highway 93 is the Hogan Ranch, including a single-family dwelling and ranching facilities. The Rocky Flats Lounge is located south of the Hogan Ranch on the west side of Highway 93. Old Tyme Lumber (sawmill) and undeveloped parcels of land currently offered for commercial development are located along the east side of Highway 93, south of the site and west of the RFETS boundary. This land, the Church Ranch Business Park and the Vauxmont area (located south of Rocky Flats and east of Highway 93), are undeveloped or underdeveloped at this time. Most of the land west of Highway 93 is dedicated open space. However, there is some existing and planned residential development in the mountains where Highway 72 enters the mountains.

The project vicinity beyond these contiguous areas is characterized by open space to the north and west, expanding residential and commercial development to the east involving the communities of Superior, Arvada, Broomfield, Westminster, and unincorporated areas of Jefferson County, and the industrial facilities on the RFETS to the south.

The aggregate mining facilities west and southwest of the site are comprised of surface excavations, material conveyors, rail lines and processing facilities. Two companies, TXI and LaFarge operate on separate, but contiguous sites located between Highway 93 and the project site's western boundary. Mineral Reserve, Inc.'s aggregate mining operation is located south of the site.

Jefferson County Airport is located due east of the site near the U.S. Highway 36/Highway 287 interchange. Airport runways are aligned in a northeast/southwest configuration. Aircraft takeoff and landing patterns do not pass directly over the NWTC.

3.1.2 Applicable Local Plans, Policies and Anticipated Future Development

Although the land use plans and policies of local governments are not applicable to federal lands, these plans and policies set forth important affected environment context for the site and surrounding areas. The following discussions focus on land use and planning matters. Policies associated with specific technical issues, such as traffic and visual resource protection, are addressed in the corresponding sections of this document.

Rocky Flats Environmental Technology Site (RFETS)

The current mission at RFETS is cleanup and closure with remediation efforts to be completed by 2006. Legislation recently approved by Congress has dedicated the site as a National Wildlife Refuge.

Boulder County and City of Boulder

Boulder County and the City of Boulder jointly own and manage open space north of the project site (Moline, 2001). Two trailheads are located near the intersection of Highways 93 and 128. The Greenbelt Plateau trailhead is located just east of the intersection along Highway 128. This trailhead provides parking for trails to the north. The Flatirons Vista trailhead provides parking for hikers headed west. No trailheads or trails have been provided southeast of the intersection of Highways 93 and 128. The Colton trailhead on the north side of Highway 128 is located approximately one mile (1.6 kilometers) east of the NWTC entrance to Highway 128. This trailhead provides parking for a trail north of Highway 128.

No land development in the project vicinity is planned within Boulder County or the City of Boulder (Moline, 2001).

Jefferson County

The Jefferson County North Plains Community Plan, prepared in April of 1990, provides goals, policies and design guidelines for an area called the North Plains Study Area. The Study Area boundaries are roughly defined by the Boulder County/Jefferson County/Adams County lines to the north and east, I-70 and U.S. Highway 58 to the south, and the base of the mountains west of Highway 93. The NWTC is located in the Study Area's North & Central Subarea. The NWTC site and the remainder of the RFETS are designated as a "Special Use" on the plan's Summary Map. Areas south and west of the Rocky Flats site are designated for retail, office or industrial uses.

The Jefferson County zoning for adjacent private properties is I-2 Industrial-Two District. A wide range of manufacturing, processing, and fabrication uses, along with many other industrial activities including rock crushing, are permitted in the I-2 District.

Jefferson County has a 30-day site approval process for new development proposals. NREL and the NWTC are not required to follow this process for new facility development (Gibson, 2001).

Superior, Broomfield, Arvada and Westminster

The communities of Superior, Broomfield, Arvada and Westminster address land use issues west of U.S. 36 and east of the project site. There is no single unifying plan for development in this area, but these communities are working together to address rapid development and development pressures in this fast growing part of Colorado.

The Town of Superior is located between the Boulder-Denver Turnpike (U.S. 36) to the north and Highway 128 to the south, just six miles east of the City of Boulder. Superior is in Boulder County with a small southern portion of land in Jefferson County.

In 1987, Superior approved a proposed development southeast of the original town that would allow new residential development and the creation of both a water and sewer treatment plant. The treatment plants would have the capability of providing clean water and sewer service to all of Superior, even after full development. The new development is known as Rock Creek Ranch. Although the land was subdivided in 1987, development is still ongoing. Through the year 2000, approximately 1,900 single-family homes and 1600 multi-family homes have been developed in Rock Creek, with an additional 171 homes in the Sagamore subdivision.

Superior recently selected a consulting firm to help update Superior's Comprehensive Plan. A Draft Preferred Land Use Alternative map for Superior was the first step. This map represents a combination of input received from citizens, the Town Board, and the Planning Commission. An update of the Community Framework Plan, a detailed graphic representation of future development, was recently submitted for review. This plan anticipates future development that includes commercial and retail development, multi-family residential units, single-family homes, and a second school.

Superior's population as presented in the year 2000 Census is 9,011. The City's current estimate is 11,600 residents. Superior anticipates a buildout population of approximately 15,400. Buildout forecasts have been altered by recent economic changes. The City currently estimates buildout will occur in 2010 (Hoffman, 2001).

Over the last five years, Broomfield has grown extensively with the buildout of the Interlocken Business Park, the opening of Flatirons Crossing Mall in August of 2000 (1.5 million square-feet), and peripheral commercial and office development. As a result of development in Superior, Broomfield, Arvada and Westminster in the last five years, land use conditions along Highway 128 from U.S. 36 to McCaslin and east of RFETS have been transformed, and more sites are set for future development. However, the unusually rapid growth in office development has abated to some degree due to economic changes in the telecommunications industry, high technology, and internet (.com) market sectors. Consequently, the fastest growing commercial area in the state now has the highest office vacancy rates in the state. In addition, regional land development and corresponding traffic forecasts by the Denver Regional Council of Governments (DRCOG), the local Metropolitan Planning Organization (MPO), and those used in the recent Northwest Quadrant Feasibility Study, now may overestimate long-term development rates (Oglesby, 2001)

Overall Future Development Pattern

Based on future use of the RFETS as a National Wildlife Refuge, long-term public open space acquisitions, natural resource preservation efforts, and restoration requirements for aggregate

mining areas, the NWTC will be virtually surrounded by large tracts of undeveloped land long into the future. The only substantial areas for development will be narrow areas along Highway 93 west of the site and properties located east and south of RFETS in Broomfield, Westminster, Superior and Jefferson County.

3.1.3 Population Growth

The U.S. Census Bureau, state governments, and various local governments collect demographic information. The U.S. Census Bureau has released only a portion of the information that was accumulated during the 2000 Census. Currently available information provides details of population, race, and ethnicity.

Jefferson County

In summary, Jefferson County is Colorado's second largest county and has the largest unincorporated population in the state. Jefferson County grew 20.2% in the past ten years, from a population of 438,430 in 1990 to 527,056 in 2000. The County increased by 88,626 persons, a yearly growth rate of about 2%.

Denver-Boulder Metropolitan Area

The Denver-Boulder metropolitan area grew nearly 30%, from 1.85 million in 1990 to 2.4 million in 2000. For comparison, the Colorado Springs metropolitan area also grew 30% from 397,000 to 517,000, and the Greeley and Ft. Collins metropolitan areas both grew faster, at 37.3 and 35.1 percent, respectively. The largest county, based on the 2000 census, was Denver, with a population of 554,636 persons.

One of the fastest growing municipalities in Colorado was Superior. Superior is located due east of the NWTC and had a growth rate of 34% over the last 10 years (see Figure 1-2).

Colorado

Between 1990 and 2000, Colorado grew from 3.3 to 4.3 million people. The increase of slightly over 1 million persons was a 30.6% increase from 1990. The ten counties of the metropolitan Front Range increased from 2.7 million in 1990 to 3.5 million in 2000, or 30.0%, slightly less than the state average. However, the 800,000 increase in population in these 10 counties constituted over 80% of the increase in the state total.

3.1.4 Ethnicity and Income

Colorado’s population in 2000 was defined by the U.S. Census to be 82.8% white, compared to the U.S. average of 75.1 percent. There are no concentrations of minority or low-income populations in the vicinity of the NWTC.

3.2 TRAFFIC AND CIRCULATION

3.2.1 Site Circulation and Access

The project site has one primary access and a perimeter circulation road that begins at an intersection with Highway 128 and forms a loop within the site (see Figures 1-2 and 1-3). The intersection is controlled via a stop sign for vehicles exiting the project site. A deceleration lane exists for eastbound motorists on Highway 128. A left turn lane for entry into the site exists for westbound motorists on Highway 128 turning into the site. The site access road is paved from Highway 128 to the Hybrid Power Test Building. The remainder of the perimeter road and other site access routes shown in Figure 1-3 have gravel surfaces.

Highway 93 is located west of the site. Highway 93 and 128 intersect northwest of the site. A stop sign controls access to Highway 93 from Highway 128.

The NWTC granted a road easement across the site to aggregate operators to the south and west (see Figure 1-3). There is no short-term or long-term plan or schedule in place for construction of a road using this easement (see related discussions in Sections 1.2.2 and 3.1.1).

3.2.2 Traffic Volumes

Traffic volumes on roads within the project site are very low and well within current design capacities. Volumes on Highway 128 in the project vicinity are also low relative to the current design capacity even at typical peak hours. Volumes on Highway 93 are higher and can exceed design capacity during A.M. and P.M. peak hours. The Level of Service (LOS), a ratio of traffic volume to design capacity rated with the letters A-F (see Table 3-1), can reach Level F at the Highway 93/Highway128 intersection during the A.M. and P.M. peak hours, resulting in considerable delays for both left turn movements. The LOS at the project entry road is rated A at all times due to relatively low volumes and delays at this intersection.

Table 3-1 Level of Service as a Function of Volume to Capacity Ratios

Level of Service	Range of Actual Volume / Design Capacity Ratios
A	0 – 0.60
B	0.61 – 0.70
C	0.71 – 0.80
D	0.81 – 0.90
E	0.91 – 1.00
F	> 1.01

Source: Transportation Research Board, 2000 Highway Capacity Manual

3.2.3 Accidents

The Colorado Department of Transportation (CDOT) was contacted to determine accident history along Highway 128 and Highway 93. In summary, there were 139 reported accidents along the portion of Highway 93 in the vicinity of the Highway 93/128 intersection over a10-year

period (January 1, 1990 to December 31, 1999). An additional 86 accidents were reported along Highway 128 between Highway 93 and milepost 6.00 (6 miles east) during a five-year period (January 1, 1995 and December 31, 2001). Three people were killed in three separate accidents along Highway 93. A total of 96 people were injured in 58 injury accidents along Highway 93. Three people were killed along Highway 128. A total of 63 people were injured in 46 injury accidents along Highway 128. There were two recorded injury accidents within two tenths of a mile of the site access road/Highway 128 intersection. Neither one of these accidents occurred in the immediate vicinity of the site access road intersection (Ellison, 2001).

3.2.4 Future Road Improvements

CDOT, the Regional Transit District (RTD), and local governments are addressing substantial road and transit improvement needs in the vicinity of the NWTC. The major improvements are those associated with U.S. 36 and the Northwest Parkway projects. Improvements to U.S. 36 are expected to involve 4 lanes in each direction and improved bus and commuter rail service in the corridor between Denver and Boulder. The Northwest Parkway toll road will begin east of U.S. 36 and connect to Interstate 25 at 158th/E-470, providing an alternative east-west highway link to U.S. 36 and Interstate 70. Current plans call for an arterial roadway (no toll) that will connect to the Northwest Parkway and then pass over U.S. 36 without interchange connections. The arterial segment will intersect Highway 128 at the Northwest corner of the Jefferson County Airport east of the project site. Construction of the Northwest Parkway began July 19, 2001. These road improvements and surrounding land development are expected to add a considerable amount of traffic to Highway 128 while addressing transportation needs for new and anticipated development (Oglesby, 2001).

The most recent and relevant transportation planning study is the Northwest Quadrant Feasibility Study. The Final Report is dated January 31, 2001. This study was commissioned by Jefferson County with the Cities of Arvada, Golden, Lakewood, Westminster and Wheat Ridge with the goal to increase mobility, improve safety, and provide a higher level of service for transportation facilities over the next 20 years.

The City of Boulder and Boulder County were not noted as participants. The scope of the Study was to develop a set of transportation improvements that meet the project goal and facilitate adoption of the improvements. Highway 128 was the study's northern border. The western border was one mile west of Highway 93.

The Northwest Quadrant Feasibility Study proposes the following long-term improvements in the project vicinity:

- Widen Highway 128 to four lanes, two in each direction;
- Widen Highway 93 to four lanes, two in each direction; and
- Construct an interchange at the Highway 128/93 intersection.

Given high levels of demand for state and federal road construction funds, limited local funds and competitive processes for individual projects to be placed into the State's Transportation Improvement Plan (TIP) and the Regional Transportation Plan (RTP), it would be unlikely that these improvements would be constructed in the next five years, and highly likely that they would not be constructed within the next 10 or 15 years (Oglesby and Ellison, 2001).

No major interim improvements are identified for either highway or for the Highway 128/93 intersection. However, some widening of shoulders and bridges along Highway 93 has been done and may be done in the future to improve safety, especially for bicycles.

There are ongoing discussions involving an alternative north/south route on or between Highway 93 and Indiana Street. The purpose of this route is to create a link between the Northwest Parkway and West C470. The NWTC is within the alignment study area, but alignments that would use NWTC lands and other lands associated with RFETS would be somewhat indirect and would face considerable public, technical, cost and environmental obstacles. At this time, this project could be considered more speculative than foreseeable, but circumstances could change over the next few years that narrow the possible alignment corridor and make this project more foreseeable.

3.3 AIR QUALITY

To address minor incremental impacts from NREL operations, NREL implements an Air Quality Protection Program under NREL Policy 6-2.5. The purpose of the program is "to prevent the degradation of local air quality while helping to preserve the quality of the local and regional airshed to the maximum extent possible." The program applies to stationary sources, not to mobile sources such as vehicles. NWTC project managers notify the NREL ES&H Office prior to the beginning of any project that poses the potential for air emissions. The ES&H Office evaluates air emissions and permitting requirements early in a project's planning phase. The ES&H Office is notified of every new piece of fuel-burning equipment and changes in the status of existing equipment. The ES&H Office contacts the Colorado Department of Public Health and Environment (CDPHE) when necessary. The NWTC operates its emissions sources in compliance with all applicable State regulations. State permits are not currently required.

3.3.1 Climate

The NWTC location is characterized by a semiarid climate that exhibits large seasonal and short-term temperature variations typically associated with movement of large continental air masses. The central Rocky Mountains are usually dominated by high pressure and the plains by low pressure. High pressure frequently governs the weather along the Front Range, resulting in fair, dry conditions at the NWTC. Although the average daily temperatures at the NWTC are moderate, large diurnal temperature variations result from the site's 6,000-foot elevation and thinner atmosphere. Average daily winter temperatures range from 20 to 45°F. Average daily summer temperatures range from 55 to 85°F. Temperatures are generally above freezing from about mid-May through mid-September. The NWTC receives approximately 15 inches of precipitation per year. Seventy percent of the precipitation occurs in April through September. The average seasonal snowfall is approximately 65 inches. There are occasional periods of severe drought along the Front Range. Average mid-afternoon humidity is approximately 40%.

Pacific Northwest National Laboratory's Wind Energy Resource Atlas of the United States locates the NWTC in an area that typically exhibits Class 4 to 6 average wind power. Areas described as Class 3 or above are those that are potentially suitable for wind energy applications (NREL web site, 2001). Average wind speeds are approximately 9 miles per hour (mph) at the NWTC. About 35% of wind velocities range from 5.6 to 9 mph. About 34% of the

time, wind velocities exceed 9 mph. Thirty percent of the winds range from 2.2 to 5.5 mph. Winds are calm approximately 1% of the time. The predominant wind direction frequency is from the east-southeast with a mean wind speed of 14.1 mph. A secondary maximum is from the east with a mean wind speed of 12.8 mph. Winds are usually from the southeast or northeast during the day when air temperature warms. The wind direction reverses at night, originating from the northwest. The site is subjected to intermittent, extremely high velocity winds that are conducive to the research conducted at the NWTC. Strong westerly downslope winds can occur during the winter and early spring. Wind speeds as high as 100 mph have been measured during storm events near the NWTC (Integrated Natural Resources Management Plan and Environmental Assessment for Rock Creek Reserve 2000 – 2006, December 2000).

3.3.2 Air Quality Regulatory Authorities

Ambient air quality in a given location is characterized by comparing the concentration of various pollutants in the atmosphere to the standards set by federal and state agencies. The purpose of these standards is to allow an adequate margin of safety for the protection of public health and welfare from adverse effects resulting from pollutants in the ambient air. The primary pollutants of concern for which federal and state ambient air quality standards have been established include criteria pollutants, hazardous air pollutants, and toxic air pollutants.

National Ambient Air Quality Standards (NAAQS) set the absolute upper limits for specific air pollutant concentrations in order to protect human health. These pollutants are called "criteria" pollutants and consist of carbon monoxide (CO), nitrogen oxides (NO_X), sulfur dioxide (SO_2), particulate matter of 10 microns in diameter or less (PM-10), total suspended particulates (State of Colorado designation), ozone, volatile organic compounds (VOCs), and lead. A geographic area that meets or exceeds the limit for a particular pollutant is called a “nonattainment” area. Areas where pollutants are measured below the limits are called “attainment” areas.

Although the Denver area was not in attainment in the past for CO and ozone, it is expected that the area will be redesignated as being in attainment for both pollutants by the end of 2001. Although the NWTC is located in a non-attainment area for PM-10, Colorado has petitioned the U.S. Environmental Protection Agency (EPA) for re-designation of the area as attainment for PM. The Colorado Air Quality Control Division (CAQCD) expects the re-designation to be successful, and the change is expected to occur by the end of year 2002 (CAQCD, Jim Geiger and Mike Silverstein, July 2001). The EPA recently revised both the ozone and particulate matter less than 2.5 microns in effective diameter (PM-2.5) NAAQS; however, the revised limits will not be effective in the state until the EPA approves the Colorado State Implementation Plan. The Denver area is in attainment for the remaining criteria pollutants.

The State of Colorado has primacy to administer the Clean Air Act within the State. The Colorado Air Quality Control Commission (CAQCC) Regulation No.3, Air Contaminant Emissions Notices, provides the provisions for construction and operating permits. An Air Pollution Emission Notice (APEN) is required for:

- Each individual emission point in a non-attainment area with uncontrolled emissions of 1 ton per year (TPY) or more of any individual criteria pollutant, 100 pounds per year of lead, or exceeds the threshold quantity of any reportable pollutant, as defined by the Colorado regulations; and

- Each individual emission point in an attainment area with uncontrolled emissions of 2 TPY or more of any individual criteria pollutant or 100 pounds per year of lead.

Prevention of Significant Deterioration (PSD) regulations limit emissions of pollutants from new sources in attainment areas. In order to implement its policy of non-degradation, the EPA designated types of areas in which certain types of increments of additional pollution would be allowed. Class I areas include federal lands such as national parks, national wilderness areas, and national monuments. These areas are granted special air quality protections under Section 162(a) of the federal Clean Air Act. Class II areas allow additional, well-controlled growth. The NWTC is located in a Class II PSD area for criteria pollutants for which the area is in attainment. The nearest Class I area is Rocky Mountain National Park, approximately 27 miles to the northwest of the site.

Under PSD regulations, a construction permit may be necessary to install a new stationary source or modification of a stationary source (any building, equipment, structure, facility, or installation or any combination, including construction activities) prior to initiation of construction activities. Construction permits are issued on the basis of production/process rates as detailed in the APEN submitted with the permit application or as requested in the application as related to emissions of criteria and hazardous air pollutants.

The National Emission Standards for Hazardous Air Pollutants (NESHAP) are designed to protect human health and the environment by reducing toxic air emissions. The underlying authority for NESHAP is Title III of the Clean Air Act Amendments of 1990 (CAAA-90), which established a listing of Hazardous Air Pollutants (HAPs). Title III of the CAAA-90 specified requirements for the EPA to identify those source categories that emit, or have the potential to emit, one or more HAPs. For each source category identified, EPA was directed to promulgate NESHAPs using standards that are modeled on the best practices and most effective emission reduction methodologies in use at the affected facilities. Threshold quantities determine application of various requirements or exemption from those requirements.

3.3.3 Emission Sources at the NWTC

Emissions at the NWTC include those generated during normal and emergency site operations. Normal operations include placing or modifying tower locations, modifying power, data, and telecommunications cables, and the use of heavy and high-lift equipment associated with the replacement and maintenance of experimental systems. Personal and site vehicles also produce emissions. Fugitive dust is temporarily generated from disturbed soils during construction. Nearby industrial operations also generate fugitive dust and other emissions.

An air emissions inventory dated November 2001 indicates that the facility has 12 primary sources of air emissions. The primary sources consist of one generator used for emergency operations, one generator used to operate a pump used in fire fighting, two generators used in connection with towers, seven generators used with the Hybrid Power Test Bed, and one generator used with the operation of the distributed energy system. Emissions from the 2001 inventory are listed below in Table 3-2. Potential emissions values reflect the operation of all sources of emissions at the site on a continuous year-round basis. Actual emissions of these pollutants from the site are much less because the sources operate intermittently and reflect the amount of pollutants actually emitted.

With respect to hazardous air pollutants, the NWTC may, from time to time, emit acetone, cyclohexane, toluene, xylene, phosphoric acid, and sulfuric acid. The emission quantities are extremely small and use is infrequent. The actual emissions are well below permit and notification thresholds.

Table 3-2. Annual Emissions at the NWTC (Tons Per Year), 2001

	Particulates	SO2	NOx	CO	TOC
Potential to Emit	6.39	5.97	91.04	19.59	7.21
Actual Emissions	0.18	0.17	2.52	0.54	0.20

Source: Compiled from NWTC November 2001 emissions inventory

* Total Organic Compounds (TOCs) are volatile organic compounds plus carbon monoxide, carbon dioxide, carbonic acid, and metallic carbides.

3.3.4 NWTC Permit Status

After reviewing the CAQCC regulations, the NREL determined that submission of APENs associated with site operations is not required. An APEN was recently submitted to the CAQCD in preparation for construction activities associated with the Proposed Action. The CAQCD issued Permit No. 00JE0010L in March 2000, which expires January 31, 2005. NREL also submitted a fugitive dust plan for land development that addresses measures to be taken during construction activities. Fugitive dust consists of emissions that are unplanned and escape from a process by a route other than a stack, chimney, or vent. In cooperation with CDPHE, NREL is in the process of determining whether other permits are necessary.

3.4 NOISE

Noise is defined as unwanted or annoying sound that is typically associated with human activities and that interferes with or disrupts normal activities (Salter, 2000). Sound and noise are measured as sound pressure levels in units of decibels (dB). Response to noise varies according to its type, its perceived importance, its appropriateness in the setting and time of day, and the sensitivity of the individual receptor. Human hearing is simulated by measurements in the A-weighting (dBA) network, which de-emphasizes lower frequency sounds to simulate the response of the human ear. Some typical sound levels from common noise sources are presented in Table 3-3.

Table 3-3. Sound Levels* of Typical Noise Sources and Noise Environments (A-weighted Sound Levels)

Noise Source (at a given distance)	Scale of A-weighted Sound Level (dBA)	Noise Environment (equivalent)	Human Judgment of Noise Loudness (relative to a reference loudness of 70 dB*)
Commercial jet take-off [200 feet (60.6 meters)]	120		Threshold of pain *32 times as loud
Motorcycle [25 feet 7.6 meters)] Diesel truck, 40 mph [50 feet (15.2 meters)]	90	Boiler room Printing press plant	*4 times as loud
Garbage disposal [3 feet (1 meter)]	80	High urban ambient sound	*2 times as loud
Passenger car, 65 mph [25 feet (7.6 meters)], Vacuum cleaner [3 feet (1 meter)]	70		Moderately loud *70 dB (Reference loudness)
Normal conversation [5 feet (1.5 meters)]	60	Data processing center Department store	*1/2 as loud
Light traffic [100 feet (30 meters)]	50	Private business office	*1/4 as loud
Bird calls (distant)	40	Lower limit of urban ambient sound	Quiet *1/8 as loud

* These values are logarithmic measurements (i.e., every 10-dBA increase is perceived by the human ear as approximately twice the previous noise level; therefore, the motorcycle is twice as loud as the garbage disposal). Sound level intensity decreases by approximately 6 dBA for each doubling of distance from the source. Further reduction occurs when sound energy travels far enough to be appreciably reduced by absorption.

Source: U.S. National Park Service and Salter, 2001

3.4.1 Sensitive Receptors

There are no sensitive human noise receptors, such as residences, schools, hospitals, or daycare centers located in the immediate vicinity of the NWTC. The nearest residence to the NWTC is approximately 2,200 feet (667 meters) due west of the western site boundary and approximately 150 feet (45.4 meters) west of Highway 93. There are no other residences within a 4-mile (6.4 kilometers) radius of the site. Two City of Boulder Open Space parking areas and trailheads are also located near the site. The Green Belt Plateau trailhead is located immediately north of Highway 128 and is slightly less than 4000 feet (1212 meters) north of the site. The Flatirons Vista trailhead is located immediately west of Highway 93 approximately 5,000 feet (1515 meters) northwest of the NWTC. The relationship between noise and wildlife is discussed in Section 4.8.4 Wildlife.

3.4.2 Noise Sources and Existing Noise Levels at Sensitive Receptors

Two primary noise sources in the vicinity of the NWTC are State Highways 128 and 93. Highway 128 is located north of the NWTC. State Highway 93 is located west of the NWTC. Roadway noise depends upon vehicle type, speed, traffic volume, surface conditions, surface gradient, and distance between source and receptor. Passenger cars moving at 65 mph can generate 70 dBA, measured at 25 feet (7.6 meters) (U.S. National Park Service website).

Traffic on the NWTC contributes little to overall traffic noise at off-site locations because of the limited number of vehicles that access the site, speed limits restricting high vehicle speeds.

Another noise source in the vicinity is the aggregate mining and processing facility located immediately west of the site, between the NWTC and Highway 93. Industrial processes and equipment generate continuous and intermittent noise, which fluctuates depending on the level of activity at the site.

The NWTC is also a noise source in the vicinity. Noise generated from wind turbines on the NWTC and other activities on the site contribute incrementally to existing noise levels generated by other sources. Turbine operations create intermittent noise while in operation on various test sites. Currently, there are 21 test sites and use of these sites for turbines varies in terms of location and operational schedule. Noise is also generated from high-lift and support equipment when turbines are installed or removed. This noise is very temporary and may be considered equivalent to the noise generated by construction operations.

The two potential sources of operational noise from a wind turbine are mechanical noise from the gearbox and aerodynamic noise from the rotor blades. Mechanical noise has virtually disappeared from modern wind turbines as a result of engineering designs that minimize vibrations. Aerodynamic noise results from blade design and rotational speed. Blade tips and back edges are currently designed to minimize aerodynamic noise associated with higher rotational speeds (Danish Wind Turbine Manufacturers Association web site, 2001). Noise resulting from moving blades is characterized by low frequencies and are, therefore, less obvious to the human ear. Slower moving blades create less noise.

Sound level measurements obtained from representative turbines that have been and/or could be installed at the NWTC under current operational parameters are shown in the Table 3-4.

As shown in Table 3-4, larger turbines of the megawatt class do not necessarily produce more noise than small turbines (NWTC, Johnson, 2001). In this example, the data suggest that noise produced from the 50-kilowatt turbine would measure approximately 73.5 dB at a distance of 300 feet (91 meters), which is higher than the noise generated by either of the two larger turbines.

Table 3-4. Representative Sound Levels Generated by Individual Turbines

Rated Capacity (kilowatts)	Typical Sound Levels (dB)	Measurement Distance *
50	82.5	104.5 (31.7 meters
750	68	347 (106.2 meters)
1,500	60	307 (93 meters)

* Aerodynamic noise generated by turbine operations is measured at a specified distance from the base of the tower. The distance is obtained by summing the installed height of the turbine (from ground level to the hub) plus the length of one rotor blade (half of the total rotor diameter).

Rated Capacity (kilowatts)	Typical Sound Levels (dB)	Measurement Distance
50	73.5	300 (91 meters)
750	69	300 (91 meters)
1,500	60	300 (91 meters)

Source: NWTC, Johnson, 2001

Although noise measurements were not taken and noise modeling was not completed in association with the development of this document, estimates have been made to characterize the ambient noise levels on the site and in specific off-site locations. The ambient noise level at the NWTC consists of sound generated by on-site and off-site vehicle traffic, turbine operations, aggregate mining and processing activities, and natural sources, such as birds and wind moving through trees and across the terrain. When no turbines are operating, the acoustic environment within the boundaries of the site area is typical of a rural location, with day-night average sound levels ranging from 35 to 56 dBA (Final EIS on Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site, 1998), depending on specific circumstances. Actual noise levels in and around the site are affected by specific noise events, proximity to noise sources, intervening topography, vegetation, and meteorological conditions, including wind speed and direction.

In order to further characterize the existing noise environment, certain turbine operational assumptions must be made. This is complex because the NWTC turbine schedules are not pre-defined nor are specific locations for particular kinds of turbines. To establish estimates for maximum noise level generation, it has been assumed that the noise level generated by the site would need to account for simultaneous turbine operation at numerous test sites using the noisiest turbines and some mix of other turbines. For this discussion, it has been assumed that a noise level of 85 dB could be produced at a point located 100 feet from the base of the operating tower nearest to a specified receptor under worst-case conditions (NWTC, Johnson, 2001). The 85-dB noise level is slightly higher than the maximum noise level generated by the single, most noise-generating turbine on the NWTC (see Table 3-4). This level would be unusual and would not be sustained all day or for extended periods of time in a given week, month or year because of normal variations in wind speed and typical testing periods at the NWTC.

Table 3-5.displays noise levels associated with increasing distance from an 85-dB source.

Table 3-5. Combined Representative Sound Levels Generated by Turbines

Distance feet (meters)	dB
100 (30.6)	85
200 (60.6	79
400 (121.2)	73
800 (242.4)	67
1600 (484.8)	61
3200 (969.6)	55
6400 (1939.2)	49

Source: O'Hare Noise Compatibility Commission, 2001.

The estimated noise resulting solely from these assumed turbine operation conditions would be as follows:

- Nearest residence: approximately 59 dB, or slightly less than the noise resulting from normal conversation.
- Flatirons Vista Trailhead: approximately 52 dB, slightly more than the noise apparent in a business office.
- Green Belt Plateau Trailhead: approximately 50 dB, equivalent to the noise apparent in a business office or light traffic.

Note: These noise level estimates at off-site receptors were developed considering only the distance from the receptors to the nearest test sites to them. Other factors may reduce these levels further.

This incremental contribution would be insignificant relative to far higher existing highway noise levels and would be inaudible under most circumstances.

3.4.3 Regulations and Guidelines

Environmental noise regulations and guidelines for outdoor, neighborhood and/or community noise levels have been promulgated by the EPA, the Federal Highway Administration (FHWA), the State of Colorado, and local governments such as the City of Denver. Although these standards are not directly applicable to the NWTC, they provide a general context for assessing noise issues.

The EPA provides guideline noise levels in relation to anticipated noise/human activity disturbance impacts in relation to industrial construction and operations, below which the general public would be protected from activity interference and annoyance. Outdoor locations "in which quiet is a basis for use" are assigned a maximum noise level of 55 dBA. Indoor locations are assigned a maximum noise level of 45 dBA.

The FHWA has created Noise Abatement Criteria for actions that involve federal roads. A noise level of 57 dBA is assigned to lands on which "serenity and quiet are of extraordinary significance… and where the preservation of those qualities is essential if the lands are to continue their intended purpose." A 24-hour average level, weighted to address the increased significance of nighttime noise, of 67 dBA is a typical threshold for considering mitigation for residential sensitive receptor exposure.

Although the State of Colorado Noise Statute (CCR 25-12-101 though CCR 25-12-109) has established statewide standards for noise level limits for various time periods and areas, the standards exclude federal agencies such as NREL and non-profit entities; however, they can be used as guidelines in order to evaluate impacts. The most stringent permissible noise levels apply to residential zones, where the maximum permissible daytime (7:00 a.m. to next 7:00 p.m.) noise level is 55 dBA and the noise level is measured at a distance of 25 feet from the property line. In addition, construction projects are limited to permit conditions or 80dBA for the period within which the construction is to be completed (or reasonable amount of time).

The City of Denver has promulgated a noise ordinance that can provide another basis for ascertaining permissible noise levels. The type of premises on which the noise is generated determines allowable noise levels. In the case of the NWTC, the most conservative approach is to consider it an "industrial premises." The maximum allowable sound pressure level is 80 dBA measured at the site property line between the hours of 7:00 a.m. to 10:00 p.m. (Revised Municipal Code, City and County of Denver, Colorado, Ordinance No. 628-97, 22 September 1997, Supplement No. 55).

The DOE has accepted the Occupational Health and Safety Administration (OSHA) noise regulations and guidelines for worker exposure and manages compliance with them. These regulations and guidelines focus on noise from machinery, equipment and tools.

Noise levels generated by most turbines under normal operations at the NWTC are within recommended levels, but older and smaller models operating in an unusual manner (together over extended periods of time) could approach certain standards within site boundaries. No standards are reached or exceeded at any off-site sensitive receptors under any reasonable scenarios.

3.5 VISUAL QUALITY/AESTHETICS

3.5.1 Visual Characteristics of the Project Site and Vicinity

Figure 3-2 presents 21 photographs to characterize existing visual and aesthetic conditions of the site and vicinity from key vantage points. These photographs are presented at the end of Chapter 3 and are referenced throughout Chapter 3, as appropriate.

The visual characteristics of the site are created by permanent facilities, temporary or transient facilities, and natural conditions (see Figure 3-2, photographs 1-9). The permanent facilities are primarily composed of buildings, roads, parking areas and test sites. The temporary or transient facilities include wind turbines, meteorological towers and construction/maintenance equipment. Many of these facilities and pieces of equipment either move from place to place within the test site area or are not always on the site. However, turbines and towers would be considered permanent visual features on the site. Much of the test site area retains natural vegetation. A portion of the site is undeveloped and retains a natural appearance.

The tallest meteorological towers are located on test sites M-2 and M-3 (see Figure 1-3). They are 264 feet (80 meters) high. There are many others of lesser height. These shorter tower heights are in the 66 to 132 foot (20 to 40 meter) range. Turbine heights from ground to the blade hub vary. The highest current hub height is 120 feet (36.4 meters).

A mix of industrial facilities, grazing lands, and natural open space defines the visual character of the project vicinity, (see Figure 3-2, photographs 1, 2, 5, 6, and 9-21). Open lands and mountains, including the Flatirons within the Boulder Mountain Parks area, dominate the visual character of the area. Views of the continental divide through Eldorado Canyon, a State Park, are visible from vantage points on and near the NWTC (see Figure 3-2, photographs 1, 6, 9 and 10).

Local community planning efforts protect views of the Flatirons and the mountains to the south that form a striking feature in the landscape. This feature is referred to as the Mountain Backdrop by a cooperating group of local agencies (see Figure 3-2, photographs 1,6,9,10,15 and16). The vast majority of the resources protected by this effort are west of Highway 93. The protected resources in the project vicinity are west of Highway 93. The NWTC site and adjacent lands south and east of Highway 128 and 93, respectively, are not protected resources.

3.5.2 Public Vantage Points and Site Visibility

There are several primary off-site vantage points in the project vicinity where the general public can see the site and/or site facilities. Key vantage points along Highway 93 exist for southbound motorists north of the Highway 93/128 intersection and for northbound motorists south of the project site (see Figure 3-2, photographs 13 and 14). However, in many instances

existing development and overhead transmission lines obscure views from the south looking northeast.

Numerous vantage points for motorists also exist along Highway 128 between Broomfield County line and the site access road. New office buildings along Highway 128 in the vicinity of Jefferson County Airport have or will have views of site facilities. Building 251, turbines, and other site features are visible from Highway 128 west of the site access intersection (see Figure 3-2, photographs 15 and 16).

Boulder County and the City of Boulder jointly own and manage open space north of the project site. Two trailheads are located near the intersection of 93 and 128. The Greenbelt Plateau trailhead is located just east of the intersection along 128. This trailhead provides parking for trails to the north (see Figure 3-2, photographs 17 and 18). The Flatirons Vista trailhead provides parking for hikers headed west (see Figure 3-2, photographs 19 and 20). No trailheads or trails have been provided southeast of the Highway 93/128 intersection. The Colton trailhead is accessible on the north site of Highway 128 about one mile (1.6 kilometers) east of the NWTC entrance off of Highway 128. These trailheads and vantage points along the trails offer users views of the project site and much of the surrounding area.

One residence is located west of Highway 93 across from the aggregate operations. No other residences are located within four miles (6.5 meters) of the site. The view of the NWTC from this residence is dominated by the aggregate facilities located just east of Highway 93.

Highways 93 and 128 are not formally designated scenic roadways by the State of Colorado or local governments.

3.6 WATER RESOURCES

3.6.1 Surface Water

There are no floodplains or substantial permanent surface water resources at the NWTC, and no perennial creeks or streams cross the property. There are a few seeps on the site. Two of these seeps form small perennial ponds. Two ephemeral streams drain the area surrounding the NWTC. Rock Creek flows easterly and is located southeast of the NWTC. Rock Creek flows into Lindsey Pond approximately 1,000 feet (303 meters) east of NWTC. Coal Creek flows to the northeast approximately 400 feet (121 meters) northwest of the NWTC.

Intermittent storms and other seasonal precipitation events may cause water to temporarily collect in topographic drainages. Surface water, when present, is not used for any purpose on or off the site. Off-site ditches convey water throughout the area to various reservoirs and lakes. The closest of these is Church Ditch, approximately 12,000 feet (3,636 meters) southeast of Rock Creek.

Wetlands and related issues are discussed in Sections 3.8 and 4.8 of this document.

3.6.2 Stormwater

The NREL implements a program at the NWTC that identifies procedures to prevent impacts to surface waters resulting from stormwater, as required under its general permit for stormwater

discharge. The procedures are detailed in its “Stormwater Pollution Prevention Program for Construction Activities." The rate of water erosion and the transport of soil and rock on site and in the vicinity are generally low (DOE, 1980).

The general slope of the NWTC is toward the southeast, directing stormwater toward Rock Creek via the natural drainages on the east side of the site. Stormwater runoff from the northwestern corner of the site and stormwater reaching the drainage east of Building 251 discharge toward Coal Creek. Due to the high percentage of undisturbed natural vegetation on the site, most stormwater infiltrates the soil. Based on site reconnaissance, current storm water volumes are not eroding on-site or off-site stream channels.

3.6.3 Groundwater

Precipitation, snowmelt, and water loss from ditches, streams, and ponds located on the alluvium on and near the site are the primary sources of groundwater in the uppermost geologic unit, the Rocky Flats Alluvium. Groundwater flow in the Rocky Flats Alluvium is generally to the east and is controlled by paleochannels and the slope of the underlying bedrock, which is approximately 2 degrees to the east (Woodward-Clyde, 1992). The infiltration rate is on the order of several centimeters per hour (DOE, 1980) and the hydraulic conductivity is estimated to be about 160 feet (48 meters) per year (EG&G, 1994).

Groundwater levels fluctuate with the seasons. A 1983 U.S. Geological Survey map of the depth to water for eastern Colorado shows this area with a water table depth in unconsolidated alluvium ranging from 5 to 20 feet (1.5 to 6 meters). In late 1991, the water table at the site was measured at three monitoring wells at approximately 30 feet (9 meters) below ground surface (Woodward-Clyde, 1992). The alluvium contains stringers of clay that can cause perched water tables of limited extent in some areas. Ponds can be temporarily observed in these areas during spring.

The Laramie-Fox Hills aquifer lies below the Rocky Flats Alluvium and is composed of the lower sandstone unit of the Laramie Formation and the upper unit of the Fox Hills Sandstone. In the western portion of the Denver Basin, these formations are steeply dipping and outcrop west of the NWTC site. Recharge occurs primarily along the exposed bedrock and leakage from adjacent alluvium (DOE, 1980). The groundwater flow is to the east or southeast below the NWTC.

A 1,200-foot (364 meter) water well, identified as WS1, was drilled in 1976 and completed in the Laramie-Fox Hills aquifer to demonstrate that wind-generated electrical power could operate an irrigation system and provide potable water. WS1 was used until 1994 as a source for drinking water, after which time the associated piping was disconnected from the buildings. The static water level (potentiometric surface) in this well seasonally fluctuated. It had been measured at 123 feet (37 meters) (Hamilton Engineering, 1993), and, later in the same year, less than 100 feet (30.3 meters) (Rust, 1993). The irrigation system project was terminated, and information regarding its termination is unavailable.

Groundwater from the site is not currently used for drinking water purposes. Generally, the rights to groundwater resources in Colorado are unrelated to ownership of the land surface. However, for the Denver Basin aquifers (see Section 3.7 – Geology and Soils**)**, which include lower systems, the right to groundwater resources derives from land ownership as long as the water is not tributary to any surface water supplies.

Sewage disposal is addressed with on-site septic tank and leach fields systems (see Section 3.11 Public Services and Utilities).

3.6.4 Groundwater Quality

Groundwater quality at the site has been the subject of studies conducted in 1982, 1989, 1992, and 1993. Samples analyzed in association with these studies indicated that most standards were not exceeded. Water quality analyses conducted in 1982 indicated that the water drawn from well WS1 displayed elevated iron concentration. Although the iron content of the water was approximately three times greater than the State-defined maximum contaminant level (MCL) of 0.3 mg/l, the MCL for iron is determined for visual clarity. There were no adverse impacts to human health resulting from the measured iron concentration level.

Water quality data collected from the 1989-sampling event indicated that some organic compounds, including benzene, toluene, 1,2,4-trimethylbenzene, and xylene, were present, but not in quantities that exceeded State criteria. Trihalomethanes, including chloroform, bromoform, dibromochloro-methane, and bromodichloromethane were also detected. The concentration of chloroform exceeded National Primary Drinking Water Regulation standards; however, chloroform and the other trihalomethanes are common byproducts of water chlorination.

The 1992 study sampled shallow groundwater beneath the NWTC to quantitatively define water quality. Analysis of the results of the study indicated that groundwater quality at the NWTC reflects naturally occurring conditions. Although the concentrations of some metals were elevated, the study concluded the concentrations could be attributed to naturally occurring conditions or well installation operations (Woodward-Clyde, 1992).

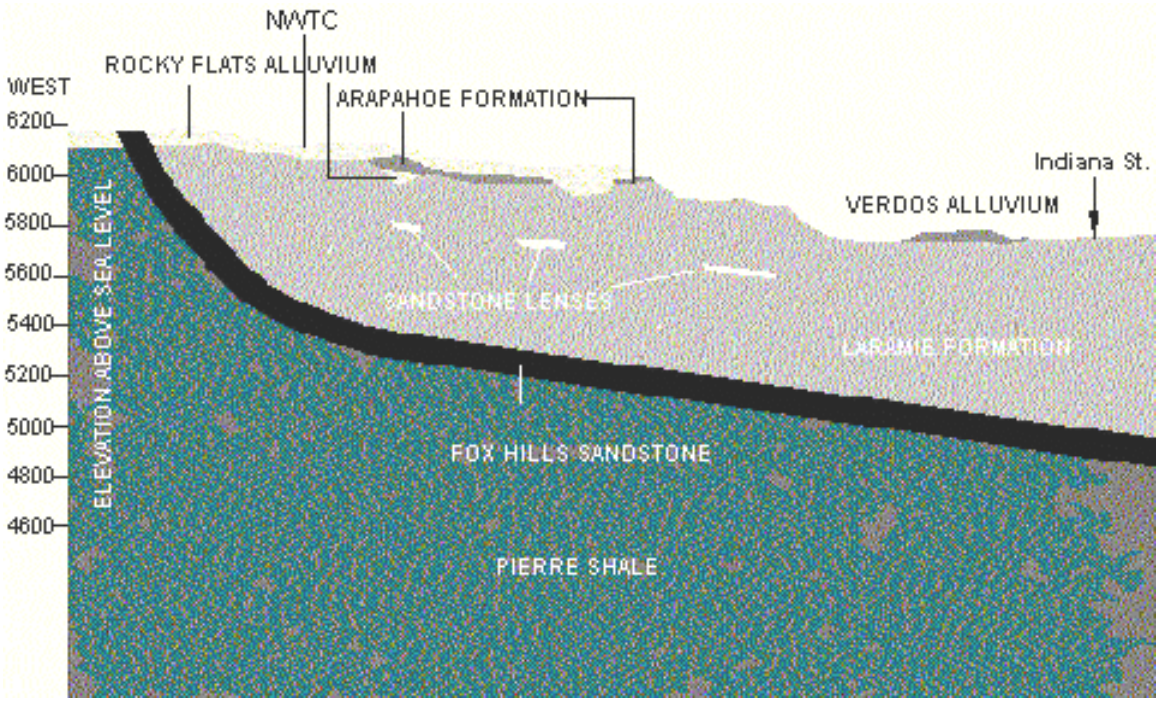
3.7 GEOLOGY AND SOILS

3.7.1 Geology

The NWTC is located on the gently sloping terrain of Rocky Mountain Front Range between the Southern Rocky Mountain Province to the west and Great Plains Province to the east. The Front Range trends north south at elevations of approximately 9,800 feet (2,969 meters), with elevations increasing to 13,000 feet (3,939 meters) along the Continental Divide, approximately 16 miles (25.8 kilometers) west of the site. The elevation of the NWTC is approximately 6,000 feet above sea level. The site area consists of a broad, eastward sloping pediment surface developed on coalescing alluvial fans at the mouth of Eldorado Canyon. The NWTC site is located on the western edge of the Denver Basin, an asymmetrical, north-south trending syncline with a steeply dipping western limb and a shallowly dipping eastern limb. Bedrock layers underneath the site dip to the east or northeast at 30 to 90 degrees from horizontal. The Denver Basin proper contains more than 9,840 feet (2,982 meters) of Pennsylvanian to Cretaceous sedimentary deposits.

The topography in the immediate vicinity of the site exhibits an approximate 2% slope to the east-northeast. No streams or creeks traverse the NWTC site. A minor drainage occurs near the eastern boundary. Figure 3-3 illustrates the geologic cross section beneath the NWTC site.

Figure 3-3 Geologic Cross Section (West-East) Beneath the NWTC Site



Source: CDPHE web site

Geologic units beneath the NWTC consist of unconsolidated Quaternary age (approximately 3 million years ago to the present time) surficial materials that lie unconformably over the Cretaceous (approximately 144 to 65 million years ago) claystone bedrock of the Laramie Formation. The Laramie Formation is a weak claystone and quartzose sandstone formation that was deposited under shallow marine and swamp conditions and is composed of two members. The upper member of the Laramie Formation consists of horizontally interbedded siltstone, sandstone, and claystone layers ranging from 300 to 550 feet (90.9 to 166.6 meters) thick. The lower member is composed of sandstone layers containing coal seams and is approximately 250 feet (75.8 meters) thick beneath the NWTC site. The Rocky Flats Alluvium dominates the surface of the NWTC and consists of unconsolidated surficial materials. The Rocky Flats Alluvium is a pediment/fan deposit composed of dense, poorly stratified clayey gravels and cobbles with some interbedded hard clays and clayey sands. The alluvium-bedrock contact occurs at approximately 40 feet (12.1 meters) below the surface at the NWTC.

The NWTC is located in a Jefferson County “Designated Dipping Bedrock Area,” where steeply dipping beds of expansive claystone bedrock are found near the ground surface. When exposed to water, layers of bedrock display different potentials for expansion, resulting in damage to roads and lightly loaded structures. Natural alluvial deposits may reduce the heaving potential of the bedrock at the site. Landslides and other mass earth movements can be present as shallow features where slopes are steep; however, because the slope of the surface at the site averages about 2%, landslides are not characteristic of the site.

The NWTC is located in the Great Plains Tectonic Province. There are several faults in the vicinity of the NWTC, but no faults have been identified under the site itself. The Precambrian-

age Golden and Livingston Faults and Idaho Springs-Ralston Shear Zone are northwest-trending faults located to the west of the NWTC. The Golden Fault separates the Front Range to the west from the Denver Basin to the east. Northeast-trending faults have been mapped north of the site in the Marshall-Superior-Louisville area. The northwest-trending Eggleston fault lies approximately one mile east of the site's northeast corner. Historically, the region has not been very seismically active.

The greatest amount of recent earthquake activity occurred as a result of deep injection of fluid at the Rocky Mountain Arsenal near Commerce City. Approximately 1,800 earthquakes occurred between 1962 and 1972 as a result of the injection, with a maximum magnitude event of 5.2 on the Richter Scale occurring in 1967 after injection was discontinued. The most recent naturally occurring seismic event took place in 1882, with the epicenter located approximately 13 miles (21 kilometers) east of the NWTC (National Wind Technology Center Sitewide Environmental Assessment, November 1996). Faults in the region surrounding the site have a 30 to 40% probability of being seismogenic (Rocky Flats Environmental Technology Site Geotechnical Investigation Report for Operable Unit No. 5, 1995).

3.7.2 Mineral Resources

Mineral resources in the immediate vicinity of the NWTC include sand and gravel, clay, rock for concrete aggregate and riprap, and coal. DOE owns surface rights at the site. Mineral rights are owned by private entities. The mineral rights for the western 160 acres of the site are owned by Rocky Mountain Fuel and apply to the extraction of coal, shale, oil, and natural gas. The mineral rights for the eastern 145 acres of the site are owned by the Spicer family, currently leased by Mineral Reserves, Inc. as successor in interest to Western Aggregates, Inc., and apply to the extraction of aggregate. Active aggregate mining and processing facilities are located to the south and west of the NWTC.

In July 27, 1995, a Utility Right-of-Way Grant of Easement and MOU between Western Aggregates, Inc. and the DOE (i.e., NREL, NWTC) created a 20-year moratorium on mining activities on the eastern 145 acres of the site (see Sections 3.1 and 4.1)

3.7.3 Soils

The soils at the NWTC are derived from surficial formations eroding from the Rocky Mountains during the Quaternary age. At the site, these poor-to-moderately sorted deposits overlie the Laramie Formation. Although a large amount of the soil consists of cobble and gravel, the subsoil that appears approximately between 13 and 47 inches (0.3 to 1.2 meters) below the surface is predominately clay. The permeability of the subsoil is very low, measured at 0.06 to 0.2 inches (0.15 to 0.5 centimeters) per hour. The clay has a moderate shrink-swell potential. Borings taken at Rocky Flats south of the NWTC indicate that groundwater is sometimes perched on top of clay in the alluvium, and that groundwater occurs at depths ranging from approximately 3.5 to 8 feet (1.1 to 2.4 meters) below the surface (Soil and Foundation Investigation, Expansion – Phase 1, NWTC, 1994).

The soils at the NWTC site are dominated by the Flatirons very cobbly sandy loam, which is formed in the noncalcareous, stony to gravely, loamy material of the Rocky Flats Alluvium. The Flatirons very cobbly sandy loam is found on slopes of 0 to 3% and exhibits a low available water capacity. It is used mainly for grazing and wildlife habitat. The Yoder Variant-Midway complex characterizes the hill slopes and ridges located in the west-northwestern areas of the

site. The soils that compose this complex exhibit low water capacity and are used for pasture and wildlife habitat. The Veldkamp-Nederland very cobbly sandy loams are found at the extreme northwestern area of the site. Rock fragments comprise approximately 35 to 75% of this complex. It is primarily used for pasture and wildlife habitat. Soil at the extreme northeastern boundary of the site is known as the Valmont clay loam and is considered to be a "high potential cropland," requiring only irrigation to support agricultural activities. The Valmont is found on slopes ranging from 0 to 3%. It exhibits moderate water capacity and a slight erosion hazard if overgrazed. It is used primarily for crop growth, pasture, and sometimes for community development (U.S. Department of Agriculture, Soil Survey of the Golden Area, Colorado, Soil Conservation Service, 1980). Grazing does not occur within site boundaries, but does occur in some adjacent off-site locations.

Soil samples were taken from the NWTC and analyzed from late 1993 through 1995. The objective of the 1993 sampling program was to define the uncontaminated characteristics of site soil prior to the construction of a leach field. The soils were analyzed for VOCs, petroleum hydrocarbons, PCBs, and radionuclides. Analytical results indicated that detectable quantities did not exceed State of Colorado regulatory limits and were representative of environmental background concentrations (Soil Sampling Program National Wind Technology Center, 1993).

Results of a 1994 geotechnical investigation for facility expansion indicated that the on-site soils are suitable for supporting structures that included new site buildings and turbine foundations. However, foundations could be at risk of heaving caused by wetting and subsequent swelling of the clay portion of the underlying soils (Soil and Foundation Investigation, Expansion – Phase 1, NWTC, 1994).

Additional samples were subsequently taken in 1994 and analyzed in order to develop a more thorough baseline assessment of site soils. The analytical results for the majority of samples were below method detection limits and, therefore, below regulatory thresholds (Report for Reconnaissance Sampling of Soil at NWTC, 1994).

Geotechnical borings were taken and percolation tests were conducted in 1995 to determine subsurface conditions at the site in preparation for construction. The results indicated that subsurface soils at the site exhibited variable swell potentials that could be compensated for by using specified engineering excavation and construction techniques for foundations (Subsurface Investigation and Engineering Analysis Report NREL NWTC Phase II CDE, 1995).

3.8 BIOLOGICAL RESOURCES

The biological resources of the NWTC are broken down into vegetation, wetlands, rare plant species, and wildlife components. The following subsections detail these resources for the NWTC site. This evaluation primarily relies upon previous reporting and fieldwork by other consultants, both for the NWTC site, and on the adjacent RFETS. An extensive annual survey process provides extensive species lists for the NWTC, RFETS, and surrounding areas (USDOE, RFETS, Annual Vegetation Report and Annual Wildlife Survey Reports).

3.8.1 Vegetation

Vegetation types within the NWTC include grasslands, shrublands, ponderosa pine woodlands, and wetlands. Table 3-6 lists the vegetation types and acreage covered. Figure 3-4 presents a vegetation map for the project site. Wetlands are a special type of habitat that are regulated by the United States Army Corps of Engineers (USACE) and the EPA, and are discussed in the wetlands subsection.

Table 3-6. Vegetation Types Occurring at the NWTC, Golden, Colorado

Vegetation Type	Area (acres)
Grassland	267
Shrubland	1
Ponderosa Pine Woodlands	4
Wetlands/Riparian	6
Disturbed Lands	27
Total	**305**

Grasslands

Grasslands make up the majority of the land area (267 acres) at NWTC and comprise 88% of the total land area (see Table 3-6). These grasslands are classified as mixed-grass prairie (Plantae, 2000). As its name implies, mixed-grass prairie communities are comprised of a combination of plant species typically found in tallgrass and short-grass prairie plant communities, as well as several intermediate grass species. At NWTC, grass species important to the mixed-grass prairie plant community include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), prairie dropseed (*Sporobolus heterolepis*), blue grama (*Chondrosum gracile*), buffalograss (*Buchloë dactyloides*), needle grasses (*Stipa spp.*), wheatgrasses (*Pascopyrum, Agropyron, Elytrigia,* and *Elymus spp.*), and bluegrasses (*Poa spp.*) (Plantae, 2000).

An example of a xeric tallgrass prairie natural community (*Andropogon gerardii – Schizachyrium scoparium*) does occur on the NWTC site in areas defined as mesic mixed grassland in an isolated area in the southwest corner of the site between Rows 1 and 2 (see Figure 3-4). The Colorado Natural Heritage Program defines this community as “rare/imperiled.” NREL has placed this area in a formal Conservation Management Area to avoid and/or minimize impacts on this community from site operations.

Shrublands

Shrublands occur at one location and are a small (1.09 acres) (see Table 3-6) component of the NWTC’s vegetative communities, comprising less than 1% of the total land area. Shrubs found at this location include chokecherry (*Padus virginiana*), sand cherry (*Cerasus pumila* ssp. *besseyi*), wild plum (*Prunus americana*), serviceberry (*Amelanchier utahensis*), skunkbush (*Rhus aromatica* var. *trilobata*), hawthorn (*Crataegus erythropoda*), waxcurrant (*Ribes cereum*), Wood’s rose (*Rosa woodsii*), and prairie rose (*Rosa arkansana*) (Plantae, 2000). A diverse array of forbs and grasses also occur at this location.

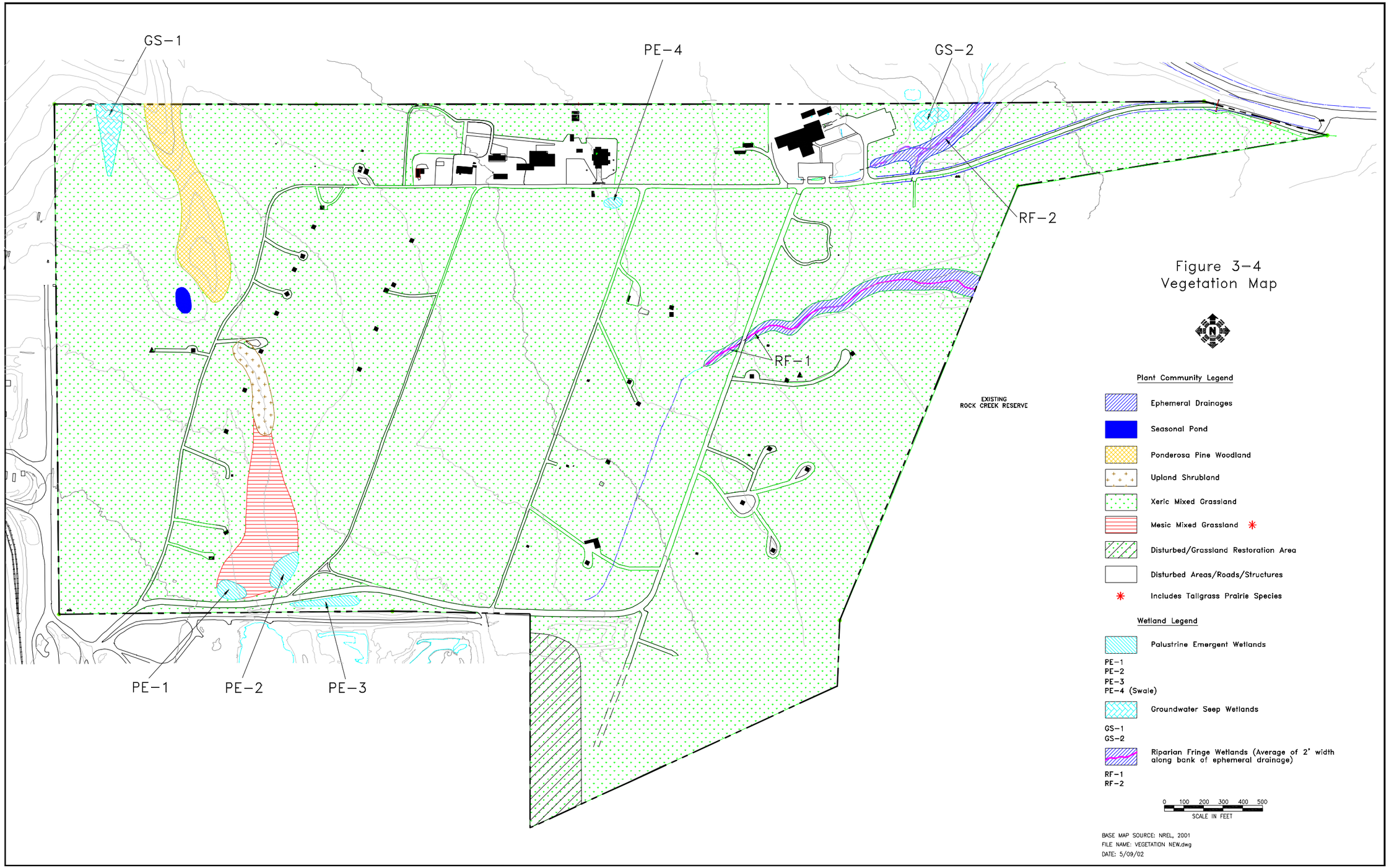


Figure 3-4
Vegetation Map

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Pine Woodlands

One ponderosa pine (*Pinus ponderosa*) woodland occurs at NWTC. This woodland community (4.30 acres) (see Table 3-6) comprises 1.5% of the total land area. The understory of this community is composed of a mixture of shrubs, grassland and foothills plant species (Plantae, 2000).

Noxious Weeds

Within each of the plant communities previously described, noxious weeds also occur. Invasive species, including noxious weeds, are regulated by the Colorado Weed Control Act (Title 35, Article 5.5). On federal lands, noxious weeds are regulated by Executive Order 13112 "Invasive Species" (February 3, 1999) and the Plant Protection Act of 2000, which mandate their control, and if possible, their eradication. Invasive species are defined as "alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Noxious weeds are invasive species that have been designated by rule (i.e. state, county, municipality, etc.) as being noxious, and meet one or more of the following criteria: 1) aggressively invades or is detrimental to economic crops or native plant communities, 2) is poisonous to livestock, 3) is a carrier of detrimental insects, diseases, or parasites, and/or 4) the direct or indirect effect of the presence of this plant is detrimental to natural ecosystems or agricultural areas (CNAP et al., 2000). Noxious weeds are found at the NWTC on some disturbed lands, but these populations are being aggressively managed through NREL's weed management programs. During a 2001 field visit by SAIC staff, the most commonly encountered noxious weeds at NWTC were diffuse knapweed (*Centaurea diffusa*) and Canada thistle (*Breea arvensis*). *Breea arvensis* was previously known as *Cirsium arvense*.

At NWTC, 11 plant species found on the State of Colorado Noxious Weed List were identified (Plantae, 2000). These species are listed in Table 3-7.

Table 3-7. Noxious Weed Species Occurring at the NWTC, Golden, Colorado.

Common Name	Scientific Name
Canada thistle*	*Breea arvensis*
Common mullein	*Verbascum thapsus*
Field bindweed*	*Convolvulus arvensis*
St. Johnswort	*Hypericum perforatum*
Teasel	*Dipsacus fullonum*
Dalmatian toadflax	*Linaria genistifolia var. dalmatica*
Diffuse knapweed*	*Centaurea diffusa*
Hoary cress*	*Cardaria draba*
Houndstongue	*Cynoglossum officinale*
Leafy spurge*	*Euphorbia esula*
Musk thistle*	*Carduus nutans*
Sulphur cinquefoil	*Potentilla recta*

**Found on the top ten priority list for noxious weed control in the State of Colorado.*
Source: Plantae, 2000.

3.8.2 Wetlands

Wetlands are a special type of habitat that are characterized by hydric soils (e.g., dark color, saturated moisture regime, sulfidic [rotten egg smell] odor), dominant vegetation typically adapted for life on hydric soils (i.e., hydrophytes), and by positive indicators of wetland hydrology (e.g., drainage paths, drift lines [flood debris wrapped around plant stems], prolonged soil saturation or inundation). Field efforts to delineate site wetlands has not been undertaken to verify the presence of hydric soils, dominance of hydrophytic vegetation, and characteristic wetland hydrology. The USACE has mapped wetlands along the site's linear drainage features (McKee, 2001). Because the USACE did not attempt to perform wetland delineations on isolated hillside seeps or non-linear surface water features, this EA document refers to the non-linear wetland features as "potential" wetland resources within the NWTC boundary.

These resources include six areas of groundwater seeps. Four of the "potential" wetland resources could more precisely be defined as palustrine (i.e., depressional) emergent wetlands using the Cowardin et al. classification scheme (1979). There are two hillside seep areas that are potential wetlands. There are also two ephemeral drainages with riparian fringe (i.e., streambank) hydrophytic vegetation that have been delineated by USACE, and constitute on-site jurisdictional wetlands. Figure 3-4 depicts the potential and previously delineated wetland resources. Table 3-8 provides designations for individual wetland areas and also provides approximate acreage for these sensitive environments.

Table 3-8. Potential and Previously Delineated Wetlands Occurring at the NWTC, Golden, Colorado

Wetland Type*	Wetland Designation	Area (acres)
Palustrine Emergent Wetlands (Potential)	PE-1 through PE-4 (Figure 3-4)	PE-1 = 0.25 PE-2 = 0.38 PE-3 = 0.28 PE-4 = 0.09
Groundwater Seep Wetlands (Potential)	GS-1 and GS-2(Figure 3-4)	GS-1 = 0.71 GS-2 = 0.30
USACE – Delineated Wetlands	Riparian Fringe (RF-1 and RF-2 on Figure 3-4)	RF-1 = 0.12 RF-2 = 0.07
	Total Acreage	**2.20**

Legend: PE = palustrine emergent; GS = groundwater seep, RF = riparian fringe
*PE is consistent with classification in Cowardin et al. 1979. GS are likely palustrine wetlands types and RF is likely a combination of riverine and palustrine wetland types in Cowardin et al. 1979.

Palustrine Emergent Wetlands

There are four potential palustrine emergent wetlands on the NWTC site constituting approximately one acre of land. The palustrine emergent wetlands PE-1, PE-2, and PE-3 are located in the southwest corner of the site, adjacent to the site's gravel access road. Each of these three potential wetlands are dominated by cattails and are formed in areas of slightly

depressed topography. The fact that they remain wet enough to support cattail growth suggests that they are receiving shallow groundwater discharge at or near the surface, or they are holding precipitation or runoff for long enough to support hydrophytic vegetation. Palustrine emergent wetland PE-4 is located just south of the Dynamometer building at the NWTC. The system features a ponded center ringed by cattails and other hydrophytic vegetation. The pond appeared to be at least 2-3 feet deep during a July 26, 2001 site reconnaissance (SAIC, 2001). This would support the assumption that this site is saturated or inundated for a large portion of the growing season, if not for the entire year.

Groundwater Seep Wetlands

There are two potential groundwater seep wetlands on the property. These systems constitute approximately 1.01 acres of habitat at the NWTC. A vegetation survey by Plantae (2000) identified several obligate wetland species in these systems. Obligate wetland species are those plants found to occur in wetlands more than 99% of the time. Table 3-9 provides a list of these obligate wetland plant species. Several other species of rushes and sedges were identified in groundwater seeps on-site, most of which qualify as facultative wetland species in the *Revision of The National List of Plant Species That Occur in Wetlands* (Reed, 1997). A facultative wetland plant is one that occurs in wetlands between 67 and 99% of the time.

Table 3-9. Obligate Wetland Plant Species Occurring in Groundwater Seep Wetlands at the NWTC, Golden, Colorado

Common Name	Scientific Name
Nebraska sedge	*Carex nebrascensis*
Woolly sedge	*Carex lanuginosa*
Spikerush	*Eleocharis palustris*
Fowl mannagrass	*Glyceria striata*
Wild iris	*Iris missouriensis*
Knotted rush	*Juncus nodosus*
Common rush	*Juncus effusus*
Common cattail	*Typha latifolia*
Narrow-leaved cattail	*Typha angustifolia*

Source: Plantae, 2000.

Groundwater seep wetland GS-1 is a swale feature immediately downstream of the seasonal pond. The swale features hydrophytic vegetation. It is speculated that the swale may be a point of groundwater discharge. It should be stressed that no fieldwork was conducted to document hydric soil or wetland hydrology indicators, thus this area's designation as a "potential" wetland is based on the dominant hydrophytic vegetation alone.

Groundwater seep wetland GS-2 is located just northeast of the parking lot for the main administration building at NWTC. This feature is another ponded area, potentially supported by discharge of shallow groundwater. Cattails and several species of bulrush surround the wetland. The ponded center of the wetland appeared at least 1 to 2 feet deep, and perhaps deeper (SAIC, 2001).

Riparian Fringe Wetlands

The NWTC features two ephemeral drainages that support riparian fringe wetlands. The first of these drainages begins near the center of the site and flows east/northeast through the site. The drainage is designated as wetland RF-1. Wetland RF-1 extends for approximately 0.5 miles (.81 kilometers) across the site's mid-section. The second ephemeral drainage on-site is located on the northeast corner of the property (RF-2). Wetland RF-2 begins on-site, but the majority of this system runs off the site to the northeast. Both of these drainages feature flowing surface water only in response to precipitation events, and were not flowing at the time of SAIC's site reconnaissance in July, 2001. Both drainages have somewhat defined channels and hydrophytic vegetation (primarily rushes, sedges, and grasses) along the fringe of these channels. The USACE has delineated both of these wetland areas and considers them jurisdictional (McKee, 2001).

Regulation and Function

Wetlands may receive jurisdictional status and incur regulation by the USACE if they meet the three criteria of presence of hydric soils, dominant hydrophytic vegetation, and characteristic wetland hydrology listed previously in this section. However, the recent Supreme Court ruling in the matter of Solid Waste Agency of Northern Cook County vs. U.S. Army Corps of Engineers, No. 99-1178 (January 9, 2001), has some bearing on jurisdictional status for all of the potential wetlands at the NWTC site. In the Supreme Court's ruling, the Department of the Army's (DA) jurisdiction over isolated, non-navigable, intrastate waters has been eliminated in cases where the sole nexus to interstate commerce is use of the waters by migratory birds.

The six "potential" wetlands of the NWTC (i.e., the four palustrine emergent wetlands and the two groundwater seep wetlands) are isolated and in non-navigable waters, with doubtful connection to any interstate commerce. For these reasons, it is not likely that these NWTC wetland resources would receive a jurisdictional status if currently reviewed by USACE. Nevertheless, these resources are valuable habitat for wildlife, and they add considerably to the plant biodiversity at NWTC. They may also function to attenuate flood flow, maintain and potentially improve water quality, support the aquatic food web, and retain sediment from runoff over the site.

3.8.3 Rare Plant Species

Two federally-listed threatened plant species, Ute ladies'-tresses orchid (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana ssp. coloradensis*), could potentially occur at the NWTC. Ute ladies'-tresses was listed as threatened under the Endangered Species Act in 1992 and Colorado butterfly plant was listed as threatened in 2000. Critical habitat has not been designated for either species. Concurrence with the USWFS was requested for the list of threatened and endangered species that are likely to occur at the NWTC (Appendix G).

Ute ladies'-tresses is a perennial orchid with 7 to 32 inch (0.2 to 1 meter) high stems. It has narrow leaves approximately 11 inches long at the base of the stem that become reduced in size going up the stem. The flowers consist of 3 to 15 small white or ivory colored flowers clustered into a spike arrangement at the top of the stem. It typically blooms from late July through August, but blooms have been recorded as early as early July and as late as early October depending on location and climate (50 CFR Part 17, Final rule, February 18, 1992). Colorado butterfly plant is a short-lived, monocarpic (flowering and bearing fruit only once),

perennial herb with one or a few reddish, pubescent stems that are 2 to 3 feet (0.6 to 1 meter) tall. The lower leaves are lance-shaped with smooth or wavy-toothed margins averaging 2 to 6 inches (5 to 15 centimeters) long, while those on the stem are smaller and reduced in number. Flowers are arranged in a branched, elongate inflorescence above the leaves. Only a few flowers are open at any one time and these are located below the rounded buds and above the mature fruits. Flowering begins in late June or early July and continues until the first hard freeze, typically late September to early October (Fertig, 2000a). Individual flowers are 0.25 to 0.5 inches (0.6 to 1.2 centimeters) long with four reddish sepals and four white petals that turn pink or red with age. The hard, nutlike fruits are 4-angled and sessile (stalkless and attached directly at the base). Non-flowering plants consist of a stemless, basal rosette of oblong, hairless leaves 1 to 7 inches (2.5 to 17.7 centimeters) long (Federal Register: March 24, 1998, Volume 63, Number 56, Proposed Rules, pp. 14060-14065).

Both Ute ladies'-tresses and the Colorado butterfly plant occur in similar habitat, namely riparian and wetland areas with vegetation that is relatively open. Ute ladies'-tresses are endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams between 1,800 and 6,000 feet (545 to 1818 meters) elevation. Ute ladies'-tresses occur primarily in areas where the vegetation is relatively open and not overly dense, overgrown, or overgrazed (50 CFR Part 17, Final rule, February 18, 1992). Populations have been documented from alkaline sedge meadows dominated by water sedge (*Carex aquatilis),* clustered field sedge (*C. praegracilis),* and wooly sedge (*C. lanuginose)*; riverine floodplains with beaked sedge (*Eleocharis rostellata),* silverberry wolfwillow/redtop (*Eleagnus commutata/Agrostis stonlonifera),* sandbar willow/coyote willow *(Salix exigua/Agrostis stolonifera),* and horsetail scouring rush (*Equisetum variegatum)* cover types; flooded alkaline meadows adjacent to yellow Ponderosa Pine/Douglas Fir (*Pinus ponderosa/Pseudotsuga menziesii)* woodlands and sagebrush steppe; and from streamside floodplains and meadows on alluvium (Fertig, 2000b).

The Colorado butterfly plant occurs on subirrigated, alluvial soils on level or slightly sloping floodplains and drainage bottoms at elevations of 5,000-6,400 feet (1515-1939 meters). Colonies are often found in low depressions or along bends in wide, active, meandering stream channels a short distance upslope of the actual channel. The plant requires early to mid-succession riparian habitats. It commonly occurs in communities dominated by silverberry wolfwillow/redtop (*Agrostis stolonifera)* and Kentucky Bluegrass (*Poa pratensis)* on wetter sites and American licorice (*Glycyrrhiza lepidota)*, flodman's thistle (*Cirsium flodmanii)*, curlycup gumweed (*Grindelia squarrosa)*, and *Hippochaete laevigata* on drier sites. These areas are usually intermediate in moisture between wet, streamside communities dominated by sedges, rushes, and cattails, and dry, upland shortgrass prairie. Typical habitat is relatively open without dense or overgrown vegetation. Sandbar willow (*Salix exigua)* and *Breea arvensis* may become dominant in areas that are not periodically flooded or otherwise disturbed.

According to the Colorado Natural Heritage Program, Ute ladies-tresses is known to occur in Jefferson County and neighboring Boulder County; the Colorado butterfly plant is not known to occur in Jefferson County, but has been found in Boulder County (CNHP, 2001). A survey was conducted at the NWTC on July 24, 2001 for both species in appropriate habitat. Appropriate habitat included the four plant communities that make up the "Seasonal Wetland/Ephemeral Hydric Soils" habitat as described in Plantae, 2000; namely cattail seeps, ephemeral drainages, hillside seeps, and seasonal pond. Survey methods for Ute ladies'-tresses followed USFWS "Interim Survey Requirements for *Spiranthes diluvialis*" (USFWS, 1992); no similar requirements are available for the Colorado butterfly plant. The survey date falls within the required survey period for Ute ladies'-tresses (July 20 to August 31) and within the flowering period for the

Colorado butterfly plant. Per the survey requirements, the USFWS was contacted prior to the survey to inquire as to whether other known populations were flowering late or early for the year so that the survey date could be adjusted if necessary (J. McKee, USFWS, pers. comm., July, 2001). The USFWS determined the survey date was appropriate and that Ute ladies'-tresses were likely to be in bloom, and therefore identifiable, due to adequate moisture during June and July 2001. The survey was submitted to the USFWS for approval on April 8, 2002, as required by the Interim Survey Requirements for *Spiranthes diluvialis*.

No Ute ladies'-tresses or Colorado butterfly plants were found during the 2001 survey. The cattail seeps did not provide appropriate habitat for either Ute ladies'-tresses or Colorado butterfly plant due to dense, overgrown vegetation. The ephemeral drainages, comprised of a mix of sedges, rushes, grasses, and forbs, provided marginal habitat for Ute ladies'-tresses, but lacked habitat features such as a perennial stream channel and associated riparian vegetation for the Colorado butterfly plant. The vegetation at the hillside seep in the northeast corner of the NWTC, dominated by prairie cordgrass (*Spartina pectinata), Glycyrrhiza lepidota,* and patches of common cattail (*Typha latifolia)* and rush (*Juncus arcticus)*, was too dense to provide habitat for either species. The seasonal pond did not provide habitat for the Colorado butterfly plant and does not appear to hold water long enough to create moist or mesic conditions throughout the summer, preferred by Ute ladies'-tresses. The dominants observed in the seasonal pond during the July 2001 survey included *Critesion jubatum ,* Canada bluegrass *(Poa compressa),* and sow thistle (*Sonchus arvensis)*; these species are generally indicative of dry, upland conditions.

In addition to the 2001 survey, previous surveys conducted at the NWTC and at the adjacent RFETS have found no Ute ladies'-tresses or Colorado butterfly plant. During the 2000 survey period, a survey for Ute ladies'-tresses was conducted as part of a larger vegetation survey at the NWTC in the "Seasonal Wetland/Ephemeral Hydric Soils" habitat, but none were found (Plantae, Consulting Services 2000). This survey did not specifically include the Colorado butterfly plant, but this species was not included on the plant species list generated from the sitewide vegetation survey conducted at the NWTC during 1999 and 2000 (Plantae, Consulting Services 2000). Vegetation surveys have been ongoing at the RFETS for several years and no Ute ladies'-tresses or Colorado butterfly plants have been found at the 6,300-acre RFETS located to the south and east of the NWTC (Exponent, 1999; NREL, 1996).

3.8.4 Wildlife

Wildlife habitat at the NWTC is primarily flat, xeric mixed grassland. The NWTC also includes a relatively small patch of mesic mixed grassland habitat (historically tallgrass prairie with big bluestem and other tallgrasses), a ponderosa pine woodland, a small upland shrubland site, six groundwater seep wetlands, and two ephemeral drainages. Each of these habitat types contains characteristic fauna. Surface water resources available to the wildlife at NWTC are very limited to the aforementioned groundwater seep areas.

The DOE prepared a biological characterization inventory for the adjoining RFETS, including the NWTC, in 1992. Much of the information for this wildlife section comes from data contained in that report, and is presented in Table 3-10. Wildlife issues identified during the scoping process included: impacts to the federally threatened Preble's meadow jumping mouse (Preble's) and its habitat, and bird and bat strikes from turbine blades. These species are discussed in more detail in subsections following Table 3-10.

Table 3-10. Wildlife Present at the NWTC, Golden, Colorado

Small Mammals	
Deer mice	*Peromyscus maniculatus*
Prairie vole	*Microtus ochrogaster*
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*
Mexican woodrat	*Neotoma mexicana*
Medium Mammals	
Desert cottontail	*Sylvilagus auduboni*
White-tailed jackrabbit	*Lepus townsendii*
Black-tailed jackrabbit	*Lepus californicus*
Large Mammals	
Coyote	*Canis latrans*
Mule deer	*Odocoileus hemionus*
Black bear	*Ursus americanus*
Mountain lion	*Felis concolor*
Reptiles and Amphibians	
Prairie rattlesnake	*Crotalus viridis*
Short-horned lizard	*Phrynosoma hernandesi.*
Bullsnake	*Pituophis catenifer*
Plains garter snake	*Thamnophis radix*
Racer	*Coluber constrictor*
Northern leopard frog	*Rana pipiens*
Turtle (possibly painted turtle)	*Chrysemys picta*
Tiger salamander	*Ambystoma tigrinum*

Concurrence from the USFWS was requested for the list of threatened and endangered species that are likely to occur in the NWTC in accordance with the informal consultation process outlined in Section 7 of the ESA (Appendix G).

Preble's Meadow Jumping Mouse

Preble's is a relatively small mouse with large hind feet and a long sparsely haired tail that is usually longer than the body [total length is generally between 7.5-10 in (187-255 mm) with the tail approximately 4-5 in (108-136 mm)] (Fitzgerald et al., 1994; Clark and Stromberg, 1987). The dorsal (back) color is yellowish brown and there is usually an indistinct dark mid-dorsal band running the length of the body. The sides are paler than the dorsum (back) and the ventral (belly) is generally white.

Preble's was listed as threatened in May 1998 (USFWS 1998a). The decline of Preble's is thought to be primarily due to habitat loss, degradation, and fragmentation (USFWS, 1998a). Other factors potentially affecting Preble's include pesticide and herbicide use, livestock grazing practices, urban development, and inadequacy of existing regulatory measures (USFWS, 1998a). Historical loss of riparian wetlands may be the largest cause of decline for this species.

Preble's occur only 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. They continue to occur over most of this range, but habitat loss and degradation has resulted in smaller isolated populations. The USFWS indicates potential

habitat for Preble's exists in Colorado below 7,600 feet (2,303 meters) elevation along the western boundary (Front Range) to a line drawn north/south through Fort Morgan along the eastern boundary and from El Paso County (Colorado Springs) north to the Wyoming Border (USFWS, 1999a).

Preble's appear to have specific habitat requirements that relate to riparian habitats along perennial streams. Preble's are most common in rank, lush vegetation along watercourses and in herbaceous understories of wooded riparian areas (Armstrong et al., 1997a, Fitzgerald et al., 1994). Generally, they are found where dense undergrowth consisting of grasses and forbs occur in wet meadows and riparian corridors and where tall shrubs or trees provide overstory cover (USFWS, 1998b; Armstrong et al., 1997a, 1997b). Most records from Colorado are from tallgrass habitat near water (Fitzgerald et al., 1994). Preble's hibernate in dry soil upland sites adjacent to the riparian habitats they occupy during the summer (Clark and Stromberg, 1987; Whitaker Jr., 1972). Dense vegetative cover is important to maintain populations of this species; therefore, overgrazing by domestic livestock in riparian zones is thought to be a primary cause of the decline of this species.

The headwaters of two ephemeral drainages occur on the NWTC (Figure 3-4). The drainage on the east side of NWTC flows east toward Rock Creek on the RFETS. The drainage on the north side of NWTC flows northwest to Coal Creek on private lands near the junction of Highways 128 and 93. Habitat within these drainages is generally considered unsuitable for Preble's because both drainages are ephemeral with only isolated patches of open water, which likely dry up in most years. While the drainages contain some hydrophytic vegetation, the vegetation structure lacks an extensive overstory component (e.g., willow), which is believed essential to suitable Preble's habitat. The lack of perennial water and complex vegetation structure (e.g. overstory) likely precludes use by Preble's. However, a single Preble's was captured in the off-site drainage in August 1997 (ETS, 1997) near the alignment of Option 1 of the proposed pipeline. As a result, the USFWS considers this drainage occupied habitat (Plage, 2001)

Birds

The following discussion is based on RFETS avian survey data, as well as previously collected on-site data. Avian species composition and abundance data have been collected at the RFETS since 1991. Details about this data are presented in the following discussion.

Since 1991, 194 species of birds have been documented, 74 of which are either confirmed or suspected breeders.

A total of 103 species of neotropical migrants have been identified on RFETS, of which 45 species are confirmed or suspected breeders. Neotropical migrants breed in the United States and Canada, but spend their winters in Central and South America. Due to loss of habitat and other mortality factors, many species of neotropical migrants are showing dramatic population declines.

Thirty-four species of waterfowl have been observed at RFETS, 14 of which are suspected breeders. Most waterfowl on the RFETS occur on large impoundments, but a few are also sighted on creeks, small pools, and grasslands. The most abundant species are Canada goose, mallard, blue-winged teal, ring-necked duck, American coot, and green-winged teal. The most common wader is the great blue heron. Waterfowl observations documented during

inventories of the NWTC were limited to two species (Canada goose and mallard) that were flying over the site. Great blue herons were also observed flying over the site, but no waterfowl or waterbirds were documented on the site itself. There are no ponds or other open water habitats on the NWTC that would attract waterfowl or other waterbirds (NREL, 1996); however, small ponds associated with an adjacent gravel pit operation may attract waterfowl and other waterbirds.

On an annual basis, the most abundant songbirds on RFETS are red-winged blackbird, European starling, house finch, western meadowlark, vesper sparrow, song sparrow, barn swallow and cliff swallow; however, seasonal differences in abundance occur (Kaiser-Hill, 1997a, 1998, 1999, 2000). Songbirds identified on the NWTC, primarily in the ponderosa pine woodlands, were green-tailed towhee, song sparrow, American robin, and dark-eyed junco (NREL EA, 1996).

The three most abundant raptors and the only raptor species that occupy the site year round are great horned owl, red-tailed hawk, and American kestrel. Swainson's hawks, turkey vultures, and ferruginous hawks are observed primarily in the spring and summer, while northern harrier, golden eagle, rough-legged hawk, prairie falcon and bald eagle are observed mostly in the fall and winter. Habitats that receive the highest use by raptors include shrublands near Rock Creek, riparian corridors, and around lakes and ponds. Raptor species that have been documented breeding on the RFETS include great horned owl, red-tailed hawk, Swainson's hawk, and American kestrel.

Several federal and/or State of Colorado avian species of concern have also been documented at RFETS. The bald eagle (federally threatened) and peregrine falcon (state endangered) have been occasional transients across the site. In 1996, bald eagles nested at Stanley Lake located approximately 3.8 miles (6 kilometers) from RFETS. In addition, two active peregrine falcon nests were reported in the vicinity. One falcon nest was reported at Eldorado Canyon, approximately 5 miles (8 kilometers) west of the NWTC, and another in the Flatirons, approximately 6.9 miles (11 kilometers) away (Monahan, 1996). Other state and/or federal species of concern documented at the site include American white pelican, long-billed curlew, white-faced ibis, burrowing owl, and loggerhead shrike (Kaiser-Hil, 1997a, 1997b, 1998, 1999, 2000). Most of these species are observed only as occasional transients; however, loggerhead shrikes are suspected to nest in appropriate shrubland habitats on the RFETS. Twenty species of birds on the Colorado State watch-list have also been documented on RFETS (Kaiser-Hill, 1997a, 1998, 1999, 2000). No nest sites for avian species of concern are currently known to exist on the NWTC site, but they are expected to be present in the vicinity.

In 1994 and 1995, an extensive study of raptor use of the NWTC was conducted to determine raptor species composition, use, flight height, and potential for collision mortality at the NWTC (Monahan 1996). This study was undertaken primarily because the wind resources that make NWTC attractive for wind energy research are also likely to attract a diverse community of raptors (Monahan, 1996).

Raptor use of the NWTC was studied for a 17-month period starting in February of 1994. At NWTC, 16 of the 18 species of raptor known to occur along the Front Range of Colorado were documented during 786 hours of observation from February 23, 1994 to June 30, 1995. Resident raptor species that used NWTC on a regular basis included red-tailed hawk, prairie falcon, American kestrel, and rough-legged hawk. All four of these species regularly perched on structures within the NWTC such as meteorological towers. Both bald and golden eagles were

seen regularly at certain seasons, but were only observed perching on one occasion each. The remaining 11 species were seen infrequently and rarely or never landed on the NWTC (see Table 3-11).

Table 3-11. Raptor Species and Abundance at the NWTC, Golden, CO

Species	Status	
	Winter	Summer
Bald Eagle	Common	Absent
Golden Eagle	Common	Uncommon
Osprey	Rare migrant	
Turkey Vulture	Absent	Common
Northern Harrier	Rare migrant	
Sharp-shinned Hawk	Rare migrant	
Cooper's Hawk	Rare migrant	
Northern Goshawk	Rare migrant	
Broad-winged Hawk	Rare migrant	
Red-tailed Hawk	Common	Common
Rough-legged Hawk	Common	Absent
American Kestrel	Very rare	Common
Merlin	Very rare migrant	
Prairie Falcon	Common	Common
Peregrine Falcon	Absent	Very rare

Source: Monahan 1996

The estimated minimum number of individuals that used (i.e., perched on) NWTC trees or structures over the study period was estimated to be two rough-legged hawks, six American kestrels, four red-tailed hawks, and two prairie falcons. All four resident species foraged on NWTC. The number of attempted prey strikes observed over the study was 136 by American kestrel, nine by red-tailed hawk, seven by rough-legged hawk, and 10 by prairie falcon. The only documented raptor nest at NWTC during the study was an American kestrel nest present in 1994.

Over the 786 hours of observation, 124 eagle sightings were made, comprised of 39 bald eagles, 67 golden eagles, and 18 unidentified eagles. Most of the eagles were seen between 2 p.m. and 6 p.m. All of the bald eagles were seen from 20 October to 26 February, indicating use of the NWTC was limited primarily to wintering birds, despite the presence of an active bald eagle nest 3.8 miles (6 kilometers) away from the NWTC. The flight paths of eagles seen passing by the NWTC in late afternoon were towards roost areas in Eldorado Canyon. As many as 10 bald and four golden eagles may have roosted in Eldorado Canyon during the winter that the study was conducted. Most eagles showed direct, sustained flight through the area and most of the bald eagles passed by north of the NWTC. After the Monahan study was completed, plague and a new development along Rock Creek nearly eliminated prairie dogs in the area. The prairie dog towns were foraging areas for wintering bald eagles. In 2001, there were no bald eagles wintering in Eldorado Canyon. For these, and possibly other reasons, the number of eagles that currently traverse the NWTC in 2002 may be lower than when the Monahan study was conducted (Marsha Murdock, Kaiser-Hill, 2001).

During spring migration in 1994 and 1995, 290 raptors of 14 species were recorded on the NWTC during 140 hours of observation. Most of the migrants were turkey vultures (56%) and American kestrels (29%). Large falcons comprised 2.5%, and accipiters and buteos each comprised 5% of the migrant birds (Monahan, 1996).

During spring counts of migrant raptors by the Colorado Hawkwatch Program at a site (6.3 miles (10-kilometers) due south of the NWTC, 2,000 to 3,000 raptors were recorded per spring migration. The number of migrant raptors seen passing by in the vicinity of the NWTC was only 12% of the number detected at the Hawkwatch site. The much lower number of migrant raptors passing over the NWTC is likely due to its geography. The NWTC is about twice as far from the foothills as is the Hawkwatch site. In addition, the Hawkwatch site is higher in elevation and positioned along a sharply defined ridge, whereas the NWTC is on a relatively flat bench. If raptors track the edge of the foothills, then their flight paths would occur primarily from 1.9 miles to 3.8 miles (3 km to 6 kilometers) west of the NWTC (Monahan, 1996). Other studies have shown that higher raptor use occurs near rim edges, canyons and other areas of rough topography than over areas with flat topography (Johnson et al., 2000a; Orloff and Flannery, 1992).

Of 15 bald eagles observed flying over the NWTC, flight heights ranged from 33 feet to 394 feet (10 m to 120 meters) and averaged 184 feet (56 meters). For 14 bald eagles flying adjacent to the site, flight height ranged from 10 feet to 164 feet (3 m to 50 meters and averaged 92 feet (28 meters). Six of the 15 bald eagles that traversed over the NWTC were flying less than the height of the tallest wind turbine present at the time (98 feet (30 meters)), and 13 of the 15 eagles were flying at or below the height of the tallest met tower present on the site (262 feet (80 meters)). For 13 golden eagles observed flying over the NWTC, flight height ranged from 33 to 295 feet (10 meters to 90 meters), and averaged 131 feet (40 meters). For 23 golden eagles observed flying adjacent to the NWTC, flight heights ranged from 33 feet to 525 feet (10 to 160 meters), and averaged 223 feet (68 meters). Six of the 13 golden eagles observed flying over the NWTC were flying at or below the tallest turbine height of 98 feet (30 meters), and 12 of the 13 were flying at or below the tallest met tower height of 262 feet (80 meters).

Of the two most common migrants, only 14 of 149 turkey vultures flew directly over the NWTC. Of these 14, only three were flying below the height of the tallest met tower (262 feet (80 meters)). For those turkey vultures flying near the NWTC, only 9% were flying $\leq$ 262 feet (80 meters). Of the American kestrels observed migrating, 81% were flying $\leq$ 262 feet (80 meters) in height. Of 13 buteos observed during migration (8 red-tailed hawks, 2 broad-winged hawks, 2 Swainson's hawks, and 1 rough-legged hawk), only two were observed flying $\leq$ 262 feet (80 meters). Six of the 14 migrant accipiters observed during the study were flying $\leq$ 262 feet (80 meters). All four large falcons (prairie or peregrine) that were observed were flying $\geq$ 262 feet (80 meters). One merlin flew over at a height of 33 feet (10 meters), and two of four migrating osprey were flying $\leq$ 262 feet (80 meters). These data indicate that many raptors traverse the NWTC at flight heights making them susceptible to collisions with turbines or meterological towers. However, flight height is only one of numerous factors that determine the potential for avian mortality. Other factors include avian abundance and composition, presence of migration corridors, geographic area, landscape features, prey abundance and wind plant features (Nelson and Curry, 1995; Orloff, 1992).

Starting on May 30, 2001, standardized plot surveys have been conducted to survey songbirds and raptors on the NWTC and adjacent, undeveloped areas. The study is funded through July of 2002. As of July 18, 2001, 15 species of songbird were recorded on the NWTC. The five

most common species were vesper sparrow, western meadowlark, European starling, black-billed magpie, and cliff swallow (Armstrong et al,. 2001). Six species of large birds were also observed on the NWTC. American kestrel was most abundant, followed by great blue heron, red-tailed hawk, double-crested cormorant, peregrine falcon, and prairie falcon. The authors believed that great blue herons were using the NWTC as a flight corridor. Some differences were noted in avian composition on the NWTC and adjacent areas. Western meadlowlarks were less common on the NWTC, whereas common grackles and Say's phoebes were more common. Species richness on the NWTC (2.29 species per survey) was also lower than surrounding areas (2.80 species per survey). No statistically significant difference was noted in raptor use or species richness on the NWTC and surrounding areas. However, the authors believed that some raptors such as American kestrels and red-tailed hawks used the NWTC more than surrounding areas due to the availability of perch sites (e.g., meteorological towers, turbines) (Armstrong et al., 2001).

Although no formal carcass searches were being conducted, two fatalities were collected at NWTC over the last four years, including a rough-legged hawk and a banded homing pigeon. Starting on May 29, 2001, NREL has been conducting systematic searches of turbines and meteorological towers on the NWTC to document avian mortality. The study is funded through July 2002. As of November 15, 2001, three avian fatalities have been found, including a yellow-rumped warbler found under a guy wire supporting a met tower, an American kestrel under a small turbine, and a black-billed magpie under a turbine with a lattice base (Armstrong et al., 2001).

To place these fatalities in perspective, it has been estimated that from 100 million to well over 1 billion birds are killed annually in the U.S. due to collisions with human-made obstacles, including vehicles, aircraft, buildings and windows, powerlines, communication towers, smokestacks, and other structures (Erickson et al., 2001; Klem, 1990; Manville, 2000). Although generally considered environmentally friendly, windpower development has been associated with the death of birds colliding with turbines and other windplant structures.

Based on a summary of windpower/avian interaction studies conducted in the U.S. and an industry projection of about 15,000 operational wind turbines in the U.S. by the end of 2001, Erickson et al. (2001) estimated that approximately 33,000 birds may be killed on an annual basis by colliding with wind turbines in the United States. Across the U.S., most collision fatalities (34.3%) are raptors, 31.5% are passerines, 14.0% are non-protected species (i.e., rock dove, European starling, house sparrow), 9.1% are owls, and the remaining 11.1% are other groups (e.g., waterbirds, waterfowl, shorebirds). Approximately 2.6% of fatalities within and 34% of fatalities outside California are considered nocturnal migrant collision victims (Erickson et al., 2001). At the current level of development, wind turbines are estimated to constitute 0.01% to 0.02% of the avian collision fatalities in the U.S.

Based on current site conditions, collision mortality to the four resident raptor species at NWTC should have no long-term or substantial population impacts because only two to six individuals of each species appear to use the NWTC (Monahan, 1996). Of those raptor species resident in the vicinity of the NWTC, turkey vultures have a low probability of collision because they were rarely observed on the NWTC and those few resident birds that were observed always flew higher than the structures. Although two peregrine falcon nests occur within 11 km of the NWTC, only one peregrine falcon was observed during the raptor study at NWTC, implying that probability of collision for this species is minimal. Although golden eagles likely nest in several locations within 30 km of the NWTC, this species has a low probability of collision because the

NWTC lacks a suitable prey base for eagles. Of all raptor species documented at the NWTC, American kestrels appear to be the only species abundant enough during migration to have an appreciable probability of collision mortality at the NWTC (Monahan, 1996). American kestrels and other migratory birds are protected under the Migratory Bird Treaty Act.

Because of its research nature, the NWTC has numerous meteorological towers not normally associated with commercial wind power developments. Thin guy wires used to support the meteorological towers are hard for birds to detect, especially at night. Some research has shown guyed meteorological towers may be more hazardous than wind turbines. At a windplant in Carbon County, Wyoming, avian collision mortality at 200-foot tall guyed meteorological towers was estimated to be 7.5 per year, compared to 1.8 collision fatalities per year for 200 foot tall wind turbines (Johnson et al., 2001).

Avian collision mortality associated with windpower development has not been shown to result in population declines of any species with the possible exception of golden eagles and burrowing owls at Altamont, California, where over 5,000 turbines exist in the Wind Resource Area (WRA). Avian collision mortality at other regional windplants (i.e., Ponnequin site in Weld County, Colorado, Foote Creek Rim Windplant in Carbon County, Wyoming) is relatively low (Kerlinger and Curry 2000; Kerlinger et al., 2000; Johnson et al., 2000b), and no population consequences for any species have been suspected. With the exception of Altamont, the number of avian collision fatalities have not been extensive enough at any commercial windplant in the U.S. to warrant further population studies designed to measure impacts.

The NWTC site has fewer turbines than most commercial windplants, and the research turbines are running far less frequently than windpower plant turbines. Despite the large number of guyed structures, mortality data collected to date do not indicate extensive avian mortality at the NWTC, and the species found to date are common (Armstrong et al., 2001). Therefore, it is logical to assume that few, if any, impacts to avian populations are occurring at the NWTC under current operational conditions. Current survey data support this conclusion. A similar conclusion was reached in a letter from the U.S. Fish and Wildlife Service to NREL prepared in relation to 1996 Site-Wide EA for the NWTC (Carlson, 1995).

Bats

Based on range maps and habitat descriptions in Fitzgerald et al. (1994), up to 10 species of bats could potentially be found on the NWTC (see Table 3-12).

NREL is currently conducting a study to evaluate bat use of the NWTC and adjacent areas within 2.5 miles (4 kilometers) of the site. The study is funded through July 2002. Bat carcasses near turbines have been searched for since late May 2001. Data collection to determine bat species composition and use of the area began in June 2001. Initial trapping surveys with mistnets have documented the presence of fringed myotis and big brown bats near the site. Bat species documented on the NWTC itself using bat detectors in August and September 2001 included hoary bat, silver-haired bat, Mexican freetailed bat, long-legged myotis, small-footed myotis, and little brown myotis. Bats have been documented foraging within wooded areas on the west side of the NWTC during the summer months. Many of the bats that use the NWTC likely roost in rock outcroppings located on open space west of the NWTC. Several bats have been observed on and near the NWTC foraging at heights similar to those occupied by turbine blades (Piaggo, 2001). No bat mortalities have been found at the site.

Table 3-12. Habitat of Bat Species Potentially Occurring on or Near the NWTC, Golden, Colorado

Species	Habitat in Colorado
Western Small-footed Myotis (*Myotis ciliolabrum*)	Broken terrain associated with canyons and foothills, most commonly in areas with tree or shrub cover.
Long-legged Myotis (*Myotis evotis*)	Ponderosa pine forest at elevations of 6,000 to 9,000 feet.
Little Brown Myotis (*Myotis lucifugus*)	Wooded areas from 5,000 to 11,000 feet.
Fringed Myotis (*Myotis thysanodes*)	Ponderosa pine woodlands and shrublands at elevations less than 7500 feet.
Long-legged Myotis (*Myotis volans*)	Ponderosa pine and pinyon-juniper woodlands, montane forests and shrublands up to 12,369 feet.
Red Bat (*Lasiurus borealis*)	Wooded riparian areas and deciduous trees associated with towns and cities. Migrant through Colorado.
Hoary Bat (*Lasiurus cinereus*)	Ponderosa pine and deciduous woodlands less than 10,000 feet elevation. Migrant through Colorado.
Silver-haired Bat (*Lasionycteris noctivagans*)	Forest edges, streams, and ponds from 4500 to 9500 feet elevation. Migrant through Colorado.
Big Brown Bat (*Eptesicus fuscus*)	All habitats below 10,000 feet elevation.
Townsend's Big-eared Bat (*Plecotus townsendii*)	Shrublands, pinyon juniper, open montane forests less than 9500 feet in elevation.

Source: Fitzgerald et al. 1994

Bat populations associated with the NWTC site are important because they can be injured or killed by wind turbines and guy wires. Bat collision mortality has been recently documented at some wind plants. Previous studies have documented bats colliding with other man-made structures, including buildings, lighthouses, and television towers (Van Gelder, 1956; Crawford and Baker, 1981). Most windplants have not documented any bat mortality and only small numbers of bat mortalities have been reported at other facilities (e.g., Erickson et al., 2000; Howell, 1997; Howell and Didonato, 1991; Orloff and Flannery, 1992; Anderson et al., 2000; Thelander and Rugge, 2000; P. Kerlinger Pers. Commun., March 2001). However, large numbers of dead bats have been found at some windplants, including 184 over a 2-year period at the 354-turbine Buffalo Ridge, Minnesota windplant (Johnson et al., 2000b), 35 over a 1-year period at a 31-turbine windfarm in Wisconsin (Steve Ugoretz, Wisconsin Department of Natural Resources, pers. commun., August 2000), and 85 over a 2-year period at a 69-turbine windfarm in Wyoming (Johnson et al., 2001). Most bat fatalities found at wind plants have been tree bats, with hoary, red and silver-haired bats being the most prevalent fatalities.

3.9 CULTURAL RESOURCES

Cultural resources are defined as any prehistoric or historic district, site, or building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious or any other reason. Cultural resources can be divided into three major categories:

1. Prehistoric and historic archaeological resources,
2. Architectural resources, and
3. Traditional cultural resources.

Prehistoric and historic archaeological resources are locations where human activity measurably altered the earth or left deposits of physical remains (e.g., arrowheads, bottles). Prehistoric resources that predate the advent of written records in a region range from a scatter composed of a few artifacts to village sites and rock art. Historic resources include campsites, roads, fences, trails, dumps, battlegrounds, mines, and a variety of other features.

Architectural resources include standing buildings, dams, canals, bridges, and other structures of historic or aesthetic significance. Architectural resources generally must be more than 50 years old to be considered for protection under existing cultural resource laws. However, more recent structures, such as Cold War facilities, may warrant protection if they manifest the potential to gain significance in the future.

A traditional cultural resource can be defined as a property that is eligible for inclusion in the National Register of Historic Places (National Register) because of its association with cultural practices or beliefs of a living community that are rooted in the community's history and are important in maintaining the continuing cultural identify of the community. Traditional resources can include archaeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other groups consider essential for the persistence of their traditional culture.

Cultural resources are protected under Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. Only significant cultural resources warrant consideration with regard to adverse impacts resulting from a proposed action. Significant cultural resources are either eligible for, or listed on, the National Register. To be eligible for the National Register, a resource must meet one or more of the criteria (as defined in 36 CFR 60.4) for inclusion on the National Register. National Register-eligible resources are those that:

a) are associated with events or have made a significant contribution to the broad patterns of our history;
b) are associated with lives of persons significant in our past;
c) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
d) have yielded, or may be likely to yield, information important in prehistory or history.

In accordance with federal laws and regulations, efforts to identify significant cultural resources on NWTC property included a records search with the State Historic Preservation Office at the Colorado Historical Society Office of Archaeology and Historic Preservation (OAHP) in Denver (see Appendix E), review of previous survey reports, consultation with Native American groups, and a survey of those areas of potential impact not previously surveyed.

Three cultural resources surveys have been conducted on NWTC property. These are Labat-Anderson 1995, Dames and Moore 1991, and Burney and Associates 1988. These surveys resulted in the identification of three non-significant historic sites and two historic isolated finds (Table 3-13).

Table 3-13. Cultural Resources Identified on the NWTC Property

Site #	Description	NRHP Status	Survey
5-JF-728	Historic: Ruins of stone building	Not Eligible	Dames and Moore 1991
5-JF-729	Historic: Possible Corral	Not Eligible	Dames and Moore 1991
5-JF-754	Historic: Isolated Find: Barbed Wire	Not Eligible	Dames and Moore 1991
5 JF 755	Historic: Isolated Find: Barbed Wire	Not Eligible	Dames and Moore 1991
5-JF-992	Historic: Concrete foundation	Not Eligible	Labat-Anderson 1995

NRHP- National Register of Historic Places
Not Eligible: Sites/Isolates determined not eligible for inclusion on the NRHP

A fourth survey was conducted on private property adjacent to the NWTC (SAIC, 2001). This survey, completed on August 22, 2001 and October 23, 2001, covered the proposed gas line (option 1 and option 2) between the NWTC property and Highway 93. No additional cultural resources were identified during the fourth survey.

3.9.1 Archaeological Resources

There are no known significant archaeological resources within or adjacent to the NWTC boundary. However, Labat and Associates (1995) identified an area of approximately 6.5 acres within the northwest corner of the NWTC site as having a high potential for buried archaeological deposits.

3.9.2 Architectural Resources

All standing structures within the NWTC property boundary are less than 50 years of age, and none of the structures have a high potential to gain cultural significance in the near future. There are no significant architectural resources within or adjacent to the NWTC boundary.

3.9.3 Traditional Cultural Resources

There are no known significant traditional cultural resources within or adjacent to the NWTC boundary.

3.10 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

Hazardous materials are substances that pose a potential hazard to human health and/or the environment if improperly managed. Hazardous wastes are hazardous materials that are disposed and are defined as being hazardous by the Resources Conservation and Recovery Act (RCRA). At the NWTC, management programs for hazardous materials and wastes attempt to reduce impacts to human health and the environment by using environmentally friendly products to the greatest extent possible, thereby minimizing the use of chemicals that contain hazardous materials, and consequently minimizing the amount of hazardous waste generated.

The foundation of hazardous materials management is imbedded in NREL Policy 6-6, Risk Assessment. This policy requires all workers to evaluate new or substantially modified activities by identifying and mitigating/eliminating environmental hazards and their potential impacts. It

does so by promoting the identification and control of environmental hazards presented by NREL activities. The evaluations apply to:

- Emissions to air;
- Releases to surface water, including storm drains;
- Wastewater releases;
- Improper waste management;
- Contamination/releases to land;
- Impact on communities;
- Use of raw materials and natural resources;
- Impacts to wildlife or vegetation;
- Erosion or contamination of storm water;
- Contamination of groundwater; and
- Life cycle impacts.

As an example of the implementation of this policy, NWTC staff members notify NREL prior to application of pesticides on the NWTC site so that the pesticide can be evaluated to determine if it is the least harmful choice with respect to human health and the environment.

All chemicals and wastes at the NWTC are managed through a network of integrated programs centrally managed by the NREL. The programs are specifically developed to minimize or eliminate adverse effects on the environment. The programs include chemical acquisition, hazardous chemical training, use monitoring, and disposal tracking. The NWTC incorporates pollution prevention practices in its research and support activities to reduce or eliminate the use of hazardous materials. All programs are managed in accordance with applicable federal, state, and local laws and regulations and DOE/NREL requirements.

Hazardous materials, including lubricating oils, are centrally tracked through NREL's chemical inventory system. The inventory system tracks hazardous materials according to type, quantity, destination, and user. This system is supplemented by a separate waste management system that documents disposition of wastes. Hazardous waste management includes characterization, storage, transportation, and disposal of waste generated at NWTC. Together the two systems provide complete tracking of NWTC hazardous materials and hazardous wastes. In addition, the NWTC actively promotes solid waste recycling.

Under NREL Program Number 6-2.1 Policy Number 4-7, Environmental Permitting and Notifications, generation and management of hazardous waste at the NWTC is constrained by the following criteria:

- The NWTC must notify the NREL ES&H office prior to generating 2,205 pounds or more of hazardous waste during a month such that the facility would be considered a large quantity generator.
- NREL does not allow the treatment (evaporation, dilution, reduction of volume or toxicity) or disposing of hazardous waste on the NWTC site.

NREL has an aggressive training program that emphasizes waste minimization and pollution prevention to ensure that chemicals are effectively selected, properly used, and disposed of in compliance with applicable laws and regulations. Chemical management training is mandatory, as are periodic refresher courses. NREL training focuses on chemical use planning, proper selection of the least hazardous materials, safe operating procedures, use of the smallest

quantity possible, waste separation, waste reduction, and reuse. Spill contingency plans and reporting procedures are standardized through NREL. Reporting procedures include the preparation of occurrence reports to document incidents involving chemicals.

3.10.1 Hazardous Materials

NWTC uses small quantities of a limited number of chemicals, including solvents, fuels, enamel paints, and some cleaning compounds. Asbestos is present at several locations. Radioactive materials are not used at NWTC. The site is free of polychlorinated biphenyl (PCB)-bearing materials, whether in transformers or light ballasts. Two 250-gallon tanks and one 500-gallon tank containing propane are located at the site. Compressed gas cylinders are managed under the Compressed Gas Safety Program that clearly outlines how the gases will be stored, handled, and used. Three types of refrigerants (R134a, R12, and R22) are currently used on-site. The total quantity of refrigerants is 204.2 pounds.

The use of hazardous materials for routine operations at NWTC has remained stable since 1996.

NREL maintains a comprehensive list of chemicals present at the NWTC. These chemicals are within the following groups: flammable liquids, compressed gases, and common products such as adhesives, caulks, lubricants, and thinners.

Eleven aboveground storage tanks (ASTs) are located at the NWTC for emergency generator and research use. NREL's tank management program includes safeguards that prevent accidental releases and include use of structural controls and operational and inspection procedures. The ASTs are capable of storing a total of 2,059 gallons of diesel fuel. See Table 3-14 for tank capacity details.

Table 3-14. Aboveground Storage Tanks at the NWTC

Tank ID	Size	Contents	Use
No. 6	400 gallons	Diesel	IUF Emergency Generator
No. 8	500 gallons	Diesel	NWTC Hybrid Power Test Bed (Convault)
No. 10	100 gallons	Diesel	NWTC NPS Daytank
No. 11	100 gallons	Diesel	NWTC HPTB North Daytank (Sim #1)
No. 12	100 gallons	Diesel	NWTC HPTB South Daytank (Sim #2)
No. 13	50 gallons	Diesel	SunWize
No. 14	200 gallons	Diesel	251 Stand-by Generator
No. 16	100 gallons	Diesel	Bergey Hybrid System
No. 17	173 gallons	Diesel	NWTC Hybrid 80 (Sim #4)
No. 18	336 gallons	Diesel	NWTC Hybrid 125 (Sim #3)

Source: NWTC, Eickhoff, 2001

ASTs at the NWTC are operated in accordance with CDPHE and the State Inspector of Oils (Colorado Department of Labor) regulations. Coordination between the NWTC and NREL is required if a tank is installed, removed, repaired or modified, or if its use is changed. The change is evaluated by the ES&H office with respect to state regulations and the NREL AST Management Plan.

3.10.2 Hazardous and Non-hazardous Wastes

The NWTC produces non-hazardous and hazardous wastes. The NWTC attempts to recycle as much of these wastes as possible. CDPHE allows some hazardous wastes to be recycled, including some batteries and waste petroleum products.

The NWTC is a Conditionally Exempt Small Quantity Generator (CESQG), which means that the facility generates less than 220.5 pounds of hazardous waste per month. The site EPA identification number, issued by the CDPHE, is COD983802448.

Hazardous wastes generated at the NWTC are corrosive, flammable, oxidizing, toxic, and reactive. Non-hazardous waste at the NWTC consists of used oil, used hydraulic fluids, and some absorbents. The NWTC attempts to recycle as much of these materials as possible. The amount of hazardous and non-hazardous waste generated in recent years is shown in Table 3-15 below.

Table 3-15. Waste Generation at the NWTC

Year	1997	1998	1999	2000	2001
Amount of hazardous waste (pounds)	160	515	118	34	2,200
Amount of non-hazardous waste (pounds)	1,720	700	6,900	34	2,280

Source: NWTC, Eickhoff, 2001

There are no known contaminated materials in NWTC soils or groundwater (see Sections 3.6 Water Resources and 3.7 Soils and Geology for related information).

The 2001 amounts are higher than the amounts for the preceding years because they include weights of waste batteries and used light bulbs accumulated over a period of months in association with a particular project. Both the batteries and the bulbs were accumulated and subsequently recycled.

NWTC spills are tracked in a spill-tracking log. Spills exceeding a reporting threshold are reported in the Occurrence Reporting and Processing System, which is part of DOE's emergency notification system. These procedures are integrated into NREL's Emergency Management Program. There have been no spills or releases that required State notification at the NWTC. There have been approximately 9 small spills during the last 10 years.

All NWTC waste handling and disposal activities conform to the requirements of the OSHA, RCRA, and DOE/NREL regulations. NWTC hazardous waste is packaged and disposed through off-site commercial treatment and disposal firms. NWTC solid (non-hazardous) waste is

managed by NREL's Site Operations Center. NREL's activities produce about 235,910 cubic feet of solid waste annually. Solid waste is deposited in a local landfill through contracts with solid waste handling companies.

3.10.3 Recycled Materials

NREL's formal waste minimization program includes an active recycling program. The site currently collects oils (lubricants and antifreeze), fluorescent light bulbs, scrap metals (iron, copper, steel, stainless steel, and aluminum), cardboard, newspaper, office paper, books, glass and plastic containers, packing peanuts, tyvek, transparencies, toner cartridges, and batteries for recycling. NREL encourages employees to bring in recyclable materials from home and use the collection containers in selected NREL parking lots.

3.11 PUBLIC UTILITIES AND SERVICES

The following discussions address electricity, gas, telecommunications, water, sewage, police, fire and ambulance services and infrastructure. Stormwater drainage is addressed in Sections 3.6 and 4.6 Water Resources. Energy is discussed in Sections 3.12 and 4.12. Figure 1-3 presents the locations of on-site utility lines (electrical, gas-oil-steam, telecommunication-CATV, water, sewer and surface drainage).

3.11.1 Electricity and Gas

Electrical power for the NWTC is delivered through Xcel Energy power lines along Highway 93 and on-site. Overhead lines enter the NWTC property from the west along a 20-foot wide easement. The 13.2 kV power lines transition from overhead to underground at the NWTC west property line. From that point, all electric lines on the NWTC property are buried underground. The 13.2 kV power lines feed the Switchgear building (Bldg. 253), which feeds a split bus with two main circuit breakers. One bus feeds the site buildings, and the other feeds the turbine 13.2 kV distribution system to the test sites.

The turbine distribution is connected in a parallel configuration with Xcel Energy, thus allowing the NWTC to feed up to 10 MVA into Xcel Energy's grid with power generated during wind turbine research activities. There is no agreement for the NWTC to sell power into the energy grid.

Power demand ranges from a low of approximately 521 kilowatts to 933 kilowatts. Monthly energy consumption ranges from approximately 141,000 to 413,000 kilowatt-hours. Annual consumption is approximately 3 million kilowatt-hours.

Natural gas is not provided to the site. The nearest gas line is a four-inch line located along the east side of Highway 93. This line terminates at a location just south of the Boulder/Jefferson County line (see Figure 3-5, photograph 21).

3.11.2 Telecommunications

The NWTC is served with 15 phone lines coming directly from Qwest and two T1 high- speed lines coming from NREL's South Table Mountain Site. The NWTC has 41 lines to service 41 incoming and outgoing calls concurrently. These connections are provided to the site via overhead powerline structures that drop below ground at the site boundary.

3.11.3 Water

The domestic water system consists of an underground 15,000-gallon tank, a transfer pump, a 2,000-gallon day tank, chlorine injection system, pressurizing pumps and an underground pipeline system to Buildings 251 and 254. The system has two pressurizing pumps. One is designed to be a backup if the primary pump can't keep the system pressurized. Currently, approximately one 3,500-gallon truck delivery is made every week to replenish domestic water supplies. No off-site domestic water lines serve the site or adjacent properties.

Low water use fixtures are being installed as funding becomes available throughout the NWTC as part of a comprehensive effort to reduce NWTC water consumption. Solar hot water heating may be included in future improvements.

3.11.4 Sewage

The sewage system at the NWTC consists of two separate septic tanks and leach fields at Buildings 251 and 254. The septic tanks are pumped once a year. Future buildings requiring domestic water would also require additional septic tank and leach fields. The size of each septic tank and leach field is based on maximum staffing and soil conditions at each facility.

3.11.5 Emergency Response and Fire Protection

In the event of a crime or other requirement for assistance on the project site, on-site security personnel would respond. If off-site support is required, the Jefferson County Sheriff would be contacted.

The on-site fire protection system consists of three 25,000-gallon insulated tanks, a 1000-gallon per minute pump, a small pressurizing jockey pump, an emergency diesel generator, underground distribution pipeline, and fire hydrants. The underground pipeline extends around all buildings in a loop and fire hydrants are spaced along the main NWTC road. Currently, only Buildings 251 and 254 have fire sprinkler protection. Buildings 251, 252, 253, 254, 255, 256, 257 and the Hybrid Building have fire detection. The current design is to provide a two-hour supply of fire protection water for a building fire. It is not likely that multiple building fires would occur simultaneously. Therefore, the existing fire protection system is considered adequate.

To protect the site from wildfire, NREL applies its Fire Protection Program to the site. NREL and the Colorado State Forest Service conduct periodic wildfire assessments to assess the hazards from wildfires and to determine if appropriate controls have been established to control these hazards. The NREL Fire Protection Program is available on the NREL website under ES&H Programs. The Colorado State Forest Service completed a wildfire hazard assessment of the NWTC in September of 2001. Their letter dated September 5, 2001 states that NREL's Wildfire Hazard Assessment, dated July 20, 2001, is technically sound and up to date.

In the event of a fire on the project site or adjacent lands, the Cherryvale Fire Protection District is under contract to provide emergency service equipment and personnel.

Ambulance service is provided by the Cherryvale Fire Protection District. In the event of an on-site injury, illness or other situation requiring an ambulance, District personnel and equipment would be dispatched to the site.

3.12 ENERGY EFFICIENCY AND RENEWABLE ENERGY

Energy is the subject of evolving national policy and longstanding debates over sources, infrastructure requirements, pricing mechanisms, environmental impacts, and related regulations and public processes. The recent peak period demand shortages in California have generated renewed interest in energy policy, and fueled old and new energy debates.

It is not the purpose of this EA to fully characterize energy policy or substantive points in the energy debates. However, this EA sets forth the idea that the mission of the NREL is to lead research, development, technology transfer and system implementation in the areas of energy efficiency and renewable energy. The NWTC is a nationally significant facility dedicated to this mission.

In this role, the NWTC takes energy conservation seriously and has implemented a comprehensive energy program as part of the “Sustainable NREL” initiative. The NWTC has a standing goal to reduce conventional energy use and views itself as a “model for the nation” in terms of sustainable technologies and designs. The Sustainable NREL” initiative addresses:

- Energy efficient building design guidelines and operational parameters including a goal of creating “zero energy” buildings that maximize use of energy conservation technology and use solar, thermal and photovoltaic systems to meet the remaining loads.
- Analysis of process loads to reduce consumption.
- Using renewable energy from on-site and off-site sources, where appropriate.
- Operating highly energy efficient vehicle fleets including the use of light duty alternative fuel vehicles.
- Encouraging employee ridesharing, minimizing commuting through alternative work schedule options and reducing business travel, where possible.

Energy Standards for DOE facilities are set forth in DOE Order 430.2 (Draft). This order requires following 10 CFR 435, which sets efficiency standards for building components (insulation, windows, etc.) and Executive Order 13123 Greening the Government Through Efficient Energy Management.

Xcel Energy provides energy in the form of electricity and gas to the project area. Related infrastructure issues are discussed in Section 3.11 and 4.11 Public Services and Utilities.

1. View of the entry sign off of Highway 128 looking west toward the Flatirons, Eldorado Canyon and the northern portion of the "Mountain Backdrop." The NWTC site is located just to the left (south) of the view.

2. View of the southeast corner of the NWTC looking east. A turbine in the test site area is visible on the left.

Figure 3-2 Photographs of the Site and Vicinity

3. View of temporary configuration of turbines and meteorological towers looking southeast from the northwest corner of the site's perimeter access road.

4. View of another set of turbines and towers looking southeast across the site using a telephoto lens. This photograph exaggerates the apparent density of turbines, towers, guy wires, and ancillary facilities on the site.

Figure 3-2 Photographs of the Site and Vicinity

5. View across the test site area looking northwest from the southeast corner of the perimeter access road.

6. View of the northwest corner of the test site area with aggregate facilities and another portion of the regional "Mountain Backdrop" visible in the distance.

Figure 3-2 Photographs of the Site and Vicinity

7. View of Building 251 looking north from the test sites.

8. View across the test site area, looking north, Building 251 is visible to the right along with other buildings in the industrial development area to the left.

Figure 3-2 Photographs of the Site and Vicinity

9. View of the largest Conservation Management Area at the NWTC looking west from the northwest corner of the site's perimeter access road. Eldorado Canyon is at the center.

10. View of a portion of the adjacent aggregate processing facilities located adjacent to the site from the perimeter access road looking west.

Figure 3-2 Photographs of the Site and Vicinity

11. View of the site and adjacent lands looking southeast toward RFETS.

12. View of Building 251 from Highway 128 north of the project site access road.

Figure 3-2 Photographs of the Site and Vicinity

13. View of the NWTC looking south from the shoulder of Highway 93 on June 25, 2001.

14. View of the NWTC looking south from the shoulder of Highway 93 on June 25, 2001 taken with a telephoto lens to clarify site features.

Figure 3-2 Photographs of the Site and Vicinity

15. View of the NWTC looking west from the shoulder of Highway 128 on June 25, 2001.

16. View of the NWTC looking west from the shoulder of Highway 128 on June 25, 2001 taken with a telephoto lens to clarify site features.

Figure 3-2 Photographs of the Site and Vicinity

17. View of the NWTC looking south from the Greenbelt Plateau trailhead.

18. View of the NWTC looking south from the Greenbelt Plateau trailhead taken with a telephoto lens to clarify site features.

Figure 3-2 Photographs of the Site and Vicinity

19. View of the NWTC looking southeast from the Flatirons Vista trailhead.

20. View of the NWTC looking southeast from the Flatirons Vista trailhead taken with a telephoto lens to clarify site features.

Figure 3-2 Photographs of the Site and Vicinity

21. View, looking south, of the upper reach of Coal Creek west of the NWTC and south of the Boulder/Jefferson County boundary line. Highway 93 is visible on the right. Xcel's existing four-inch natural gas pipeline terminates just south of this vantage point on this side of Highway 93.

Figure 3-2 Photographs of the Site and Vicinity

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Figure 3-2 Photographs of the Site and Vicinity

4. ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

Chapter 4 addresses primary, direct, induced, secondary and cumulative impacts of the Proposed Action and No Action Alternatives. Beneficial and adverse, on-site and off-site, construction, operation, and maintenance impacts are also described, as appropriate.

The analyses focus on overall site development impacts and differentiate impacts from the short-term vs. long-term scenarios, where appropriate. Specific impacts from individual improvements (buildings, machines, devices, equipment, tools) are provided only where appropriate to clarify a unique environmental situation or consequence of a specific program element. Comparisons between various optional elements of the Proposed Action (short-term only) are provided only if meaningful impact differences would result from implementation of the options and those differences can be clarified at this time.

The impact analyses presented in this chapter consider NREL's broad and extensive environmental commitments as described in Chapter 1, and refer to specific commitments, as appropriate, to characterize potential impacts and substantiate related impact findings.

4.1 LAND USE, PLANNING, PUBLIC POLICY, SOCIOECONOMICS

4.1.1 Land Use Impacts

The proposed short-term and long-term improvements of the Proposed Action would have minor on-site and off-site land use impacts, but each improvement would be subject to review under applicable programs, policies and procedures implemented by NREL at the NWTC intended to avoid and/or minimize impacts at the site. Sensitive areas of the NWTC are protected by various policies and practices and in most cases, the requirements pertaining to Conservation Management Areas. Designated corridors would be used for utility installation and restoration is required for surface disturbances.

Development of vacant land and improvements to existing facilities and buildings would allow for increased site activity. The development would involve research and development uses within the NWTC development area, adding new test sites and associated facilities within the test site area.

The primary short-term improvements would include:

- 5 new buildings,
- 3 large megawatt class turbines,
- 20 new test sites,
- Several large and small solar devices, and
- Utility upgrades including some off-site improvements.

The long-term improvements would add more buildings, building additions and/or taller buildings, along with two additional megawatt class turbines. A total of 50,000 square feet of interior space would be added.

Foundations for the five 5-megawatt class turbines could require up to about 0.65 acres of land in the test site area if the larger (75 feet x 75 feet or 22.7 meters by 22.7 meters) foundation designs were used.

The proposed land uses are consistent with current uses. Proposed building designs would be reasonably consistent with existing development, and the anticipated improvements would create no land use conflicts, compatibility issues, or other land use impacts. The long-term scenario suggests buildings could be as high as 75 feet (22.7 meters), which is approximately 25 feet (7.6 meters) taller than Building 251. Higher density in the development area and increased use in the test site area for research and development purposes involving renewable energy facilities, such as wind turbines and solar devices, would be entirely consistent with the mission of the NWTC.

The proposed short-term and long-term site development would have little or no land use impacts on surrounding areas. Growth inducement and related impacts associated with site development would not be expected or would be quite limited because the NWTC provides on-site facilities for related private sector ventures. The impacts from any growth induced by site development would not be considered significant for this reason and because much of the site is surrounded by dedicated public open space so growth would be diverted to large underutilized commercial real estate and buildings located east of the site in the Interlocken Business Park and elsewhere. The demand for redevelopment of the adjacent aggregate mining sites and commercial and industrial sites would not be considered linked to NWTC activities or related site development.

Use of either natural gas line alignment (north or south) would have no substantive land use implications.

Construction of five megawatt-class turbines, more towers and/or higher towers requires coordination to address FAA requirements associated with Jefferson County Airport height restrictions for navigation and communication equipment. NREL complies with FAA requirements and would follow the FAA Form 7460 process, which relates to an air space analysis that would occur when new towers are actually proposed. Preliminary consultation with FAA indicates that approval of the anticipated towers would not be precluded, but certain lighting and other requirements would apply. Light fixture requirements are likely to be similar to existing fixtures, but it is possible they may be needed in multiple locations for the taller towers (Bauer, 2001). No unmitigated impacts would be anticipated.

4.1.2 Compatibility with Applicable Local Plans, Policies and Anticipated Future Development

Although the land use and zoning plans and policies of local governments are not applicable to federal lands, the following discussions address future conditions based on these plans, and characterize land use and planning issues that future on-site and off-site development may present.

The planned improvements would be consistent with local land use designations for the site and would be consistent with industrial zoning designations on adjacent parcels.

The NWTC's location was selected at time when future land use scenarios for surrounding properties were far different from current scenarios. In recent years, independent and

cooperative open space acquisitions by local governments have essentially isolated the NWTC from future urban development. This isolation prevents impacts associated with encroachment of urban development, but may create public access pressures, generate interest in on-site development proposals, and create pressure for long-term facility decommissioning activities.

Access pressures may be intensified because of development east of the designated open spaces located east of the site, substantial road improvements that will direct vehicles to Highway 128, and growing operations at and around Jefferson County airport. Increasing use of Highway 128, Highway 93 and open space trails, combined with increasing site visibility from office buildings to the east in Broomfield and Superior and other new development, may generate increased interest in site operations. None of these impacts would be considered significant or adverse.

4.1.3 Social and Economic Impacts

Executive Order 12898, enacted by President Clinton in 1993, requires that each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

The Proposed Action would have no direct impacts on minority or low-income populations because no off-site human health or environmental effects of the proposed action are anticipated, and no minority or low-income populations are located in the vicinity of the site.

The Proposed Action would have direct and indirect economic impacts because it would create jobs and would involve substantial construction expenditures. In addition, a total of 300 employees might work at the NWTC under the long-term scenario estimates. The 220 new jobs, construction jobs and construction expenditures would incrementally increasing local housing demands and corresponding economic activity in the vicinity. These indirect impacts would not be considered significant given far larger economic forces and activities, and might be considered beneficial by local governments pursuing economic development.

4.1.4 Impacts of the No Action Alternative

The No Action Alternative would allow existing on-site land uses, site development density and operations to remain as they are now. Installing and testing different kinds of turbines on the site would continue, but larger towers and turbines would not be added. Community development beyond nearby open spaces would still result in increased interest in the site and related activities. Fewer beneficial economic impacts would result because building construction would not occur and related job growth would be limited.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation measures are required under NEPA.

4.2 TRAFFIC AND CIRCULATION

4.2.1 Site Circulation and Access Impacts

The Proposed Action would not cause significant site circulation or access impacts. The Proposed Action will allow for increased site activities and the total number of employees working on the site (to 300 in 2021 from approximately 80 in 2001), thereby increasing on-site parking requirements and vehicle use within and surrounding the site. Future development and related approval processes implemented at the NWTC would address circulation and parking requirements as each facility goes through final design. On-site roads would easily accommodate anticipated vehicle movements with anticipated surface improvements.

The installation of a left turn lane and acceleration and deceleration lanes along Highway 128 at the site access road intersection addresses future site access safety needs. However, if future improvements by others that would create a four-lane facility for Highway 128 are advanced through the planning process and construction is scheduled and budgeted, NWTC site access facilities would need to be incorporated into the plans and specifications for Highway 128. These facilities would also need to address future use of the site access intersection by aggregate trucks traveling over the recently created road easement through the NWTC, even though this traffic generation source is speculative at this time.

4.2.2 Level of Service and Accident Impacts

Additional trips on local roadways and through local intersections are expected to increase significantly from off-site development, primarily east of the NWTC. The Proposed Action will incrementally add to these local traffic volumes, have a minor impact on the timing of planning improvements, and will contribute incrementally to accident rates in the vicinity. The contribution of the project to these impacts would be considered insignificant even if the site accommodates A.M. and P.M. peak hour trips from an estimated future total of 300 employees. The project increment would add to cumulative impacts and corresponding facility requirements addressed by recent transportation studies because future land use considerations do not directly consider the Proposed Action on the NWTC site.

Future traffic volume increases on Highway 128, and to a lesser degree Highway 93, would contribute substantially to cumulative traffic volumes and corresponding congestion during peak periods at the Highway 128/93 intersection. Left turn movements are expected to remain at LOS F for many years, along with steady or increasing accident rates, until an interchange is completed or interim improvements such as a traffic signal are proposed and installed.

4.2.3 Impacts of the No Action Alternative

The No Action Alternative would allow existing development and employee totals at the NWTC to remain unchanged. Incremental impacts from site development associated with the Proposed Action on congestion and accidents would be avoided. LOS would remain poor at the Highway 93/128 intersection and would be expected to decline from increasing traffic volumes associated with development in other locations in the vicinity.

MITIGATION MEASURES

There are no significant impacts; therefore, no mitigation measures are required under NEPA.

4.3 AIR QUALITY

Air quality impacts are indicated by changes in the concentrations of atmospheric pollutants as a result of specified actions. This section discusses impacts to air quality from site preparation and construction at the NWTC resulting from the Proposed Action, as well as impacts resulting from emissions associated with subsequent site operations. The purpose of the air quality analysis is to provide a general idea of construction and operational impacts to air quality resulting from the Proposed Action rather than to define precise emission levels and corresponding mitigation measures. Consequently, modeling was not performed to precisely calculate future emissions.

NREL has an ongoing overall Air Quality Protection program, an Indoor Air Quality program, a Particulate Emissions Control for Construction program, a Local Exhaust Ventilation program, and a wide range of other programs that directly and indirectly contribute to avoiding, minimizing and mitigating air pollution emissions and associated impacts and risks. These programs are in place and would apply to all future improvements and activities at the NWTC.

Based on proposed activities and operations, emissions resulting from new facilities and increased use of existing NWTC facilities are expected to be insignificant. Operational emissions under the Proposed Action would be intermittent and would not be expected to contribute to an exceedance of an ambient air quality standard or substantially impact regional air quality attainment status or progress.

4.3.1 Construction Impacts

During construction, temporary and localized increases in atmospheric concentrations of NO_2, CO, SO_2, VOCs, and PM would result from exhaust emissions of worker's vehicles, heavy construction vehicles, and other machinery, equipment and tools. Air quality impacts would result from airborne particulates (fugitive dust) arising from earthwork during site preparation and construction. New construction at the NWTC would be conducted in stages; therefore, emissions of fugitive dust would not be continuous. Under certain wind conditions, there could be a minor incremental increase in particulates detectable at the open space trailheads to the north and northwest of the NWTC during site construction. However, the impact is expected to be inconsequential because the distances between the site and trailheads would allow for substantial dispersion of the particulates before reaching trail users. Impacts at the residence located west of the NWTC would also be minor for similar reasons. Additional particulate emissions from the NWTC would contribute incrementally and insignificantly to emissions originating from the aggregate facility and other area-wide sources and for a limited duration.

4.3.2 Impacts from New Equipment and Operations

There would be no new major stationary sources or major modifications to existing operations associated with the Proposed Action. Emissions associated with the proposed Fuel Cell Thermal and Moisture Management Facility (heaters, coolers, humidifiers, and dryers) would consist primarily of water vapor. Other new emissions sources would be consist of natural gas

combustion devices and related dispensing facilities such as the proposed natural gas fueling station and natural gas pressure regulating station. If fuel storage tanks were installed on the site, there may be emissions associated with the tanks, depending on the volume and type of fuel stored. Consistent with State of Colorado regulations, the NREL ES&H staff would evaluate emissions associated with new emissions sources prior to their installation. The greatest aggregate amount of actual emissions currently generated at the site is 2.42 TPY of NOx, primarily in association with the operation of Hybrid Power Test Beds. This quantity of NOx emissions does not approach the 100-TPY threshold amount for Major Source designation. Emissions resulting from the sources associated with the implementation of the Proposed Action would contribute an amount that would not significantly increase the amount of pollutants that currently exist in the ambient air. The use of HAPS and related emissions are not expected to increase substantially or approach any threshold quantities that would trigger new regulatory requirements.

4.3.3 Impacts of the No Action Alternative

If the Proposed Action were not implemented, incremental air quality impacts of the Proposed Action would not occur. Existing emissions from on-site operations would remain at current levels.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation measures are required under NEPA.

4.4 NOISE

The purpose of the noise analysis in this EA is to estimate and characterize construction and operational impacts resulting from the Proposed Action and the No Action Alternative. Detailed predictive noise modeling to precisely define future noise levels was not considered necessary.

Compliance with OSHA requirements for noise exposure is a site mandate, so anticipated impacts on NWTC staff would be minimized and mitigated.

4.4.1 Impacts from Construction Noise

The Proposed Action would result in construction noise from heavy equipment operation, building of foundations and structures, earthwork, and trenching and utility installation. Construction would be phased resulting in associated noise that would be generated intermittently and typically during daylight hours.

Construction operations could generate temporary noise levels up to 95 dBA measured at a reference level of 50 feet from the source (NRC, 2000). These maximum construction-related noise levels would be reduced to approximately 63 dBA at the nearest residence due to reduction of noise intensity with distance. Typical average traffic noise from adjacent roadways and industrial sites would be of roughly the same magnitude, thereby masking the construction noise at off-site locations.

Construction-related noise levels are expected to be approximately 58 dBA at the nearest trailhead. This noise level is equivalent to hearing normal conversation. However, average traffic noise originating from Highways 93 and 128 is likely to be greater than 58 dBA.

Therefore, noise resulting solely from construction activities is not expected to be annoying or even discernable at nearby receptors.

Table 4-1 displays the reduction in noise intensity associated with a 95-dB construction-related source over increasing distances. This table does not consider additional factors that contribute to the reduction of noise intensity, such as topography, weather conditions, and noise sources external to the NWTC (such as traffic noise).

Table 4-1. Reduction of Sound Level Intensity of a 95-dB (Construction-Related) Source as a Function of Receptor Distance

distance feet (meters)	dB
50 (15.5)	95
100 (30.3)	89
200 (60.6)	83
400 (121.2)	77
800 (242.4)	71
1600 (484.8)	65
3200 (969.6)	59
6400 (1939.2)	53

Noise levels associated with increased vehicle traffic resulting from construction activities would be temporary and limited to the times when construction actually takes place. Large trucks and other vehicles associated with the aggregate mining facilities and RFETS frequently use Highways 93 and 128 for access. Temporary increases in noise associated with construction traffic would produce a minor and inconsequential impact at nearby receptors.

4.4.2 Impacts from Operational Noise

Noise from various combinations of operating turbines will contribute to ambient noise levels on the NWTC site and make a minor contribution to off-site noise levels. Given substantial technology improvements, the primary sources of noise from the turbines would be from wind passing by rotor blades and mechanical noise from rotating turbine housings. Incremental noise generated by the operation of additional turbines would depend upon the total number of turbines being operated at a particular time, the relative locations of the turbines in relation to each other and to the nearest receptors, the types of turbines in operation, and meteorological conditions at the time. Noise produced by intense and simultaneous use of the site by turbines combines logarithmically.

The noise level that can be expected on the NWTC site from the simultaneous operation of turbines of various sizes turbines could decrease if newer (quieter) turbines dominate the test pad area, or could increase if smaller, older or otherwise noisier turbines dominate the test pad area. It has been assumed that the turbines could generate 90 dB measured at 100 feet from the test pad site (NWTC, Johnson, 2001).

Table 4-2 displays the reduction in noise intensity associated with a 90-dB source over increasing distances. This table does not consider additional factors that contribute to the reduction of noise intensity, such as topography, weather conditions, and noise sources external to the NWTC (such as traffic noise).

Table 4-2. Reduction of Sound Level Intensity of a 90-dB Source (Operations) as a Function of Receptor Distance

distance feet (meters	DB
100(30.3)	90
200 (60.6)	84
400 (121.2)	78
800 (242.2)	72
1600 (484.8)	66
3200 (969.6)	60
6400 (1939.2)	54

The estimated noise resulting solely from these assumed turbine operation conditions would be as follows:

- Nearest residence: approximately 64 dB, or slightly greater than that of normal conversation.
- Flatirons Vista Trailhead: approximately 57 dB, slightly less than the noise level of a normal conversation.
- Green Belt Plateau Trailhead: 58.5 dB, slightly less than the noise level of a normal conversation.

This incremental contribution would still be insignificant relative to far higher existing highway noise levels and would be inaudible under most circumstances.

Outdoor maintenance, rearranging equipment and the use of machines, equipment and tools in the test site area would temporarily and incrementally increase noise generated from turbine operations. Assuming that the noise created by these operations is equivalent to that generated during construction, this incremental impact would generate noise levels that would be considered insignificant at off-site locations.

Incremental impacts at off-site receptors from vehicle trips associated with adding new employees to the site would be inconsequential relative to existing highway vehicle use and anticipated increases associated with regional development and roadway linkages (see Section 3.2).

The relationship between noise and wildlife is discussed in Section 4.8.4.

4.4.3 Impacts of the No Action Alternative

No “new” noise sources would be added to the NWTC site if the No Action Alternative were implemented. Off-site noise levels in the area would continue to be dominated by vehicle traffic and aggregate operations.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation measures are required under NEPA.

4.5 VISUAL QUALITY/AESTHETICS

4.5.1 Visual Impacts of Proposed Buildings, Wind Turbines and Other Site Features

The Proposed Action would add new and larger features to the site that would be visible from off-site locations, but these impacts would not be considered significant because the new features would be reasonably consistent with existing features, views would not be blocked, and NREL's building and facility design review processes would be implemented to reduce visual and aesthetic impacts.

Eight photographs are presented in Figure 4-1 to characterize the potential visibility of existing and proposed buildings, wind turbines, solar facilities, and other site facilities and features. These photographs are presented at the end of Chapter 4. The horizontal lines represent a rough approximation of the maximum hub heights of five 5-megawatt-class turbines distributed evenly across the test site area in a worst-case configuration. The vertical lines represent approximate site boundaries. These lines, and the assumptions discussed in Chapter 2 that form the basis for these approximations, are subject to change.

The maximum hub heights of 446 feet (135 meters) would be over three times the hub height of the existing 600 KW turbines, which are 120 feet (36 meters) high and higher than the existing meteorological towers, which are 264 feet (80 meters). The blade diameters on the 5-megawatt turbines would be 221 feet (67meters) longer than those on the largest turbines (0.6 megawatts = 600 kilowatts) currently on the site. The maximum height for future meteorological towers is 594 feet (180 meters), which would be 330 feet (100 meters) higher than existing towers. Buildings would not exceed approximately 75 feet (22.7meters). The solar facilities will be well below 66 feet (20 meters) in height.

Preliminary consultation with FAA indicates that red hazard lights similar to the fixtures on existing towers would be needed on the taller turbine and meteorological towers, and might be needed in multiple locations for these towers (Bauer, 2001). No significant visual impact would be anticipated by these future lighting requirements because the fixtures would be the same or similar to those already on the site.

As described in Chapters 1 and 2, the configurations of wind turbines, meteorological towers and related facilities change over time within the test site area and future building locations and design features have not been developed, so detailed long-term visual characteristics of the site cannot be presented and views from surrounding vantage points of turbines and towers will continue to change. However, it is clear that the addition of taller towers, longer turbine blades, several new buildings, the addition of solar facilities that have not been placed on this site before, use of new test sites for turbines and towers and increased use of the test site area would create "new" visual elements in the landscape over time as development occurs and more devices are gradually placed on the site and new technologies are tested. It is also clear that these new facilities would be more visible from all off-site vantage points (see Figure 4-1, photographs 1-8). However, the overall appearance of the site would be relatively constant with periodic changes occurring from new configurations. The new buildings would be most visible from vantage points north and east of the site.

Wind turbines are typically visible from off-site locations because they must be located in windy areas characterized by open terrain with limited interruptions of wind from trees or buildings.

Consequently, basic visibility is relatively unavoidable except in extremely remote locations. The perception of wind turbines, solar power devices and related facilities generates different reactions from different people. Some people find man-made intrusions of this type or other changes in a viewshed objectionable, while others may find turbines, new devices or even research buildings attractive and/or interesting subjects for viewing from roads and trails given their purposes.

Extension of the natural gas line from Highway 93 would have inconsequential long-term visual impacts because the line would be placed underground and the site would be restored according to NREL programs and policies. The construction process for the northern option would temporarily disturb the natural condition of the upper reach of Coal Creek, which is visible from Highway 93 (see Figure 3-2, photograph 21). The construction process for the southern option would be equally visible, but would have less impact because it would involve previously disrupted areas.

Off-site, above ground electricity system improvements would also be visible, but the impact would be inconsequential or minor from public vantage points due to intervening topography and landscape characteristics.

4.5.2 Impacts of the No Action Alternative

The No Action alternative would leave overall site features and associated visual elements unchanged, but views of the site would continue to change with new turbine and tower configurations. The overall number of turbines and towers would remain relatively constant because no new test sites would be added.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation measures are required under NEPA.

4.6 WATER RESOURCES

Water resource impacts are typically indicated by degradation of the quality of the surface water and groundwater. This section discusses potential impacts to surface water and groundwater from the proposed construction and operating activities. Sampling of surface water and groundwater and/or modeling were not performed in association with the preparation of this section.

Site planning, standard procedures, and the NWTC's "Stormwater Pollution Prevention Program for Construction Activities" would address potential impacts on water resources. Any future incremental and cumulative impacts to surface water, groundwater and stormwater would be insignificant.

4.6.1 Surface Water and Stormwater Impacts

Potential impacts to surface water resulting from the implementation of the Proposed Action would not be significant because NREL's existing programs, policies and practices would avoid or minimize impacts to stormwater during construction and operations at the NWTC. The Proposed Action would not substantially alter surface water hydrology.

Disruption of the surface soils during pipeline construction could result in the transport of sediment in nearby drainages by stormwater. Turbidity in stormwater may increase from wind and water deposition during grading operations; however, the larger drainages within the site are largely avoided.

The northern natural gas pipeline alignment could have slightly more impact in the form of sediment transport than the southern alignment because of its proximity to the upper reach of Coal Creek and the naturally occurring drainages in the vicinity. There could be a minor increase in particulates transported on-site resulting from the construction of new parking areas and additional vehicle use on the site.

Stormwater volume may increase after implementation of the Proposed Action because of a small increase in impervious surface areas. If the volume of stormwater does increase, the additional amount should be small, and it is not expected to cause flooding, contribute significantly to erosion of stormwater channels, or require substantial infrastructure modifications.

4.6.2 Groundwater Impacts

Site development would incrementally reduce on-site groundwater recharge by creating an additional amount of impervious surface on the site. This loss would represent a small percentage of the total NWTC site acreage and would not have meaningful consequences on recharge or groundwater availability.

Groundwater may be encountered during excavation of the alluvium for test site foundations and building construction, depending on seasonally and geographically fluctuating groundwater levels. It is expected that most of the construction activities are likely to occur without disturbing groundwater. In the event that the water table is encountered, water would be pumped out of the excavation onto the ground and returned to the alluvium via seepage through the soil. There would be no significant impact to the unconfined aquifer from this water removal and subsequent discharge.

In the case of a spill or release of chemicals or hydrocarbons during construction, existing best management practices and procedures associated with spill response and materials handling would minimize subsurface impacts.

Sewage output would increase and would be handled by additional septic systems and leach fields. The poor permeability and slow percolation of the soil limits the effectiveness of individual sewage disposal systems. However, septic tank and leach field sizes would be based on anticipated loads from maximum staffing and soil characteristics. The adequacy of the system would be verified by CDPHE through their permitting process. Compliance with State standards ensures that septic and leach field systems are adequate to meet the needs of a proposed sewage system. Consequently, impacts to groundwater would be insignificant.

4.6.3 Impacts of the No Action Alternative

The No Action Alternative would have no impacts to surface water, stormwater, or groundwater resources. Implementation of this No Action Alternative would preclude minor and incremental impacts resulting from improvements associated with the Proposed Action.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation measures are required under NEPA.

4.7 GEOLOGY AND SOILS

This section discusses the assessment of potential environmental impacts to geologic resources and soils during site preparation, construction, and operation of the expanded facility. Impacts to the geological, mineral, and soil resources at the site resulting from the Proposed Action are expected to be insignificant.

4.7.1 Impacts on Mineral Resources

The proposed action would have no adverse impacts on mineral resources under the site and presents no immediate or substantial conflicts with the existing Utility Right-of-Way Grant of Easement or MOU. However, if the moratorium set forth in the MOU were not extended after the defined termination date, new buildings and facilities would limit surface access in a few locations. This loss of access would not be considered a significant impact because it would represent a very small proportion of the area available for future mining and these features could be removed if the site is decommissioned.

4.7.2 Impacts to Geological Resources and Soils

Resources such as concrete aggregate, crushed rock, and asphalt would be required during construction at the expanded facility. These materials could easily be obtained through commercial sources.

Construction or operational activities under the Proposed Action would not precipitate seismic activity in the vicinity of the site since there would be no injection of fluids. Excavation for new structures would probably not occur below the alluvial surface, approximately 40 feet deep, minimizing the need to blast for construction purposes.

The relatively flat terrain at the site is not physically predisposed to the occurrence of landslides that could be exacerbated by precipitation on surfaces exposed or denuded as a result of construction activities (see Section 4.6 Water Resources). There would be some loss of soils due to the physical alteration of the existing soil profile. However, the nonproductive attributes of most of the site's soils preclude agricultural productivity, therefore the loss of these non-productive soils would be insignificant.

The impacts to land use, loss of vegetation and habitat are described in Sections 4.1 and 4.8. Impacts to water drainage and water erosion are described in Section 4.6.

4.7.3 Impacts of the No Action Alternative

The No Action Alternative would result in no impacts to geological resources. Minor impacts to soil resources from ongoing site activities would be expected.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation measures are required under NEPA.

4.8 BIOLOGICAL RESOURCES

NREL has extensive programs, policies and practices designed to avoid, minimize and mitigate impacts to the biological resources of the site. These efforts range from designation of formal conservation management areas covering sensitive locations to detailed efforts to restore disrupted areas and avoid noxious weed invasion. NREL's programs, policies and practices are referenced, where appropriate, in the following discussions.

4.8.1 Vegetation Impacts

Impacts to native vegetation can occur in three ways: as direct impacts, secondary impacts, or as cumulative impacts. The direct loss of native vegetation by construction or other disturbance may be either permanent or temporary. Secondary impacts to native vegetation may occur due to noxious weed invasion, or as changes in vegetation types due to changes in runoff, shading, etc. Cumulative impacts are the additive impacts resulting from past, present, and planned future activities from the project or other reasonably foreseeable projects.

The activities described for the Proposed Action would result in a direct, but temporary and insignificant loss of grassland habitat. Site development would disrupt site soils and vegetation during normal operations, turbine modification and maintenance activities and related construction work. However, NREL's revegetation policies would mitigate these impacts, including incremental losses of tallgrass prairie species.

Temporarily impacted lands, due to land clearing and disturbance from construction activities, have an increased susceptibility to noxious weed invasion. Weeds such as diffuse knapweed, Canada thistle, hoary cress, leafy spurge, and musk thistle occur on the site and are among the ten most widespread noxious weeds in the State of Colorado. The potential spread of these and other noxious weeds found at NWTC into disturbed areas represents secondary impacts as a result of the Proposed Action. NREL, understanding the potential for adverse effects caused by noxious weed spread, actively manages weeds on-site through NREL's aggressive Weed Control Program.

Although the Proposed Action represents a loss of grassland habitat, the cumulative effect of this loss is minimal due to protection of this habitat type on-site in conservation management areas and the widespread existence of grasslands on the adjacent RFETS and surrounding areas.

4.8.2 Wetland Impacts

The northern pipeline option described in the Proposed Action may result in direct and temporary loss of wetland habitat at wetlands in the drainage way along U.S. Highway 93. It is unknown at this time, how much acreage would be directly impacted by Option 1, but it is likely to be less than 1/10th of an acre. There are no wetlands involved in the Option 2 pipeline route.

Potential secondary impacts from the Proposed Action to wetland resources may include runoff of sediments from nearby construction activities and the invasion of noxious weeds from construction/disturbed areas, into wetland habitat. Because of NREL's commitment to its Stormwater Pollution Prevention Program and Weed Management Programs, such impacts are likely to be short term, minimized and insignificant.

4.8.3 Rare Plant Species

No Ute ladies'-tresses or Colorado butterfly plants occur on the NWTC property based on two consecutive years of surveys (2000 and 2001). The NWTC does not contain habitat for the Colorado butterfly plant and the on-site ephemeral drainages provide only marginal habitat for Ute ladies'-tresses; therefore the occurrence of undocumented populations of either species is unlikely. The ephemeral drainages occur within Conservation Management Areas, which are to remain conservation areas and are not to be developed. The Proposed Action will not affect Ute ladies'-tresses orchid, Colorado butterfly plant, or their habitat.

4.8.4 Wildlife Impacts

The Proposed Alternative would result in a direct loss of minor amounts of xeric, mixed grassland habitat. Construction of new structures and expansion of existing structures would most likely have minor or inconsequential impact small mammals, reptiles, and insects. These impacts are mostly going to be temporary for these species; however, animals with restricted abilities to migrate and occupy new territory may suffer mortality (i.e., permanent impact).

In addition to the direct impacts of construction, there is a secondary impact concern from invasion of weeds into newly cleared lands. Weed infestation may alter habitats enough to cause some species to lose cover or food sources important to their survival. The Proposed Alternative represents an incremental loss of grassland habitat, but this loss would not be considered significant because of widespread existence of grassland habitat on-site and within surrounding landscape, much of which will be permanently preserved as open space.

Noise is another type of impact that may affect wildlife; however, the incremental increase associated with the Proposed Action is not expected to be significant. See Bowles (1995) for a review on the effects of noise on wildlife.

Impacts on Preble's Meadow Jumping Mouse

On-site improvements and activities associated with the Proposed Action will not affect Preble's or Preble's habitat because no Preble's habitat occurs on the NWTC and because the drainages upstream from Preble's habitat are within Conservation Management Areas, where development would not occur or would be limited.

Preble's habitat exists off-site and they have been documented in both the Coal Creek and Rock Creek drainages near NWTC. The proposed gas pipeline from Highway 93 to the site could cross an unnamed tributary of Coal Creek adjacent to Highway 93. A single Preble's was captured in the off-site drainage in August 1997 (ETS, 1997) near the alignment of Option 1 of the proposed pipeline. As a result, the USFWS considers this drainage occupied habitat (Plage, 2001). Should pipeline Option 1 be constructed, Preble's habitat would be affected by the pipeline construction. Direct effects would include temporary loss of habitat (until disturbed

areas are successfully reclaimed) and possible fatality of individual Preble's mice if they occur in the construction zone. This impact would be considered potentially significant (i.e., result in take of a threatened species), but implementation of mitigation measures could reduce the potential impact to less than significant levels (i.e., minimize or eliminate the possibility of take).

Preble's have been documented along drainages near NWTC to both the east and west. Actions, which may affect the riparian corridors of Coal Creek and Rock Creek, may indirectly affect Preble's if they degrade habitat along these drainages. Such degradation is not anticipated even during periods of active construction because NREL would implement existing programs intended to prevent erosion and minimize downstream impacts.

Based on existing and future use of the site, it is unlikely that Preble's will occur on the site or Preble's habitat will develop on the site because the drainages lack a perennial water source that encourages growth of overstory plants.

Avian and Bat Mortality Impacts

The following short-term and long-term Proposed Action components are related to bird and bat use and mortality risks at the NWTC:

- Increased use of the test site area for turbines and longer cumulative turbine operation times;
- Larger, megawatt class, turbines and associated increases in blade sweep areas;
- Taller meteorological towers and longer guy wires; and
- Increased development and activity on the site (more buildings and associated facilities).

The first three changes would be expected to incrementally contribute to avian and bat collision injuries and fatalities while increased development and activity on the site would incrementally reduce mortality impacts by discouraging site use. Permanently preserved open space in the vicinity provides ample habitat for any displacement that might occur.

As the number, size and overall operational time of turbines increases and more and longer guy wires are added, the annual rate of fatalities could increase incrementally relative to current conditions. No long-term or sustained avian population impacts are likely given industry history and available NWTC site mortality data. For these reasons, the incremental impacts of the Proposed Action are not expected to be significant and no take is expected to occur under the Migratory Bird Treaty Act (MBTA) or Endangered Species Act (ESA). However, any collision fatalities involving birds protected by the MTBA and ESA should be reported to USFWS.

Construction of buildings, new turbines, roads and other facilities and increased site activity would likely result in some displacement and/or disturbance of birds as well as other wildlife using the NWTC. To characterize the magnitude of such impacts, the following discussion describes some related situations in other locations allowing for some comparisons with the NWTC site. However, it should be noted that displacement of birds by the new turbines at NWTC is likely to be much lower than displacement associated with new commercial windplants.

In Europe, wind plant-related displacement effects are considered to have a greater impact on birds than collision mortality, and several European studies have addressed this issue. Many

groups of birds, including waterfowl, shorebirds, waders, and passerines, have shown disturbance effects ranging from 250 m to as far as 800 m away from turbines (Peterson and Nohr, 1989; Pederson and Poulsen, 1991; Vauk, 1990; Winkelman, 1989; Winkelman, 1990; Winkelman, 1992). Reductions in use of up to 95% have been recorded (Winkelman, 1994). Most disturbances have involved feeding, resting, and migrating birds (Crockford, 1992). Disturbance to breeding birds appears negligible and was documented during only one study (Pedersen and Poulsen, 1991). For other avian groups or species or at other European wind plants, however, no displacement effects were observed (Karlsson, 1983; Phillips, 1994; Winkelman, 1989; Winkelman, 1990).

Avian displacement associated with windpower development has not received as much attention in the U.S. At a large wind plant on Buffalo Ridge, Minnesota, abundance of shorebirds, waterfowl, upland gamebirds, woodpeckers, and several groups of passerines was found to be significantly lower at survey plots with turbines than at plots without turbines. There were no differences in avian use as a function of distance from turbines; however, suggesting that the area of reduced use was limited primarily to within 330 feet (100 meters) of the turbines (Johnson et al., 2000b). These results are similar to those of Osborn et al. (1998) who reported that birds at Buffalo Ridge avoid flying in areas with turbines, and Leddy (1996), who found that densities of male songbirds within 264 feet (80 meters) of turbines were significantly lower than densities 264 feet (80 meters) away from turbines. In Minnesota, lower avian use within the windplant was attributed to avoidance of turbine noise and maintenance activities and reduced habitat effectiveness due to the presence of access roads and large gravel pads surrounding turbines. Similar disturbances likely occur at the NWTC and would be incrementally increased by future NWTC development.

At the Foote Creek Rim, Wyoming windplant, the estimated breeding population of mountain plovers on top of the rim was reduced from a mean of 50 during the two years prior to construction to a mean of 25 in the three years following initiation of construction. Maps of plover distribution over time on top of the rim showed that plovers were likely displaced by the wind development (Johnson et al., 2000a). At a small commercial windplant sited within a deciduous forest in Vermont, the numbers of several species of forest breeding birds were lower after construction, while the numbers of several forest edge breeding species increased after construction. The change in species composition was attributed to the change in habitat caused by opening clearings in the forest for the development (Kerlinger, 2000).

Some displacement of birds has already occurred at the NWTC due to the presence of turbines, buildings, human activity, roads, and other structures and due to on-site influences on neighboring properties. Data suggest decreases in western meadowlarks and increases in European starlings and Say's phoebe (Armstrong et al., 2001). Due to the small size of the NWTC in relation to other suitable and protected habitat in the vicinity, such changes in avian composition have not and are not likely to result in any significant population changes on a regional scale.

Displacement and future displacement associated with the Proposed Action is generally of concern only under special circumstances, such as presence of an active raptor nest within 0.5 miles (0.8 kilometers) of construction activities (USFWS, 1999) or disturbance to animals that cannot readily relocate. Future impacts to nesting raptors are likely insignificant because raptor nesting is rare on the NWTC (one American kestrel nest has been documented on the NWTC during extensive studies) and it occurred when the site was in operation. Displacement of other nesting birds is not likely to result in any significant impacts because new facilities will be placed

in previously disturbed areas with low wildlife habitat value, sensitive habitats such as the ponderosa pine ridges will be avoided and suitable habitat elsewhere is available and expected to remain into the future through public open space acquisition efforts. If nesting birds are displaced or avoid the NWTC, one potential direct benefit would be an incremental reduction in the potential for collision mortality (Crockford, 1992).

Beneficial Impacts from NREL Avian Research

Wind energy is becoming a very important source of clean, renewable energy. Due to several recent technological advances, power produced at wind plants in the U.S. is now cheaper than power produced at natural gas fired power plants (American Wind Energy Association [www.AWEA.org]). Despite the benefits and growing importance of wind energy, wind projects have been delayed and sometimes stopped at new wind sites across the country due to concerns with avian and other wildlife impacts.

Although minor avian collision mortality occurs at the NWTC research facility, the NREL wind program has played a much larger role in the avian collision issue through working with affected stakeholders and funding research to address the avian impact issue. Before 1992, no coordinated research program existed to examine the potential impacts of wind power development on birds.

In 1992, increasing concern about the possible negative impacts of wind power caused DOE to direct NREL to start a coordinated research effort. NREL then supported several ongoing research efforts, while also organizing the National Avian-Wind Power Planning Meeting. Held in 1994, the meeting was cosponsored by DOE, the American Wind Energy Association, Electric Power Research Institute, National Audubon Society, and Union of Concerned Scientists, and was attended by interested public and private parties. The meeting was the first time stakeholders had met with the goal of reaching consensus on ways to address avian-wind power issues. Participants agreed that research was needed to better define the problem and to develop standard methods for conducting population and other studies in the field. Standard procedures would allow researchers in different locations to compare their data as they seek answers to questions such as: Why do birds come near wind turbines? What, if any, are the effects of wind development on bird populations? What can be done to mitigate the problem?

The initial set of research projects was designed to gain an understanding of the magnitude of the bird-wind power problem in a variety of geographic settings. Additional projects were then developed that test ideas and hypotheses developed during the initial research projects and seek to reduce bird mortality in wind plants. NREL then participated in development of documents to provide standardized metrics for studying avian/windpower interactions (Anderson et al., 1997) and to permit new wind energy facilities (National Wind Coordinating Committee, 1999). NREL contributed over $5 million for research on the avian impact issue. Although DOE funding for future research of this type is being phased out, NREL still maintains staff, databases and a library that provide an international resource for all stakeholders, a service that will continue in the future.

4.8.5 Impacts of the No Action Alternative

Under the No Action Alternative only minor direct, secondary, or cumulative impacts associated with ongoing operations would occur to the vegetative communities at NWTC. On-going weed

management activities are expected to control existing noxious weed populations. Hydrology supporting wetlands is likely to remain constant.

The No Action Alternative would not affect individuals or habitats of the Ute ladies'-tresses orchid, Colorado butterfly plant or Preble's. Existing conditions created by turbines, guy wires, and other site features and their effects on avian species and bats, would continue under the No Action Alternative.

The incremental impacts of more and larger turbines, taller towers and longer guy wires on avian species and bats would be avoided.

MITIGATION MEASURES

If Option 1 for the gas pipeline route is selected, the following measures are required to minimize potential impacts to the Preble's:

- A Biological Assessment (BA) as defined by the ESA will be prepared to fully evaluate potential effects from the pipeline and determine whether the construction will adversely affect Preble's;
- Initiate formal consultation with the USFWS to obtain a Biological Opinion and Incidental Take Statement if effects to Preble's are determined to be adverse;
- Determine conservation measures through consultation with the USFWS to minimize the possibility of adversely affecting Preble's and the possibility of incidental take occurring. Measures may include but not be limited to:

  - Minimize the pipeline corridor width through the riparian habitat to the trench cut and a minimal swath for equipment passage and overburden storage;
  - Conduct a three night trapping survey at the site of the proposed pipeline crossing immediately before any ground disturbance to capture and remove Preble's from the area; and
  - Maintain compliance with applicable permit stipulations regarding erosion control and impact minimization.

4.9 CULTURAL RESOURCES

Impacts to significant cultural resources can occur as a result of building or road construction, utility work, demolition, changes to a resource's setting, or use (including both noise and ground-disturbing activities). This section evaluates potential impacts to cultural resources within the NWTC. The likelihood of impacts is evaluated based on primary, secondary and cumulative impacts of the Proposed Action and No Action alternatives.

Section 106 of the National Historic Preservation Act of 1966 (as amended) requires agencies to consult with the State Historic Preservation Officer (SHPO) when making determinations of eligibility and effect for cultural resources within or adjacent to a project. Consultation letters between DOE and SHPO are included Appendix E.

4.9.1 Impacts from Facility and Infrastructure Improvements

No cultural resource impacts are anticipated for facility and infrastructure improvements. However, earthwork and trenching present a very limited potential to uncover, disturb or destroy resources that are not expected, but could be found in construction areas. Should any evidence of archaeological resources be discovered during construction at the NWTC, the impact would be mitigated by NREL's commitment to stopping the work in the vicinity until a qualified archaeologist can completely evaluate the significance of the find according to criteria established by the National Register.

Option 1 for the natural gas pipeline passes through the 6.5-acre area identified by Labat and Anderson (1995) as having potential for buried archaeological deposits. Based on the recommendations of the Labat and Anderson report, this area should be avoided. If avoidance is not possible, SHPO consultation and systematic testing of the impacted area is recommended prior to ground disturbance to determine if there are any buried archaeological deposits. The level of systematic testing would be determined by the nature of the resource and the potential for impact.

4.9.2 Impacts of the No Action Alternative

Under the No Action Alternative there would be no ground disturbing activities within the area identified by Labat and Anderson (1995) as sensitive for buried cultural resources. All other areas within the NWTC were previously cleared for cultural resources, so any disturbance associated with ongoing operations would be expected to be minor and would be addressed by standard protocol and NREL procedures.

MITIGATION MEASURES

The following measure, an existing NREL commitment, is recommended to address potential impacts of the Proposed Action:

- If natural gas pipeline Option 1 is selected, systematic archaeological testing will be implemented. The testing will occur prior to construction activities and will be approved, as necessary, by the SHPO.

4.10 HAZARDOUS MATERIALS AND WASTES

The Proposed Action is not expected to require new hazardous materials and would require only minor increases in hazardous materials use and waste generation. The NWTC's hazardous waste generator status is expected to remain the same. New facilities and activities are not expected to increase the potential for accident releases or spills. All existing programs, policies and practices associated with hazardous materials and waste would remain in place to apply to future improvements and activities associated with the Proposed Action.

4.10.1 Construction Impacts

Construction activities (tower foundation excavations, on-site utility infrastructure trenching, off-site gas line installation, earthwork, grading, etc.) present the potential to encounter previously

unidentified soils or groundwater contaminated by hazardous materials. Based on field reconnaissance activities conducted by DOE, NREL and Xcel Energy personnel on March 2, 2001 within the proposed natural gas pipeline alignments on and adjacent to the NWTC, the likelihood of encountering contamination is extremely low. If contaminated materials were encountered, standard construction practices and NREL procedures would be applied to avoid related impacts.

4.10.2 Operational Impacts

The Proposed Action would be expected to result in more site activity, which presents the potential to increase the demand for and use of existing hazardous materials and could result in requests for new hazardous materials. Neither of these issues is expected to be significant because:

- the nature of the research to be performed on the site is not going to change substantially;
- chemical manufacturing and processing is not proposed;
- no laboratory wet methods are proposed that would materially increase chemical use, no radiological or other substantial or new risks are anticipated;
- hazardous materials would continue to be handled centrally through NREL and tracked through the chemical inventory system;
- aggressive waste minimization training and implementation would continue to ensure that the amounts of hazardous materials used on-site would be the least possible consistent with research objectives; and
- most importantly, substantial changes would be reviewed by NREL's Risk Assessment Program and stringent management and procedural practices will continue to be implemented at the NWTC.

If new storage tanks are needed for future activities, they would be constructed and managed consistent with state, federal, and NREL tank requirements.

Hazardous waste generation would be expected to increase if the quantities of hazardous materials used increases. However, based on planned improvements and future activities, the amount of hazardous waste generated is not expected to exceed the CESQG criteria limits. It is anticipated that the NWTC would remain a CESQG. NREL's pollution prevention program and other efforts are expected to minimize the amount of hazardous waste generated at the NWTC.

NREL solid, non-hazardous waste quantities have increased only slightly during the past few years due to proactive management and recycling programs. Solid waste levels are expected to increase only slightly and in proportion to increased program activity and higher levels of personnel. The increase in solid waste would not affect current disposal agreements.

4.10.3 Impacts of the No Action Alternative

If the No Action Alternative were implemented, the existing quantities and types of hazardous materials and hazardous wastes associated with the site would remain constant. The possibility of encountering unidentified contaminated materials during construction of new facilities would be reduced relative to the Proposed Action.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation measures are required under NEPA.

4.11 PUBLIC SERVICES AND UTILITIES

The following discussion addresses the impacts of the Proposed Action on the capacity of infrastructure and service providers. Storm water issues are addressed in Sections 3.6 and 4.6 Water Resources. Broad energy issues are discussed in Sections 3.12 and 4.12 Energy Efficiency and Renewable Energy. Environmental impacts from the construction of new utility infrastructure are discussed throughout Chapter 4, as appropriate.

4.11.1 Electricity and Gas

As described in Chapter 2, the Proposed Action requires and includes a major electrical system upgrade and a natural gas line extension from Highway 93. No significant impacts on the capacity of these systems or the local service providers are anticipated from the Proposed Action.

The demand for electricity and gas by the NWTC is not expected to be substantial with respect to Xcel Energy's overall capacity or local infrastructure. The new demand would not contribute substantially to peak period power demand and associated power generation capacities. However, all additional peak period power demand contributes incrementally toward the cumulative need for new power plants and corresponding environmental impacts. These cumulative impacts would be offset by NREL's commitment to sustainability, which includes purchasing "green" power, extensive on-site energy conservation measures, and the potential energy efficiency and renewable energy technology benefits anticipated from the work performed at the NWTC (see Sections 3.12 and 4.12 for related findings).

4.11.2 Telecommunications

The Proposed Action would improve and extend the on-site telecommunications infrastructure to support new research and development activities, facilities, and an increasing number of employees on the site. No off-site infrastructure requirements are needed and the capacity of local service would not be adversely impacted by the proposed improvements.

4.11.3 Domestic Water System

The Proposed Action would create no significant off-site water infrastructure requirements or significant demands on water sources. The capacity of on-site infrastructure and local service would be adequate with contemplated improvements.

The Proposed Action includes improvements that would upgrade the existing domestic water system to accommodate additional buildings and water use. Water use would be expected to increase as new buildings and facilities are constructed and as additional on-site employees are added. The additional water would be hauled onto the site by more frequent and/or larger capacity truck deliveries. If water delivery trucks hauling the same volume of water per trip continue to serve the site, delivery frequencies would be expected to increase in a manner roughly proportional to facility development and employee growth. The long-term scenario

could involve multiple truck trips per week relative to one trip per week in 2001 based on a long-term increase in on-site employees.

The current water system can accommodate additional buildings and associated office areas and restroom facilities with the addition of an underground pipe that would be installed from new buildings to the nearest domestic water loop. This improvement would be included in individual building designs.

4.11.4 Sewage

The Proposed Action would increase demand on existing septic tank and leach field systems in proportion to on-site employment growth. Increased demand would include improvements associated with new buildings and other improvements. These improvements are expected to involve additional septic tank and leach fields, as necessary. The size of each septic tank and leach field would be based on maximum staffing at each facility and associated soil conditions. Existing and proposed systems to address site needs adequately and would satisfy State requirements.

4.11.5 Emergency Response and Fire Protection

The new facilities and additional staff associated with the Proposed Action would incrementally increase demand for police, fire and ambulance services, but the increases would be considered minor given site use and anticipated needs for emergency service providers.

The Proposed Action would not increase the risk of wildfire on the site, but it would result in the installation of new facilities, equipment, and buildings, as well as the presence of additional people. The NREL Fire Protection Program currently addresses this risk and other fire risks. The Proposed Action includes fire hydrant requirements and new underground piping to protect new and existing facilities, buildings, equipment and personnel. No off-site infrastructure requirements would be needed, and the capacity of on-site and local infrastructure and local service would not be disrupted by the proposed improvements or new demands for fire protection services.

4.11.6 Impacts of the No Action Alternative

The No Action Alternative would limit demand growth for public services and utilities by retaining existing employment levels and operational activity at current levels. New buildings, machines and equipment would not be added. Incremental capacity impacts on existing service providers caused by the Proposed Action and the impacts of associated infrastructure improvements would be avoided.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation measures are required under NEPA.

4.12 ENERGY EFFICIENCY AND RENEWABLE ENERGY

The Proposed Action has a complex impact on energy because it will increase on-site energy demand, generate electricity for use on-site, may generate some electricity for distribution

through the regional energy grid and is expect to contribute substantially to nationwide and possibly global use of energy efficiency and renewable energy technology. Overall, the Proposed Action has a beneficial impact on energy efficiency and renewable energy. The following discussion addresses two primary energy impacts of the Proposed Action:

- Electricity Generation for the Site and Regional Grid; and
- Contribution Toward Energy Efficiency and Renewable Energy Technology.

The impacts of the Proposed Action on electricity and gas demand and associated infrastructure is discussed in Section 4.11 Public Utilities and Services.

4.12.1 Electricity Generation for the Site and Regional Grid

The Proposed Action increases the potential for the site to provide electricity for a portion of its own needs and includes the possibility of negotiating an agreement to occasionally add electricity to the regional power grid. This is a beneficial impact of the proposed action.

The possibility that the site could become a “power plant” by exporting more electricity than is imported on a sustained basis is extremely remote because wind conditions are highly inappropriate for efficient and sustained wind power generation and the NWTC is a laboratory designed for intermittent operations and temporary testing configurations. Given fluctuating and uncertain operational parameters, annual energy consumption is expected to exceed annual energy generation by a considerable margin during the life of the NWTC. The NWTC is not and is not intended to become a renewable energy generation plant.

It is important to note that the net energy requirement at the NWTC has no implications relative to the feasibility of wind or solar power as efficient power generation sources.

4.12.2 Contribution Toward Energy Efficiency and Renewable Energy Technology

The Proposed Action is fully intended to make a substantial contribution to energy efficiency and renewable energy technology including advances in wind power and distributed energy resources. The magnitude of these beneficial impacts could range from minor to globally significant depending on the technology achievements resulting from the Proposed Action and related efforts worldwide. Clearly, improvements in technology and corresponding cost-effectiveness since the mid-1970’s have been substantial, and current energy pricing scenarios and research prospects indicate that further advances may be substantial.

These direct benefits would also result in indirect and/or secondary beneficial impacts to the environment including, but not limited to reduced air pollution as compared to emissions generated with conventional energy technologies.

4.12.3 Impacts of the No Action Alternatives

The No Action Alternative would maintain the NWTC’s energy production capacity and energy consumption at current levels. Beneficial energy impacts and corresponding environmental impacts would still be anticipated, but these benefits would be less substantial than those associated with the Proposed Action.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation measures are required under NEPA.

4.13 SUMMARY OF SECONDARY AND CUMULATIVE IMPACTS

Secondary impacts are those that are caused by a Proposed Action, but may occur later in time or farther removed in distance, relative to the primary impacts of the Proposed Action. “Cumulative impacts result from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions" (40 CFR Section 1508.7).

This Site-Wide EA considers past, present and reasonable foreseeable short-term and long-term future actions on the site. In addition, it considers off-site factors and reasonably foreseeable off-site projects.

Reasonably foreseeable off-site projects considered in the cumulative impacts analysis include ongoing aggregate mining in the site vicinity and a wide range of land development in the communities east of the site and along Highway 93.

Cumulative and secondary impacts are discussed in Sections 4.1 through 4.12, as appropriate. The most important examples of secondary and cumulative impacts associated with the Proposed Action are as follows:

- Traffic congestion at the Highway 93/128 intersection;
- Regional and local air pollutant emissions;
- Front range development intensification and changing landscapes;
- Habitat conversion and increased mortality risk for wildlife and plant habitats;
- Demand for energy; and
- Beneficial impacts from improved alternative energy sources.

As stated in Chapter 4, the Proposed Action’s incremental impact on these secondary and cumulative impacts would be insignificant and the No Action alternative would not contribute to these impacts. Cumulative impacts are important to identify, but characterizing their significance is difficult because to some degree these impacts are speculative and may or may not be addressed or mitigated by entities with discretionary authority over reasonably foreseeable projects or efforts that are not foreseeable today. One example would be interim and long-term measures to address congestion issues at the Highway 93/128 intersection. Future plans call for an interchange at this location, but no funding or schedule commitments are currently in place.

4.14 IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible commitment of resources is defined as the loss of future options. The term applies primarily to the effects of use of nonrenewable resources such as minerals or cultural resources, or to those factors such as soil productivity that are renewable only over long periods. It could also apply to the loss of an experience as an indirect effect of a "permanent" change in the nature or character of the land. An irretrievable commitment of resources is defined as the loss of production, harvest, or use of natural resources. The amount of

production foregone is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume production.

The Proposed Action would not have irreversible impacts because future options for using this site would remain possible. A future decommissioning process could restore the site for alternative uses, ranging from natural open space to urban development. No loss of future options would occur.

The primary irretrievable impacts of the Proposed Action would involve the use of energy, labor, materials and funds, and the conversion of some lands from a natural condition through the construction of buildings and facilities. Irretrievable impacts would occur as a result of construction, facility operation and maintenance activities. Direct losses of biological productivity and the use of natural resources from these impacts would be inconsequential, and would be offset by the mission of the NWTC to improve energy efficiency and renewable energy technology and by the generation of renewable power by turbines, distributed energy systems, and other facilities at the NWTC and elsewhere.

4.15 THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The following discussion addresses the commitment of resources associated with the Proposed Action relative to the loss of long-term productivity associated with these commitments.

The Proposed Action would commit resources in the form of energy, labor, materials, and funds over 20 years or more. The justification for these commitments at this time is described in Section 1.1 Purpose and Need. Long-term productivity associated with the site relates to agricultural value for livestock grazing, biological value as habitat and open space values associated with aesthetic quality and recreation. 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 insignificant and off-set by the potential for the Proposed Action to improve energy efficiency and harness renewable energy resources. Improved efficiency and increased reliance on renewable energy resources could substantially reduce reliance on coal, oil, and nuclear fuels and reduce resource productivity losses in resource extraction areas.

No long-term risks to public health and safety would be created by the Proposed Action.

4.16 UNAVOIDABLE ADVERSE IMPACTS

There would be no significant unavoidable adverse impacts of the short-term or long-term components of the Proposed Action. However, some adverse impacts would be expected. These impacts and corresponding mitigation measures are described throughout Chapter 4 and are listed in the Summary of this document.

4.17 SITE-WIDE ENVIRONMENTAL MANAGEMENT MATRIX

Table 4-3 presents a Site-Wide Environmental Management Matrix. The matrix provides an overview of impact issues associated with individual components of the Proposed Action. It will also serve NWTC staff, managers and other decision-making persons and entities by providing a quick reference guide for the key issue raised by anticipated short-term and long-term improvement programs at the NWTC.

The matrix covers a wide range of issues. These issues and others are managed at the NWTC under a series of Environmental, Safety and Health (ES&H) policies and programs developed and implemented by DOE and NREL. The ES&H policies and programs are well developed and are already integrated into NWTC operations and processes for new projects.

The matrix lists each of the key components of the short-term and long-term improvement programs anticipated at the NWTC and then compares them to key environmental management issues. The improvements and environmental issues are presented in the same order as they are presented in Chapters 2, 3 and 4 of the EA. If limits on the number, location or other characteristics of a particular improvement are defined in the EA, those limits or ceilings are noted. If issue clarifications are needed and/or important NEPA “significance” thresholds can be characterized for a particular issue, details are provided in subsequent footnotes.

At this time, no other possible improvements/changes are anticipated. However, in an effort to improve the utility of this tool, additional improvements/changes are included in the matrix to guide site managers in the event that unforeseen circumstances warrant changes to the program of improvements.

No mark in the matrix indicates that a particular issue does not relate to a particular improvement. An “X” in the matrix indicates that a particular issue applies or may apply to the corresponding improvement. In many cases, NREL has made commitments related to this issue or has ES&H policies and procedures in place that relate to this issue and may need to be considered as part of project implementation. A red “X” indicates high sensitivity for a particular improvement to the corresponding issue. If an X is present, existing ES&H practices and procedures and corresponding commitments presented in Chapter 1 of the EA should be evaluated to determine whether and how they may apply.

Table 4-3. Site-Wide Environmental Management Matrix

PROGRAM OF IMPROVEMENTS	POTENTIAL ISSUES																														
	Off-Site Land Use Compatibility (1)	Site-Wide Land Use Compatibility (2)	Comp. with Local Planning Policy (3)	Social or Economic Impact	Site Circulation and Parking (2)	Traffic Generation and Congestion (4)	Traffic Safety and Accidents (4)	Air Pollution Constituents (5)	Air Pollution Emissions (5)	Air Quality Attainment Goals (5)	Equipment Noise	Traffic Noise	Visibility and Visual Impact (6)	Surface Water Resources	Ground Water Resources	Storm Water	Soils	Aggregate Resources (7)	Tall Grass Prairie (8)	Prebles' Meadow Jumping Mouse Habitat (8)	Ute Ladies'-Tresses Orchid Habitat (8)	Wetlands (8)	Avian (Bird or Bat) Impacts	Cultural Resources (9)	Use of Hazardous Materials (10)	Generation of Haz. Materials (10)	Disposal of Hazardous Materials (10)	Power Use	Water Use	Sewage Generation	Emergency Services
SHORT-TERM																															
Facility and Research Area Modification and Construction																															
Expansion of the Structural Blade Testing Facility (25,000 square feet, 25 employees)		X			X	X					X		X			X	X								X	X	X	X	X	X	X
Construction of a New Structural Blade Testing Facility (25,000 square feet, 25 employees)		X			X	X					X		X			X	X								X	X	X	X	X	X	X
Expansion of the Dynamometer Test Facility (10 megawatt Dynamometer)		X			X						X		X			X	X								X	X	X	X	X	X	X
Construction of a New Dynamometer Test Facility (10 megawatt Dynamometer)		X			X						X		X			X	X								X	X	X	X	X	X	X
Installation of Three New Large (Megawatt-Class) Turbines (5 megawatts, foundation excavations o 75 feet by 75 feet)		X									X		X			X	X		X				X								X
Installation of Additional Smaller Turbines and Associated Facilities		X									X		X			X	X		X				X								
Installation of 20 additional test sites		X											X			X			X			X	X					X	X	X	

X=Issue applies or may apply
X(red)=High sensitivity to the issue

Table 4-3. Site-Wide Environmental Management Matrix

PROGRAM OF IMPROVEMENTS	POTENTIAL ISSUES																														
	Off-Site Land Use Compatibility (1)	Site-Wide Land Use Compatibility (2)	Comp. with Local Planning Policy (3)	Social or Economic Impact	Site Circulation and Parking (2)	Traffic Generation and Congestion (4)	Traffic Safety and Accidents (4)	Air Pollution Constituents (5)	Air Pollution Emissions (5)	Air Quality Attainment Goals (5)	Equipment Noise	Traffic Noise	Visibility and Visual Impact (6)	Surface Water Resources	Ground Water Resources	Storm Water	Soils	Aggregate Resources (7)	Tall Grass Prairie (8)	Prebles' Meadow Jumping Mouse Habitat (8)	Ute Ladies'-Tresses Orchid Habitat (8)	Wetlands (8)	Avian (Bird or Bat) Impacts	Cultural Resources (9)	Use of Hazardous Materials (10)	Generation of Haz. Materials (10)	Disposal of Hazardous Materials (10)	Power Use	Water Use	Sewage Generation	Emergency Services
Const. of a DERTF (general location specified) Phase 1: Construction of a Systems Interconnection Test Lab (10,000 sq. ft., 10 emp)		X			X	X					X		X			X	X								X	X	X	X	X	X	X
Const. of a DERTF (general location specified) Phase 2: Construction of a Hybrid and System Test Lab (additional 10,000 sq. ft. and 10 more employees)		X			X	X					X		X			X	X								X	X	X	X	X	X	X
Construction of a Distributed Energy Resources (DER) Test Area (location in development area specified in general terms)		X			X	X					X		X			X	X								X	X	X	X	X	X	X
Installation of Large and Small Solar Dish/Converter Systems		X											X																		
Fuel Cell Thermal and Moisture Management Research (1000 square feet, fuel cells up to 55 kW)		X																							X	X	X	X	X		
Installation of a 25kW Electrolyzer System		X									X		X												X	X	X	X			

X=Issue applies or may apply
X(red)=High sensitivity to the issue

Table 4-3. Site-Wide Environmental Management Matrix

PROGRAM OF IMPROVEMENTS	POTENTIAL ISSUES																														
	Off-Site Land Use Compatibility (1)	Site-Wide Land Use Compatibility (2)	Comp. with Local Planning Policy (3)	Social or Economic Impact	Site Circulation and Parking (2)	Traffic Generation and Congestion (4)	Traffic Safety and Accidents (4)	Air Pollution Constituents (5)	Air Pollution Emissions (5)	Air Quality Attainment Goals (5)	Equipment Noise	Traffic Noise	Visibility and Visual Impact (6)	Surface Water Resources	Ground Water Resources	Storm Water	Soils	Aggregate Resources (7)	Tall Grass Prairie (8)	Prebles' Meadow Jumping Mouse Habitat (8)	Ute Ladies'-Tresses Orchid Habitat (8)	Wetlands (8)	Avian (Bird or Bat) Impacts	Cultural Resources (9)	Use of Hazardous Materials (10)	Generation of Haz. Materials (10)	Disposal of Hazardous Materials (10)	Power Use	Water Use	Sewage Generation	Emergency Services
Renovation of the East Wing of Building 251		X											X															X	X	X	X
Modification of Existing Facilities		X											X															X	X	X	X
Infrastructure Improvements																															
Upgrade the Existing Electrical Infrastructure, Option 1 Upgrade Switchgear and Cable, 20 MVA	X	X											X				X											X			
Upgrade the Existing Electrical Infrastructure, Option 2 Separate 10 MVA Feeder Line, different Switchgear and Substation	X	X											X			X	X											X			
Extend Natural Gas Pipeline from Highway 93 to the Site, (6 inch pipeline, complete service loop), Option 1 Northern Route	X	X						X	X				X	X		X	X			X		X		X	X		X	X			X
Extend Natural Gas Pipeline from Highway 93 to the Site, (6 inch pipeline, complete service loop), Option 2 Southern Route	X	X						X	X				X			X	X								X		X	X			X
Upgrade and Extend Telecommunications Infrastructure	X	X											X			X	X														

X=Issue applies or may apply
X(red)=High sensitivity to the issue

Table 4-3. Site-Wide Environmental Management Matrix

PROGRAM OF IMPROVEMENTS	POTENTIAL ISSUES																														
	Off-Site Land Use Compatibility (1)	Site-Wide Land Use Compatibility (2)	Comp. with Local Planning Policy (3)	Social or Economic Impact	Site Circulation and Parking (2)	Traffic Generation and Congestion (4)	Traffic Safety and Accidents (4)	Air Pollution Constituents (5)	Air Pollution Emissions (5)	Air Quality Attainment Goals (5)	Equipment Noise	Traffic Noise	Visibility and Visual Impact (6)	Surface Water Resources	Ground Water Resources	Storm Water	Soils	Aggregate Resources (7)	Tall Grass Prairie (8)	Prebles' Meadow Jumping Mouse Habitat (8)	Ute Ladies'-Tresses Orchid Habitat (8)	Wetlands (8)	Avian (Bird or Bat) Impacts	Cultural Resources (9)	Use of Hazardous Materials (10)	Generation of Haz. Materials (10)	Disposal of Hazardous Materials (10)	Power Use	Water Use	Sewage Generation	Emergency Services
Upgrade Existing (independent) Domestic Water System		X															X											X	X		
Upgrade Fire Protection System		X																											X		X
Upgrade Sewage System		X														X	X														
Upgrade and Modify On-Site Roads, Parking Areas, and Site Entrance		X			X	X	X						X			X	X														
Implementation of Security Modifications																X															X
Site Activities and Routine Maintenance																															
Office and Lab Work																									X	X	X				
Installing and Removing Wind Turbines, Meteorological Towers and Instrumentation, and Installation of the Necessary Infrastructure			X								X		X			X							X		X	X	X				
Maintenance and Monitoring of Atmospheric and Wind Turbine Experiments, Tests and Certifications											X		X										X		X	X	X				
Onsite Environmental Monitoring								X	X		X					X			X			X	X		X	X	X	X	X	X	
Site Amenities		X											X			X															
Fuel Storage and Use								X	X																X	X	X	X			X

X=Issue applies or may apply
X(red)=High sensitivity to the issue

Table 4-3. Site-Wide Environmental Management Matrix

PROGRAM OF IMPROVEMENTS	POTENTIAL ISSUES																														
	Off-Site Land Use Compatibility (1)	Site-Wide Land Use Compatibility (2)	Comp. with Local Planning Policy (3)	Social or Economic Impact	Site Circulation and Parking (2)	Traffic Generation and Congestion (4)	Traffic Safety and Accidents (4)	Air Pollution Constituents (5)	Air Pollution Emissions (5)	Air Quality Attainment Goals (5)	Equipment Noise	Traffic Noise	Visibility and Visual Impact (6)	Surface Water Resources	Ground Water Resources	Storm Water	Soils	Aggregate Resources (7)	Tall Grass Prairie (8)	Prebles' Meadow Jumping Mouse Habitat (8)	Ute Ladies'-Tresses Orchid Habitat (8)	Wetlands (8)	Avian (Bird or Bat) Impacts	Cultural Resources (9)	Use of Hazardous Materials (10)	Generation of Haz. Materials (10)	Disposal of Hazardous Materials (10)	Power Use	Water Use	Sewage Generation	Emergency Services
LONG-TERM																															
50,000 square feet of additional new laboratory, office and/or other suppor space with:no heights exceeding 75 feet, no more than 300 total employees on the site, road and parking facilities, utility connections		X			X	X	X						X			X	X											X	X	X	X
Installation of a 4th and 5th Large (Megawatt-Class) Turbine (not to exceed 5 Megawatts)		X									X		X			X	X						X		X	X	X				X
OTHER POSSIBLE IMPROVEMENTS/CHANGES																															
Accelerated Development Schedule		X			X	X							X												X	X	X	X	X	X	X
Decelerated Development Schedule		X																													
Substantial changes to land use designations: new allowable uses or activities presenting new potential impacts or risks, allow uses in areas reserved for other uses, loss of conservation management areas, conversion of test site areas to permanent facility development areas	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X		X			X	X		X	X	X	X	X	X	X

X=Issue applies or may apply
X(red)=High sensitivity to the issue

Table 4-3. Site-Wide Environmental Management Matrix

PROGRAM OF IMPROVEMENTS	POTENTIAL ISSUES																														
	Off-Site Land Use Compatibility (1)	Site-Wide Land Use Compatibility (2)	Comp. with Local Planning Policy (3)	Social or Economic Impact	Site Circulation and Parking (2)	Traffic Generation and Congestion (4)	Traffic Safety and Accidents (4)	Air Pollution Constituents (5)	Air Pollution Emissions (5)	Air Quality Attainment Goals (5)	Equipment Noise	Traffic Noise	Visibility and Visual Impact (6)	Surface Water Resources	Ground Water Resources	Storm Water	Soils	Aggregate Resources (7)	Tall Grass Prairie (8)	Prebles' Meadow Jumping Mouse Habitat (8)	Ute Ladies'-Tresses Orchid Habitat (8)	Wetlands (8)	Avian (Bird or Bat) Impacts	Cultural Resources (9)	Use of Hazardous Materials (10)	Generation of Haz. Materials (10)	Disposal of Hazardous Materials (10)	Power Use	Water Use	Sewage Generation	Emergency Services
New roads or utility extensions		X			X	X	X						X			X			X			X									
Turbines larger than 5 MW		X	X								X		X			X	X						X		X	X	X				X
Meteorological Towers in excess of 180 meters		X	X										X			X							X								
More overall building square footage, more than 300 employees, taller buildings		X		X	X	X							X			X												X	X	X	X
Other Improvements that Exceed Designated Limits		X			X	X		X	X		X		X			X			X			X	X		X	X	X	X	X	X	X

X=Issue applies or may apply
X(red)=High sensitivity to the issue

Footnotes:

1. *Off-Site Land Use Compatibility*: Project requires activities on lands beyond the boundaries of the NWTC. Coordination and/or negotiations with associated property owners and local governments may be a lead item and issues may result that have not been fully addressed by ES&H policies and procedures or commitments in the EA. NEPA could be triggered by substantial controversy or potentially significant off-site impacts that have not been addressed in the EA.

2. *Site-Wide Land Use Compatibility*: Project design elements should be checked with respect to development limitations: building locations, structure heights, circulation, access, parking, implications on other projects, etc. Variations in excess of limits or outside of assumed parameters could necessitate NEPA review.

3. *Compatibility with Local Planning Policy*: Larger turbines and meteorological towers require review by the Federal Aviation Administration with respect to Jefferson County Airport aviation requirements.

4. *Traffic Congestion and Accidents*: Off-site road improvements and on-site changes that might substantially increase truck traffic, special event traffic volumes or long-term peak period traffic volumes will necessitate coordination with the Colorado Department of Transportation and local governments. NEPA review is unlikely unless a project would generate more than the anticipated number of employees on the site (300).

5. *Air Quality*: Projects that increase air pollutant emissions beyond acceptable thresholds or add one or more new air pollutants to site emissions should be reviewed with respect to emission inventory figures in the NWTC's Air Pollution Emission Notices (APENs), Colorado Department of Public Health and Environment, Air Pollution Control Division permit thresholds and associated policies, procedures and committed measures. A significant air pollution impact requiring NEPA review and /or revisiting NWTC permits and notifications would be needed if total site-wide emissions exceed permitted limits one or more new harmful pollutants is added to the NWTC's emission inventory.

6. *Visual Quality*: Buildings and turbines visible from key off-site vantage points that exceed the limits defined in Chapter 2 of the EA or towers in excess of 594 feet (180 meters) should be reviewed with respect to visual impacts. A significant visual impact requiring NEPA review would not have specific thresholds, but would require a technical judgment based on the variation from defined limits and potential public reaction to the difference.

7. *Aggregate Resources*: Projects that might be considered inconsistent with the rights of the owner of subsurface resources and/or more specifically, compromise the agreements defined within the Memorandum of Understanding between NREL and Western Aggregates, Inc. may trigger legal issues and/or subsequent NEPA review.

8. *Biological Resources*: The following would be expected to trigger additional NEPA review and/or other specified processes:

- Elimination of substantial portions of tall grass prairie with no feasible habitat and/or population restoration process.

- Trapping of a Preble's in a new area where surface disturbance is unavoidable and mitigation measures are deemed inadequate by key state and federal agencies. NEPA review and processes associated with the Endangered Species Act would apply.
- Documented presence of Ute Ladies Tresses Orchid or other protected species in an area where surface disturbance is unavoidable and mitigation measures are deemed inadequate by key state and federal agencies. NEPA review and processes associated with the Endangered Species Act would apply.
- Impacts on wetlands as set forth under Section 404 of the Clean Water Act and associated requirements and guidance. A permit from the U.S. Army Corps of Engineers may be required. NEPA review would not be necessary, unless off-site or unusual circumstances and impacts were anticipated.
- Documented mortality of species protected under the Endangered Species Act.
- A documented increasing trend in mortality of species protected by the Migratory Bird Treaty Act.

9. *Cultural Resources*: Projects involving earthwork may uncover previously unknown and undocumented cultural resources. Risks are low in areas anticipated for development. If human remains or other substantial resources are encountered, all work must stop and protocol set forth under the Section 106 of the National Historic Preservation Act would apply. The State Historic Preservation Officer should be contacted. NEPA review would be unlikely unless impacts were deemed significant and unavoidable.

10. *Hazardous Materials*: Projects that would involve hazardous materials trigger numerous ES&H policies and procedures and require careful review with respect to agency permits notifications. NEPA would not be triggered unless substantial new risks were associated with increasing quantities or new materials. Contact the NREL NEPA Coordinator in the ES&H office.

1. View of the NWTC looking south from the shoulder of Highway 93 on June 25, 2001.

2. View of the NWTC looking south from the shoulder of Highway 93 on June 25, 2001. Note: The turbines and towers visible in these photographs may be removed, relocated or replaced with different facilities over time.

Figure 4-1 Potential Visibility Zones for Proposed Buildings, Turbines, and Other Site Facilities

3. View of the NWTC looking west from the shoulder of Highway 128 on June 25, 2001.

4. View of the NWTC looking west from the shoulder of Highway 128 on June 25, 2001 taken with telephoto lens to clarify site features.

Figure 4-1 Potential Visibility Zones for Proposed Buildings, Turbines, and Other Site Facilities

5. View of the NWTC looking south from the Greenbelt Plateau trailhead.

6. View of the NWTC looking south from the Greenbelt Plateau trailhead taken with a telephoto lens to clarify site features.

Figure 4-1 Potential Visibility Zones for Proposed Buildings, Turbines, and Other Site Facilities

7. View of the NWTC looking southeast from the Flatirons Vista trailhead.

8. View of the NWTC looking southeast from the Flatirons Vista trailhead taken with a telephoto lens to clarify site features.

Figure 4-1 Potential Visibility Zones for Proposed Buildings, Turbines, and Other Site Facilities

5. COMMENTS ON THE DRAFT EA AND RESPONSES

Five comment letters (A-F) were received following circulation of the Draft EA (see Appendix D). On each letter are notations that identify specific comments (A.1, A.2, C.2, D.5, etc.), which are summarized in this section of the EA and then followed by a specific response. Some responses involved revising the text presented in the Draft EA and some did not. The text of this Final EA includes the entire text of the Draft EA and the appropriate revisions.

A. Southern Ute Indian Tribe, Tribal Information Services, Edna Frost, Director, February 25, 2002.

A.1 There are no known impacts to areas of Native American cultural sites that are sensitive to this Tribe.

Response: The comment is noted.

A.2 In the event of inadvertent discoveries of Native American sites, artifacts, or human remains, this Tribe would appreciate notification.

Response: The comment is noted.

A.3 Please address all future NAGPRA correspondence to Mr. Neil Cloud.

Response: The comment is noted.

B. United States Department of Agriculture, Natural Resources Conservation Service, Eugene H. Backhaus, District Conservationist, March 7, 2002.

B.1 What kind of mitigation measures are to be installed during construction to control erosion by wind and water?

Response: Erosion control policies, programs and mitigation measures applicable to the construction of buildings, installation of infrastructure, excavation and other activities at the NWTC are set forth in several NREL documents. Specific mitigation measures are determined on a case-by-case basis. Examples of measures that might be applied are included in NREL's NWTC Stormwater Pollution Prevention Program for Construction Activities.

B.2 Soil on the site has the potential to be expansive, but related impacts can be mitigated.

Response: Existing construction practices at the NWTC address this issue.

B.3 We would like to offer a specific revegetation seed mix.

Response: The recommended mix is noted. NREL uses a similar seed mix, specifically customized for the NWTC. NREL's current mix is based on input from the Natural Resources Conservation Service and information from a site survey of native vegetation.

C. Jefferson County Planning and Zoning Department, Michael Smyth, AICP, Planner, March 15, 2002.

C.1 Jefferson County does not have jurisdiction within federal property for regulating land use and construction.

Response: The comment is noted.

C.2 The North Plains Community Plan applies to the general vicinity of the NWTC.

Response: The relevant aspects of the North Plains Community Plan, North and Central Plains section, are addressed in Section 3.1 of the EA.

C.3 The proposed uses of the NWTC are consistent with Jefferson County land use designations for the site.

Response: The comment is noted.

C.4 There are no specific land use suggestions in the North Plains Community Plan for the land in the immediate vicinity of the NWTC.

Response: The comment is noted.

C.5 Applicable General Policies in the North Plains Community Plan suggest encouraging preservation of historic sites when possible and being sensitive to impact on wildlife populations and native vegetation in the area.

Response: These policies are consistent with NREL's policies, which are described throughout the EA.

C.6 The map on page 40 of the North Plains Community Plan indicates that a wagon road or trail may run across the southern end of the property.

Response: The wagon road shown in the referenced figure is not located on the NWTC, but it is close to the southeast corner of the site. The Proposed Action does not involve specific improvements in the southeast corner of the site or outside of the site's boundaries, so there would be no direct impacts or substantive indirect impacts on the wagon road.

C.7 Impacts on wildlife and Preble's meadow jumping mouse habitat should be considered in the decision making process.

Response: Wildlife and Preble's issues are addressed in Sections 3.8 and 4.8 of the EA.

C.8 The U.S. Fish and Wildlife Service should be consulted to determine the best approach for wildlife and endangered species conservation.

Response: The U.S. Fish and Wildlife Service has been consulted and their conservation recommendations are presented in the EA.

C.9 Conservation measures for native vegetation suggested in the North Plains Community Plan address revegetation with native species, minimizing the area of construction disturbance, maintaining existing soil types and unusual hydrologic conditions.

Response: NREL's site management plans, programs and policies address these issues and they are generally consistent with those set forth in the North Plains Community Plan.

C.10 Option 2 for the natural gas line avoids the impacts of Option 1. Option 2 is preferred.

Response: The comment is noted. The EA findings are consistent with this comment.

C.11 County mapping of approximate Preble's habitat, sensitive vegetation area and wetlands is available upon request.

Response: The availability of these maps is noted. NREL and others have mapped these resources for the NWTC site and the vicinity.

C.12 Contacting the U.S. Fish and Wildlife Service for updated information is suggested.

Response: The U.S. Fish and Wildlife Service has been contacted for this reason and to obtain other input.

C.13 Jefferson County land use designations in the vicinity of the site include retail, office, industrial, or open/space/recreation uses. Residential land use designations have been avoided.

Response: The comment is noted.

C.14 The North Plains Community Plan suggests that development in the vicinity of Rocky Flats should be referred to the Colorado Department of Health for evaluation of ambient levels of radiation in site soils and the adequacy of emergency evacuation plans.

Response: The comment is noted.

C.15 The North Plains Community Plan suggests that office and industrial buildings should be limited to heights appropriate to the available fire protection and to reduce the impact on visual corridors.

Response: The planning and design process for new buildings and facilities at the NWTC will consider fire protection requirements and visual impact issues. The visual corridors referenced in the North Plains Community Plan primarily involve vantage points along Highway 93 and viewsheds to the west of Highway 93. The visual corridors in the plan do not relate directly to the location of proposed buildings on the NWTC.

C.16 Jefferson County routinely addresses the following issues as a matter of policy and regulation for projects in the vicinity of the NWTC: outdoor lighting, emissions of heat, glare, radiation and fumes, height restrictions, setbacks, parking allotments, soil and geologic constraints, wildlife and vegetation conservation, and mineral rights issues.

Response: As described in Comment C.1, Jefferson County's land use and construction regulations and policies do not apply to the NWTC site. NREL applies a comprehensive set of policies and programs to address these and other issues at the NWTC and subjects new development proposals to a thorough planning and design review process. Soil and geologic constraints are addressed in Section 3.6 and 4.6 of the EA. Wildlife and vegetation considerations are addressed in Sections 3.8 and 4.8. Mineral estate owners were contacted (See Letter D).

D. Massey Semenoff Schwarz & Bailey, P.C. David A. Bailey, Attorney at Law, legal counsel for Mineral Reserves, Inc., March 15, 2002.

D.1 Construction of the access road (that is a key component of the Utility Right of Way Grant of Easement and a Memorandum of Understanding) should be considered a "planned future action" rather than "speculative."

Response: The last two sentences in Section 1.2.2, page 1-12, have been modified to read:

"Consequently, construction and use of a road within the easement is not considered in this analysis. Any proposal by Mineral Reserves, Inc. to develop/use the road easement would be subject to a separate NEPA analysis when a formal proposal is submitted for DOE consideration."

D.2 The Draft EA should not summarily conclude that construction of the access road would be subject to additional environmental analysis or any particular form of NEPA compliance in advance of an actual proposal, design drawings, or other specific documentation

Response: The last two sentences in Section 1.2.2, page 1-12 and similar sentences elsewhere in the EA have been modified as set forth in Response to Comment D.1.

D.3 The Draft EA should state that the "No Build Zone" is a commitment of NREL, not of MRI pursuant to its leasehold interest and the associated access road.

Response: Text in sections 1.2.3, page 1-15, has been modified to include a reference to the Mineral Reserves Inc. road easement.

D.4 The Spicer mineral lease is currently held by Mineral Reserves, Inc., as successor in interest to Western Aggregates, Inc.

Response: Section 3.1.1, page 3-1, paragraph 4, third sentence and Figure 3-1 have been modified to make this clarification.

D.5 Along with the MOU, the Draft EA should refer to the Utility Right-of-Way Grant of Easement and should note that MRI is a corporate affiliate of Lafarge West, Inc.

Response: Section 3.1.3, page 3-5, first two paragraphs, have been modified to read:

"A July 27, 1995, Utility Right of Way Grant of Easement and an MOU between Western Aggregates, Inc. and the DOE (Golden Field Office) created a 20-year moratorium on

mining activities on the eastern 120 acres of the site. Via this agreement, DOE granted a road easement over which Minerals Reserve, Inc., as successor in interest to Western Aggregates, Inc. and a corporate affiliate of Lafarge West, Inc. may construct, at no cost to DOE, a roadway connecting LaFarge Facilities to Highway 128. The general location of the easement is shown in Figure 3-1.

"The road to be placed in the easement is not described in the utility easement and MOU. No road facility…"

D.6 Construction of the access road (that is a key component of the Utility Right-of-Way Grant of Easement and a Memorandum of Understanding) should be considered a "planned future action" rather than "speculative."

Response: See Response to Comment D.1. A corresponding change to the EA has been made on Page 3-5.

D.7 Neither Mineral Reserves, Inc., nor Lafarge West, Inc. operates "aggregate mining facilities west of the NWTC site. Mineral Reserves, Inc.'s operation is located south of the site.

Response: Two changes to the EA have been made to make this correction:

Section 3.1.1, page 3-5, paragraph 3, first sentence has been modified to read:

". . . and the recently designated National Wildlife Refuge to the east and south, and industrial uses (AMS Drilling and Blasting) to the west, and aggregate mining to the southwest."

Section 3.1.1, page 3-5, paragraph 5 has been modified to read:

"The aggregate processing facilities west and southwest of the site are comprised of surface excavations, material conveyors, rail lines and processing facilities. Two companies, TXI and LaFarge operate on separate but contiguous sites located between Highway 93 and the NWTC. Mineral Reserves, Inc.'s aggregate mining operation is located south of the site.

D.8 The Spicer mineral lease is currently held by Mineral Reserves, Inc., as successor in interest to Western Aggregates, Inc.

Response: Section 3.7.2 has been modified to make this correction.

D.9 Mineral Reserves, Inc. does not adopt, and is not bound by the Draft EA.

Response: The comment is noted.

D.10 Footnote 7 on page 4-3 should reflect that the Spicer mineral lease is currently held by Mineral Reserves, Inc., as successor in interest to Western Aggregates, Inc and the existence of the Utility Right-of-Way Grant of Easement

Response: There is no footnote 7 on page 4-3. References in the document to the Spicer mineral lease have been revised to reflect Mineral Reserves, Inc., as successor in interest to Western Aggregates, Inc. References to the MOU have been modified to also mention the "Utility Right-of Way Grant of Easement."

D.11 Mineral Reserves, Inc.,reiterates and incorporates by reference the "Scoping Comments" presented in a letter dated July 17, 2001, from David Bailey.

Response: The referenced letter was presented in the Draft EA in Appendix C. The following summarized comments and corresponding responses are from the referenced scoping letter.

1. Mineral Reserves, Inc., requests that the EA expressly recognize and discuss the mineral leases, Easement Agreement and the MOA, including without limitations Mineral Reserves, Inc.'s right to conduction mining operations on the leased property.

Response: The comment is noted. Section 3.1.1, page 3-1 last paragraph and 3-2 first paragraph states:

"Surface rights at the NWTC are owned by DOE. Mineral rights are owned by private entities. The mineral rights for the western 160 acres of the site are owned by Rocky Mountain Fuel and apply to the extraction of coal, shale, oil, and natural gas. The mineral rights for the eastern 145 acres of the site are owned by the Spicer family and are currently leased by Western Aggregates, Inc. (see Figure 3-1). Active aggregate mining and processing facilities are located to the south and west of the NWTC.

A July 27, 1995, Utility Right of Way Grant of Easement and an MOU and between Western Aggregates, Inc. and the DOE (Golden Field Office) created a 20-year moratorium on mining activities on the eastern 120 acres of the site. The MOU states that DOE granted a road easement over which Minerals Reserve, Inc., as successor in interest to Western Aggregates, Inc. may construct, at no cost to DOE, a roadway connecting LaFarge Facilities to Highway 128. The general location of the easement is shown in Figure 3-1."

2. Mineral Reserves, Inc. requests that the EA acknowledge that new construction or modification of existing facilities by DOE at the NWTC may reduce the already minimal quantity of topsoil available for reclamation activities on Mineral Reserves, Inc.'s leased property.

Response: The comment is noted. NREL environmental guidelines and construction specifications require the salvage of topsoil. The environmental guidelines are included in the EA by reference to the NREL Storm Water Pollution Prevention Program for the NWTC. This document may be viewed on NREL's website: http://www.nrel.gov/esh/.

3. DOE should acknowledge in the EA their commitment to work with Mineral Reserves, Inc. to allow Mineral Reserves, Inc. to fully obtain the benefits of its legal rights and the cost implications of improvements that would have to be removed to assure Mineral Reserves, Inc.'s right and ability to mine the property

Response: The comment is noted. See Response to Comment 1.

4. There appears to be overlap between the boundaries of the NWTC and the Rock Creek Reserve. Mineral Reserves, Inc. believes that the federal agencies should work closely together to avoid duplicative or inconsistent regulation of the property and that Mineral Reserves, Inc.'s right to conduct mining operations on the property be recognized and protected by both planning processes.

   Response: There is no overlap in the locations or boundaries of the NWTC and the proposed Rock Creek Reserve (see Figure 3-1) nor the Rocky Flats National Wildlife Refuge designated by Congress on December 12, 2001, included in the National Defense authorization Act for fiscal year 2002 (Formerly the Allard/Udall legislation). Also see Response to Comment 1.

5. The EA should acknowledge ongoing grassland studies by ESCO and address adverse impacts to the study plots.

   Response: Consultations with David Buckner from ESCO on May 6, 2002 confirm that the Rocky Flats Bluestem Grassland Study "study plots" are located outside the boundaries of the NWTC site. The closest study plots are located near the NWTC's eastern boundary line. The Study indicates that the grasslands in the vicinity of the NWTC and within the eastern half of, and possibly other locations within, the NWTC site represent some of the highest quality examples of the bluestem grassland ecosystem. Section 4.8 of the EA acknowledges potential adverse impacts to these grasslands. There are no anticipated adverse impacts from the Proposed Action on the study plots.

6. The EA should account for the possibility of an adverse ruling in presently pending litigation filed by the Sierra Club concerning the right of way granted by the Easement Agreement.

   Response: The EA focuses on proposed future activities at the NWTC. It is premature to account for various scenarios involving a future ruling in the Sierra Club lawsuit. DOE will determine its rights and obligations upon issuance of a Court ruling in such lawsuit.

7. The EA should describe how the NWTC will fit into the wildlife refuge(s) proposed by Senator Allard and Representative Udall and presently under consideration by Congress.

   Response: It is premature to consider how the NWTC would fit into the Rocky Flats National Wildlife Refuge, as no formal management plan for the Rocky Flats National Wildlife Refuge has been prepared. DOE is committed to working with the Department of Interior Fish and Wildlife Service to promote the compatibility of NWTC and the future Rocky Flats National Wildlife Refuge.

E. Department of the Army, Corps of Engineers, Omaha District, Denver Regulatory Office, Timothy T. Carey, Chief, February 19, 2002.

E.1 The Denver Regulatory Office should be notified by NREL if any work involves Department of the Army permits or changes in permit requirements pursuant to Section 404 of the Clean Water Act.

Response: the Army Corps of Engineers reviewed their regulatory jurisdiction over pipeline Option 1 and wrote a letter dated February 21, 2001 stating that the Corps "…does not have the authority to regulate work in the area reflected in your application. Therefore, no permit or other authorization by the DA (Department of the Army) is required." (Corps File No. 200180109)

At this time, the Proposed Action, including gas pipeline Option 2, is not anticipated to require a permit under Section 404 of the Clean Water Act. If gas pipeline Option 1 is selected later, the USACE and USFWS will be consulted, as required.

F. Department of Energy, Rocky Flats Field Office, Steven R. Schiesswohl, Realty Officer, April 4, 2002.

F.1 (a) The EA includes 305 acres (with 25 new acres) although the administrative transfer has not occurred.

Response: NWTC is comprised of 280 acres managed by DOE's Golden Field Office and the National Renewable Energy Laboratory. The National Defense Authorization Act for Fiscal Year 2002 has designated an additional 25 acres for inclusion within the NWTC. The EA considers management of and potential impacts to the entire 305 acres.

(b) The site is not part of the RFETS or its buffer zone.

Response: As discussed in Section 1.2.1 of the Draft EA, GO has managed the 280 acre NWTC since 1993, and the Rocky Flats Field Office manages the balance of the buffer zone. The entire area is listed by EPA on its National Priority List.

F.2 S.2.1, page S-3: Suggest a change to tall grass prairie or tall prairie grassland instead of tall prairie grass.

Response: The correct terminology is "tallgrass prairie." The Final EA uses this term.

F.3 S.2.1, page S-3: No additional (development –No Action) alternative is the only alternative – no alternatives- see alternatives evaluation in Chapter 1.

Response: The New Site, Off-Site Improvements, Other Site Development Configuration, and Reduced Development Intensity Alternatives are presented as alternatives considered, but eliminated from further analysis. The EA focuses on the Proposed and No Action Alternatives. The justification for this focus is presented in the EA.

F.4 S.2.1, page S-3: Add a bullet - potential conflicts with the Rocky Flats National Wildlife Refuge.

Response: It is premature to consider potential conflicts between management of the NWTC and the Rocky Flats National Wildlife Refuge, as no formal management plan for the Rocky Flats National Wildlife Refuge has been prepared. DOE is committed to working with the U.S. Fish and Wildlife Service to promote the compatibility of NWTC and the future Rocky Flats National Wildlife Refuge.

F.5 1.2.1, page 1-2: Change the acreage to 208.7 from 305 acres – the 25–acre transfer has not yet occurred.

Response: See Response to Comment F.1(a).

F.6 1.2.1, page 1-3: This area is no longer located within the RFETS boundary. The transfer of 208.07 (*280.07*) acres from RFETS to Chicago Operations Office in 1993 should be discussed.

Response: See Response to Comment F.1(b).

F.7 1.2.1, page 1-3: The 25 acres has not been transferred. Change acreage accordingly.

Response: See Response to Comment F.1(a).

F.8 1.2.1, page 1-5: The GIS polygon does not align with RFETS west boundary.

Response: The comment is noted. Figures in the EA have been revised to address this comment.

F.9 (a) 1.2.1, page 1-7: NWTC GIS polygon does not align with base map – specifically, the SE corner should align with the western section line of Section 3 and the west polygon line should fall on this extension.

Response: The comment is noted. Figure 1-2 has been revised.

(b) The hatched area along Hwy 128 should not cover RFETS property. RFETS is not part of Superior.

Response: The comment is noted. Figure 1-2 presents general boundary lines.

(c) The RFETS southeast boundary follows the centerline of Indiana, not 150 feet inside it.

Response: The comment is noted. Figure 1-2 presents general boundary lines.

F.10 1.2.1, page 1-9: The Western Aggregates road easement is depicted on RFETS buffer zone south of the NWTC property line and fence. This map should be adjusted. The proposed alignment of the road is not on RFETS buffer zone, but on the NWTC property only.

Response: The comment is noted. Figure 1-3 has been revised.

F.11 1.2.1, page 1-11: Also, Mineral Reserves, Inc., a LaFarge subsidiary, should replace Western Aggregates on the label for the proposed easement's future road.

Response: The comment is noted. The EA has been revised to reflect that Mineral Reserves, Inc. is the successor in interest to Western Aggregates, Inc., and Mineral Reserves, Inc. is a corporate affiliate of LaFarge West, Inc.

F.12 1.2.3, page 1-13: Replace the word restoration with reclamation. Restore equates to complete replacement of the ecology including species, diversity, geological and soil structure, etc. I don't believe this is the goal. Reclamation refers to a replacement of habitat or vegetation for a general land use with ecological values that may or may not replace a particular species or soil structure.

Response: The comment is noted. One of the environmental protection goals stated in NREL policy 6-2 is, "To maintain and enhance the environment on NREL's sites through restoration or other means which foster the preservation of native ecosystems." "Other means" could include reclamation, in appropriate situations.

F.13 1.2.3, page 1-14: The Rock Creek Reserve's purpose and basis does not reference the three Executive Orders (13148, 13101, and 13123) listed in the EA.

Response: The EA has been modified to reflect the fact that the Rock Creek Reserve was not established in relation to the referenced Executive Orders.

F.14 1.5.1, page 1-20: Add a bullet – Coordinate with mining companies on control of noxious weeds.

Response: This issue was not raised in response to the project's scoping letter.

F.15 (a) 2.1.1, page2-2: Where are the 20 additional test sites? Can they be identified on the map? If location is to be determined, then describe it as such.

Response: The comment is noted. Figure 1-3 has been revised to show the test site area.

(b) How large is the solar dish array?

Response: The Solar Dish/Converter Systems are described in Section 2.1.1, where the maximum height is given as approximately 40 feet.

(c) What about connecting the extension of the gas pipeline from Highway 93 to Highway 128? Are there other connected actions?

Response: The gas line improvement involves two options for the alignment of a medium-pressure line. The text on page 2-11 of the Draft EA has been revised to clarify the pipeline proposal:

"Xcel Energy, the local gas provider, has requested an easement across the site to Highway 128. Xcel would use the easement to install only the line needed by NWTC, and could use the easement to form a future service loop through the NWTC site. The pipeline is expected to be a medium pressure design using a polyethylene type piping material operating at a maximum operating pressure of 60 psig with a maximum standard metering pressure of 2 psig. A 20-foot wide construction easement would be required for the length of the pipeline route. Construction proposed for summer 2002 would terminate at Building 251."

(d) Fencing the additional 25.7 acres is not listed.

Response: Fencing was described in the Draft EA in the description of security improvements and modifications on Page 2-16. There is no need for a reference to a specific area of the site.

F.16 2.1.1, page 2-10: (a) Where and who owns the "west property easement line" to Building 253? Which Easement?

Response: The word "easement" should not have been included in this phrase and has been deleted.

(b) Does this NEPA document cover the gas line project, granting an easement to Excel, and construction, O&M of the gasline for DOE purposes, and extensions/connections to the high pressure line at Highway 128 or will additional NEPA documentation cover these activities?

Response: Refer to Response to Comment F.15(c).

(c) Does MP stand for medium pressure?

Response: Yes. The line would operate at 60 pounds per square inch (PSI).

(d) Does the safety analysis cover the 6" commercial line (HP) line and the (HP) line running just north of DOE?

Response: See Response to Comment F.15(c)

(e) Would the 6" line follow the same Option 1 alignment?

Response: See Response to Comment F.15(c)

(f) What about (gas line) access and maintenance roads?

Response: See Response to Comment F.15(c)

F.17 2.1.1, page 2-15: (a) Natural gas fueling facility - Are there fire dangers or safety issues related to wild fires?

Response: Fire Protection is discussed in Sections 3.11.5 and 4.11.5, Emergency Response and Fire Protection.

(b) Would this facility constrain controlled burn plans or open space burn plans at Rocky Flats?

Response: The Rocky Flats Field Office is responsible for planning and managing controlled burns within the confines of the RFETS. Wildfire management on the NWTC site is discussed in EA Sections 3.11.5 and 4.11.5, Emergency Response and Fire Protection.

F.18 2.1.1, page 2-16: Is a storm water discharge permit required for road paving?

Response: As indicated in Appendix F, NREL is covered by a site-wide general permit for storm water discharge associated with construction activities. NREL also maintains a Storm Water Pollution Prevention Program for the NWTC.

F.19 2.1.1, page 2-17: Are there impacts to Rock Creek Reserve or the Wildlife Refuge due to siting Gazebos, picnic tables/benches, outdoor gathering areas, bike trails, or footpaths?

Response: No. Site amenities would be primarily located adjacent to and in the immediate vicinity of Building 251 and the other buildings in the Research and Support Facilities area.

F.20 2.1.1, page 2-17: State that appropriate SPCC plans and countermeasures are in place to address fuel storage.

Response: A corresponding statement to this effect has been included on page 2-17. The applicable Spill Prevention Control and Countermeasures (SPCC) Plan is included in the list of NREL's Environmental Safety and Health Programs presented in Appendix A.

F.21 2.2, page 2-19: Section 2.1.1 states that new construction may occur as part of the No Action Alternative yet 2.2 states that the No Action alternative will "add no new facilities."

Response: Section 2.1.1 presents components of the Proposed Action. Section 2.2 presents the No Action Alternative.

F.22 3.1.1 (3-1): The NWTC is located outside the new RFETS boundary. Also, Boulder County owns the land directly north of the NWTC South of Highway 128.

Response: The text of the EA has been revised to reflect this fact.

F.23 Although GFO states that they have not conveyed an easement to either Western Aggregates or its successor lessee, Mineral Reserves, Inc., Figure 3-1 labeled a road as Western Aggregate Inc. Road Easement.

Response: Section 3.1.1 has been revised to state that DOE has provided a utility and road easement to Mineral Reserves, Inc., as successor in interest to Western Aggregates, Inc., via a July 27, 1995, Utility Right of Way Grant of Easement and MOU.

F.24 3.1.1 (3-5) Was the easement granted (deed conveyed) or not? The EA is not clear. State the facts: An MOU and easement agreement were executed. A conveyance instrument has not been executed, as the actual alignments have not been determined.

Response: See Response to Comment F.23.

F.25 3.1.1 (3-5) Surrounding areas – The Draft EA does not list the sawmill, the other blasting company or lease buildings B060 and 061. Either be general or list all specific buildings.

Response: The text of Section 3.1.1 has been modified to address this comment.

F.26 3.1.1 (3-5) Jefferson County Airport runway alignments were not designed so that aircraft takeoff and landing patterns do not pass directly over the NWTC. Change the word "so" to reflect that the aircraft patterns do not interfere or there are no impacts.

Response: The text in 3.1.1 has been modified to make this clarification.

F.27 A reference to the new National Wildlife Refuge should be made in Section 3.1.1 (page 3-5) instead of Rock Creek Reserve.

Response: This clarification has been made in the Final EA.

F.28 3.1.1 (3-5) Change NTWC to NWTC.

Response: The text in Section 3.1.1 has been corrected.

F.29 3.1.2 (3-6) Delete the statement – At closure, all nuclear materials and wastes will have been removed from the site. This is not under GFO control.

Response: The comment is noted. The statement has been deleted.

F.30 In Section 3.2.1 (page 3-9) it is stated that the NWTC granted a road easement. Clarify this statement.

Response: See Response to Comment D.5.

F.31 3.2.3 (3-10) Accidents - 4 lines up –1st paragraph – ". . . 63 people injured in 46 accidents along Highway 93. (Should this be 128?)

Response: The EA has been modified to correct this error.

F.32 3.3 (3-11) In the section describing that ES&H evaluates proposed or estimated air emissions in the planning stage, there is no reference to the fugitive dust coming from the gravel mines to the west.

Response: Fugitive dust emissions from adjacent activities and the vicinity are not the subject of NREL's ES&H programs or corresponding emission inventories. The EA has been modified to identify off-site sources of fugitive dust.

F.33 (a) 3.8.1 (3-29) The Federal Noxious Weed Act has been superseded by the Plant Protection Act of 2000.

Response: The EA has been revised to reflect this update.

(b) Last sentence on the page-add "r" to "*avense*" – "*arvense*".

Response: The EA has been revised to correct this error.

F.34 3.8.1 (3-30) Table 3-7 is missing Field Bindweed, *convolvulus arvensis*, which is on the top ten list in Colorado.

Response: This species has been added to Table 3-7.

6. LIST OF PREPARERS

The following persons were primarily responsible for preparing this EA.

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7.2 AGENCIES AND PERSONS CONSULTED

The following individuals from outside of the U.S. DOE were contacted during the preparation of this EA:

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Ellison, Charles David, Colorado Department of Transportation, telephone communication, July 2001.

Evans, Beverly, Planning Department, Jefferson County, telephone and personal communications, June 2001.

Dilley, Jerry, Regional Air Quality Council, telephone communications, November, 2001.

Fogg, Peter, Manager, Long Range Planning Division, Boulder County, telephone communication, June 2001.

Geiger, Jim, Colorado Air Quality Control Commission, telephone communication, July 2001.

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Young, John, Community Development Department, City of Arvada, telephone communication, July 2001.

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Appendix B – Sources of Additional Technical Information
Appendix C – Scoping Letter and Response Letters from Recipients
Appendix D – Copy of Draft EA Distribution Letter and Comments on the Draft EA
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APPENDIX A

NREL'S ENVIRONMENTAL, HEALTH AND SAFETY POLICIES AND PROGRAMS

APPENDIX A

NREL'S ENVIRONMENTAL, HEALTH AND SAFETY POLICIES

2-1 Integrated Safety Management
6-1 Environment, Safety, and Health
6-2 Environment Management
6-3 Property Protection
6-4 Worker Safety and Health
6-5 Occupational Medicine
6-6 Risk Assessment

NREL'S ENVIRONMENTAL, HEALTH AND SAFETY PROGRAMS

Aboveground Storage Tank Management
Access to Medical Records
Air Quality Protection
Asbestos Management
Biosafety
Bloodborne Pathogen Control
Chemical Safety
Compressed Gas Safety
Concerns - ES&H
Confined Space Program
Construction ES&H
Cultural Resource Protection
Decommissioning - ES&H
Drinking Water
ES&H Lessons Learned
ES&H Office Desk Procedure, Radioactive Waste Disposal
Electrical Safety
Emergency Response Team (ERT)
Environmental Permitting and Notification
Ergonomics
Fall Protection
Fire Protection
Groundwater Protection
Hazard Identification and Control
Hearing Conservation
Hoisting & Rigging
Incident Reporting, Investigation, and Trending
Indoor Air Quality
Inspection - ES&H
Integrated Safety Management
Laser Safety
Local Exhaust Ventilation
Lockout/Tagout
Medical Management
Medical Surveillance
Modified Work
National Environmental Policy Act (NEPA) Implementation
Necessary and Sufficient ES&H Standards
Non-Ionizing Radiation
Ozone-Depleting Substances Management
Particulate Emissions Control for Construction
Personal Protective Equipment
Radiation Safety Program
Respiratory Protection
Safe Work Permit
Safety Council Charter
Spill Prevention Control Plan for Lab Operations
Spill Prevention Control & Countermeasures
Stormwater Pollution Prevention, NWTC
Stormwater Pollution Prevention, STM
Toxic Gas Alarm
Training - ES&H
Waste Management & Minimization
Weed Management, NWTC
Weed Management, STM Site

APPENDIX B

SOURCES OF ADDITIONAL TECHNICAL INFORMATION

APPENDIX B SOURCES OF ADDITIONAL TECHNICAL INFORMATION

U.S. DOE Sites:

http://nrel.gov/ Web site for the U.S. Department of Energy's (USDOE) National Renewable Energy Laboratory (NREL), a premier laboratory for renewable energy research & development and a lead lab for energy efficiency research & development.

http://www.nrel.gov/wind/ Web site for the National Wind Technology Center.

http://nrel.gov/energy_resources/ NREL distribution energy web site.

http://www.eren.doe.gov/wind/ Web site for U.S. DOE's Wind Energy Program.

http://www.eren.doe.gov/distributedpower/ and http://www.eren.doe.gov/der/
DOE distributed power homepage.

Other Sites:

The following documents and Internet resources provide additional information about wind and solar technology.

http://www.energyinfosource.com Web site for Energy Info Source, Inc., An energy industry publishing company that produces newsletters and reports focusing on current trends in the electric and gas industries. Publications on green power, distributed generation sustainable energy technologies are available at this site.

http://www.windpower This site is home to the Danish Windpower Manfacturers Association and provides " more than 100 animated pages and calculators on wind resources, wind turbine technology, economics, and environmental aspects of wind energy. Also available are links to related sites, articles, statistics, pictures, a reference manual and answers to Frequently Asked Questions. The Table of Contents for the Reference Manual provided at this site http://www.windpower.org/stat/units.htm is as follows:

1. Wind Energy Concepts
2. Energy and Power Definitions
3. Proof of Betz' Law
4. Wind Energy Acoustics
5. Wind Energy and Electricity

    1.Three Phase Alternating Current
    2.Connecting to Three Phase Alternating Current
    3.Electromagnetism Part 1
    4.Electromagnetism Part 2
    5.Induction Part 1
    6.Induction Part 2

6.Wind Energy, Environment, and Fuels
7.Bibliography
8.Wind Energy Glossary

Answers to the following Frequently Asked Questions (FAQs) about Wind Energy are provided at the following site http://www.windpower.dk/faqs.htm

1. Are wind turbines noisy?
2. Do wind turbines really save energy?
3. Are there enough wind resources around?
4. Can wind contribute significantly to electricity production?
5. Is there any progress in wind turbine technology?
6. Is wind energy expensive?
7. Is wind energy safe?
8. Are wind turbines reliable?
9. How much land is required to site wind Turbines?
10. Can wind turbines blend into the landscape?
11. How is the landscape affected after a wind turbine has been dismantled?
12. Do wind turbines bother wildlife?
13. Can wind turbines be placed anywhere?
14. Can wind turbines be used economically in inland areas?
15. How can the varying output from wind turbines be used in the electrical grid?
16. Will wind energy work on a small scale?
17. Can wind energy be used in developing countries?
18. Does wind energy create jobs?
19. Is wind energy popular in countries, which already have many wind turbines?
20. What is the wind energy market like?
21. Why are Danish wind turbines well known around the world?

http://www.awea.org/ American Wind Energy Association web site. Examples of key private sector companies are as follows. Web sites for these companies provide extensive details about turbine options.

AEROMAX Corporation
Atlantic Orient Corporation
Bergey Windpower Company, Inc.
Dutch Pacific L.L.C.
Enron Wind Corporation
Mitsubishi Heavy Industries America
NEG Micon USA, Inc.
Nordex
Northern Power Systems
Southwest Windpower
Synergy Power Corporation
Vestas-American Wind Technology, Inc.
WindTech International, L.L.C.
The Wind Turbine Company
Wind Turbine Industries Corporation

www.solstice.crest.org Solstice, Information service of the Center for Renewable Energy and Sustainable Technology - provides comprehensive index to alternative energy resources.

http://pollution.about.com/cs/photovoltaics/ and http://pollution.about.com/cs/solarenergy/
Research information on photovoltaics and the latest technology in solar energy.

APPENDIX C

SCOPING LETTER AND RESPONSE LETTERS FROM RECIPIENTS

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

June 13, 2001

DISTRIBUTION LIST

SUBJECT: REQUEST FOR PUBLIC AND AGENCY COMMENTS ON ENVIRONMENTAL ISSUES RELATED TO THE CONTINUED OPERATION AND PROPOSED SITE-WIDE IMPROVEMENTS AT NREL'S NATIONAL WIND TECHNOLOGY CENTER.

The U.S. Department of Energy (DOE) will be preparing a site-wide Environmental Assessment (EA) of continuing and proposed operations at the National Wind Technology Center (NWTC), consistent with the National Environmental Policy Act (NEPA) and DOE's NEPA implementation guidance. NEPA compliance is required because the Proposed Action involves a federal facility and the expenditure of federal dollars. DOE is the lead agency, and other federal, state, and local agencies will be invited to participate in the environmental documentation process. The EA is scheduled for completion in early 2001. The DOE requests your input on the proposed NEPA process, Proposed Action and associated environmental issues to be addressed. **For due consideration, please provide your input to the contact listed below on or before July 18, 2001.**

SITE BACKGROUND, HISTORY AND CONDITIONS

The 280-acre NWTC is located south of Highway 128 and directly east of aggregate mining and processing facilities located east of Highway 93 in Golden, Colorado (northwest Jefferson County). The Boulder/Jefferson County line is the site's northern boundary line. A regional location map is presented in Figure 1.

The primary use of the site is for wind energy research, development and testing. Wind power research activities have been ongoing at the site since the 1970's, and NWTC is the only facility of its type in the United States. There are currently 6 buildings and 5 large turbines and associated meteorological towers in addition to numerous smaller support and testing facilities located onsite. NWTC supports wind turbine design, development, testing and certification and fundamental research of turbine aerodynamic and mechanical behavior, as well as atmospheric conditions and their associated interactions. In addition the site supports NREL's research in the areas of hybrid power technologies and distributed energy resources.

Federal Recycling Program Printed on Recycled Paper

PURPOSE AND NEED

A site-wide EA for NWTC was prepared in 1996. In accordance with the DOE NEPA Regulations (10 CFR section 1021.330), DOE is required to evaluate an existing site-wide EA every 5 years to determine whether it adequately addresses current agency plans, functions, programs and resource utilization. Based on new environmental conditions, applicable regulatory processes and site development proposals that were not addressed in the previous EA, DOE has determined that a new comprehensive EA should be prepared for the site.

This site-wide EA will provide an opportunity to review the collective potential effects of existing and proposed facilities and operations at NWTC. The purpose of NWTC environmental assessment activities, in conjunction with site planning activities, is to maintain and enhance the NWTC's role and capabilities as a world-class research facility focused on wind energy generation technology and other renewable energy sources.

PROPOSED ACTION AND ALTERNATIVE

The following presents a summary of the Proposed Action and Alternative that will be addressed in the EA.

Proposed Action

The Proposed Action is to continue operation of the NWTC for alternative energy research with new and improved capability. New construction projects will include permanent physical improvements to the site that involve buildings and new equipment, utilities and other infrastructure. Other activities that do not require permanent facilities or infrastructure include research programs, facility operations, management practices and maintenance activities.

The components of the Proposed Action are sorted into short-term (2002-2006) and long-term (2007-2021) estimated implementation periods. The actual schedule for implementation of the site improvements is dependent on federal budgeting decisions and fluctuating priorities, so the Proposed Action cannot be specific with respect to actual construction schedules. Those actions most likely to occur in the short term will be analyzed in detail. Because of uncertainties in future funding, the long-term wind research and distributed energy facility infrastructure improvements have not been defined in specific terms. Therefore this EA will employ a "bounding analysis" approach addressing potential implementation scenarios to provide a mechanism for analysis of future activities as they become sufficiently defined to allow for evaluation.

The Proposed Action designates the western portion of the site as a Conservation Management Area. Other measures protect Xeric Tallgrass Prairie, wetlands and other natural resources on the site. Standard construction practices include protocol and measures to limit site disruption and include site restoration requirements.

Wind turbines and other energy generating facilities on the NWTC site have and will continue to contribute power to support site needs. However, the NWTC's objective is research, not power generation. The site was selected because of unusual and high-wind characteristics that aid research. These characteristics do not support the objective of full-time wind power generation. The NWTC is not a wind farm or a dedicated renewable energy generation facility and no short-term or long-term plans exist to convert the site to serve this purpose.

Figure 2 presents a site plan that highlights the existing and proposed improvements. The following improvements define the primary components of the Proposed Action along with examples of each:

Construction of New Facilities and Research Areas

- Expansion of the Structural Blade Testing Facility to allow testing of larger blades
- Expansion to allow for a Large Dynamometer Test Facility for testing larger turbines
- Installation of three new large turbines and associated facilities
- Installation of additional test sites
- Construction of Phase I System Interconnection Test Lab to enhance distributed energy research
- Construction of test lab and field testing area for testing of advanced design technologies including: Photovoltaics, wind, fuel cells, micro-turbines, concentrated solar power, storage, combined heat and power, modular biomass, and other technologies in both generation independent and hybrid applications
- Installation of up to 10 large and 10 small solar dish/converter systems to generate 2 to 2.5 kW of power each from concentrated sunlight and to perform systems testing

Modifications and Improvements to Existing Facilities

- Renovation of the east wing of Building 251

Infrastructure Modifications and Improvements

- Improve existing road surfaces and improve building access to address fire access requirements
- Installation of new or upgraded telecommunications systems
- Installation of a new natural gas line from Highway 93 to the site for both research use and for space and water heating
- Installation of a natural gas vehicle fueling station
- Installation of electrical upgrade systems

Alternatives

At this time, the No Action Alternative is the only alternative that will be addressed in the EA. The No Action Alternative would leave the site in its current configuration, add no new facilities, and maintain current research, operation and management practices.

Other alternatives that have been considered, but eliminated from further analysis include: New Site and Off-Site Improvements Alternative: not considered feasible because of the technical and cost implications associated with decentralized operations and site/infrastructure complications.

- Other Site Development Configuration Alternatives: not considered feasible because of the interrelated nature of the proposed facilities, site development constraints and the inherent flexibility of the Proposed Action with respect to future facility footprints.
- Reduced Development Intensity Alternative: not considered feasible because it is inconsistent with the project's purpose and need and the intent of preparing this site-wide EA.

Other alternatives raised during the scoping period will be considered and may be addressed in the EA if they are consistent with the project's purpose and need and the intent of this site-wide EA.

ENVIRONMENTAL ISSUES TO BE ADDRESSED

The proposed EA will address primary, direct, induced, secondary and cumulative impacts of the Proposed Action and alternatives. Beneficial and adverse, on-site and off-site, construction, operation, and maintenance impacts will be discussed, as appropriate. The environmental topics to be discussed in the EA include:

Land Use, Planning, Socioeconomics and Public Policy
Traffic and Circulation
Air Quality and Noise
Visual Quality/Aesthetics
Water Resources
Soils and Geology
Biological Resources
Cultural Resources
Waste Management
Public Facilities, Services and Utilities
Energy

SCHEDULE

The following key milestones and estimated dates summarize the anticipated project schedule:

Close of Scoping Period	July 18, 2001
Public Distribution of the Draft EA	October 2, 2001
Deadline for Comment on the Draft EA	November 5, 2001
Public Distribution of the Final EA	December 14, 2001
Deadline for Comments on the FINAL EA	January 14, 2002

No formal public scoping meeting is currently planned for this project.

Please direct written and oral comments to:

Steven Blazek
NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Boulevard
Golden, CO 80401-3393
(303) 275-4723
(303) 275- 4788 (fax)
steven_blazek@nrel.gov

We look forward to hearing from you. **For due consideration, please provide your input on or before July 18, 2001**. Thank you.

Sincerely,

Frank M. Stewart, Manager
U.S. Department of Energy, Golden Field Office

Attachments:

Figure 1	Regional Setting Map
Figure 2	Site Map

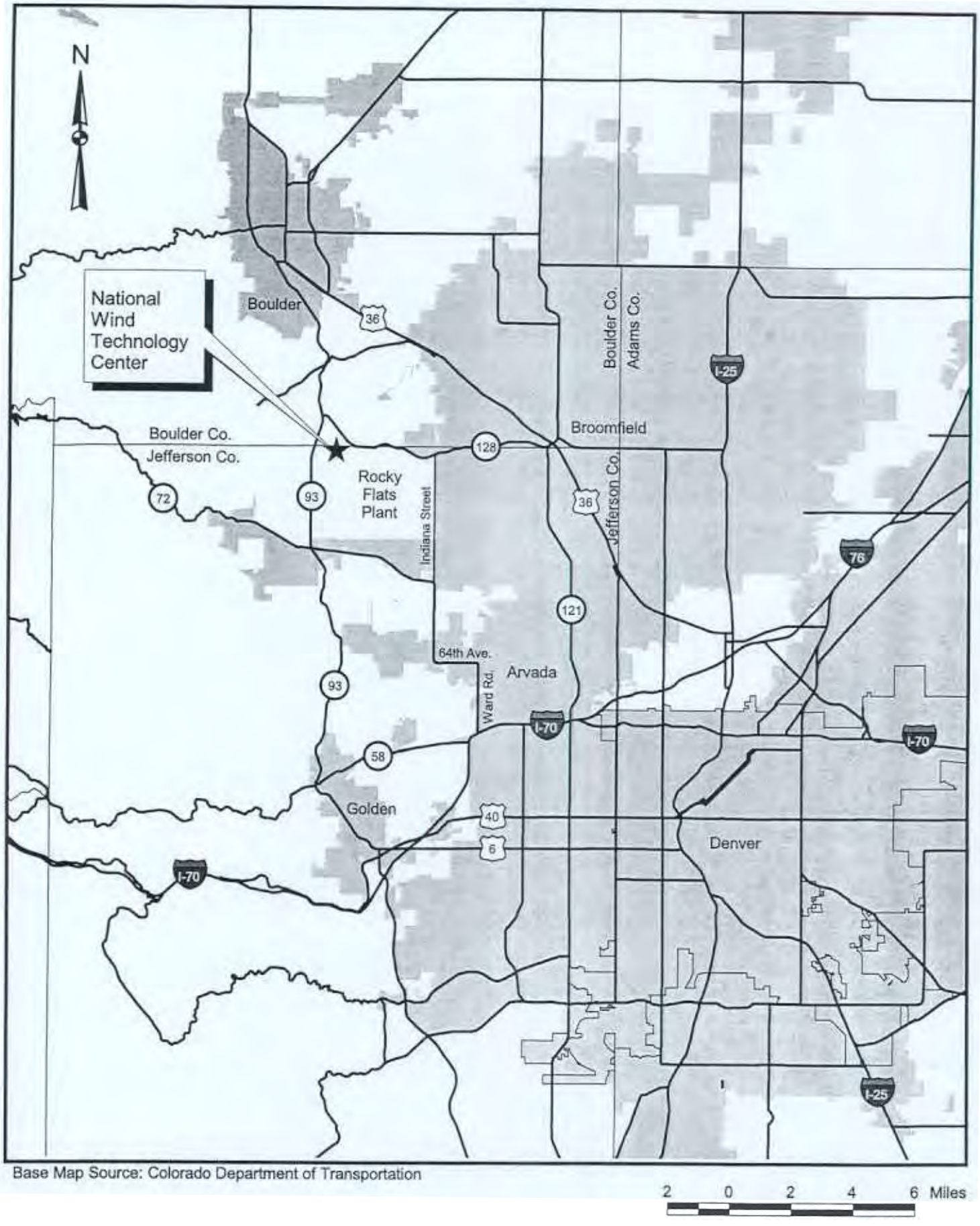

Figure 1. Regional Location Map, National Wind Technology Center

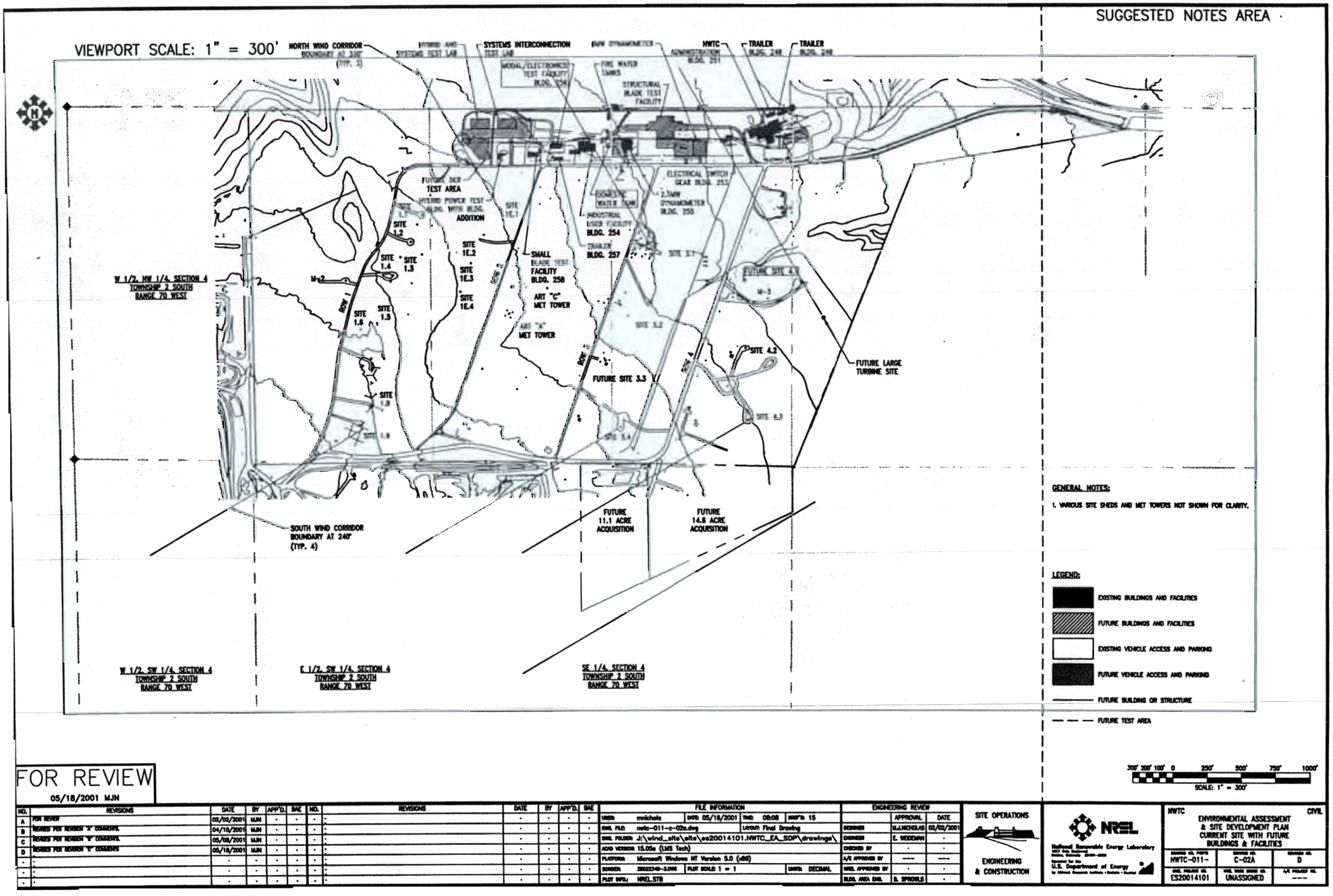

Figure 2. Site Plan, Short-Term Program of Improvements

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Colorado State Forest Service
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(303) 442-0428

Colorado Coop Fish & Wildlife Unit
Dept. Fishery and Wildlife Biology
201 Wagner Building, CSU
Fort Collins, CO 80523-1484
(970) 491-5396

Colorado Single Point of Contact
Division of Local Government
1313 Sherman Street, Room 521
Denver, CO 80203

Northwest Mountain Office
Federal Aviation Administration
1601 Lind Avenue SW
Renton, WA 98055-4056

Executive Director's Office
Colorado Dept. of Natural Resources
1313 Sherman Street, Room 718
Denver, CO 80203
(303) 866-3311

CO Office of Energy Management &
Conservation
225 E. 16th Ave, Suite 650
Denver, CO 80203
(303) 894-2383

Mr. Bob Storterant
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203 Forestry Bldg., CSU
Fort Collins, CO 80523
(970) 491-6303

Colorado Wildlife Federation
P.O. Box 280967
Lakewood, CO 80228
(303) 987-0400

Mr. Timothy Carey
Omaha District - Project Office
Dept. of the Army, Corps of Engineers
9307 S. Platte Canyon Rd.
Littleton, CO 80128
(303) 979-4120

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EPA Region VII
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9285 Blue Mountain Dr.
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Ms. Nancy Hollinger
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9184 Fern Way
Golden, CO 80402

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Mr. William Hogan
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100 Jefferson County Pkwy.
Golden, CO 80419
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100 Jefferson County Pkwy., Ste. 3500
Golden, CO 80419-3500
(303) 271-8495

Ms. Nanette Neelon
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Mr. Troy Stover
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11755 Airport Way, Terminal Building
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(303) 466-2314 - Fax:303-279-0908

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Jefferson County Dept. of Health
260 South Kipling Street
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Ms. Judy Peratt
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(303) 271-8215 - Fax: 303-637-1285

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Ms. Carol Deck
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Kaiser-Hill, LLC
10808 Highway 93, Unit B - Bldg. 115
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11658 Highway 93
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1333 West 120th Ave., Suite 210
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Ms. Kristine Pollard
Office of Senator Wayne Allard
7340 E. Caley, Suite 215
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(303) 412-1200 - Fax: 303-425-1997

Real Estate Division - Rocky Mountain Fuel Co.
910 15th Street
Denver, CO 80202
(303) 573-9655 - Fax: Ext. 3032

Rocky Mountain Chapter - Sierra Club
1410 Grant Street, Suite #B205
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Ecolological Science Dept.
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655 Parfet Street Room E20C
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Mr. Bruce Williams
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124 E. Coal Creek Drive
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Mr. LeRoy Carlson
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Mr. Grady Towns
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US Fish and Wildlife Service
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State of Colorado
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Nancy & Walter Zavitz
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Betsy Chapoose
Uinta and Ouray Ute Tribal
Business Council
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Ft. Duchesne, UT 84026

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Assistant Coordinator - Rosebud Sioux Tribe
NAGPRA Consultation Group
P.O. Box 490
Rosebud, SD 57570

Wilbur Between Lodges
Oglala Sioux Tribe
Pine Ridge, SD 57770

Mr. Chuck Jacobs
Pine Ridge Indian Reservation
Pine Ridge, SD 57770

Clement Frost
Tribal Leader - Southern Ute Tribe
P.O. Box 737
Ingacio, CO 81137

Mr. Alden Naranjo
Ute Language and Culture Committee
Southern Ute Tribe
P.O. Box 737
Ingacio, CO 81137

Ms. Dorothy Naranjo
Ute Language and Culture Committee
Southern Ute Tribe
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Ingacio, CO 81137

Mr. Leonard C. Burch
Chairman - Ute Language and Culture
Committee
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Mr. Terry Knight
Spirtual Coordinator - Ute Mountain Ute Tribe
P.O. Box 53
Towaoc, CO 81334

Ms. Judy Knight-Frank
Chairperson - Ute Mountain Ute Tribal Council
General Delivery
Towaoc, CO 81334

Ronald Wopsock
Northern Ute Indian Tribe
P.O. Box 190
Ft. Duchesne, UT 84026

Roland McCook
Northern Ute Indian Tribe
P.O. Box 190
Ft. Duchesne, UT 84026

Ms. Amy Aglar
Assistant to the Chief of Staff
Office of Senator Ben Nighthorse Campbell
6950 E. Belleview Ave, Ste 200
Englewood, CO 80111

SPB

RECEIVED
JUN 29 2001
DOE/GO

JEFFCO AIRPORT
DENVER'S CORPORATE CHOICE

June 27, 2001

Steven Blazek
NEPA Compliance Officer
DOE Golden Field Officer
1617 Cole Boulevard
Golden CO 80401

Dear Mr. Blazek:

After reviewing the Environmental Assessment of the National Wind Technology Center, Jefferson County Airport has some concerns of potential interference with height restrictions and navigation and communication equipment that could effect the safe operations of aircraft. The Airport recommends the following:

File the appropriate FAA Form 7460-1 Notice of Proposed Construction or Alteration for both the building height and any construction cranes necessary for the project and for the concern of interference to the FAA VOR Navigational device. Obstruction lights may also be required on top of the structures.

Enclosed is a FAA Form 7460-1 for your use.

We appreciate the opportunity to comment on the project and would like to be kept informed about the status of it. If you have any questions, please contact me at 303-466-2314.

Sincerely,

Traci L. Plunkett

Traci Plunkett
Property Administrator
Jefferson County Airport

BOARD OF COUNTY COMMISSIONERS
MICHELLE LAWRENCE
DISTRICT NO. 1
PATRICIA B. HOLLOWAY
DISTRICT NO. 2
RICHARD M. SHEEHAN
DISTRICT NO. 3

AIRPORT MANAGEMENT
JEFFREY C. PRICE
AIRPORT MANAGER
TROY W. STOVER
ASSISTANT AIRPORT MANAGER

11755 AIRPORT WAY
TERMINAL BUILDING
BROOMFIELD, COLORADO 80021

PHONE: (303) 466-2314
FAX: (303) 271-4875
HTTP://JEFFCOAIRPORT.CO.JEFFERSON.CO.US

FAA CONTROL TOWER • ILS ON 29R
RUNWAYS: 29R-11L (9,000′)
29L-11R (7,000′) 02-20 (3,600′)

Please Type or Print on This Form

Form Approved OMB No. 2120-0001

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

Board of County Commissioners

Michelle Lawrence
District No. 1
Patricia B. Holloway
District No. 2
Richard M. Sheehan
District No. 3

July 3, 2001

RECEIVED
JUL 5 2001
SRB

Mr. Steven Blazek
NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Boulevard
Golden, CO 80410-3393

Re Request for Comment – National Wind Technology Center

Dear Mr. Blazek:

In response to your request for comments, we offer the following observations:

We suggest that you consider the possibility that your site contains the Prebles Meadow Jumping Mouse habitat, or the animal itself.
We believe that your site contains tall grass prairie. We suggest that you contact the Jefferson County Naturalist Association for maps and information.

3. We recommend that you continue to provide the community service of monitoring wind speed and direction. This monitoring could assist with emergency evacuation of any nearby residents in the case of some sort of toxic spill/gas release.
4. Access to the Highway 128 appears to be "awkward" and is not at a right angle. Improvements to this intersection for safety purposes may be needed. Please fully analyze this issue, which would be compounded with the possibility of adding new employees to the site.
5. Please continue to offer public viewing areas so that the public can view the ongoing research.

Finally, as you develop detailed site plans, we suggest that you file an application for Site Approval with Jefferson County. It is a 30 day process which culminates in a hearing before the Planning Commission. With this process, we could offer you a detailed planning and engineering review of your plans.

In closing, we thank you for the opportunity to respond.

Sincerely,

Preston E. Gibson, AICP
Planning and Engineering Manager

100 Jefferson County Parkway, Golden, Colorado 80419
(303) 279-6511
http://co.jefferson.co.us

Boulder County

Post Office Box 471 • Boulder, Colorado 80306

Land Use Department

Courthouse Annex
2045 13th Street • 13th & Spruce Streets • Boulder, Colorado 80302 • (303) 441-3930

TO: Brian Kennedy, SAIC
FROM: Peter Fogg – Manager, Long Range Division
DATE: July 13, 2001
RE: EA NEPA Compliance for NREL's National Wind Technology Center Improvements

Having reviewed the Issues list on page 4 of the DOE's transmittal, we do not foresee any particular concerns arising from the site plans. The Biological Resources of interest to Boulder County -- xeric tallgrass prairie, wetlands, potential Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*) habitat, potential presence of Ute's ladies tresses orchid (*Spiranthes diluvialis)*, Colorado butterfly plant (*Gaura neomexicana ssp. coloradensis)* and other features are apparently to be addressed. Lands in Boulder County adjoining the site are held in City of Boulder open space. No land use developments within the City or Boulder County are being contemplated along the south county line. Visual impacts from the existing facility are minimal from county subdivisions and roads with the exception of vehicle traffic using SH 128. I am personally unaware of any complaints being lodged by Boulder County residents regarding any aspect of the facility's location and operations over the 10 years I have been the manager of the Long Range Planning Division. I am forwarding the DOE's Request for Comments to our Transportation Department for their review. For your records the contact persons in that department are either Mike Thomas or Clark Misner. The phone number is (303) 441-3900. Please call me at your convenience if you need additional information or clarification.

Jana L. Mendoz
County Commissioner

Ronald K. Stewart
County Commissioner

Paul Danish
County Commissioner

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Rocky Mountain Arsenal National Wildlife Refuge
Building 111
Commerce City, Colorado 80022-1748
Telephone (303) 289-0232 Fax (303) 289-0579

July 17, 2001

RECEIVED
JUL 18 2001
DOE/GO

Mr. Steven Blazek
NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

Dear Mr. Blazek:

This letter is in response to the Department of Energy's request for public and agency comments on environmental issues related to the continued operation and proposed site-wide improvements at NREL's National Wind Technology Center (NWTC). The United States Fish and Wildlife Service, from the Rocky Mountain Arsenal National Wildlife Refuge, at the Rocky Flats Environmental Technology Site has reviewed the scoping document and has the following comments.

1. Make sure the schedule and the text match completion dates.
2. The proposed action designates the western portion of the site as a Conservation Management Area. What is the purpose of this area? What is being conserved and why? Will there be a formal Conservation Management Plan? If so, when and who will prepare the plan? Who will be responsible for implementing the management of the area?
3. The scoping document states: "Other measures protect Xeric Tallgrass Prairie, wetlands, and other natural resources on the site." What are the other measures?
4. If new turbines are installed, the U.S. Fish and Wildlife Service should be consulted on the potential for bird strikes.
5. The maps do not show where the new natural gas line from Highway 93 would enter the site. Will it be running through the Conservation Management Area?
6. The U.S. Fish and Wildlife Service understands that the NWTC was built on property that was formerly a part of what is now known as the Rocky Flats Environmental Technology Site (RFETS). Knowing that the RFETS is undergoing a Comprehensive Environmental Response, Compensation, and Liability Act cleanup. Was the property transferred to the NWTC delisted from the National Priority List?
7. As the NWTC is developed, impacts to off-site resources should be investigated and may require consultation with the U.S. Fish and Wildlife Service on endangered species issues.

The U.S. Fish and Wildlife Service appreciates this opportunity to comment on the scoping for the site-wide Environmental Assessment of continuing and proposed operations at NWTC. We look forward to working with you on the Draft Environmental Assessment. If you have questions, please contact me at (303) 966-5413.

Sincerely,

R. Mark Sattelberg
U.S. Fish and Wildlife Service
c/o U.S. Department of Energy, Rocky Flats Field Office
10808 Highway 93, Unit A
Golden, Colorado 80403-8200

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SEMENOFF
SCHWARZ &
BAILEY, P.C.
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EDWARD W. STERN, ESQ.
IN MEMORIAM 1942-2000

DAVID A. BAILEY
303.893.1827
dbailey@mssdenverlaw.com

July 17, 2001

RECEIVED
JUL 18
DOE-GO

BY TELECOPY (303-275-4723) AND U.S. MAIL

Mr. Steven Blazek
NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3993

Re: Comments to Site-Wide Environmental Assessment of Continuing and Proposed Operations at the National Wind Technology Center ("NWTC")

Dear Mr. Blazek

This firm is legal counsel for Mineral Reserves, Inc. ("MRI"), which provides the following comments as part of the scoping process for the site-wide Environmental Assessment of continuing and proposed operations at the NWTC (the "EA"). As you know, MRI is the lessee of certain mineral leases which authorize it to conduct sand and gravel mining and processing operations on property located south of the NWTC property and, subject to final approval by Jefferson County, to expand those operations to certain other properties, including a portion of the site on which the NWTC is located currently. MRI, as successor to Western Aggregates, Inc., is also a party to that certain Utility Right-of-Way Grant of Easement, dated July 27, 1995 (the "Easement Agreement"), and a Memorandum of Agreement, also dated July 27, 1995 (the "MOA"). Both of the foregoing agreements are between MRI and DOE.

Scoping Comments

1. MRI requests that the EA expressly recognize and discuss the mineral leases, Easement Agreement and the MOA, including without limitation MRI's right to conduct mining operations on the leased property. MRI believes that it is important for all persons with an interest in the property currently and to be mined by MRI to publicly and consistently recognize MRI's rights to conduct mining and processing operations. Similarly, MRI's right to use the access created by the Easement Agreement should be expressly acknowledged and protected as part of any federal land planning process such as the EA. Please contact us if we

can provide legal descriptions of, or information about, the property subject to the leases, the Easement Agreement or the MOA.

2. New construction or modification of existing facilities by DOE at the NWTC may reduce the already minimal quantity of topsoil available for reclamation activities on MRI's leased property. MRI requests that EA acknowledge this potential and require DOE and its consultants and contractors to work closely with MRI to preserve this resource to the maximum extent possible.

3. Any new land acquisition (*see* Figure 2) or facility improvement at the NWTC should explicitly recognize MRI's lease rights, the Easement Agreement and the MOA, and DOE should acknowledge in the EA a commitment to work with MRI to allow it to fully obtain the benefits of its legal rights. For example, construction of new structures or modification of existing ones could, in the absence of advance planning, result in removal of federal improvements or implementation of other costly means to assure MRI's right and ability to mine the property.

4. MRI notes that there appear to be some areas of overlap between the current and proposed location of the NWTC and the existing and proposed area of the Rock Creek Reserve as described in the Integrated and Natural Resources Management Plan, Environmental Assessment and Finding of No Significant Impacts for the Rock Creek Reserve, issued by DOE and the Fish and Wildlife Service in May 2001. MRI believes that the federal agencies should work closely together to avoid duplicative or inconsistent regulation of the property and that MRI's right to conduct mining operations on the property be recognized and protected by both planning processes.

5. Several grassland studies are currently on-going at the NWTC and on the property DOE apparently is planning to acquire for the NWTC, including a study by ESCO (David Buckner) and certain test plots maintained by MRI. The EA should recognize these studies and be certain that no future land use plans for the NWTC adversely impact areas included in the study.

6. The EA should account for the possibility of an adverse ruling in presently pending litigation filed by the Sierra Club concerning the right-of-way granted by the Easement Agreement (such as alternate routing) to ensure that MRI receives its full contractual benefits under the Agreement.

7. The EA should describe how the current or expanded NWTC will fit into the wildlife refuges proposed by Senator Allard and Representative Udall and presently under consideration by Congress.

MRI appreciates this opportunity to provide comments to the scoping process for the EA and looks forward to being a continuing participant in the assessment process.

Please do not hesitate to call if you have any questions or comments

Yours very truly,

David A. Bailey

DAB/zm

cc: Mr. John Hickman
Mr. Duane Bollig

APPENDIX D

COPY OF DRAFT EA DISTRIBUTION LETTER AND COMMENTS ON THE DRAFT EA

SPD

A.

SOUTHERN UTE INDIAN TRIBE

February 25, 2002

MAR - 4 2002
DOE/GO

Attn: Steve Blazek / NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Bouldvard
Golden, Colorado 80401-3393

Subject: Draft Site-Wide Environmental Assessment of National Renewable Energy Laboratory's National Wind Technology Center

Dear Mr. Blazek:

A.1 The Southern Ute Indian Tribe believes, at this time, there are no known impacts to areas of Native American cultural sites that are sensitive to this Tribe in regards to, your continued operation of the NWTC for energy efficiency and new construction
A.2 projects including additional test sites and permanent physical improvement to the site. In the event of inadvertent discoveries of Native American sites, artifact, or human remains, this Tribe would appreciate notification of such findings.

A.3 Mr. Neil Cloud is the tribes official NAGPRA Coordinator. Please address all future NAGPRA concerns to Mr. Cloud.

Should you require additional comments or have any questions, please contact Mr. Cloud at the number listed below, extension 2209.

Sincerely,

Edna Frost

Edna Frost, Director
Tribal Information Services

Cc: Neil Cloud, NAGPRA Coordinator

P.O BOX 737 IGNACIO CO 81137 PHONE 970-563-0100

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
Metro Office
655 Parfet Street - RM. E300
Lakewood, CO 80215

720-544-2868 OFFICE
720-544-2964 FAX
www.co.nrcs.usda.gov
eugene.backhaus@co.usda.gov

SP13

B.

RECEIVED
MAR 1 2002
DOE/GO

March 7, 2002

Steve Blazek
NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Blvd.
Golden, CO 80401-3393

Re: Draft State-wide EA for Renewable Energy Laboratory's National Wind Technology Center

Dear Mr. Blazek:

B.1 Our main concern with the construction project in this location of the Wind Technology Center is the potential for erosion during construction. What kind of mitigation measures are to be installed during construction to control erosion by wind and water?

B.2 According to the Golden Area Soil Survey, the soil on this site has potential to be expansive. But it also states that proper engineering, backfilling with material that has low shrink-swell potential and installing surface and subsurface drains will mitigate this potential problem.

B.3 Timely revegetation can offset the potential erosion problems, but species adapted to the site must be used to insure longevity of the stand. Native species normally found on the site include big bluestem, yellow indiangrass, switchgrass, little bluestem, mountain muhly, etc. We would like to offer the following mix for revegetation purposes:

COBBLY FOOTHILLS SITES (1)

Species	Variety	Percent of Mix	PLS lbs./Acre (Drilled Planting)	PLS lbs./Acre (Broadcast)
Big bluestem	Kaw	20	2.2	4.4
Little bluestem	Pastura	20	1.4	2.8
Sideoats grama	Vaughn	15	1.4	2.8
Blue grama	Lovington	10	0.3	0.6
Yellow indiangrass	Llano	10	1.0	2.0
Switchgrass	Nebraska 28	10	0.5	1.0
Western wheatgrass	Arriba	15	2.4	4.8
TOTAL:		100	9.2 lbs./ac.	18.4 lbs./ac.

Sincerely,

Eugene H. Backhaus
District Conservationist

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

An Equal Opportunity Provider and Employer

Board of County Commissioners

Michelle Lawrence
District No. 1
Patricia B. Holloway
District No. 2
Richard M. Sheehan
District No. 3

C.

March 15, 2002

MAR 20 2002
DOE/GO

Mr. Steve Blazek
NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Boulevard
Golden, CO 80401-3393

Re Comments on the DRAFT SITE-WIDE ENVIRONMENTAL ASSESSMENT OF NATIONAL RENEWABLE ENERGY LABORATORY'S NATIONAL WIND TECHNOLOGY CENTER.
Jefferson County Case No. 2015022ORP1

Thank you for the opportunity to comment on this draft Environmental Assessment for National Renewable Energy Laboratory's National Wind
C.1 Technology Center. While Jefferson County does not have jurisdiction within federal property for regulating land use and construction The North Plains
C.2 Community Plan applies to the general area in question. Please review the enclosed copy of the plan with special attention to the North and Central Plains section starting on page 16.

C.3 NWTC is sited in an area designated as Special a Use Area (Rocky Flats Nuclear Facility and buffer zone). Light and medium industrial uses are permitted in this area. Medium industrial use allows for structure heights above 35 feet, processing visible from outdoors, and significant site coverage. This fits the
C.4 proposed uses described in the draft. There are no specific suggestions within the North Plains Community Plan for land use in the immediate area of the
C.5 NWTC site. Applicable General Policies (page 34) in the plan suggest:

- encouraging preservation of historic sites when possible.
- being sensitive to impact on wildlife populations and native vegetation in the area.

C.6 The map on page 40 of the North Plains Community Plan indicates that a wagon road or trail may run across the southern end of the site Please send a copy of the referral materials to:

Jefferson County Historical Commission
9225 W Jewel Place # 107
Lakewood, CO 80227

Please incorporate these comments in your decision making process.

C.7 Impact on wildlife populations on this site is of immediate concern. Preble's Meadow Jumping Mouse was identified in the EA as being on site with habitat
C.8 likely to be disturbed. Jefferson County plans require that the U.S. Fish and Wildlife Service be consulted on how best to approach wildlife and endangered
C.9 species conservation. Conservation measures for native vegetation suggested in the North Plains Community Plan are:

- incorporating existing vegetation into site landscaping whenever possible;
- minimizing construction disturbance area, especially west of Colorado State Highway 93; and
- maintaining the rocky soil types and unusual hydrologic conditions characteristic of much of the North Plains.

C.10 It appears that installing the proposed natural gas line along the path indicated as Option 2 in Figure 2-3, Page 2-21 of the EA would avoid the indicated conservation areas almost entirely. Pending results from the U.S. Fish and
C.11 Wildlife Service this would be the preferred option. County mapping of the approximate Preble's habitat, sensitive vegetation areas (primarily xeric grasses)
C.12 and wetlands is available upon request. Contacting the USFWS for updated information is suggested.

C.13 Those areas within unincorporated Jefferson County that are immediately adjacent to Rocky Flats on the south, west, and a portion of the eastern boundary are all designated as retail, office, industrial, or open space/recreation land uses. Boulder County is to the north and Broomfield is to the east of the Rocky Flats area. Residential land use designations in the area of the site and adjacent to the larger Rocky Flats boundaries have been avoided in unincorporated Jefferson County.

Specific directions included in the North Plains Community Plan suggest that:

C.14 • Industrial and office development within the a four mile radius of Rocky Flats should be referred to the Colorado Department of Health for evaluation of ambient levels of radiation existing in the soil and adequacy of emergency evacuation plans for the proposed development.

C.15 • Office and industrial buildings should be limited to heights appropriate to the available fire protection and to reduce the impact on visual corridors.

C.16 There are a number of concerns routinely addressed by County policy and regulation for construction of this type within county jurisdiction in this area. These are:

1. Containing outdoor lighting to the site.
2. Heat, glare, radiation, and fumes should be contained within the property boundaries.

3. Industrial zoning for this area has no height restrictions or lot size minimums. It would be reasonable to set back any structure such that if it collapses it will remain on the owner's property with an adequate safety margin.
4. Manufacturing and industrial uses generally are served by one parking space per two employees on a single shift. Warehouse uses generate more parking with one space for every employee plus one space per 2,000 square feet of gross lease space. Loading spaces are generally provided a one per 25,000 square feet.
5. Much of the site is within the "Dipping Bedrock" overlay zone. This indicates problems with soil stability. Please contact Pat O'Connell, geologist, at 303.289.8707 for details.
6. The clay pits on the southwestern boundary present a geologic hazard for construction should the site be expanded in that direction.
7. Concerns about wildlife and vegetation have been addressed above.
8. Notification of mineral estate owners prior to development per the requirements set forth in the Colorado statutes is routine in Jefferson County. (CRS 24-65-5-103) Several mining permits have been issued in this area. It is suggested that the necessary research be done to avoid any conflict of rights.

Please call me at 303.271.8719 with any questions.

Sincerely,

Michael Smyth, AICP
Planner
Planning and Zoning Department
100 Jefferson County Parkway, Suite 3550
Golden, CO 80419

cc: Preston Gibson
Current Planning Administrator
Planning and Zoning
100 Jefferson Parkway, Suite 3550
Golden, CO 80419-3550

Nanette Neelan
Special Projects Coordinator
County Administrator's Office
100 Jefferson Parkway
Golden, CO 80419

SPD

D.

MASSEY
SEMENOFF
SCHWARZ &
BAILEY, P.C.
ATTORNEYS AT LAW

HUDSON'S BAY CENTRE
1600 STOUT STREET, SUITE 1700
DENVER, COLORADO 80202

TELEPHONE 303.893.1815
FAX 303.893.1829
www.mssdenverlaw.com

EDWARD W. STERN, ESQ.
IN MEMORIAM 1942-2000

DAVID A. BAILEY
303.893.1827
dbailey@mssdenverlaw.com

RECEIVED
MAR 18
DOE GO

March 15, 2002

BY TELECOPY (303-275-4788) AND U.S. MAIL

Mr. Steven Blazek
NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3993

Re: Comments to Draft Site-Wide Environmental Assessment of National Renewable Energy Laboratory's National Wind Technology Center ("NWTC")

Dear Mr. Blazek:

This firm is legal counsel for Mineral Reserves, Inc. ("MRI"), which provides the following comments to the "Draft Site-Wide Environmental Assessment of National Renewable Energy Laboratory's National Wind Technology Center" (the "draft EA"). MRI is the lessee of certain mineral leases which authorize it to conduct sand and gravel mining and processing operations on property located south of the NWTC property and, subject to final approval by Jefferson County, to expand those operations to certain other properties, including a portion of the NWTC site. MRI, as successor to Western Aggregates, Inc., is also a party to that certain Utility Right-of-Way Grant of Easement, dated July 27, 1995 and a Memorandum of Understanding, also dated July 27, 1995.

Page	Comments
D.1 1-12	Construction of the access road should not be characterized as "speculative." A "planned future action" would be more accurate.
D.2 1-12	The draft EA should not summarily conclude that construction of the access road would be subject to additional environmental analysis or any particular form of NEPA compliance in advance of an actual proposal, design drawings or other specific documentation. While the access road may have some impact on the NWTC property, this impact cannot be accurately predicted at this time. Moreover, the statutory and regulatory

scheme may also be different at the time construction is proposed, including whether approval of the access road constitutes a "major federal action" and the possible applicability of any categorical exclusions.

D.3 1-13 The draft EA should state that the "No-Build Zone" is a commitment of NREL, not of MRI pursuant to its leasehold interest (subject to state and county regulation), including without limitation the access road described in the draft EA.

D.4 3-1 The Spicer mineral lease is currently held by Mineral Reserves, Inc., as successor in interest to Western Aggregates, Inc.

D.5 3-5 Along with the July 27, 1995 Memorandum of Understanding, the draft EA should also refer to and/or discuss the Utility Right-of-Way Grant of Easement of the same date since both documents are necessary to a complete understanding of the road easement and related issues. Also, Mineral Reserves, Inc. is the successor in interest to Western Aggregates, Inc. with respect to both agreements. Mineral Reserves, Inc. is a corporate affiliate of Lafarge West, Inc.

D.6 3-5 MRI incorporates its prior comments and objections to characterization of construction of the road as "speculative" and to the potential applicability of NEPA to road construction or use.

D.7 3-5 Neither MRI nor Lafarge West, Inc. operates "aggregate mining facilities west of the [NWTC] site." MRI's operation is located south of the site.

D.8 3-24 The Spicer mineral lease is currently held by Mineral Reserves, Inc., as successor in interest to Western Aggregates, Inc. Also, as noted previously, any discussion of the MOU should also include the "Utility Right-of-Way Grant of Easement."

D.9 General MRI does not adopt, and is not bound by, the draft EA's characterization or discussion of "Water Resources" (section 3.6), "Geology" (Section 3.7), "Vegetation" (section 3.8.1), "Wetlands" (section 3.8.2), "Rare Plant Species" (section 3.8.3), "Wildlife" (section 3.8.4) or "Cultural Resources" (section 3.9) or any other portion of the draft EA not specifically enumerated in this comment for any purpose related to its current or future mining operations and regulation of the same.

D.10 4-3 Footnote 7 should be corrected to the effect that the Spicer mineral lease is currently held by Mineral Reserves, Inc., as successor in interest to

Western Aggregates, Inc. Also, any discussion of the MOU should also include the "Utility Right-of-Way Grant of Easement."

D.11 With respect to the remainder of the draft EA and any subsequent revision thereof, MRI reiterates and incorporates by this reference the "Scoping Comments" made by it in correspondence, dated July 17, 2001, from David Bailey to Steven Blazek.

MRI appreciates this opportunity to provide comments to the draft process for the EA and looks forward to being a continuing participant in the assessment process.

Please do not hesitate to call if you have any questions or comments.

Yours very truly,

David A. Bailey

DAB/zm

cc: Mr. Duane Bollig

E.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
DENVER REGULATORY OFFICE, 9307 S. PLATTE CANYON ROAD
LITTLETON, COLORADO 80128-6901

February 19, 2002

RECEIVED
FEB 21 2002
DOE/GO

Mr. Steve Blazekf
NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

RE: Draft Site-Wide Environmental Assessment of National Renewable Energy Laboratory's National Wide Technology Center
Corps File No. 200180432

Dear Blazekf:

Reference is made to the above-mentioned project located in Section 4, Township 2 South, Range 70 West, Jefferson County, Colorado.

E.1 If any work associated with this project requires the placement of dredged or fill material, and any excavation associated with a dredged or fill project, either temporary or permanent, in waters of the United States at this site, this office should be notified by a proponent of the project for proper Department of the Army permits or changes in permit requirements pursuant to Section 404 of the Clean Water Act. Waters of the U.S. includes ephemeral, intermittent and perennial streams their surface connected wetlands and adjacent wetlands and certain lakes, ponds, drainage ditches and irrigation ditches that have a nexus to interstate commerce.

Work in waters of the U.S. should be shown on a map with a list identifying the Quarter Section, Township, Range and County of the work and the dimensions of work in each area of waters of the U.S.

If there are any questions concerning this matter please call **Mr. Terry McKee** of this office at 303-979-4120 and reference **Corps File No. 200180432.**

Sincerely,

Timothy T. Carey
Chief, Denver Regulatory Office

tm

F.

RFO F 1325.8

United States Government — Department of Energy
Rocky Flats Field Office

memorandum

DATE: APR - 4 2002

REPLY TO ATTN OF: ES:OS:SRS:02-00557

SUBJECT: Draft Site-Wide Environmental Assessment of the National Renewable Energy Laboratory's National Wind Technology Center

TO: Steve Blazek, NEPA Compliance Officer
Department of Energy Golden Field Office
1617 Cole Blvd.
Golden, CO 80401-3393

We have reviewed the Draft Site-Wide Environmental Assessment (DOE/EA 1378) of the National Renewable Energy Laboratory's National Wind Technology Center and have attached our comments as discussed with you previously. Please let me know if you have any questions.

Steven R. Schiesswohl
Realty Officer

Attachment

cc w/Att:
J. Long, OCC, RFFO

cc w/o Att:
J. Legare, ES, RFFO
J. Rampe, IS, RFFO

NWTC EA - RFFO Comments

March 14, 2002

	Section	Page	Comment
	Summary		
F.1	S.1.2	(S-1)	The EA includes 305 acres (with the new 25 acres) although the administrative transfer has not occurred. The site is <u>not</u> part of the RFETS or its buffer zone.
F.2	S.2.1	(S-3)	Suggest a change to tall grass prairie or tall prairie grassland instead of tall prairie grass.
F.3	S.2.1	(S-3)	No additional alternative is the only alternative – no alternatives – see alternatives evaluation in Chapter 1
F.4	S.2.1	(S-3)	Add a bullet– Potential conflicts with the Rocky Flats National Wildlife Refuge.
	Introduction		
F.5	1.2.1	(1-2)	Change the acreage to 208.07 from 305 acres- The 25 acre transfer has not yet occurred.
F.6	1.2.	(1-3)	This area is no longer located within RFETS Boundary. The transfer of 208.07 acres from RFETS to Chicago Operations Office in 1993 should be discussed.
F.7	.2.	(1-3)	The 25 acres has not been transferred. Change Acreage accordingly.
F.8	1.2.1	(1-5)	The GIS polygon does not align with RFETS' West boundary
F.9	1.2.1	(1-7)	NWTC GIS polygon does not align with base map – specifically the SE corner should align with the western section line of Section 3; and the west polygon line should fall on this extension. The hatched area along Hwy 128 should not cover RFETS property. RFETS is not part of Superior. Also RFETS SE boundary follows the centerline of Indiana, not 150 feet inside.
F.10	.2.1	(1-9)	The Western Aggregates road easement is depicted on RFETS buffer zone south of the NWTC property line and fence. This map should be adjusted. The proposed alignment of the road is not on RFETS buffer zone, but on the NWTC property only.
F.11	.2.	(1-11)	Also, Minerals Reserve, Inc., a Lafarge subsidiary, should replace Western Aggregates on the label for the proposed easement's future road.
F.12	.2.3	(1-13)	Replace the word restoration with reclamation. Restore equates to complete replacement of the ecology including species, diversity, geological and soil structure, etc. I don't believe this is the goal. Reclamation refers to a replacement of habitat or vegetation for a general land use with ecological values that may or may not replace a particular specie or soil structure.
F.13	1.2.3	(1-14)	The Rock Creek Reserves (RCR) purpose and basis does not reference the three Executive Orders (13148, 13101, 13123) listed

in the EA. What are the dates of the Executive Orders and were they signed subsequent to the initiation of the RCR?

F.14 1.5.1 1-20) Add a bullet – Coordinate with mining companies on control of noxious weeds.

F.15 Proposed Action and Alternatives

2.1.1 (2-2) Where are the 20 additional test sites? Can they be identified on the map? If location is to be determined, then describe it as such.

- How large is the solar dish converter array?
- Extension of the gas pipeline from Hwy 93 – What about connecting it to Hwy 128? Are there other connected actions?
- Fencing the additional 25.7 acres is not listed.

F.16 2.1.1 (2-10) 1. Option one 10 MVA cable extension – 1.) Second sentence – Where and who owns the "west easement property line" to Building 253?. Which easement?

2. Does this NEPA document cover the gas line project, granting an easement to XCEL, and construction, O&M of the gas line for DOE purposes, and extensions/connections to the high pressure line at Highway 128 or will additional NEPA documentation cover these activities??

- The MP, 3" line – does MP stand for medium pressure? What PSI? Will this change if a connection is made to the high pressure line at Highway 128?
- Does the extension from B251 require additional NEPA compliance and documentation?

P 2-11 states that the EA covers the 6" commercial line (high pressure). Does the safety analysis cover the 6" line and does it cover it as a high pressure line running just north of the DOE building? Would the 6" line follow the same option 1 alignment? What about access and maintenance roads?

F.17 2.1 (2-15) Natural gas fueling facility – upwind of refuge – Are there fire dangers or safety issues related to wild fires? Would this facility constrain our controlled burn plans or open space burn plans?

F.18 2. 1 (2-16) Resurfacing (Paving roads – Is a storm water discharge permit required?

F.19 2 1 (2-17) Site Amenities – Are there impacts to Rock Creek Reserve or the Wildlife Refuge due to siting gazebos, picnic tables/benches, outdoor gathering areas, bike trails or footpaths

F.20 2.1 (2-17) Fuel Storage – State that appropriate SPCC plans and counter measures are in place.

F.21 2.2 (2-19) No action – 2.1.1 states that new construction may occur including 50,000 square feet of renovations, plus expansion of the Structural

			Blade Testing Facility and Dynamometer Test Facility may also include "construction of a new facility" and also includes construction of a DERTF, etc., yet 2.2 states that the no action alternative will "add no new facilities."
	Affected Environment		
F.22	3.1.1	(3-1)	The NWTC is located "outside" the new RFETS boundary. Also, Boulder County owns the land directly north of the NWTS south of Highway 128.
F.23			Fig 3-1 – Although GFO states that they have not conveyed an easement to either Western Aggregates or its successor lessee, Mineral Reserves, Inc., Figure 3-1 labeled a road as West Aggregate Inc Road Easement.
F.24	3.1.1	(3-5)	Same comment – Was the easement granted (deed conveyed) or not? The EA is not clear. State the facts: An MOU and easement agreement were executed. A conveyance instrument has not been executed as the actual alignments has not been determined.
F.25	3.1.1	(3-5)	Surrounding areas – Did not list the sawmill, or the other blasting company. Also did not list B060, 061 - lease buildings. Either be general or list all specific buildings.
F.26	3.1	(3-5)	Jefferson County Airport runway alignments were not designed <u>so</u> that aircraft takeoff and landing patterns do not pass directly over the NTWC. Change the word "so" to reflect that the aircraft patterns do not interfere or there are no impacts.
F.27	3.1.1	3-5	Think discussion of the new National Wildlife Refuge should be here instead of Rock Creek Reserve.
F.28	3.1.1	(3-5)	Change NTWC to NWTC (last word on page).
F.29	3.1.2	(3-6)	Delete the statement – At closure, all nuclear materials and <u>wastes</u> will have been removed from the site. This is not under GFO control.
F.30	3.2.1	(3-9)	Again – it is stated that the NWTC granted a road easement. Clarify this statement.
F.31	3.2.3	(3-9)	Accidents – 4 lines up – 1st paragraph - ...63 people injured in 46 accidents along Highway 93. (Should this be 128?)
F.32	3.3	(3-11)	In the section describing that ES&H evaluates proposed or estimated air emissions... in the planning stage, –there is no reference to the fugitive dust coming from the gravel mines to the west.
F.33	3.8.1	(3-29)	Under noxious weeds section, the Federal Noxious Weed Act has been superseded by the Plant Protection Act of 2000. Last sentence on the page- – add "r" to avense – "arvense".
F.34	3.8.	(3-30)	Table 3-7 is missing Field Bindweed, Convolvulus arvensis, which is on the top ten list in Colorado.

APPENDIX E

LETTER TO STATE HISTORIC PRESERVATION OFFICER
AND
LETTER OF CONFORMANCE FROM STATE HISTORIC PRESERVATION OFFICER
(STAMPED)

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

November 2, 2001

Georgianna Contiguglia
State Historic Preservation Officer
Colorado Historical Society
1300 Broadway
Denver, CO 80203

Subject: Site-Wide Environmental Assessment for National Renewable Energy Laboratory's National Wind Technology Center
Report # DOE/EA-1378

This letter and the enclosed Limited-Results Cultural Resources Survey Form constitute a request for concurrence on our determination of no historic properties affected by proposed improvements and maintenance activities at the Department of Energy's (DOE's) National Wind Technology Center (NWTC) referenced above. The NWTC is located in the northwest corner of the Rocky Flats Environmental Technology Site, in northern Jefferson County, Colorado (see enclosed Map 1).

The DOE proposes new and improved capabilities at the NWTC to support DOE's mission to research and develop renewable energy technologies. New construction would include permanent physical improvements to the site that involve buildings and equipment, utilities, and other infrastructure. The proposed action also includes typical operation and maintenance activities. The components of the proposed action are divided into two implementation periods, Short-Term (2002-2006) and Long-Term (2007-2021).

The proposed action includes a connection to an existing gas line west of the NWTC property line (see enclosed Map 2). The enclosed survey report summarizes the cultural resources survey on private property beyond the NWTC boundary. The EA proposes two options for the gas line. Option 1 enters the NWTC property to the north and option 2 enters the property to the south.

Laura Ziemke of Science Applications International Corporation (SAIC) completed the survey on Wednesday, August 22, 2001. No cultural resources were identified during the survey.

Three previous cultural resources surveys have been conducted on the NWTC facility. Through these surveys, the entire property has been surveyed to 100 percent Class III standards. These surveys were conducted by:

Federal Recycling Program Printed on Recycled Paper

Burney & Associates. 1989. An Archaeological and Historical Survey of Selected Parcels within the Department of Energy, Rocky Flats Plant, Northern Jefferson County, Colorado.

Dames & Moore. 1991. Cultural Resources Class III Survey of the Department of Energy Rocky Flats Plant, Northern Jefferson and Boulder Counties, Colorado.

Labat-Anderson Incorporated. 1995. Archaeological Assessment of the National Wind Technology Center.

These surveys (conducted between 1989 and 1995) resulted in identification of three historic sites and two historic isolates on the NWTC property. No prehistoric sites or isolates were identified. None of these sites were determined eligible for the National Register of Historic Places.

Sites & Isolates Identified by Previous Surveys on the National Wind Technology Center Property

Resource #	Description	Official Determination
5JF728	Ruins of a stone masonry spring house	Not Eligible
5JF729	Possible corral	Not Eligible
5JF754	Isolated find – Barbed Wire	Not Eligible
5JF755	Isolated find – Barbed Wire	Not Eligible
5JF992	Concrete foundation	Not Eligible

We hereby request your concurrence on our determination of no historic properties affected by the proposed action addressed in the Site-Wide Environmental Assessment for the National Wind Technology Center in Jefferson County, Colorado. Your response is necessary for the Department of Energy's compliance with Section 106 of the National Historic Preservation Act (as amended) and with the Advisory Council on Historic Preservation regulations.

If you require additional information, please contact Laura Ziemke (consultant) at 720-981-7438.

Sincerely

Steve Blazek, NEPA Compliance Officer
U.S. Department of Energy, Golden Field Office
1617 Cole Blvd.
Golden, CO 80401

Enclosures

Cc Laura Ziemke, SAIC
Maureen Jordan, NREL

SPB

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

RECEIVED

JAN 0 1 2002

CHS/OAHP

November 2, 2001

Georgianna Contiguglia
State Historic Preservation Officer
Colorado Historical Society
1300 Broadway
Denver, CO 80203

Subject: Site-Wide Environmental Assessment for National Renewable Energy Laboratory's National Wind Technology Center
Report # DOE/EA-1378

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Federal Recycling Program Printed on Recycled Paper

- Burney & Associates. 1989. An Archaeological and Historical Survey of Selected Parcels within the Department of Energy, Rocky Flats Plant, Northern Jefferson County, Colorado.

- Dames & Moore. 1991. Cultural Resources Class III Survey of the Department of Energy Rocky Flats Plant, Northern Jefferson and Boulder Counties, Colorado.

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	Possible corral	Not Eligible 8/26/92
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5JF755	Isolated find – Barbed Wire	Not Eligible IF
5JF992	Concrete foundation	Not Eligible

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If you require additional information, please contact Laura Ziemke (consultant) at 720-981-7438.

Sincerely,

Steve Blazek, NEPA Compliance Officer
U.S. Department of Energy, Golden Field Office
1617 Cole Blvd.
Golden, CO 80401

Enclosures

I concur Mark Wolfe for Georgianna Contiguglia
State Historic Preservation Officer
DAte 1/3/02

Cc: Laura Ziemke, SAIC
Maureen Jordan, NREL

APPENDIX F

LIST OF NREL'S ENVIRONMENTAL PERMITS

LIST OF NREL'S ENVIRONMENTAL PERMITS

NWTC site operations and/or implementation of the Proposed Action involve or may involve the following kinds of permits, licenses and entitlements:

- National Environmental Policy Act (NEPA) Site-Wide environmental review and associated documents;
- Air Pollution Emission Notices (APENs) filed with the Colorado Department of Public Health and Environment (CDPHE);
- Asbestos notifications for renovation and demolition would be filed with CDPHE;
- Resource Conservation and Recovery Act hazardous waste generator identification number;
- Some aboveground tanks containing chemicals, oils, fuels, and other fluids require registration with the Colorado Department of Labor;
- Clean Water Act, Section 404 permits from the U.S. Army Corps of Engineers would be required for certain actions involving "wetlands" and other waters of the United States;
- Construction related permitting for air emissions (fugitive dust), stormwater discharge, drinking water and septic systems; and
- SARA Title III Compliance: Emergency Planning and Community Right-to-Know Act (EPCRA)
- NWTC Public Water Supply Identification.

APPENDIX G

USFWS CONSULTATION AND COORDINATION LETTERS

In a telephone consultation on June 7, 2002, between SAIC and LeRoy Carlson from the USFWS, Mr. Carlson formally concurred with the list of species developed by SAIC. The species list was attached to the SAIC letter and is presented in the following contact report reflecting USFWS concurrence during this telephone consultation. No response letter from the USFWS was prepared or is anticipated.

Science Applications International Corporation
An Employee-Owned Company

April 8, 2002

Mr. Leroy W. Carlson
U.S. Fish and Wildlife Service
Ecological Services, Colorado Field Office
755 Parfet Street, Suite 361
Lakewood, CO 80215

RE: Site-Wide Environmental Assessment of the National Renewable Energy Laboratory's National Wind Technology Center. Submission of *Spiranthes diluvialis* survey report and informal consultation: request for concurrence of attached species list.

Dear Mr. Carlson:

The National Renewable Energy Laboratory (NREL) is preparing a new site-wide Environmental Assessment (EA) for the National Wind Technology Center (NWTC) to address new site development proposals and changes in the regional environment. Science Applications International Corporation (SAIC) is under contract with NREL to prepare the site-wide EA. This document will serve as a planning tool that aids decisions about future use and development of the site. When subsequent individual projects are identified in the NWTC, assessments would be prepared at that time to further analyze specific effects to environmental receptors. A map showing the location of the NWTC and the summary of the current draft EA are enclosed for your use.

Prior to completing the final EA, we require concurrence from your office regarding the following two issues.

Spiranthes diluvialis Survey
Enclosed is rare plant survey for *Spiranthes diluvialis* conducted on July 24, 2001 in the NWTC. This report is being submitted to you pursuant to the 1992 interim survey requirements for *Spiranthes diluvialis.*

Section 7 Species List
Based on data obtained from the Colorado Natural Heritage Program and the Department of Energy, we developed the attached species list. Preparation of the species list considered all plants and animals that are currently listed as federally threatened, endangered, candidate and proposed for listing in accordance with the Endangered Species Act (ESA) as amended (16 U.S.C. 1531 et seq.) that we determined to have potential to be affected by project alternatives. This letter serves to request your concurrence on the attached list of species in accordance with the informal consultation process outlined in Section 7 of the ESA.

Your attention to this request for concurrence of the attached species list and acceptance of the *Spiranthes diluvialis* survey report is appreciated. Please address your questions and concurrence

8100 Shaffer Parkway, Suite 100, Littleton, CO 80127 (720) 981-2400 • Fax: (720) 981-7488
Other Colorado SAIC Offices: Colorado Springs, Denver, Golden, Grand Junction, Greenwood Village, Lakewood

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letter to my attention at the address on this letterhead. Please contact me at 720-981-2406 if you have any questions.

Sincerely,

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Christiana J. Manville

Christiana J. Manville
Wildlife Ecologist

CC: Robert J. Henke, SAIC, Quality Assurance for Natural Resources
Brian Kennedy, SAIC Project Manager

Attachments: Regional Location Map, Draft EA Summary, Rare Plant Survey Report

Plant and Animal Species that are Candidates, Proposed for Listing, or Listed as Federally Threatened or Endangered that are Likely to Occur in the National Wind Technology Center, Jefferson County, Colorado

Species	Federal Status
Birds	
Bald eagle (*Haliaeetus leucocephalus*)	FT
Mammals	
Preble's meadow jumping mouse (*Zapus hudsonius preblei*)	FT
Plants	
Colorado butterfly plant (*Gaura neomexicana ssp. coloradensis*)	FT
Ute ladies' tresses orchid *(Spiranthes diluvialis)*	FT

FE – federally endangered, FT – federally threatened, FC – federal candidates, PT – proposed threatened

The following federally-listed species and candidate species were considered, but because either their known ranges did not overlap with the National Wind Technology Center (NWTC), habitat types were not available in the NWTC, or other favorable conditions did not exist in the NWTC to support the species, they were not included in the above list.

Mammals
Canada lynx (*Lynx canadensis*) FT
Black-tailed prairie dog (*Cynomys ludovicianus*) FC

Birds
Mexican spotted owl (*Strix occidentalis lucida*) FT
Eskimo curlew (*Numenius borealis)* FE
Mountain plover *(Charadrius montanus)* PT

Invertebrates
Pawnee montane skipper (*Hesperia leonardus montana*) FT

CONTACT REPORT FORM

This box for data entry only

Doc. No. F- _____

Ref. _____

Person Contacted: LeRoy Carlson

Date: 6/7/02, 3:15 pm

Title/Position: Colorado Field Supervisor

Organization: USFWS

Location: Lakewood, Colorado

Telephone/Fax: 303-275-2370

Type of Contact: X Telephone Visit

Topic (s): Section 7 Species List Consultation

Subject: NREL-NWTC Site-wide EA

Prepared By (Name): Christiana Manville **Date:** 6/7/02

Distribution: Brian Kennedy SAIC project manager, file

Summary of Discussion:

Mr. Carlson concurred with the list of species developed by SAIC, listed below:

Plant and Animal Species that are Candidates, Proposed for Listing, or Listed as Federally Threatened or Endangered that are Likely to Occur in the National Wind Technology Center, Jefferson County, Colorado

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