Bureau of Land Management

WEST-WIDE ENERGY CORRIDOR GUIDEBOOK

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1.0 INTRODUCTION

The United States Department of the Interior, Bureau of Land Management (BLM) manages more than 245 million acres of public lands - more than any other federal agency currently manages. The BLM's management of those lands is based on the principles of multiple use and sustained yield, as mandated by the Federal Land Policy and Management Act of 1976 (FLPMA), as amended. FLPMA also requires the BLM to manage public lands in accordance with land use plans. Those plans establish goals and objectives for resource management in a planning area, and identify where appropriate uses of public lands are allowable, restricted, or prohibited.

One such appropriate and important use of BLM-managed lands is the development and operation of electrical transmission and distribution lines, gas pipelines, and other energy transmission infrastructure. Accordingly, the BLM has been directed by the FLPMA to consider whether to designate locations of utility corridors for the placement of rights-of-way (ROW) for energy transmission infrastructure during the land use planning process. Thousands of miles of pipelines and electrical transmission and distribution lines are located on BLM lands. Those pipelines and electrical lines are important for the delivery of fuel and electricity from generation sources to users throughout the United States.

In recognition of the importance of efficient future development of energy on public lands, Section 368 of the Energy Policy Act of 2005 (EPAct, 42 U.S.C. § 15926) directed five federal agencies (the Departments of Agriculture, Interior, Defense, Energy, and Commerce) to:

- Designate energy corridors on federal lands in 11 western states[1];
- Establish procedures to ensure that additional corridors are identified and designated as necessary; and
- Expedite applications to construct or modify oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities (see **Text Box 1-1** for the complete text of Section 368).

In January 2009, pursuant to the EPAct, the BLM designated 117 "west-wide" or "Section 368" energy corridors traversing more than 5,000 miles, and adopted Interagency Operating Procedures (IOPs) to guide the use of the corridors. Since 2009, the BLM has conducted a review of the development and use of those corridors, and established a process to identify potential corridor revisions, deletions, and additions, in connection with a Settlement Agreement relating to a challenge of the BLM's Section 368 corridor designation decision.

This *West-Wide Energy Corridor Guidebook* (guidebook) describes the policies, requirements, and practices for authorizing oil, gas, and hydrogen pipelines and electricity transmission and distribution projects within Section 368 corridors. The intent of this guidebook is to assist those interested in developing compatible pipelines, distribution lines, or transmission lines understand the advantages of and requirements for using Section 368 corridors and the processes for obtaining a ROW from the BLM for energy transport projects within those corridors. In addition, this guidebook is intended to aid BLM staff responsible for managing Section 368 corridors in understanding the unique requirements for processing ROW applications for development within the corridors and for modifying land use

This West-Wide Energy Corridor Guidebook describes the policies, requirements, and practices for authorizing and developing oil, gas, and hydrogen pipelines and electricity transmission and distribution projects within Section 368 corridors.

plans to revise, delete, or add Section 368 corridors. This guidebook describes existing policies and practices of the BLM; it does not create or modify any BLM policies.

The remainder of **Section 1** summarizes past and ongoing actions by BLM and other federal agencies to designate Section 368 corridors, develop policies for the use of those corridors, and recommend modifications to corridor designations and policies. Subsequent sections of the guidebook describe:

- Section 2 - Preparing and processing ROW applications for developing compatible infrastructure within Section 368 corridors;
- Section 3 - IOPs, mitigation, and other requirements for development within Section 368 corridors;
- Section 4 - BLM land use planning to incorporate changes to Section 368 corridors; and
- Section 5 - Efficient design, management, and use of corridors.

1.1 Past and Ongoing Actions to Designate Corridors and Review Their Use

Since enactment of the EPAct in 2005, the BLM and other federal agencies have designated thousands of miles of Section 368 corridors, developed policies for use of those corridors and conducted reviews of their use, and started a process to identify potential revisions to the designated corridors.

A summary of those completed and ongoing steps taken to designate, review, and consider revisions to Section 368 corridors, is provided in this Section.

1.1.1 Designation of Section 368 corridors

To designate Section 368 corridors mandated by Section 368 of the EPAct (**Text Box 1-1**), federal agencies[2] completed a Programmatic Environmental Impact Statement (PEIS) (U.S. Department of Energy [DOE] and U.S. Department of Interior [DOI] 2008) in 2008 to:

- Examine the energy infrastructure status and issues in the western United States;
- Identify west-wide corridors for the preferred location of future oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities on federal lands;
- Programmatically assess the potential positive and negative environmental, social, and economic effects of designating and developing the identified energy corridors; and
- Incorporate the designated corridors into federal land use and resource management plans.

The five federal agencies sought input from the public; Tribal Nations; federal, state, and local agencies; and industry representatives to identify corridors that would provide for the west-wide transport and distribution of energy between supply and demand areas while considering land use and regulatory constraints and avoiding sensitive resources to the fullest extent possible. The agencies used the following four-step process to identify corridors:

1. Developed an "unrestricted" conceptual network of energy transport paths that connect energy supply areas with demand centers, regardless of land ownership, environmental, or regulatory issues;
2. Examined and revised individual segments of the network to avoid non-Federal lands and major known environmental, land use, and regulatory constraints, resulting in a preliminary Section 368 corridor network;

Text Box 1-1

Energy Right-of-Way Corridors on Federal Land, Public Law 109-58, Energy Policy Act of 2005, Sec. 368

(a) Western States - Not later than two years after the date of enactment of this Act, the Secretary of Agriculture, the Secretary of Commerce, the Secretary of Defense, the Secretary of Energy, and the Secretary of the Interior (in this section referred to collectively as "the Secretaries"), in consultation with the Federal Energy Regulatory Commission, States, tribal or local units of governments as appropriate, affected utility industries, and other interested persons, shall consult with each other and shall -

(1) designate, under their respective authorities, corridors for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities on Federal land in the eleven contiguous Western States (as defined in section 103(o) of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1702(o));

(2) perform any environmental reviews that may be required to complete the designation of such corridors; and

(3) incorporate the designated corridors into the relevant agency land use and resource management plans or equivalent plans.

(b) Other States - Not later than four years after the date of enactment of this Act, the Secretaries, in consultation with the Federal Energy Regulatory Commission, affected utility industries, and other interested persons, shall jointly -

(1) identify corridors for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities on Federal land in States other than those described in subsection (a); and

(2) schedule prompt action to identify, designate, and incorporate the corridors into the applicable land use plans.

(c) Ongoing Responsibilities - The Secretaries, in consultation with the Federal Energy Regulatory Commission, affected utility industries, and other interested parties, shall establish procedures under their respective authorities that -

(1) ensure that additional corridors for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities on Federal land are promptly identified and designated as necessary; and

(2) expedite applications to construct or modify oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities within such corridors, taking into account prior analyses and environmental reviews undertaken during the designation of such corridors.

(d) Considerations - In carrying out this section, the Secretaries shall take into account the need for upgraded and new electricity transmission and distribution facilities to -

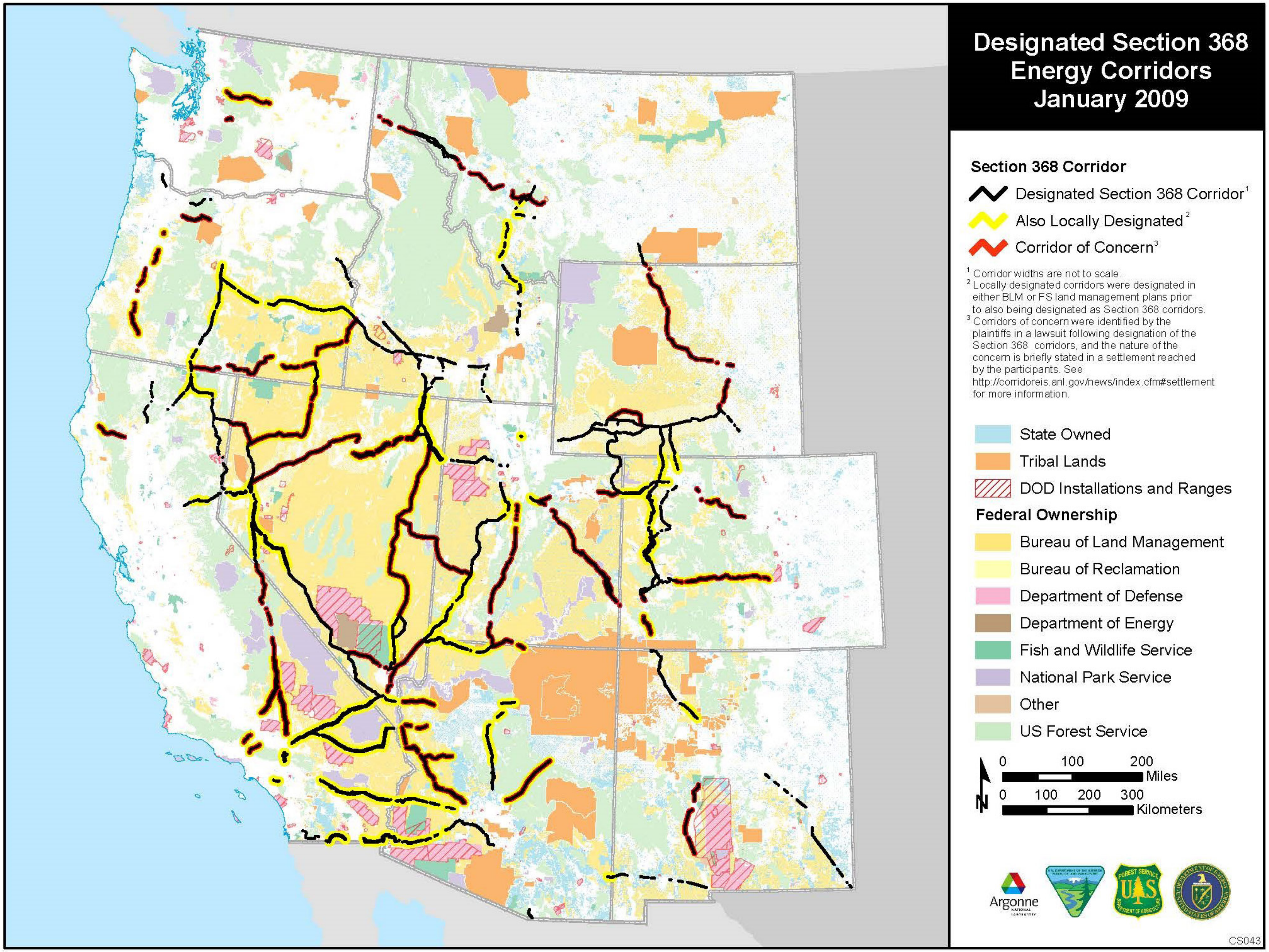
(1) improve reliability;

(2) relieve congestion; and

(3) enhance the capability of the national grid to deliver electricity.

(e) Specifications of Corridor - A corridor designated under this section shall, at a minimum, specify the centerline, width, and compatible uses of the corridor.

Figure 1-1. Designated Section 368 Corridors



3. Sought and incorporated input from local federal land managers and staff and adjusted corridor locations to further avoid important or sensitive resources and ensure consistency with land use plans; and

4. Following issuance of a Draft PEIS in November 2007, addressed concerns raised during the public comment period and government-to-government consultations, to ensure consistency with land management responsibilities and further avoid sensitive resources.

Following that process, the agencies published a Final PEIS in November 2008. The BLM then approved a Record of Decision (ROD) in January 2009 (BLM 2009) to amend 92 of the land use plans in 11 western states to designate approximately 5,000 miles of Section 368 corridors on land managed by the BLM (**Figure 1-1**). The BLM ROD specified the width (or range of widths) and the authorized energy transport modes (e.g., underground only, electric only, or compatible multimodal use) of each corridor. The U.S. Forest Service (FS) also approved a ROD in 2009 that designated about 1,000 miles of Section 368 corridors on lands managed by that agency.

The designated energy corridors are located in all of the 11 western states considered, and over 80% of the length of the corridors is on lands managed by the BLM (**Figure 1-1**). Although the corridors are considered preferred locations for energy transport projects on land managed by the BLM and FS, they are not required for use by future energy transport projects. A default corridor width of 3,500 feet (ft) was typically selected for corridor width to accommodate the construction and operation of multiple projects and to provide flexibility within a corridor to avoid important resources that could be identified during project-specific analyses. However, there are corridors and corridor segments that are wider or narrower than 3,500 ft. The selected Section 368 corridors were quite often designated on top of existing utility corridors, designated in BLM land use plans, that already contained existing infrastructure.

The agencies also analyzed in the PEIS IOPs that establish practicable means of avoiding or minimizing environmental harm resulting from future ROW grants within designated corridors. The BLM and FS RODs adopted those IOPs as mandatory minimum requirements for managing and implementing energy transport projects in Section 368 corridors. Those IOPs, which are described in detail in Section 3 of this guidebook, are intended to increase the efficiency of using designated corridors for energy transport by providing uniform processing and performance criteria for applicable projects.

It is important to note that the completion of the PEIS and issuance of a ROD to designate Section 368 corridors and modify land use plans in accordance with federal regulations did not authorize development of any project or initiation of any activities within the corridors. Like all other projects proposed to occur on BLM-managed land, a ROW application must be submitted, reviewed in accordance with the National Environmental Policy Act (NEPA) and other laws and regulations, and approved following the process described in Section 2 of this guidebook to receive authorization to develop a pipeline, transmission line, or other energy delivery infrastructure within a designated corridor.

1.1.2 Additional Activities Influencing the Use of Corridors

In 2009, several organizations, consisting primarily of non-governmental organizations, filed a complaint against the BLM and other federal agencies that challenged the energy corridor designations in the PEIS and associated RODs. Those organizations and involved federal agencies entered into a Settlement Agreement in 2012, which specified actions that the agencies must take, including:

- Completing a Corridor Study (Section 1.1.3);
- Regional Periodic Review of the Section 368 corridors and IOPs;
- Developing an interagency Memorandum of Understanding (MOU) that describes the process for conducting regional periodic corridor reviews (Section 1.1.4); and
- Updating agency guidance and training.

Text Box 1-2

West-Wide Energy Corridor Siting Principles[3] for Consideration in Evaluating Corridor Revisions, Deletions, and/or Additions

1. Section 368 corridors are thoughtfully sited to provide maximum utility and minimum impact to the environment;
2. Section 368 corridors promote efficient use of the landscape for necessary development;
3. Appropriate and acceptable uses are defined for specific Section 368 corridors; and
4. Section 368 corridors provide connectivity to renewable energy generation to the maximum extent possible while also considering other sources of generation, in order to balance the renewable sources and to ensure the safety and reliability of electricity transmission.

In conducting the Regional Periodic Review, the Settlement Agreement listed four general siting principles that the BLM is to consider when developing future recommendations to add, delete, or modify Section 368 corridors. Those principles are listed in **Text Box 1-2**.

In addition, the Plaintiffs identified 36 of the 119 total west-wide energy corridors as "corridors of concern (COC)" because of potential environmental conflicts such as special status species habitat, proximity to special sensitive or protected areas, impacts on water or cultural resources, and proximity to and for benefit of coal-fired generating stations. The BLM and other federal agencies agreed to notify project proponents of corridors of concern, and to encourage the consideration of alternative locations if a proposed project segment is within one of those corridors. That notification process, and the potential issues related to development within a COC, is further described in Section 2.

1.1.3 Section 368 Corridor Study

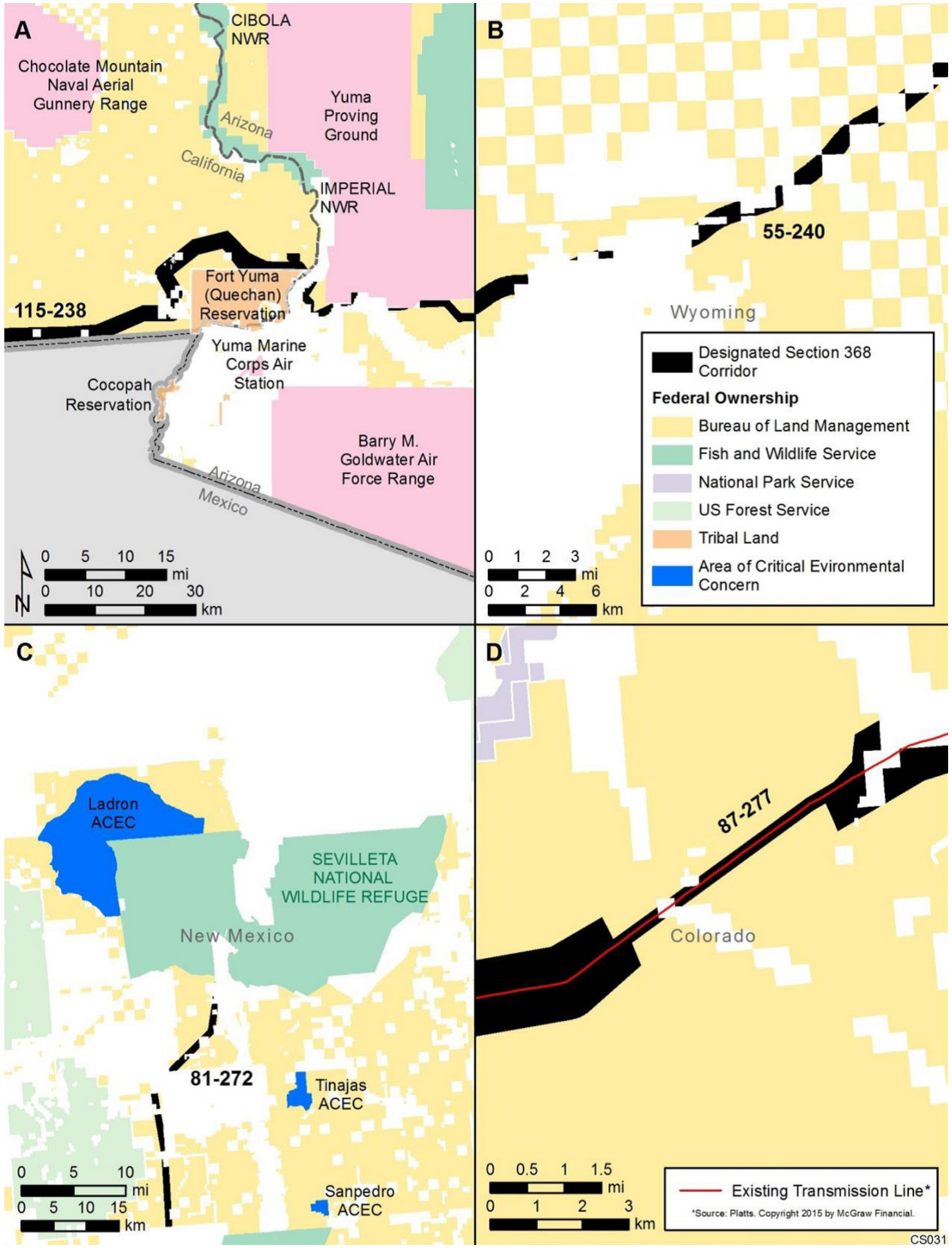
The Argonne National Laboratory (ANL) completed a *Section 368 Corridor Study* (ANL 2016) in 2016 that evaluated whether the designated Section 368 corridors are effectively promoting environmentally responsible corridor-siting decisions and reducing the proliferation of dispersed ROWs crossing federal lands. The results of that study provide an initial source of key information and guidance for subsequent regional periodic reviews of the corridors. These results are of value to project proponents and BLM staff for understanding the advantages and challenges of using Section 368 corridors and for maximizing the corridors' efficiency.

For that study, the BLM, FS, and the DOE requested information from the public about existing and planned uses of the corridors, conditions within corridors, problems encountered with their use, recommended changes to corridor designations and related policies, and other related topics (Request for Information: West-Wide Energy Corridor Review 79 Fed. Reg. 17567, [March 28, 2014]). Staff from BLM District and Field Offices and FS National Forest Supervisors' Offices also were asked for site-specific information about the use of, congestion within, and recommended changes to corridors.

Project proponents, federal staff, and other stakeholders that responded to the solicitations for information identified advantages for using Section 368 corridors, which are described in Section 1.2. They also identified challenges that have been encountered by developers attempting to locate pipelines and transmission lines within the corridors that have resulted in Section 368 corridors not being considered for some proposed projects. Those routing challenges should be considered by federal staff when discussing the use of Section 368 corridors with project developers, during reviews of ROW applications for the use of the corridors, and during future regional periodic reviews. Routing challenges identified in the study are summarized in **Text Box 1-3,** and examples are shown in **Figure 1-2**.

The Section 368 Corridor Study summarized existing and proposed uses of Section 368 corridors as of 2015, and identified a number of corridors that appear to be congested or over-utilized. It's important to remember the Section 368 corridors contained existing infrastructure upon designation. **Figure 1-3**, which is taken from that report, estimates the percentage of corridor length with existing transmission, though it does not assess the degree to which corridors could accommodate additional projects within their width.

Figure 1-2. Examples of Corridor Issues, as Identified in the 2015 Corridor Study (ANL 2015, Figure 3-1). [A] Corridor 115-238 routing around the Fort Yuma (Quechan) Reservation [Southwest Arizona/Southeast California], [B] discontinuous corridors in a region with checkerboard and other gaps in Federal jurisdictions (Western Wyoming), [C] Corridor 81-272 ending at Sevietta National Wildlife Refuge (South Central New Mexico), and [D] bottleneck in Corridor 87-277 [Central Colorado])



Text Box 1-3

Corridor Study Results: Routing Challenges and Other Issues with the Use of Section 368 Corridors (ANL 2014)

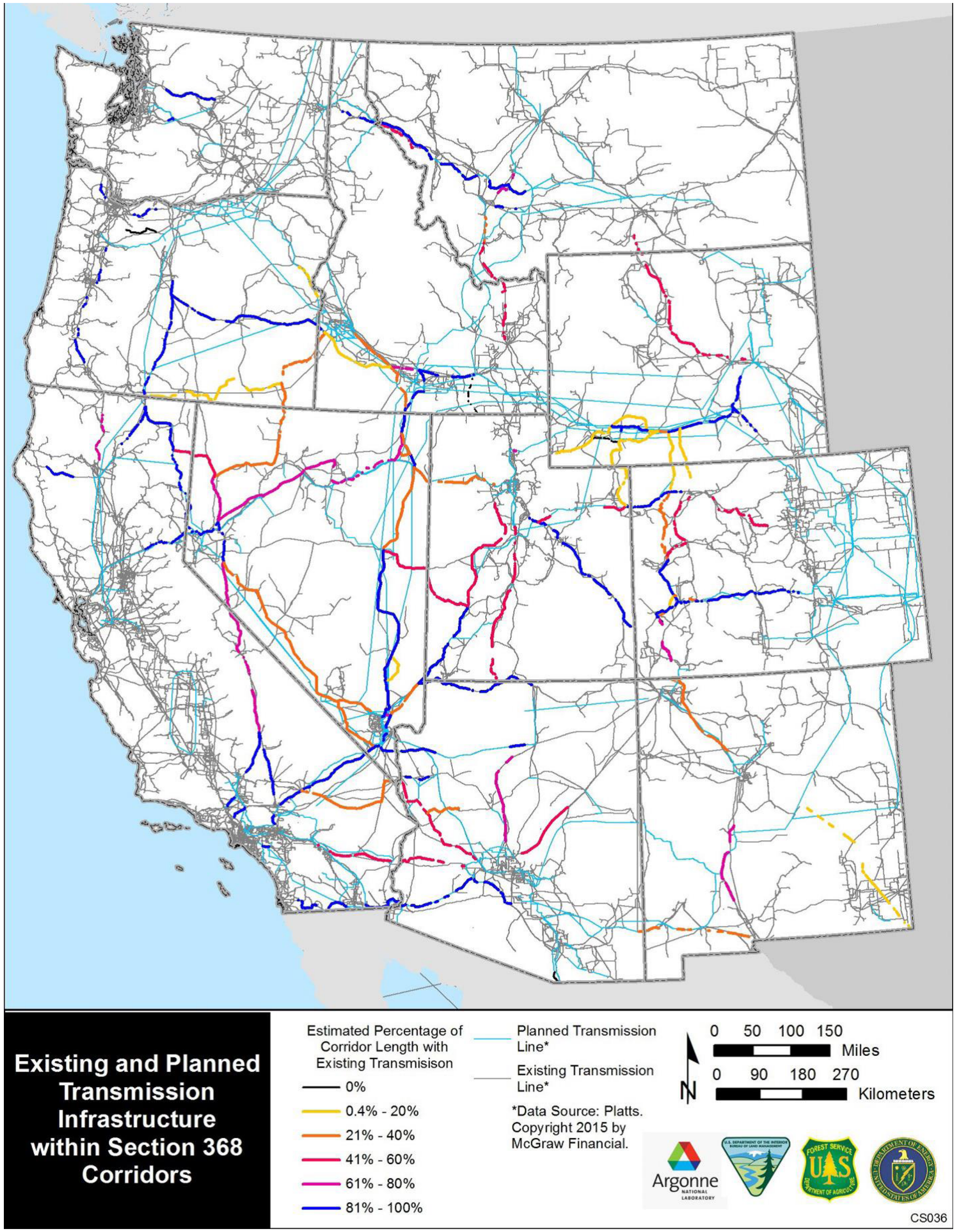
- Gaps in corridor routes across private or other non-Federal lands, or termination at these locations, make the corridors unattractive to use and remove many of the benefits of west-wide energy corridors, such as expedited permitting.
- Corridors that end at a specially designated area, private property, conservation easement, or otherwise end without a connection or hub are unattractive to applicants, in part because it might be easier to propose a different route rather than acquire a private easement.
- Some corridors were designated in areas with difficult terrain or other topographic issues.
- Physical bottlenecks prohibit additional ROWs from being located within some corridors.
- There is lack of coordination among Federal agencies, resulting in non-continuous corridors that are designated by one agency but not by another and therefore are less desirable or unusable.
- Routing of some corridors to avoid tribal lands has resulted in less-direct corridors that require longer routes across Federal and other lands or inefficient corridor alignments.
- Resource concerns, such as avoidance of habitat of protected species, sites with cultural resources, and other environmentally sensitive areas, have resulted in the avoidance of some corridors.
- Congestion, inefficient routing of existing facilities, and incompatible use of pipelines and transmission lines has limited the use of some corridors.
- The locations of corridors do not align with the needs of specific projects.

The origins of congestion, which also should be considered when reviewing future ROW applications for use of corridors and developing modifications to the corridors, include:

- **Cherry picking** - Past selection of an idealized, meandering route within a corridor, utilizing the whole width and making it unusable for subsequent applicants;
- **Pinch points** - Sections where the width of a corridor is reduced because of proximity to a specially designated area (e.g., an Area of Critical Environmental Concern), an insurmountable terrain feature, or some other obstruction;
- **Habitat concerns** - Restrictions to avoid important habitat for a protected species within part or all of a corridor could create congestion within the remainder of the corridor;
- **Spacing** - Previous requirements for allowable space between projects have resulted in an entire corridor being fully utilized by only a few projects; and
- **Mode contention** - Requirements for substantial separation between pipelines and electric transmission lines to prevent pipeline corrosion.

The Section 368 Corridor Study emphasized the advantages of conducting co-location evaluations for existing infrastructure, such as during the pre-application process, to reduce bottlenecks and identify route options that maximize the use of a corridor. Such exercises will be especially important where resource issues could restrict future development to existing designated corridors.

Figure 1-3. Corridor Study Results: Existing and Planned Transmission Lines as of 2015, with Designated Section 368 Corridors Categorized by the Percentage of the Corridor Where Existing Transmission Lines Are Present (ANL 2016).



Section 4 of the *Section 368 Corridor Study* also summarized numerous other issues that federal staff should consider when addressing energy transport projects within Section 368 corridors, responses received for changes to designated corridors and IOPs, and the Geographic Information System (GIS)-based data available to understand and depict conditions within designated corridors.

1.1.4 Regional Periodic Reviews of Section 368 Corridors and IOPs

In 2016 the BLM, FS, and DOE initiated regional reviews of Section 368 corridors to examine new relevant information and stakeholder input on those corridors and, based on the information gathered, identified potential revisions, deletions, or additions to the corridors. Elements of the regional reviews, including general siting principles for Section 368 corridors (**Text Box 1-2**), were defined in the Settlement Agreement (Section 1.1.2) and further developed in an approved Work Plan, as formulated under an Interagency MOU.

The outcome of each regional review will be a report identifying potential revisions, deletions, and additions to the Section 368 energy corridors. These potential corridor changes will be considered during one of the following subsequent BLM and FS land use planning activities;

- During the normal course of land use plans revisions;
- During amendments to land use plans prompted by project proposals that do not conform to land use plans, or when issues within a Section 368 energy corridor necessitate review of an alternative corridor; or
- During amendments to land use plan(s) that address changes to Section 368 energy corridors.

Applicable environmental reviews of the potential corridor changes will be completed to address the requirements of NEPA and other applicable regulations prior to modification of any land use plans.

The West-Wide Energy Corridor Information Center website contains information and tools for public involvement in the process, information on the process and results for each region, and other related documents.

Corridor abstracts and a GIS-based mapping tool have been developed to support the review process and provide information to those considering developing energy transport projects within Section 368 corridors, and can be accessed from the website.

Corridor Abstracts

Corridor abstracts present an initial analysis of energy development opportunities and concerns for each corridor under review. The abstracts also assist in analyzing whether the corridors effectively meet current and projected energy transport needs and, if not, whether they are inadequate due to limited remaining capacity, site-specific conflicts, or other considerations. The corridor abstracts are intended to serve as an important data source to document known corridor concerns and energy use opportunities that can be used or referenced during the scoping phase of subsequent NEPA and land use planning actions. These abstracts also are valuable resources for developers that are evaluating the opportunities and challenges for use of a specific Section 368 corridor.

Section 368 Energy Corridor Mapping Tool

An interactive, GIS-based mapping tool has been developed to provide geospatial corridor siting information during the regional reviews. This interactive GIS tool includes much of the available geospatial data used to support the analysis of whether a Section 368 energy corridor may need to be modified due to changing conditions. The data in the GIS tool also provide an early indicator of resource issues that could arise when processing a ROW application within the corridor.
In addition to having links to available corridor abstracts, the mapping tool includes numerous geospatial data layers, such as existing and planned infrastructure, cultural resource areas, ecological resources, areas of potential incompatible land uses, aerial imagery, and renewable energy zones.

1.2 Advantages of Siting Pipelines and Transmission Lines within Section 368 Corridors

The designation of the corridors and the policies and practices that have been established by the BLM to manage Section 368 corridors have resulted in advantages for the use of the corridors for energy transport projects. These advantages are summarized and listed in **Text Box 1-4**.

The designation of Section 368 corridors, and associated interagency policies and practices, are intended to, in part, reduce the time required to review and process ROW applications for use of a corridor. Most importantly, applicable energy transport projects to be located in Section 368 corridors will be in conformance with land use plans, eliminating the sometimes lengthy process of evaluating conformance and modifying land use plans for a project.

In addition, because corridors have been located to avoid, where possible, conflicting land uses and important resources, NEPA analyses could be less complex and mitigation required to minimize adverse effects could be less intensive than some alternative route locations. The complexity and time required for a NEPA analysis also may be reduced when that evaluation can be tiered from a NEPA document completed for the designation or use of a corridor. Relevant information has been captured and continues to be updated, and is being synthesized as part of the corridor designation and review process.

For example, the corridor abstracts described in Section 1.1.4 list the location of potential resource and land use conflicts throughout corridors that have been or are being reviewed during the regional periodic review process. Site-specific information is also commonly available from past evaluations of infrastructure developed within and near the corridors. This and other available information will be of value to developers as they plan their projects and evaluate potential routes. It also will be very useful for developing ROW applications and conducting NEPA and land use plan reviews, possibly reducing the costs and time needed for those steps.

As identified in the Corridor Study report (Section 1.1.3) and summarized in **Text Box 1-3**, there also are some challenges to locating energy transport projects within Section 368 corridors. Many of these are the result of the discontinuous pattern of federal land managed by the BLM and FS that is crossed by many of the Section 368 corridors. The corridors are not continuous across private property, tribal lands, and other areas not managed by the BLM or FS; thus, developers will be required to coordinate with and obtain permission from landowners, tribes, and

Text Box 1-4

Potential Advantages to Locating Energy Transport Projects within Section 368 Corridors

- Applicable projects located within designated corridors will be in conformance with local land use plans, and conformance reviews and modification of those plans will not be required.
- Corridors have been located to avoid where possible land use and resource conflicts, reducing the time for project reviews and requirements for mitigating adverse effects.
- Substantial information about site-specific conditions within corridors has been or is being developed, which can be used to more confidently plan and evaluate potential routes and which could reduce the costs and time required to develop and review ROW applications.
- Processes for interagency cooperation have been developed, and one agency will be identified to lead the ROW review process.
- IOPs have been developed and accepted by the BLM and FS, and the requirements for development of energy transport projects within corridors therefore are defined and consistent between agencies.
- The EPAct required expedited processing of applications to construct or modify oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities within designated corridors.
- Project-level NEPA analysis can be informed by relevant resource information within and adjacent to corridors captured as part of the corridor review process.

agencies not involved in the coordinated Section 368 review process. Other challenges are caused by the presence of difficult terrain, existing infrastructure, or other obstacles; protected resources; or specially designated lands. These difficulties, however, occur on most or all routes considered for long-distance energy transport projects, and are likely to be less of an issue within designated Section 368 corridors. In addition, developers and agency staff should be aware that some Section 368 corridors were identified by plaintiffs in the lawsuit challenging the agencies' decisions designating corridors as COC, and siting within such a corridor may result in significant environmental impacts, involve extensive and lengthy reviews and challenges, and require extensive mitigation.

[1] The 11 western states are Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

[2] The Department of Energy and Bureau of Land Management, were the lead agencies in preparation of the PEIS. The Forest Service; Department of Defense; and Fish and Wildlife Service were cooperating federal agencies in preparation of the document.

2.0 REQUESTING AND REVIEWING ROW AUTHORIZATIONS WITHIN WEST-WIDE ENERGY CORRIDORS

This section describes the requirements and processes developers must follow to request permission to develop an energy transport project within Section 368 corridors and the steps the BLM takes to review and render a decision on those requests. It highlights the requirements for Section 368 corridors that must be considered when implementing the BLM's established procedures for compiling, submitting, and processing ROW applications; conducting reviews; and issuing a decision.

Anyone wanting to utilize Section 368 corridors to site electric transmission or distribution lines or oil, gas or hydrogen pipelines on land managed by the BLM must obtain a ROW grant from that agency. ROW grants for electric transmission and distribution facilities, and for hydrogen pipelines are issued by the BLM in accordance with FLPMA and associated implementing regulations at Title 43 of the Code of Federal Regulations, Part 2800 (43 CFR 2800). ROW grants for oil and natural gas pipelines are issued in accordance with the Mineral Leasing Act (MLA) and associated BLM implementing regulations (43 CFR 2880). Project proponents are encouraged to read the regulations under 43 CFR subpart 2804 – Applying for FLPMA Grants (or Subpart 2884 – Applying for MLA Grants, as applicable).

In addition, the BLM brochure *Obtaining a Right-of-Way on Public Lands* provides a general summary of the regulations and processes involved, and the following BLM Permanent Instruction Memorandum (IM 2017-002, *Policy Guidance for Processing Right-of Way Applications for High-Voltage Electric Transmission Lines*) is another resource to consult (**Text-Box 2-1**).

This application process, and the unique considerations for requesting and granting ROWs for energy transport projects in Section 368 corridors, is described here in more detail.

The BLM's decisions to grant a ROW must conform to existing land use plans. Land use plans identify allowable (as well as restricted and prohibited) uses, such as the development of ROWs, and the locations where those allowable uses may or may not occur within a planning area. Corridors designated in land use plans are the preferred locations for the placement of ROWs for allowed facilities. When processing requests for a ROW that is partially outside of a designated corridor, BLM staff must consider whether the proposed uses of those areas are compatible with the land use decisions specified in the associated land use plans.

The remainder of this section summarizes the steps in the BLM ROW process that are important or unique for energy transport projects to be developed in Section 368 corridors.

2.1 Project Planning and Pre-Application Meetings

During initial planning of energy transport projects to be located on public lands in the western U.S., project developers should determine whether their projects could be located within one or more Section 368 corridors. Those corridors, and other utility corridors identified in land use plans, are the preferred location for such projects on BLM lands, and BLM staff will encourage the use of Section 368 corridors for applicable projects. Developers therefore should be prepared to consider the corridors as a possible location for their project or be prepared to justify why Section 368 corridors would not be suitable.

Corridor abstracts, which have been prepared during the regional reviews of the energy corridors (Section 1.1.4), list the locations of existing and proposed infrastructure and potential physical, jurisdictional, and resource-specific conflicts within corridors. In addition, updated GIS data on land use plan allocations are often available for the most current site-specific information.

Early in the planning process, project developers are encouraged to request a pre-application meeting or meetings with the BLM by contacting the BLM field office with jurisdiction over the land where the ROW is needed (43 CFR 2804.10). If more than one office will be involved, the BLM will direct project proponents to coordinate with the office with the largest land management interest in the project. Depending on the scope and complexity of the project, more than one pre-application meeting may be beneficial.

As outlined in 43 CFR 2804.10 (a)(1), During a pre-application meeting, BLM can:

- Identify potential routing and other constraints;
- Determine whether the ROW being considered is within a designated corridor or other existing ROW corridor;
- Tentatively schedule the processing of the proposed application; and
- Inform project developers of their financial obligations, such as processing and monitoring costs and rents.

The BLM may share information provided during pre-application meetings with Federal, state, tribal, and local governments to ensure that these agencies are aware of any authorizations that could be needed from them, and to initiate effective coordinated planning (43 CFR 2804.10(b)).

Text Box 2-1

Permanent Instruction Memorandum No. 2017-002: Policy Guidance for Processing Right-of-Way Applications for High-Voltage Electric Transmission Lines.

Purpose: This Instruction Memorandum (IM) updates guidance on the review of right-of-way (ROW) applications for high-voltage electric transmission line projects. For purposes of this policy, high-voltage electric transmission lines are those that are 100 kV or larger. This IM reiterates and clarifies existing Bureau of Land Management (BLM) land use plan (LUP) and National Environmental Policy Act (NEPA) guidance to assist BLM offices with processing these applications.

Policy/Action: Applications for proposed high-voltage electric transmission line projects on BLM-administered public lands are processed as ROWs under Title V of the Federal Land Policy and Management Act (FLPMA) and in accordance with Title 43, Part 2800 of the Code of Federal Regulations (CFR). The processing of high-voltage electric transmission line ROW applications must also comply with the BLM planning, environmental, and other regulatory requirements. To secure obligations imposed by the grant and applicable laws and regulations, the authorized officer shall make a determination of the need for a bond, in accordance with 43 CFR 2805.12(g) and MS-2805.12D. That determination may be made prior to issuance of a new grant or prior to issuance of amendments or renewals.

This is especially important for large-scale energy transport projects that will span multiple jurisdictions. For such projects, there may be multiple "lead agencies" and "cooperating agencies."

Project developers should be prepared to describe in detail at pre-application meetings the project, including the purpose, location, size, and schedule of the project, and initial design features and best management practices (BMPs) being considered to comply with mandatory IOPs and to mitigate potential adverse effects. Developers should also discuss their plan for public and government outreach, in part so the BLM can determine whether there are opportunities to integrate their requirements for stakeholder involvement.

BLM staff should be ready to discuss during pre-application meetings the information required to complete and process a ROW application; the level of NEPA analysis required and the process that will be followed to complete that analysis; timeframes for reviews; cost-recovery fees and other financial considerations; the requirement to implement mandatory IOPs (Section 3); and points of contact for the project.

In addition, BLM line managers will do the following during the pre-application stage of applicable energy transport projects that could be located in or near Section 368 corridors:

» Encourage project proponents to locate applicable projects within Section 368 corridors;

» If there are site-specific constraints within a corridor (such as required separation distances to meet electric reliability standards), encourage the proponent to site their project as close as practical to Section 368 corridors or within or adjacent to other BLM designated corridors, existing linear ROWs, or previously disturbed lands; and

» For projects that are proposed to be sited, in part or in whole, within a corridor of concern segment:
    - Notify project proponents in writing about Corridor of Concern (COC) with identified siting concerns;
    - Encourage project proponents to consider alternative locations to project components within a corridor of concern segment.

For interstate electrical transmission facilities, a proponent may elect to initiate the DOE Integrated Interagency Pre-application (IIP) Process. The IIP Process is facilitated by DOE and "allows project proponents to engage early project information sharing and the development of an applicant-prepared environmental assessment intended to inform any subsequent environmental review by federal agencies under the National Environmental Policy Act." The IIP Process is voluntary and is requested by a project proponent directly to DOE for a proposed project that qualifies under the regulations.

2.2 Plan of Development and ROW Application

To initiate the BLM process for review of a ROW application, a project developer must prepare and submit the following:

» A completed Standard Form 299, Application for Transportation and Utility Systems and Facilities on Federal Lands;

» Initial POD; and

» Copies of any information filed with other agencies for other federal licenses, certificates, or other authorizations.

The application should address all activities and associated locations required to construct the project, including those to be included in a temporary use permit/short term ROW grant, in addition to those activities and locations required for the long-term operation of the energy transport projects. The BLM regulations (43 CFR 2804.12 and 2884.11) and the BLM brochure *Obtaining a Right-of-Way on Public Lands* includes detailed instructions for filling out the application form and a description of applicable fees, and IM 2017-002, *Policy Guidance for Processing Right-of Way Applications for High-Voltage Electric Transmission Lines*, includes suggested POD outlines for pipelines and power lines.

When preparing the POD for energy transport projects within Section 368 corridors, developers must consider and incorporate the mandatory IOPs described in Section 3.

The POD should document how the relevant IOPs are to be implemented; for example, by including a table that links the requirements to project design features and applicant committed measures. That table will need to be updated as compliance requirements and mitigation measures are identified during the BLM review process and therefore will not be complete until the final terms and conditions of the ROW grant have been developed.

To complete Standard Form 299, the application also must include information required to describe site-specific conditions and the likely environmental effects of a project, including results of any necessary field surveys and evaluations. BLM staff will inform project proponents during pre-application meetings of the surveys and evaluations required for a project. Substantial information about site-specific conditions within Section 368 corridors may be available in the corridor mapping tools (Section 1.1.4) and in NEPA documents prepared for past requests for ROWs within and near those corridors.

Activities necessary to collect data for filing a ROW application such as sampling, marking of routes or sites, surveying, and other activities that do not unduly disturb the surface or require the extensive removal of vegetation are considered casual use and do not require a temporary use permit. More invasive activities, such as geotechnical studies, will require submittal for and receipt of a short-term ROW grant (for activities permitted under FLPMA) or temporary use permit (for activities permitted under MLA).

2.3 BLM Processing and Review of ROW Application

Following receipt of an application, the BLM staff will verify whether the information in the application is complete and will inform the applicant of any additional information required, per 43 CFR 2804.25 and 43 CFR 2884.22. Upon receipt of a complete application, BLM will review the application to determine the appropriate cost recovery fee schedule for processing the application and monitoring the ROW.

The BLM must review the project in accordance with its regulations and guidance, including the 2800 Manual and Handbook series on ROW management, Handbook H-1790-1, BLM National Environmental Policy Act, Manual 1601, Land Use Planning, and the Land Use Planning Handbook.

BLM staff will also initiate communications and other actions required for Tribal consultations (BLM Manual 8120) and to comply with the Endangered Species Act (BLM Manual 6840); National Historic Preservation Act (BLM Manual 8100); and other federal, state, and location regulations. The BLM must also ensure that all applicable IOPs (Section 3) will be implemented for a project. Additional guidance on processing of ROW applications for electric transmission lines is contained in a permanent IM 2017-002 and **Text Box 2-2**.

In accordance with 43 CFR 2804.12 (**Text Box 2-2**), ROW applications for transmission lines with a capacity of 100 kV or more must:

- Include in the application a general description of the proposed project and a schedule for submission of a POD conforming to the appropriate BLM POD template (see Section 2.2);
- Address all known potential resource conflicts with sensitive resources and values, including special designations or protections, and include applicant-proposed mitigation measures for such resource conflicts, if any;
- Initiate early discussion with any grazing permittees that may be affected by the proposed project (in accordance with 43 CFR 4110.4); and
- Schedule and hold two preliminary application meetings.

The preliminary application meetings must be held within six months of the receipt of cost recovery fees by the BLM. The first meeting will be with the BLM to discuss the general project proposal, status of BLM land use planning for the lands involved, potential siting issues or concerns, potential environmental issues or concerns, potential alternative site location and the ROW application process. The second meeting will be with appropriate Federal and State agencies and tribal and local governments to facilitate coordination of potential environmental and siting issues and concerns (43 CFR 2804.12).

As recommended in the Section 368 Corridor Study (ANL 2016), the project proponent/applicant with assistance of the BLM should consider conducting a co-location evaluation of the Section 368 corridors and other utility corridors that are proposed for use by a project. The objective of such an evaluation would be to identify design and siting approaches (e.g., maximum spacing, structure design, and routing requirements) that could reduce bottlenecks and maximize current and future compatible use of the corridors by multiple projects. The results of that evaluation could aid in the development of alternatives to consider during the environmental review. See Section 5 of this guidebook for additional information on the design of energy transport projects for efficient management and use of corridors.

Upon receipt of a completed application, BLM evaluates the proposed route for compliance with the relevant land use plan(s). In cases where project proposals are inconsistent with land use plans, applicants will be encouraged to modify their proposal to the extent feasible to conform to the plan. If a modified proposal would still require an amendment(s) to a land use plan(s) and the BLM Manager, consistent with the Land Use Planning Handbook, determines it is warranted to consider amending the plan(s), it could benefit the BLM and project proponent to combine the proposal and plan amendment into a single environmental review process.

In processing the applications, BLM staff are encouraged to incorporate by reference applicable analysis from the PEIS and other relevant documents, but should note that tiering to the PEIS cannot substitute for site-specific analysis required to comply with NEPA regulations. Handbook H-1790-1, BLM National Environmental Policy Act, has detailed information about the requirements for and use of tiering. In addition, if an applicable electric transmission or pipeline project is proposed to be located in a corridor of concern, alternatives to the use of that corridor segment must be evaluated in the NEPA document. IM 2017-002 and the attachments to that IM also have supplemental guidance regarding land use planning and NEPA compliance for processing ROW applications for high-voltage (i.e., 100 kV or larger) electrical transmission lines.

2.4 ROW Grant and Project Implementation

Upon completion of the requirement of NEPA and compliance with other applicable environmental regulations, the BLM will issue a decision to reject the application or to grant a ROW. If a decision to grant a ROW is chosen, the project proponent usually is required to prepare a final POD. The POD and the ROW grant issued by the BLM must address all applicable IOPs for projects that occur within Section 368 corridors.

All applicable IOPs and any design features, best management practices, and other requirements to avoid or minimize adverse impacts are incorporated into the grant as terms and condition, and must be implemented during the project.

The BLM will regularly monitor the ROW to ensure compliance with the grant's terms and conditions. The ROW holder will designate an authorized representative to work with the Agency's Compliance Inspector Contractor to respond to the BLM and implement corrective actions identified by the BLM during construction, operations, and decommissioning activities. The BLM may suspend or terminate a ROW grant if the holder does not comply with applicable laws, regulations, terms, conditions, or stipulations of the ROW grant (43 CFR 2807.17).

Text Box 2-2

Information on wind, solar, and 100kV transmission line applications (43 CFR 2804.12(b))

When submitting an application for a solar or wind energy development project or for a transmission line project with a capacity of 100 kV or more, in addition to the information required in paragraph (a) of this section, you must:

(1) Include a general description of the proposed project and a schedule for the submission of a POD conforming to the POD template at http:// www.blm.gov;
(2) Address all known potential resource conflicts with sensitive resources and values, including special designations or protections, and include applicant-proposed mitigation measures for such resource conflicts, if any;
(3) Initiate early discussions with any grazing permittees that may be affected by the proposed project in accordance with 43 CFR 4110.4–2(b); and
(4) Within 6 months from the time the BLM receives the cost recovery fee under §2804.14, schedule and hold two preliminary application review meetings as follows:

(i) The first meeting will be with the BLM to discuss the general project proposal, the status of BLM land use planning for the lands involved, potential siting issues or concerns, potential environmental issues or concerns, potential alternative site locations and the right-of-way application process;
(ii) The second meeting will be with appropriate Federal and State agencies and tribal and local governments to facilitate coordination of potential environmental and siting issues and concerns; and
(iii) You and the BLM may agree to hold additional preliminary application review meetings

3.0 INTERAGENCY OPERATING PROCEDURES (IOPS)

This section describes and lists IOPs, which are mandatory requirements for energy transport projects in Section 368 corridors and intended to be practicable means to avoid or minimize environmental harm from future project development that may occur with the designated corridors. It also includes a summary of other possible sources of requirements that should be considered by project proponents and the BLM to develop a project-specific list of design features, BMPs, and other mitigation measures for a project.

3.1 Interagency Operating Procedures

The 2008 PEIS (DOE and DOI 2008) for designation of Section 368 corridors identified IOPs, which are uniform requirements and performance criteria for the planning, construction, operation, and decommissioning of oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities within west-wide energy corridors. Through the 2009 ROD (BLM 2009), the BLM adopted these IOPs as mandatory requirements in all Section 368 corridors on BLM-administered land.
The intent of the IOPs is to:

- Meet the requirements of Section 368 to expedite the permitting process by providing coordinated, consistent interagency management procedures for permitting ROWs within Section 368 corridors;
- Foster long-term, systematic planning for energy transport development in the west; and
- Identify mandatory requirements that will help ensure that future projects developed within Section 368 corridors are planned, constructed, operated, and eventually decommissioned in a manner that protects and enhances environmental resources and long-term sustainability (DOE and DOI 2008, BLM 2009).

Text Box 3-1 summarizes the IOPs, and Appendix A contains a complete list of the IOPs from the 2008 PEIS (DOE and DOI 2008). Note that the summary in **Text Box 3-1** does not include all of the detailed actions and stipulations required by each IOP and project proponents should reference Appendix A for the complete list.

The IOPs are organized by project phase (planning, construction, operation, and decommissioning) and by resource area or activity within each phase (**Text Box 3-1**). Many of the IOPs address general requirements to comply with laws and regulations, while others describe more detailed actions for avoiding or minimizing the potential adverse effects of a project. Not all IOPs will be appropriate for all energy transport projects; for example, some IOPs are specific to the development of pipelines and do not apply to electric transmission or distribution lines.

Project proponents and BLM staff are responsible for ensuring that all applicable IOPs are incorporated into a project's POD and implemented during construction. The BLM encourages project proponents to include a table in the POD that demonstrates how the project satisfies all applicable IOPs.

Text Box 3-1

Section 368 Energy Corridors - BLM Interagency Operating Procedures (IOPs)

The IOPs address the following topics as summarized below. Appendix A contains a complete description of all IOPs and should be referenced to ensure full compliance..

Project Planning

- **Regulatory Compliance** - Conduct National Environmental Policy Act analysis and comply with National Historic Preservation Act, Endangered Species Act, and Fisheries Conservation and Management Act;
- **Agency Coordination** - Coordinate with Department of Defense, National Park Service, Fish and Wildlife Service, and the Federal Aviation Administration. Incorporate regional management plans as applicable;
- **Government-to-Government Consultation** - Consult with affected tribes and prepare an ethnographic study if needed;
- **General** - Prepare a POD and monitoring plan, comply with agency policy and guidance, follow state and federal BMPs, design to efficiently use corridors, and consider cumulative effects early in development;
- **Project Design** - Locate projects to promote effective future use of corridor and to avoid corrosion effects of transmission lines on metallic pipelines and wells;
- **Transportation** - Design access roads to agency standards and travel plans, address effects of equipment transport and construction on road use and traffic;
- **Groundwater** - Avoid adversely affecting sole source aquifers and contact the Environmental Protection Agency and other relevant agencies if such an aquifer is crossed;
- **Surface Water** - Identify and avoid or otherwise mitigate adverse effects to wild and scenic rivers and impaired streams, and coordinate with relevant agencies;
- **Paleontological Resources** - Avoid or otherwise mitigate adverse effects to paleontological resources and develop a protocol for unexpected discoveries;
- **Ecological Resources** - Identify and avoid or otherwise mitigate impacts to important habitat, special-status species, and wetlands and other aquatic habitats, and restore disturbed habitat to specified success criteria;
- **Vegetation Management** - Implement a vegetation management plan for the control of noxious weeds and invasive species;
- **Cultural Resources** - Implement a comprehensive cultural resource management plan to comply with applicable regulations, inventory cultural resources, avoid or otherwise mitigate impacts, coordinate with tribes and agencies, provide training and public outreach, and manage information;
- **Tribal Traditional Cultural Resources** - Identify and consult with potentially affected tribes, comply with applicable regulations, and avoid or otherwise mitigate impacts to traditional cultural resources;
- **Visual Resources** - Access effects in accordance with current agency procedures and methods, develop a management plan, and design and implement projects to mitigate effects to visual resources;
- **Public Health and Safety** - Develop fully compliant health/safety and emergency management plans to protect workers and the public during all phases of a project;
- **Hazardous Material Management** - Implement a spill prevention and response plan; and
- **Fire Management** - Implement strategies to manage vegetation and minimize the risk of human-caused fires.

Text Box 3-1 continued

Construction

- **General** - Avoid conflict with Federal and non-Federal operations, locate equipment away from residences, and pay fair market value for forest products that are removed;
- **Soil, Excavation, and Blasting** - Salvage topsoil and restore sites; backfill excavations with suitable material; and avoid effects to aquifers, wildlife, and residences when blasting;
- **Mitigation and Monitoring -** Implement all established mitigation and control measures;
- **Surface and Groundwater Resources** - Avoid or minimize dewatering aquifers and wetlands, erosion, stream crossings, drainage alternations, and hydrologic conduits between aquifers;
- **Paleontological Resources** - Implement a paleontological resources mitigation plan. All paleontological specimens found on Federal lands remain the property of the U.S. government;
- **Ecological Resources** - Identify and mark sensitive habitat, avoid indirectly impacting surface waters, and comply with permits for conducting activities in wetlands and waters;
- **Visual Resources** - Plan and implement visual resource mitigation into all phases of construction;
- **Cultural Resources** - Submit data, employ a monitor during construction, and handle inadvertent discoveries of human remains and resources as specified in applicable plans;
- **Hazardous Materials and Wastewater Management** - Properly store and remove wastewater and hazardous materials from project sites;
- **Air Emissions** - Minimize dust emissions by covering soil stockpiles and watering land during activities;
- **Noise** - Limit noisy construction activities to least noise-sensitive times of day; and
- **Fire Safety** - Properly store flammable materials and maintain construction equipment.

Operation

- **Mitigation and Monitoring** - Implement established mitigation and control measures during operations;
- **Ecological Resources** - Understand potential impacts, avoid harassment, and report wildlife problems;
- **Pesticide and Herbicide Use** - Apply only EPA-registered pesticides in accordance with project plans and agency policies. Avoid use of pesticides near sole source aquifers;
- **Visual Resources** - Implement and monitor required mitigations during project operations;
- **Hazardous Materials, Wastes, and Wastewater Management -** Properly store and remove hazardous materials, provide secondary containment, and implement and report spill cleanup procedures;
- **Air Quality** - Implement dust abatement measures; and
- **Noise** - Maintain sound-control devices on equipment.

Decommissioning

- **General** - Decommission in accordance with agency standards and ROW requirements; remove equipment and materials, including gravel; and report abandoned below-grade components;
- **Mitigation and Monitoring** - Implement approved decommissioning and reclamation plans that include applicable mitigation measures, and coordinate with owners of other facilities in the corridor;

Text Box 3-1 continued

- **Surface Water** - Obtain and implement a Stormwater Pollution Prevention Plan;
- **Transportation** - Use previously developed access roads and remove and reclaim all roads no longer needed for other energy systems within the corridor;
- **Restoration -** Salvage topsoil; use approved, weed-free materials; and grade to pre-disturbance contours to restore sites to approved vegetative conditions; and
- **Hazardous Materials, Wastes, and Wastewater Management** - Properly remove all fuels, hazardous materials, hazardous wastes, and other chemicals, and clean all spills of petroleum and chemicals.

3.2 Mitigation Requirements

Project proponents must include in their POD and/or other ROW application materials a description of the design features, BMPs, and other actions being considered to mitigate potential adverse effects of their proposed project. After reviewing a ROW application, BLM staff will then identify any additional actions that will be required during implementation of the project to (1) comply with laws, regulations, and associated permits; (2) implement mitigation measures identified in land use plans; and (3) meet other applicable requirements. BLM staff also will identify project-specific monitoring, evaluation, and adaptive management requirements.

The following principles from BLM policies apply to all energy transport projects within Section 368 corridors:

- When evaluating the requirements for mitigating impacts of a project to resources (and their values, services, and/or functions), the BLM will consider the mitigation requirements as defined in the Council of Environmental Quality regulations;
- Mitigation should address the adverse direct, indirect, and cumulative impacts of a project to baseline conditions of resources from the full life-cycle of a project;
- The BLM will identify and consider mitigation to address impacts to resources in NEPA analyses for proposed projects, and will require mitigation to address impacts in a project's decision documents and land use authorizations. The BLM will require, as appropriate, mitigation to address reasonably foreseeable impacts that are significant or otherwise warrant mitigation;
- Through its land use planning process, the BLM will identify mitigation standards for resources that are important, scarce, sensitive, or have a protective legal mandate; and
- Mitigation is considered and implemented on all relevant scales.

By building projects within Section 368 corridors, project proponents successfully avoid many adverse effects to the environment. Furthermore, by following all applicable IOPs, project proponents minimize many adverse effects related to their project. Project proponents should consider the following sources for applicable mitigation measures when preparing a POD for submission to the BLM:

- Mitigation standards and other requirements in applicable land use plans;

- Requirements from agreements and compliance documents that are applicable to the project (e.g., biological opinions issued for compliance with the Endangered Species Act, Memorandum of Agreement for implementation of requirements for compliance with Section 106 of the National Historic Preservation Act);
- Requirements to satisfy state, local, and other permits issued to the project proponent for development and operation of the project;
- Suggested mitigation measures identified in the 2008 PEIS (DOE and DOI 2008); and
- Requirements in recent land use authorizations or NEPA decision documents for other, similar projects in the region.

4.0 MANAGING THE WEST-WIDE ENERGY CORRIDORS; LAND USE PLANNING FOR PUBLIC LANDS

In accordance with the EPAct, the BLM designated over 5,000 miles of Section 368 corridors in 92 land use plans in 2009 (BLM 2009). That Act also requires that the BLM and other agencies establish procedures to ensure that additional corridors for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities on federal land are promptly identified and designated as necessary (**Text Box 1-1**). Since the initial planning designations for Section 368 corridors were implemented in 2009, changes have been made to some corridors through the normal course of land use planning as potential changes have been identified during the comprehensive regional review process initiated in 2016 (Section 1.1.4).

This section summarizes information BLM staff should consider when modifying, adding, or deleting Section 368 corridors through the land use planning process.

All modifications, additions, or deletions of Section 368 corridors on BLM-managed lands must occur through revisions or amendments of land use plans. The BLM may amend or revise a land use plan when new information, new or revised policy, or changes in circumstances indicate that decisions in a plan, or major portion of a plan, no longer serve as a useful guide for resource management.

The following should be considered when modifying, adding, or deleting Section 368 corridors during an amendment or revision to a land use plan.

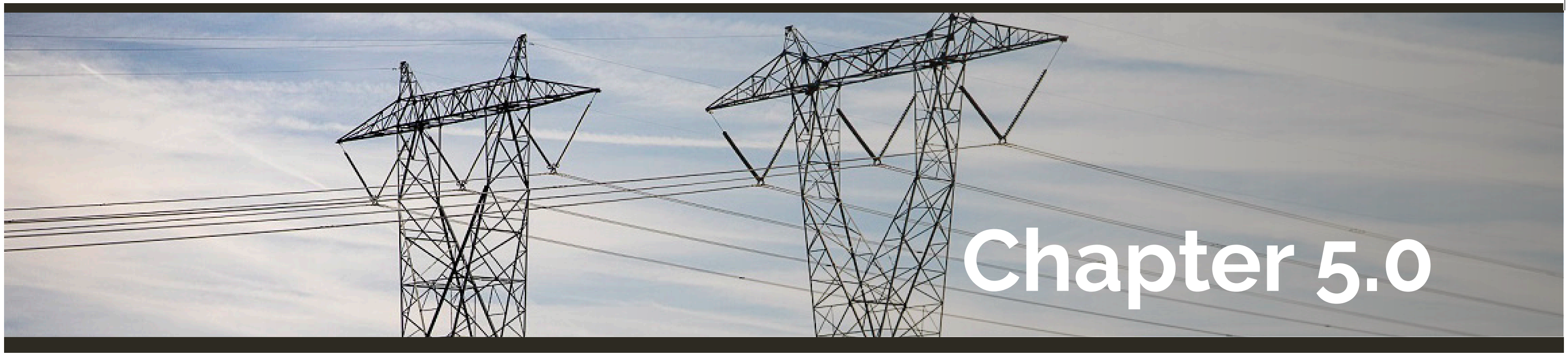
- The BLM must meet requirements of the EPAct Section 368 (**Text Box 1-1**). Those requirements include the following:
  - Section 368 corridors are to be designated for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities; and
  - Designations of Section 368 corridors shall, at a minimum, specify the centerline, width, and compatible use of the corridor.
- The BLM is participating in regional periodic reviews (Section 1.1.4) along with the FS and DOE to identify potential revisions, deletions or additions to Section 368 corridors. Descriptions of the regional reviews are available in the West-Wide Energy Corridor Information Center;
- In conducting the regional reviews, the BLM assessed the need for corridor revisions, deletions, or additions within the framework of the following general corridor siting principles:
  - Corridors are thoughtfully sited to provide maximum utility and minimum impact on the environment;
  - Corridors promote efficient use of the landscape for necessary development;
  - Appropriate and acceptable uses are defined for specific corridors; and

- Corridors provide connectivity to renewable energy generation to the maximum extent possible while also considering other sources of generation, in order to balance the renewable sources and to ensure the safety and reliability of electricity transmission.

» The potential corridor changes identified in each regional review report did not change the Section 368 energy corridors. Instead, the BLM and/or FS are to consider implementing the changes during future amendments or revisions to land use plans at the field level. There are three circumstances when such consideration may occur:

- During the normal course of BLM or FS land use plan revisions;
- During amendments to BLM or FS land use plans that are prompted by project proposals that do not conform to a land use plan, or when issues within a Section 368 energy corridor necessitate review of an alternative corridor; or
- During amendments to BLM or FS land use plans to address Section 368 energy corridor changes.

The BLM land use planning process is further described in BLM Manual 1601, Land Use Planning, and the BLM Handbook H-1601-1, Land Use Planning.



5.0 OVERVIEW OF ENERGY INFRASTRUCTURE DESIGN AND CONSTRUCTION TO MAXIMIZE USE OF WEST-WIDE ENERGY CORRIDORS

5.1 Introduction

To use the Section 368 corridors to their fullest potential, compatibility of various energy infrastructures that could be placed in a given corridor must be considered. The intent of the Section 368 corridors are to accommodate power transmission lines, power distribution lines, oil and gas pipelines and other relevant facilities pertaining to energy transport.

This section provides a basic orientation to transmission infrastructure to assist in considerations on how multiple utilities may be incorporated and co-located within a federally managed corridor, while maintaining compliance with all North American Electric Reliability Corporation (NERC) and Pipeline and Hazardous Materials Safety Administration (PHMSA) Standards for the separate entities that own each piece of infrastructure. Addressing concerns related to ROW widths, terrain and topography, aesthetics, and various voltage classifications of transmission lines is paramount to the successful adoption of Section 368 corridors.

A comprehensive review of potential ROW widths for transmission line voltages of 115 kV and above will be required for facilities to occupy the corridors. Depending on voltage, structure types, terrain and aesthetics, varying ROW widths should be anticipated for each line. The review of potential ROW widths based on voltage and structure type is one of the main considerations of co-locating various pipeline or electric transmission assets within the same corridor.

High voltage transmission can be either Alternating Current (AC) or Direct Current (DC). AC transmission has three phases (conductors) that transmit electricity 120° out of synchronism with each other. See **Figure 5-1** for a depiction of transmission tower components, including the phases. These three phases of electricity are labeled Phase A, B, and C in design and construction drawings.

Text Box 5-1

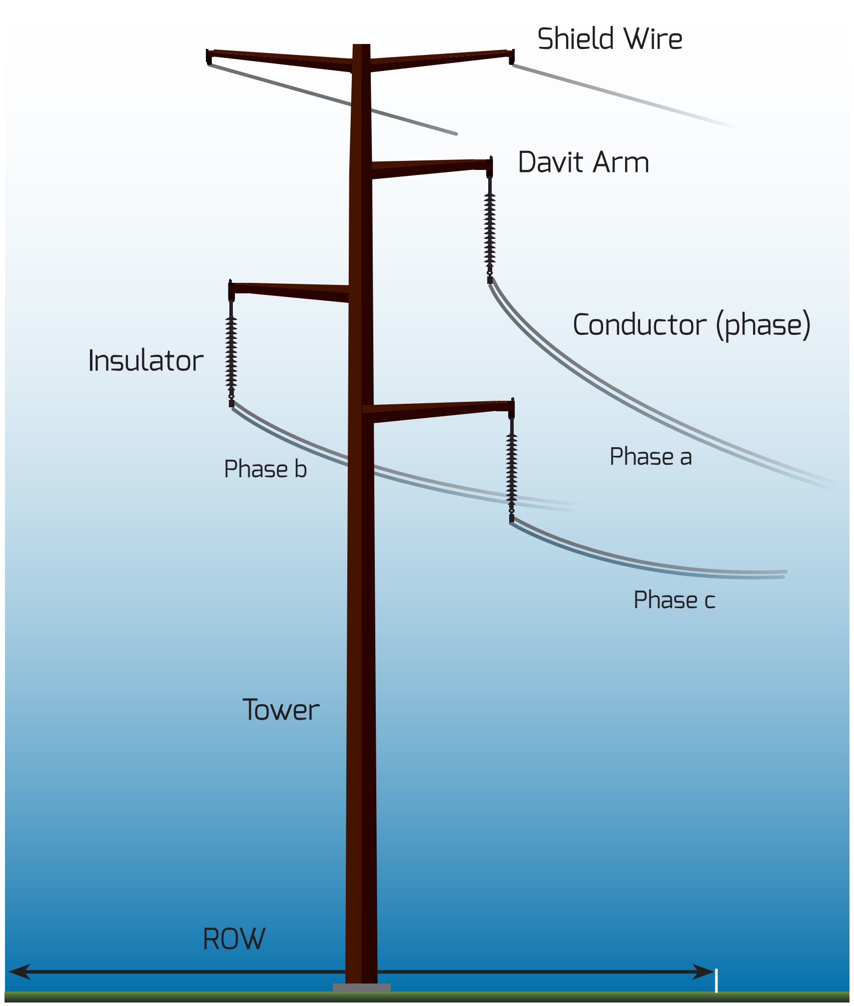
Line Voltages and typical ROW total widths

69	75-100
115	100-125
138	100-150
161	100-150
230	125-200
345	150-225
500	150-250

Higher voltage lines often have multiple conductors per phase. DC transmission has only two poles (conductors) instead of three, referring to the positive and negative values of the direct current circuit, similar to a battery. DC lines may also have multiple conductors per pole as shown in **Figure 5-2**.

DC transmission lines are unique in the way they can continue to transmit electricity when one pole is out of service and the earth acts as the return path in place of the pole that is out.

Figure 5-1. Transmission Tower Components



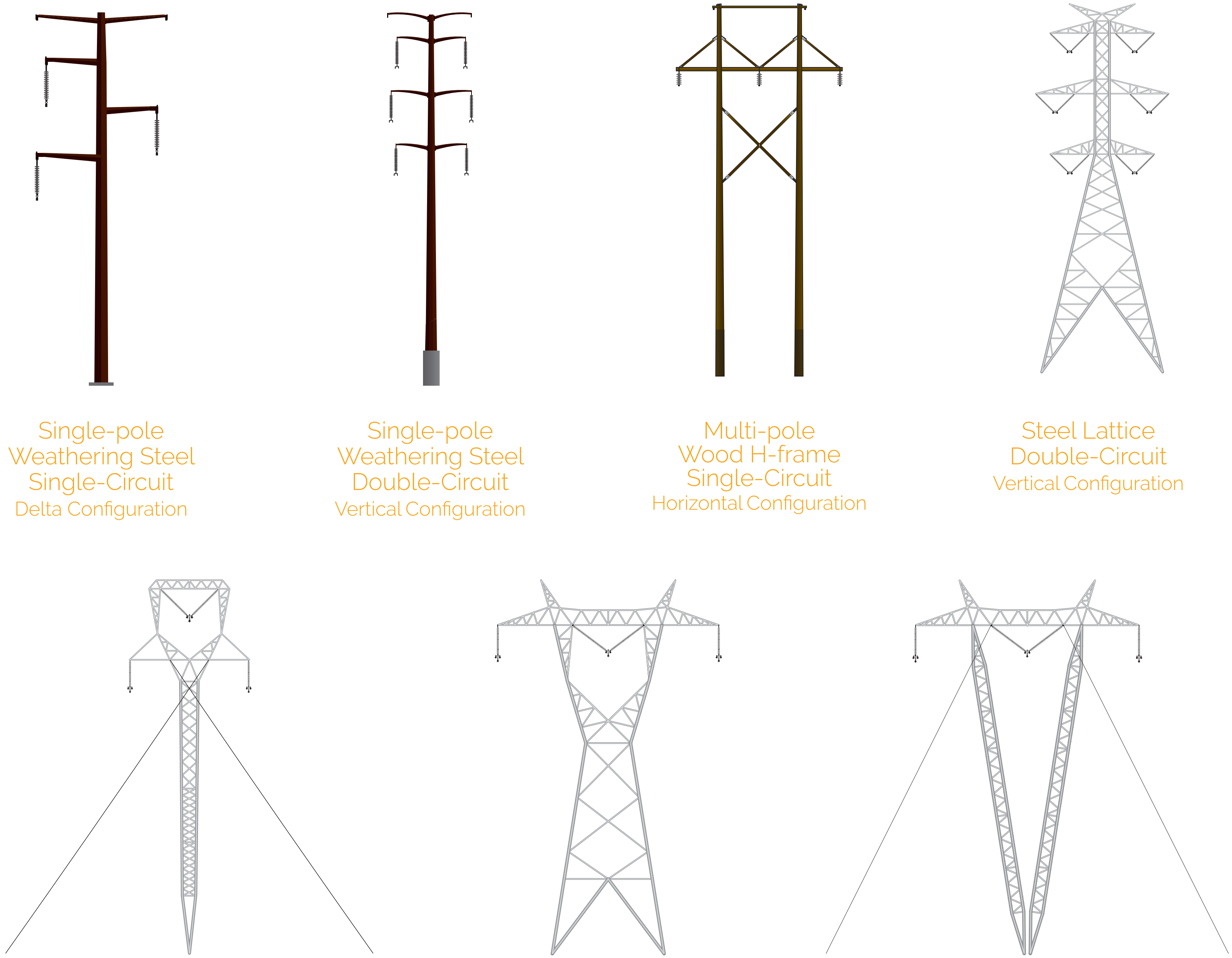
Transmission lines are separated into voltage classifications, measured in increments of 1,000 volts; 1 kV=1,000 volts. Typical transmission level voltages are 69 kV, 115 kV, 138 kV, 161 kV, 230 kV, 345 kV and 500 kV (**Text Box 5-1**). As the voltage increases, more power can be transmitted and less power is lost via transmission resistive losses across long distances. Transformation to step high voltages down to distribution voltages can be expensive, which creates a tradeoff decision when planning the voltage of a new line.

Figure 5-2. High Voltage DC Structures

A transmission structure is the backbone of the transmission grid and is composed of different components as shown in **Figure 5-1**. **Figure 5-1** depicts a double circuit single-pole steel tangent AC structure with the phases arranged vertically.

Two shield wires (also called overheard ground wires or OHGW) are attached to the top of the pole to protect the phase conductors from lightning strikes. **Figure 5-2** shows a 400 kV DC steel lattice line with double conductors crossing a 250 kV DC single conductor line.

Figure 5-3. Structure Types



Single-pole
Weathering Steel
Single-Circuit
Delta Configuration

Single-pole
Weathering Steel
Double-Circuit
Vertical Configuration

Multi-pole
Wood H-frame
Single-Circuit
Horizontal Configuration

Steel Lattice
Double-Circuit
Vertical Configuration

Guyed Steel
Lattice
Single-Circuit
Delta Configuration

Steel Lattice
Single-Circuit
Horizontal
Configuration

Guyed-V Steel
Lattice
Single-Circuit
Horizontal Configuration

Text Box 5-2

Structure Types and Materials

High voltage structures are categorized by three types:

- Tangent
- Running angle (turning)
- Dead-end

Structure materials include:

- Single and multi-pole wood
- Single and multi-pole steel
- Steel lattice
- Laminated wood

5.2 Electric Transmission Structures

During the design stage, structure types, conductor sizes and types, and foundation materials are evaluated for engineering constraints, costs, and typical voltage ranges as discussed in the following Sections. There is no single structure type that will fit all design applications, and different structures are used to fit the requirements of the location and project requirements. **Figure 5-3** and **Text Box 5-2** describe various transmission line structures and materials.

5.2.1 Structure Types

5.2.1.1 Tangent, Turning, and Dead-end Structures

Tangent structures are designed for transmission line sections that are constructed in a straight line as shown in **Figure 5-4**. They do not provide support for any side tension or stress. They aren't specifically designed for differential longitudinal or transverse loading as compared to running angle and dead-end structures. Tangent structures have insulators that support just the weight of the conductor with the structural force on the tower in the downward direction. A change in line direction will introduce longitudinal and transverse loading from forces that pull the tower to the side.

Running angle structures are used where the alignment of the structures changes slightly or turns such that the direction of the line changes. Running angles are either guyed or require special foundations to support the transverse load as shown in **Figure 5-5**. This tower used a drilled pier concrete foundation to offset the differential longitudinal and transverse loading of the sharp turn. Guy wires could also be used, but would require a much wider footprint for the tower as discussed in Sections 5.2.2 and 5.2.3.

Dead-end structures are those where the full tension of the conductors is transferred into the supporting structure at the insulators. These can become very large and are typically more expensive compared to tangent and running angle structures. A dead-end structure is often included in a long straight section of line and is used at stringing locations or as storm cascading failure prevention locations. A large dead-end structure is shown in the foreground in **Figure 5-6**. For example, if a tangent structure were to fall during a storm event, adjacent tangent structures would be unable to support the load. Thus, dead-end structures are used every few miles even in a straight line configuration for eliminating possible cascading damage. Dead-ends are also typically used where the transmission alignment changes by 60° or more as shown in **Figure 5-5**. Note the different configuration of the insulator strings for the dead-end structures in **Figure 5-5** and **Figure 5-6** compared to the tangent structures in **Figure 5-4** and **Figure 5-7**, and in the background of **Figure 5-6**.

5.2.2 Material Types

5.2.2.1 Traditional Wood Pole Structures

Single-pole wood (**Figure 5-4**) and multi-pole wood structures (**Figure 5-7**) are generally used for most applications below 230 kV because of their low cost. The required ground clearance between the conductor and the earth increases as the voltage increases. Therefore, wood poles become less economical as voltage and, thus, pole height requirements increase. A general rule of thumb would be to transition from wood to steel pole types at approximately 90 ft. of required pole height. Also, as the voltage and conductor size increase, achieving adequate strength with wood poles becomes more challenging. Wood poles of heights less than 90 ft. are advantageous because of their abundance of availability, ease of construction, and cost.

Figure 5-4. Single-pole Wood Tangent

Figure 5-5. Single-pole Steel Dead-end

Figure 5-6. Steel Lattice Dead-end & Tangents

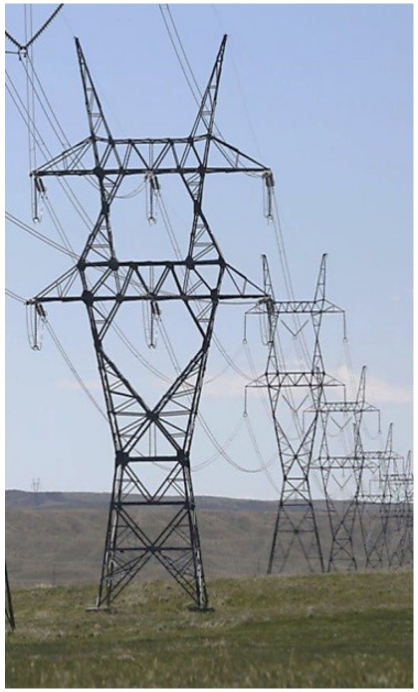


Figure 5-7. Wood H-frame Tangent

Disadvantages of wood poles include generally shorter life spans than steel poles or lattice poles, less control over the quality, higher susceptibility to fire damage, and increased risk of damage from wildlife. The high probability of damage from woodpeckers and insects can affect the decision on whether wood versus steel should be used for a given transmission line.

Single-pole wood structures (**Figure 5-4**) are the least environmentally impactful pole type as they have a small footprint and require minimal disturbance during installation. Biological impacts are most often related to avian activity. Birds have been known to build nests on transmission line structures which can interfere with the safe operation of the line and possibly harm the bird. The Avian Power Line Interaction Committee (APLIC) publishes suggested practices for avian-safe design options for new construction and installation of covers and other retrofits for existing poles. Single-pole wood structures require a shorter distance between phase conductors, which can result in electrocution of larger bird species such as condors and eagles if their wings can touch or be in very close proximity to multiple phases or structure components at the same time.

Multi-pole wood structures are most commonly configured in an "H" shape as shown in **Figure 5-7**. This allows for wider conductor separation which results in longer average spans between structures. This is one of the most widely used structure configurations for long-distance transmission alignments. H-frame structures require a wider ROW width because of the horizontal configuration and increased conductor spacing.

Typical multi-pole structure heights range from 55 ft. to approximately 90 ft. with a range of ROW widths from 75 to 125 ft.

Installing multi-pole wood structures has a greater environmental impact because of the increased number of foundation holes; however this impact is offset by increased span lengths and, thus, fewer structures.

Multi-pole wood structures share the avian concerns as single wood pole structures; however, the horizontal conductor configuration increases the distance between conductors and the potential electrocution risks. An H-frame structure has the advantage of horizontal conductor configuration which can minimize collisions in certain areas.

Figure 5-8. Diverters on towers and conductors to reduce avian collisions. Utilities may implement avian protection measures through company policies and practices developed in an Avian Protection Plan (APP). An APP incorporates suggested practices of the Avian Powerline Interaction Committee (APLIC), based on specific impacts and the needs of the utility. APPs can include a plan for retrofitting existing infrastructure, if applicable

Impacts with conductors have been known to cause blunt force trauma to avian species and it is common to place bird diverters on the conductors to mitigate collisions (as shown in **Figure 5-8)** particularly in areas with significant migratory and raptor bird populations. Avian impacts must be considered, if possible, in any study related to siting a transmission line and the APLIC publication on reducing avian collisions with power lines can be referenced.

Regardless of the structure type, during application review for proposed lines, appropriate avoidance, minimization, and mitigation measures are determined for avian protection and compliance with the Migratory Bird Treaty Act of 1918 (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA).

Figure 5-9. 100 kV Laminated Wood Pole (left) Typical Wood Pole with Guy (right)

5.2.2.2 Laminated Wood Poles

In addition to traditional round wood poles, laminated pole types are becoming increasingly popular as a transmission structure alternative. Laminated poles can be either single-pole or multi-pole configurations and support voltages from 69 kV to 345 kV.

Figure 5-9 illustrates a typical laminated wood pole (left) adjacent to a traditional guyed wood pole structure (right). Laminated wood poles are less susceptible to fire than round wood poles and they offer additional flexibility to customize structure strength and quality. Laminated poles can be fabricated for very tall structures. They are more economical than round wood poles as the height requirements approach 90 ft. or more.

Wood poles are almost always either directly embedded into the ground or set inside of a culvert, so they have very little resistance to non-vertical loads. This means that angle or point of inflection, wood poles require guying. Guying angles range from 1:1 to 2:1. For a structure 90 ft. in height, therefore, it may be necessary to place a guy wire and anchor 45 to 90 ft. away from the base of the structure.

Guy wires may increase the required ROW width. Guying may also be used in steel pole applications; however, concrete drilled pier foundations may also be used as an alternative.

5.2.2.3 Steel Structures

Single-pole steel structures are normally used for voltages ranging from 69 kV to 345 kV. There are some instances of using single-pole steel structures for 500 kV when ROW widths are constrained. Single-pole steel structures are either made of a weathering material or have a galvanized finish. Weathering steel may be less expensive and more aesthetically pleasing as it forms a natural layer of rust that both protects the steel and blends into the natural environments better than galvanized steel, though measures can be taken with galvanized steel to reduce visual impacts.

Single-pole steel structures are either directly embedded into the ground or mounted on drilled pier concrete foundations. Another type of foundation used in steel lattice applications is a spread footing which might be used depending on the soil condition. These often are not preferred because they disturb a larger area, cost more than a circular drilled pier, and don't resist the overturning side force as efficiently. Foundation types will be discussed in more detail in Section 5.3. Single-pole steel structures require a hole with a larger diameter than that of their wood pole counterparts. This results in a marginally larger area of disturbance at the pole setting location.

Multi-pole steel will normally be used for applications in the 115 kV - 500 kV range; however, there are exceptions to this for higher or lower voltage classes. This structure type is often arranged in an "H" configuration as with wood poles. These structures can be either directly embedded into the ground, encased in a culvert (caisson), or mounted on a drilled pier concrete foundation.

As with single-pole steel structures, multi-pole can be made of a weathering material or have a galvanized finish. For transmission lines in locations where a longer useful life is warranted, steel poles offer a substantial increase in lifespan when compared to wood poles. A typical lifespan for wood poles is approximately 30 years whereas a steel pole (in a non-corrosive environment) can last for up to 75 years.

An example where steel pole structures would be used instead of a wood pole structure would be where a line is located in difficult terrain and is critical for reliability. Steel poles are less susceptible to storm and bird damage resulting in an overall reduction in life cycle cost.

Installing multi-pole steel structures disturb an even larger area of the environment than installing single-pole structures because of the need for additional holes for each structure location; however, this can be offset by the need for fewer structures per mile. Avian protection concerns remain the same.

Both single-pole and multi-pole steel structures offer a high degree of design flexibility. Support arms can be customized for additional length on long spans or shortened for narrower ROW widths. Pole heights and diameters can be specified to a great degree of accuracy. In areas where pole setting is constrained, a designer can specify a maximum base diameter. Steel is a very predictable material from a performance standpoint. This provides for a greater degree of reliability than wood. Steel poles also offer natural resistance to fire damage. This makes them ideal for use in areas that have high levels of combustible fuels for fires.

Steel Lattice Structures

Lattice structures are normally used on lines with operating voltages higher than 230 kV due to their design strength and their ability to carry multiple conductors per phase. Lattice structures also offer very long spans which reduces the overall number of structures required for a given transmission line. Steel lattice structures require a wider ROW which often can limit their application in constrained corridors. Typical ROW ranges are provided in **Table 5-1**.

Foundation systems for taller lattice structures are also easier to construct because they consist of four smaller drilled pier types rather than one or two very large drilled piers needed for single and multi-pole steel structures. Lattice structures disturb the largest area per structure because of their wide footprint and the need for multiple foundations for each structure; however, only four to five structures per mile are needed for a lattice line. Because of the design flexibility of steel lattice structures, they are the strongest of the structure types. Birds have been known to nest within the cross members of lattice poles; over time this can cause structural issues because of the acidity of the bird scat in continuous contact with steel.

Single and multi-pole steel structures become less economical for very tall structures when compared to lattice structures. The shaft thickness of tubular steel poles increases substantially as the above-ground height increases. Lattice steel structures have standard and variable thicknesses and are significantly lighter than single-pole or multi-pole tubular steel structures. This means that the capital investment in the raw materials is reduced compared to the amount needed for tubular steel poles at heights of approximately 100 ft. or more. Steel lattice structures are less susceptible to fire than wood pole structures and they offer additional flexibility to customize structure strength and quality.

The strength of lattice towers is controlled through the member sizes, strength of the members, and addition and subtraction of angled members. Steel is a very common building material and therefore is readily available and takes very few special tools to produce. Lattice towers have a very predictable performance envelope allowing engineers to specify exact design tolerances with a high degree of reliability. Steel lattice offers the best options for strength and height of all the alternative structure types commonly in use today.

5.2.3 Single Circuit vs. Double Circuit

Regardless of material type of the structure, each can be configured to carry either a single circuit of transmission conductors or multiple circuits. Each pole type can also support multiple voltage classifications. Lower voltage lines predominately use wood poles and it is common practice to co-locate a distribution line below the higher voltage line on single-poles. Higher voltage lines are more critical and therefore use engineered materials such as steel lattice more often.

It is a common practice in higher voltage construction (230 kV and above) to add two circuits to each alignment. This results in taller or wider structures but also a more efficient use of a corridor when multiple circuits of capacity are needed. In areas with constrained corridor availability, it is not uncommon for a transmission owner to design structures to accommodate more than one circuit to meet future demand which will protect their investment and ultimately provide a higher degree of reliability through redundancy at a lower overall investment cost.

It is unusual to have different owners share the same set of towers because of safety and liability issues that may arise during maintenance and storm damage repairs. More often the capacity of the line can be shared under a contractual arrangement with just a single owner of the transmission facilities responsible for operation and maintenance.

The disadvantage of double circuit lines is the loss of two circuits during an outage and the need to de-energize both circuits during maintenance; although hot line maintenance and repair work is becoming more common on critical double circuit lines. NERC Standards require studies to demonstrate the system can withstand loss of both circuits of a double circuit line as a condition for meeting reliability criteria.

Another common tower type used in high and extra high voltage applications for environmentally sensitive soil areas is the guyed V structure pictured in **Figure 5-10**. This structure requires a significant ROW width often exceeding 250 ft. but does not need significant foundations and is least impactful to soils. This type of structure is commonly used where soil conditions would require special foundations to minimize cost. This structure along with other large structure types can be erected using helicopters for placement which results in the least impact to the terrain, but requires a much wider ROW to accommodate guy wires with greater impacts to recreational users and wildlife. These structures can also be constructed using traditional ground crews and cranes, but will have more impact to the corridor.

5.3 ROW Widths and ROW Calculations

ROW width is a major factor when reviewing an application for Section 368 corridor usage. This section will provide a discussion of factors that must be evaluated in the determination of whether or not the request is reasonable for the intended facility type and voltage. **Table 5-1** indicates structure framing configuration as well as the general required ROW widths for a variety of structure types and voltage levels. When an applicant submits an application, the proposed structure types with dimensions between conductors at each structure should be shown in the Plan of Development. The horizontal conductor spacing serves as the first basic input into the required ROW width calculation. A ROW applicant might ask for a wider ROW easement than specifically needed to allow for greater clearance to other planned or existing utilities and/or more flexibility for line maintenance.

All Transmission Owners/Operators are obligated to follow the National Electric Safety Code (NESC)[1] for the design and construction of transmission lines to insure public safety around energized facilities. In addition, all Transmission Owners/Operators must document compliance with all applicable NERC Standards[2] through annual compliance reviews and self-certification of adherence to all applicable standards. Consistent with NERC standards, ROW applicants should not request more ROW space than required to ensure maximum use of corridor space future projects.

Figure 5-10. 765 kV guyed V structure with guy wires and four conductors per phase

Table 5-1. Comparison of Structure Types and Materials*

Pole Type	Voltage Range (kV)	ROW Width (ft.)	Heig
Single Wood Pole	< 115 kV	50-100 ft. width	40-90
Single Steel Pole	> 69 kV	100-150 ft. width	40-120
Multi-Pole Wood	< 230 kV	100-160 ft. width	40-90
Multi-Pole Steel	> 230 kV	100-160 ft. width	40-150
Laminated Single-pole	< 230 kV	50-100 ft. width	40-140
Multi-Pole Laminated	< 345 kV	100-160 ft. width	40-140
Steel Lattice	> 230 kV	160-250 ft. width	> 100 f

*These are typical ranges, and individual projects, or project segments, may, in some c

eight (ft.	Strengths	Weaknesses	Relative Cost	Typical Life Span (years)
-90 ft. high	Widely available, easily customizable with typical field tools, predictable material properties	Shorter service life, susceptible to fire as well as damage from animals, hard to obtain as required structure height increases	Lowest of all material types for structure heights < 90 ft..	45-60 year lifespan
-120 ft. high	Engineered material provides very predictable performance, highly customizable at fabricator, less likely to be damaged by fire	Construction efforts increased due to structure weights and handling requirements, longer lead times compared to wood or laminated poles due to fabrication durations	High when ordered as a customized structure and higher than a comparable wood pole when ordered en masse	60-100 year lifespan
-90 ft. high	Supports longer spans resulting in less structures for a given alignment, readily available, easy construction compared to other materials	Shorter service life, susceptible to fire as well as damage from animals, hard to obtain as required structure height increases	Slightly higher than single wood poles on a per structure basis with a higher cost/installation compared to single wood poles	45-60 year lifespan
-150 ft. high	Engineered material provides very predictable performance, highly customizable at fabricator, less likely to be damaged by fire	Construction efforts increased due to structure weights and handling requirements, longer lead times compared to wood or laminated poles due to fabrication durations	Typically highest of common structure material types. Constructing structures in field requires precision construction methods to ensure that pole tops are aligned	60-100 year lifespan
-140 ft. high	Highly predictable material type, lower cost for wood pole heights > 90 ft.. Quick lead times	Susceptible to fire damage, geometry of poles can cause issues with setting poles properly, varying strength in different loading directions	Higher than wood poles for heights < 90 ft.. Reduced cost for poles > 90 ft..	45-65 year lifespan
-140 ft. high	Highly predictable material type, lower cost for wood pole heights >90 ft, quick lead times	Susceptible to fire damage, geometry of poles can cause issues with setting poles properly, varying strength in different loading directions	Higher than wood poles for heights < 90 ft. Reduced cost for poles > 90 ft.	45-65 year lifespan
ɪ00 ft. high	Engineered structures provide very predictable performance, offers greatest design flexibility for strength and height	Larger footprint than single or H-frame, erection requires more space, susceptible to bird nesting	Highest cost of all structure types	60-100 year lifespan

me cases, may exceed the ranges shown.

Text Box 5-3

ROW Considerations

To develop a ROW width that will fully contain the structures and associated motion of the conductors, one must account for:

- Structure Type
- Structure Materials
- Conductor Size and Type
- Voltage (number of bells in the insulator strings)
- Angles/Dead-ends/Guying requirements
- Weather (e.g., wind and ice loading)
- Co-location of Additional Facilities (e.g., gas pipelines, other transmission lines)

Normal operation and maintenance procedures and practices must also follow standards prescribed by the NESC and NERC Standards to insure public safety and reliable power system operation on an on-going basis.

As discussed in Section 5.2, structure types and conductor configurations have the greatest influence on required ROW widths for electric transmission lines. Multi-pole structures will require a wider ROW than single-pole structures of the same heights because they require a larger foundation footprint. Also, the flat horizontal configurations have a wider impact area than the vertical configurations of single-pole structures due to the increased "blowout" distance of each conductor. Blowout is the allowance for lateral movement of the conductors due to wind.

Conductor type also plays a critical role in determining required ROW widths in addition to the basic phase separation determined by the structure type. Depending on weather assumptions such as high wind and ice loading, and the conductor sag between structures, an adder will be applied to the basic ROW width to account for motion of insulators as well as horizontal wind blowout (movement) of conductors.

An “adder” is a value used by designers to give a small buffer to the calculated result for clearances. This is often used to account for any inaccuracies in a survey or construction plan to insure NESC and NERC requirements can be met.

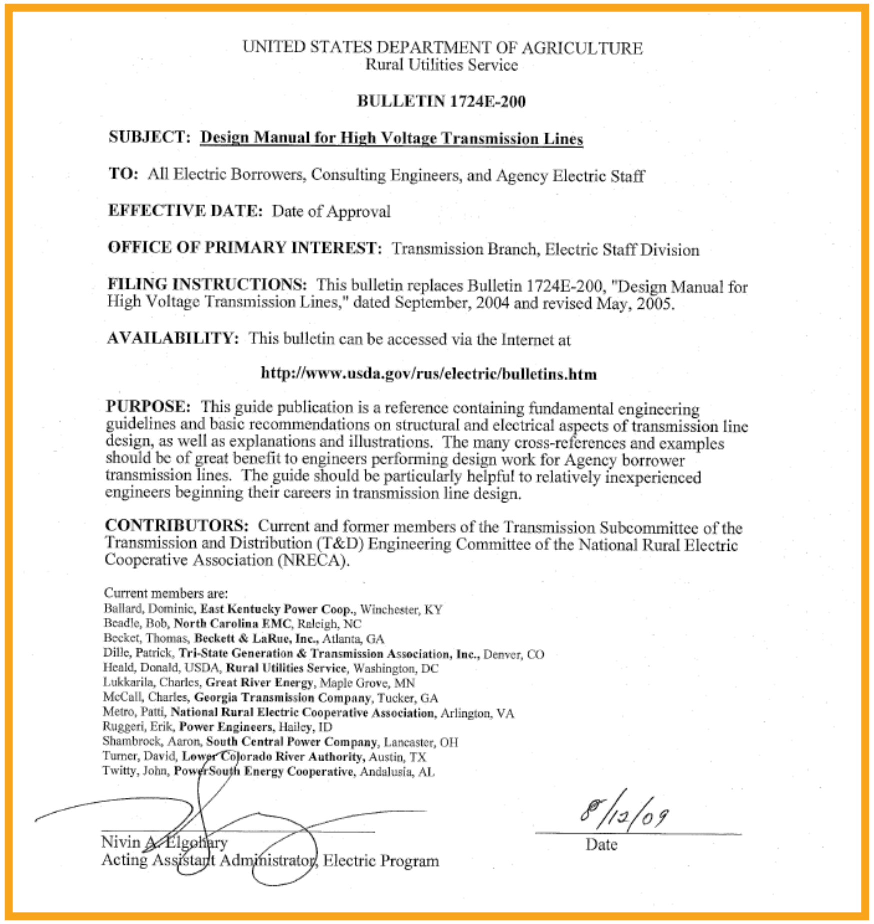
Larger diameter conductors will tend to horizontally blowout further due to the amount of surface area exposed to an assumed horizontal wind load. Basic ROW widths are calculated for a single line based on a 6 pounds per square feet (approximately 48 mph) wind being applied horizontally to a conductor, but can be adjusted for varying geographic locations with higher average wind speeds. When multiple transmission lines are co-located on a common corridor, a higher wind speed might be used for the calculation to ensure no interference or overlap of conductors from the transmission lines occur during high wind events.

Transmission line designers can refer to the NESC Rules 234B through I, as well as tables 234-1 through 234-3 for guidelines on determining ROW widths. When developing or validating a specific ROW width request both the ROW applicant and the evaluator should refer to the NESC code.

In addition to the standard requirements for design included in the NESC, the Rural Utility Services (RUS) of the United States Department of Agriculture (USDA) has a handbook (**Figure 5-11**) that provides guidance and specific standards for the design of transmission lines. Any cooperative or agency that uses RUS funding for a transmission project must meet these standards before a project loan will be approved.

Section 5 of RUS Bulletin 1724e-2005[3] provides guidelines for calculating allowable distances from common ROW encroachments such as buildings, vegetation, grain bins, and elevators; and most importantly, other transmission lines. Although these standards are more rigorous than NESC, they clearly document what is considered good utility practice by many design professionals. When an applicant does not have standards for transmission line design, the RUS handbook can be used to insure compliance with all NESC Standards.

Figure 5-11. Rural Utilities Service (RUS) of the United States Department of Agriculture (USDA) handbook



UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Utilities Service

BULLETIN 1724E-200

SUBJECT: **Design Manual for High Voltage Transmission Lines**

TO: All Electric Borrowers, Consulting Engineers, and Agency Electric Staff

EFFECTIVE DATE: Date of Approval

OFFICE OF PRIMARY INTEREST: Transmission Branch, Electric Staff Division

FILING INSTRUCTIONS: This bulletin replaces Bulletin 1724E-200, "Design Manual for High Voltage Transmission Lines," dated September, 2004 and revised May, 2005.

AVAILABILITY: This bulletin can be accessed via the Internet at

http://www.usda.gov/rus/electric/bulletins.htm

PURPOSE: This guide publication is a reference containing fundamental engineering guidelines and basic recommendations on structural and electrical aspects of transmission line design, as well as explanations and illustrations. The many cross-references and examples should be of great benefit to engineers performing design work for Agency borrower transmission lines. The guide should be particularly helpful to relatively inexperienced engineers beginning their careers in transmission line design.

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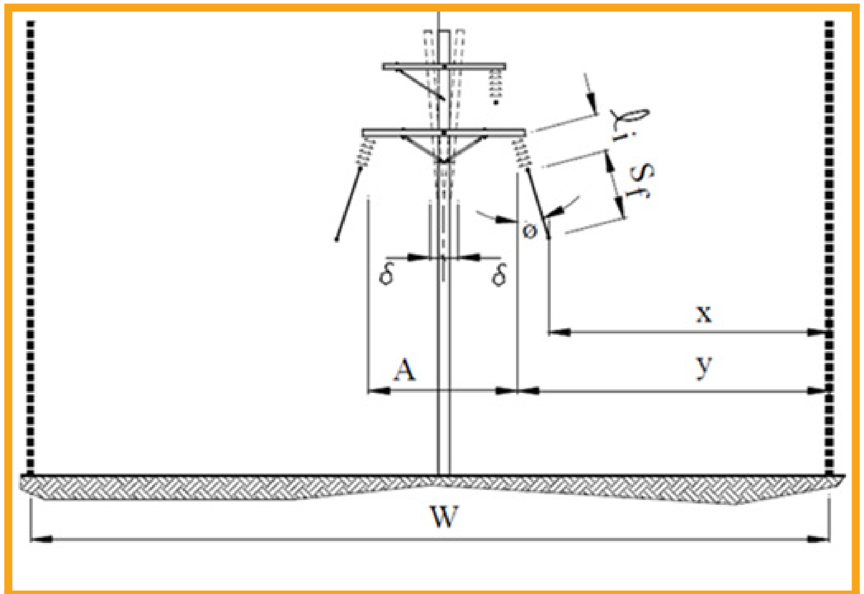
Using the RUS method to calculate ROW width, co-locating two 230 kV transmission lines would require a minimum ROW width of 400 ft. (200 ft. per line) for two typical steel lattice or single-pole double circuit 230 kV lines to safely share the corridor. Conductor configuration, terrain, and other factors may increase the ROW width as applicants strive to minimize project impacts and costs.

A ROW width can be calculated using the parameters shown in **Figure 5-12** with some basic assumptions made on the line design using the equation in the insert. Higher voltage lines require more insulator bells, and larger diameter conductors tend to horizontally blow out further due to the amount of surface area exposed to an assumed horizontal wind load.

Figure 5-12. ROW Width Calculation, Figure 5-9 from RUS Bulletin 1724e-2005



ROW Width Required $W = A + 2(l_i + S_f)\sin\varphi + 2\delta + 2x$
Where:

- A = separation between points of suspension of insulator strings for two outer most phases
- x = distance from conductor to edge of ROW with assumed wind speed of 48.5 miles per hour (mph) and 6 pounds per square feet (psf)
- Y = distance from conductor to edge of ROW with no wind and conductors at rest
- li = length of insulator string
- Sf = sag of conductor at its lowest point at 60° F with 6 psf wind loading
- δ = the angle of vertical deflection of the tower with 6 psf wind loading
- φ = the angle of vertical deflection of the insulator string with 6 psf wind loading

5.4 Foundations

The easiest and most economical way to erect a single or multi-pole wood or steel transmission structure is to directly bury the pole in a hole drilled to the proper diameter and depth. If direct bury (or direct-embed) is not feasible because of soil conditions or structure requirements then a concrete or a caisson foundation can be used. There are several different types of foundations that are specifically designed for certain types of transmission structures. The location, soil type, and structure type often dictate which foundation is used. Foundation installation can be one of the most environmentally impactful activities during construction because of the need for heavy equipment. This section will discuss the most commonly used foundation types for steel structures.

5.4.1 Drilled Concrete Pier Foundation

Where it is not possible to direct bury a single-pole wood or steel structure, a steel structure is necessary to connect to a concrete pier foundation. As shown in **Figures 5-13**, and **5-14**, a large hole (~ 3 to 8 ft.) is drilled and a metal cage made of steel rebar is lifted into the hole.

Once the rebar has been properly aligned, a metal bolt cage is positioned and attached with appropriate concrete forms as shown in **Figures 5-15** and **5-16**.

Once the forms have been correctly positioned and aligned, concrete is poured into the hole and allowed to cure (**Figure 5-17**) before the tower is attached as shown in **Figure 5-18.**

As discussed earlier, single-pole steel structures are often used in locations where a strong foundation is required because of the line design. In locations where soil conditions are poor a caisson or culvert may be needed to keep the soil from collapsing around the rebar and destroying the integrity of the concrete. Caissons are more commonly called culverts and are used for foundations in water bodies and sandy soil. Caissons are inexpensive corrugated steel tubes as shown in **Figure 5-19**.

Figure 5-13. Drilling hole for Concrete Pier Foundation

Figure 5-14. Positioning Rebar Cage

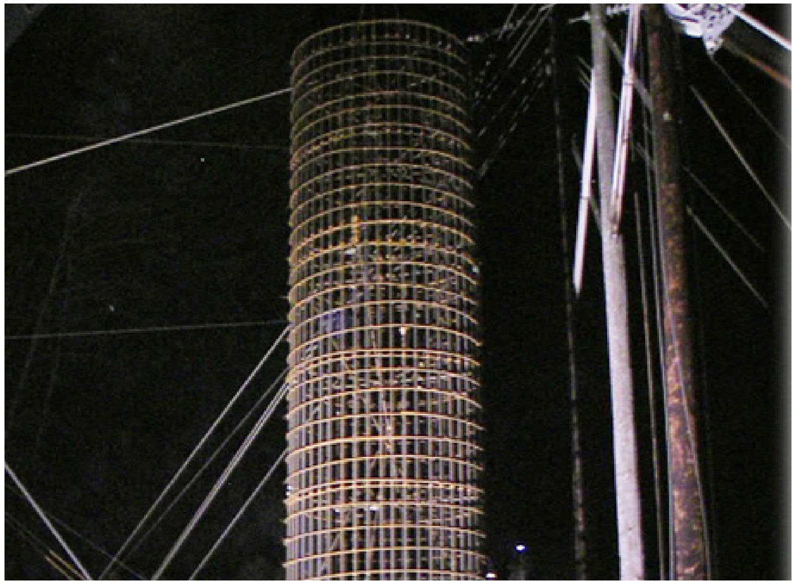


Figure 5-15. Foundation Bolt Cages

Figure 5-16. Mounting Bolt Cage with Concrete Forms

Figure 5-17. Concrete Pier Foundation

Figure 5-18. Single-pole Steel Structure on Concrete Pier Foundations

5.4.2 Spread Footing Foundations

Spread footing foundations are used in areas with very poor soil, where a drilled pier footing is not feasible, or where a much larger foundation is required such as for a steel H-frame structure or a river crossing with a very long span length.

It is usually flat and square depending on the structure height and stress that is placed on the tower base. It is a poured concrete footing with anchor bolt cages to attach the tower as shown in **Figure 5-20**. This is a large foundation with rebar and forms being prepared for the concrete pour.

5.4.3 Grillage Foundations

Grillage foundations are used for large steel lattice structures where the tower uplift stress may be significant such as a dead-end, at a river crossing, or where the structure is located between two hilltops. A large hole is excavated and a prefabricated steel grill with a connecting flange (**Figure 5-22**) is positioned at the proper angle and depth for erection of the tower as shown in **Figure 5-21**. It can be used for single-pole, multi-pole, or steel lattice structures. One advantage of this type of foundation is that it can be delivered to the site (as shown in **Figure 5-22**) and does not require concrete to be poured over the top, but can use soil or gravel at the site which may reduce cost. Grillage foundations disturb a large footprint because of the excavation required for each footing, but once underground it is not visible.

It is also a less expensive option than a traditional concrete footing and can be used in areas where concrete delivery would be difficult or very expensive. Spread footings, grillage foundations, along with caisson pier foundations are commonly used in the commercial building construction industry.

Figure 5-19. Caisson Concrete Pier Foundation

Figure 5-20. Spread Footing Foundation

Figure 5-21. Grillage Foundation in Form

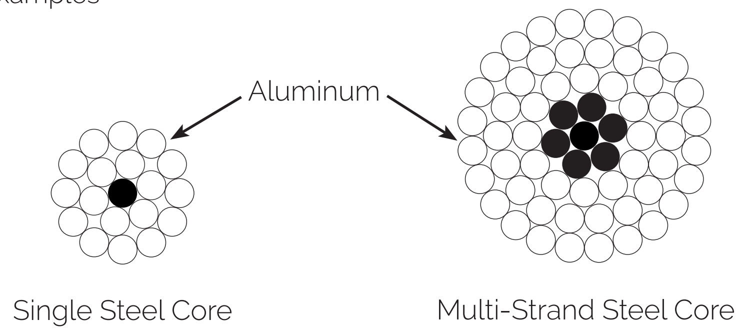
Figure 5-22. Grillage Structure

5.5 Conductor Wire Types and Sizes

Wire types and sizes for conductors have a dramatic effect on overall ROW widths, ground clearance requirements, structure heights, load capacity, and cost.

Conductors consist of multiple strands of a single metal or a combination of metal types in various configurations. The most common conductor in use today is Aluminum Conductor Steel-Reinforced (ACSR). This is comprised of stranded aluminum in a concentric pattern with a high strength steel core as seen in **Figure 5-23**. The core can either be a single wire or, more commonly, stranded concentrically like the aluminum. The legend on the large conductor pictured on the lower right illustrates 84 aluminum strands wrapped around 19 steel core support wires. The design capacity of the line is directly related to the conductor chosen and is measured in amperes.

Figure 5-23. Aluminum Conductor Steel-Reinforced (ACSR) Stranding Examples



The steel core can also be coated with a preservative coating that will protect it from rust or corrosion. ACSR is a very high strength material that also has relatively low sag characteristics because of its steel-reinforced core.

ACSR conductors are typically operated up to a maximum temperature of 212° F. The Mega Volt (MVA) rating of conductors is a function of the maximum operating temperature, which is directly related to the ambient air temperature and wind speed. Above the maximum operating temperature, the conductor will begin to sag and clearance violations will occur violating both NESC and NERC Standards.

AAC (All Aluminum Conductor) is another common conductor type. Greater current transfer is possible with AAC conductors when compared to ACSR conductors due to the increased amount of aluminum for a given diameter of cable.

AAC conductors can be operated at a much higher temperature than ACSR, typically at 392° F as a standard design practice. AAC conductors generally have more sag than when ACSR is used.

Due to the increased sag, span lengths are reduced which will result in more structures per mile. Alternatively, taller structures can be used if there is reduced flexibility in span length. ACCR combines the best attributes of ACSR and AAC in that it has high capacity and low sag resulting in longer span lengths without requiring taller structures. It is the most costly of the options.

T2 (Twisted Pair Aluminum Conductor) is a conductor type that consists of two smaller conductors wrapped around each other. This conductor provides a greater degree of self-damping, anti-vibration, characteristics during heavy wind or ice conditions, which can provide a reduction in the overall ROW width required for a the desired load requirement. The primary drawback of this conductor type is that it requires special attachment hardware and construction can take longer to complete. It is commonly used in areas with frequent ice storms and high winds for improved customer reliability.

5.6 Maintenance and Operations of Transmission Lines

Routine maintenance and inspections are required of all transmission assets on a regular basis and are codified in the NERC Standards. Inspections are done at least annually and maintenance may be required more often depending on the project, location, and components. During inspections, field technicians visit each structure and review it for corrosion, hardware loosening, broken insulators or insulator contamination, etc. When an issue is found that may result in equipment failure, additional personnel are deployed to remedy the observed conditions under approved operational clearance procedures. Line owners prefer long-term access routes to every structure location where possible to facilitate the maintenance process. In highly sensitive environmental areas, helicopter access is an option for some repair functions. Failure to maintain a transmission facility and associated components may result in extensive environmental damage. Fallen conductors could cause injury, damage, or ignite a fire.

All transmission owners and operators are required to meet the applicable NERC standards for maintenance activities which include vegetation management, and facility operation within approved rating levels and operating limits (Facilities Design, Connections, and Maintenance (FAC) 001 through 014).

Table 5-2. Comparison of Conductor Types

ACSR (Aluminum Conductor Steel Core)	Extremely common conductor type, good balance between sag and capacity	Reduced capacity for a given conductor compared to all aluminum counterpart or composite reinforced counterpart	Low
AAC (All Aluminum Conductor)	Very high current capacity for given size due to entire conductor being aluminum	Higher sags due to reduced strength without a strong core material will require shorter spans and more structures or taller towers	Medium
ACCR (Aluminum Conductor Composite Core)	Low sag and High capacity	Construction constraints with bending of composite core, not as readily available as other conductors	High

In addition to potential damage to the local environment, higher voltage lines are typically critical for the continued stable operation of the greater electric system. Due to their critical infrastructure designation, transmission owners and operators will be required by NERC Standards to maintain accurate logs of observation and repairs performed to keep the asset in proper working order.

5.7 Co-location of Natural Gas and Electric Infrastructure on Section 368 Corridors

The ability to use a common corridor for electric and gas infrastructure has been analyzed for many years and is commonly done in North America provided the appropriate measures are taken to insure the safety and integrity of the facilities. Numerous entities have developed guidelines to mitigate potential risks involved with co-locating gas and electric infrastructure and are discussed in this section. The Interstate Natural Gas Association of America (INGAA) and the Canadian Energy Pipeline Association (CEPA) have prepared guidelines[4] for designing, testing, and monitoring the co-location of gas pipelines on a common corridor with high voltage AC transmission facilities. They assume the transmission line has been constructed first and the mitigation must be done during pipeline construction.

5.7.1 The Basics of Pipeline Construction[5]

Pipeline construction will have a significant impact on Section 368 Corridor utilization and the ability to co-locate electric transmission lines along the same corridor. Authorization to construct a new interstate pipeline is granted by the Federal Energy Regulatory Commission (FERC), whereas an electric transmission line permit is granted by individual states and affected federal agencies.

A typical interstate, long-haul (long-distance) pipeline project is constructed in manageable sections known as construction spreads that use highly specialized and qualified work crews. Each crew has its own set of responsibilities. Construction spread lengths and crew sizes are determined by a number of factors, including seasonal restrictions, project and commercial requirements, construction complexity (terrain, rock, congestion with other facilities, amount of road/utility crossings, etc.), land use and environmental considerations (wetland and water bodies, migratory birds endangered and threatened species, fisheries, etc.).

Crews are formed to perform specific tasks or projects, including clearing and grading, welding, inspection, and other construction-related tasks. These crews build the pipeline in sections much like a moving assembly line. As one specialized construction crew completes its work, the next crew will move into position to complete its portion of the construction process. Additionally, facilities such as compressor stations are often considered separate spreads. On a long-haul pipeline project, there could be 600 to 700 people working at the peak of the construction activity on multiple spreads. A typical activity crew might consist of 15 to 20 people in any one area and a spread may stretch as long as one mile or more with multiple crews in action.

There are several discreet steps in the construction process with each step requiring a specialized crew and time schedule. The basic process for constructing a pipeline is similar to that used in constructing an electric transmission line with much planning and coordination done ahead of time. The use of cranes during pipeline construction near energized electric transmission lines requires special safety procedures by both the pipeline contractor, and the transmission operator to protect the work environment of the construction crews. As a result, the co-location of transmission lines and pipelines can be an engineering challenge for both parties.

Text Box 5-4

Typical Steps in Pipeline Construction

- Design of Line Pipe and Equipment
- Construction Survey
- Clearing and Grading of ROW, and Erosion Control
- Trenching
- Hauling and Stringing
- Pipe Bending
- Welding
- Coating
- Lowering the Pipe into the Trench
- Tie-Ins
- Testing and Initial Internal Inspections
- Cleanup and Restoration of the ROW
- Environmental Compliance Monitoring

1.0
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A

5.7.3 The Basics of Alternating Current Interference: The Critical Issue for Co-location

The location of steel pipelines in the vicinity of AC transmission facilities results in mutual electrical interference problems that can produce damaging effects on both facilities and potentially the public. Electric currents and induced voltages can be introduced into structures and pipelines based on the fundamental law of physics known as magnetic induction. Mitigation measures can be taken to avoid or minimize the risks to human safety and equipment damage.

There are three modes of AC interference that can cause damage to pipeline systems and present an electrical shock hazard to pipeline personnel: inductive coupling, resistive (conductive) coupling, and capacitive (electrostatic) coupling[6] (**Text Box 5-5**).

Under steady-state conditions, the AC interference could result in safety problems for people coming in contact with the metal pipe or it's above ground equipment and in accelerated corrosion on the underground section of the pipe (i.e., AC corrosion). Under fault conditions, the AC interference could result in:

- damage to the pipe itself (i.e., electrical arc between the structure grounding and the pipe);
- safety concerns for pipeline personnel that could include electrocution; and
- damage to pipeline coating, isolation flanges, and compression equipment.

The identification, mitigation, and monitoring of electrical interference between electrical transmission lines and pipelines should be considered a mutual concern that requires the cooperation of both the transmission line owner and the gas pipeline owner to optimize the effectiveness of any corrective measures. Mitigation measures typically require the design of AC electrical grounding systems for safety in accordance with the NESC.

5.7.4 Factors Influencing Induced Voltage and Current in Pipelines

There are several key factors that influence the magnitude of induced voltages and currents in pipelines which can be mitigated using various design alternatives. The following must be clearly understood by the design engineers of both pipelines and electric transmission lines to insure the highest level of safety possible.

Separation Distance –A high level of interference can be expected if the distance between the pipeline and transmission line is less than 100 ft.. As this distance is increased, the level of interference will gradually drop off based on the other factors listed in this Section.

Transmission Line Current – The amount of current flowing on the transmission line is one of the key factors in the level of magnetically induced current in a pipeline. Many High Voltage Alternating Current (HVAC) lines have a current rating of 2000 A or more which can induce a large voltage (also called potential) and subsequent current flow in the pipeline.

Soil Resistivity -- Soil conditions with low resistivity, less than 2500 ohm/cm such as clay or farm topsoil, allow a higher level of induced voltage and current than a high resistivity soil such as sand or gravel.

Co-location Distance – The longer the distance that pipelines and transmission lines are in parallel, the greater the likelihood of the occurrence of induced voltage and currents in the pipeline. Distances greater than one mile are almost certain to require some level of corrective action.

Co-location Crossing Angle – Ideally, a pipeline would cross under a power line at a 90° angle which would minimize the occurrence of induced voltage and current based on the factors above. As the crossing angle gets smaller and the pipeline begins to parallel the transmission line, the level of induced voltage and current increases.

Text Box 5-5

Types of AC Interference

Inductive Coupling

Inductive coupling, the most common type of interference, occurs under steady-state (normal operation) and electric system fault conditions. Every conductor of every circuit on one or more electric transmission lines that parallel a pipeline produce a magnetic field.

The strength of this magnetic field is directly dependent on the magnitude of the individual conductor current and inversely proportional to the distance between conductor and the pipeline. The magnitude of the induced AC voltage and subsequent current flow depends on the conductor current, the length of co-location, the distance between pipeline and transmission line, and the pipeline-power line configuration.

Conductor currents can range from several hundred amperes to 2,000 amperes. The resulting current in the pipeline appears as a result of the net magnetic field produced by all of the phase conductors.

High voltage AC circuits consist of three phases (conductors) separated by 120°, such that if a pipeline is located equidistant from each phase and if each phase was transmitting the same current there would be no net magnetic field and therefore, no net current induced in the pipeline. Of course, it is impractical to locate a pipeline equidistant from each phase and currents in each circuit are not exactly the same (i.e., phase imbalance). Therefore, there is inevitably a steady-state induced current in a pipeline that parallels a transmission line and that is within the influence of the magnetic field produced by the individual phase currents. This is described in the Canadian Energy Pipeline Association (CEPA) AC Interference Guideline Final Report, June 2014 and shown in **Figure 5-24**.

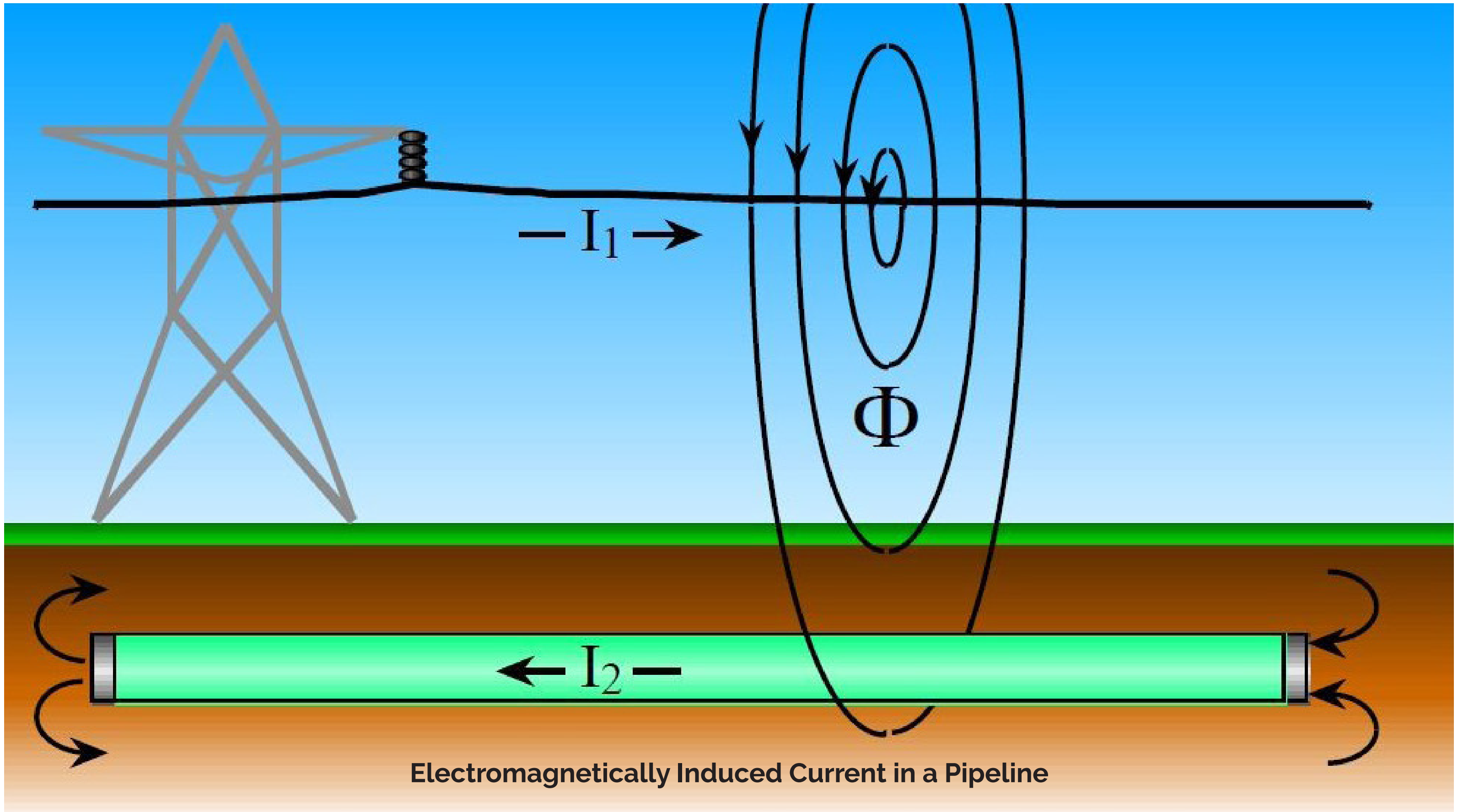
Resistive (Conductive) Coupling

Resistive (conductive) coupling only appears under electric system line fault conditions and is uncommon. The fault current flowing through the grounding of the transmission line structure produces a potential rise in the neighboring soil defined as "ground potential rise" (GPR). Part of this voltage rise is transferred to the pipe and would be added to the AC induced voltage caused by the nearby energized power line. Soil conditions play an important role in the magnitude of the GPR and might change along the length of the pipeline and parallel transmission line.

Capacitive (Electrostatic) Coupling

Capacitive (electrostatic) coupling is only a concern during construction when the steel pipe is elevated on skids and not in contact with the ground. This is often mitigated with grounding of the pipeline segments during the staging and construction process and is a common safety practice.

Figure 5-24. From the Canadian Energy Pipeline Association (CEPA) AC Interference Report, Figure 4.3



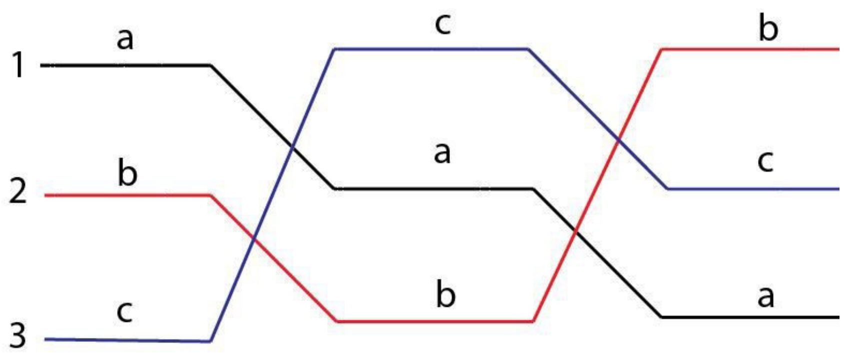
5.7.5 Mitigation Measures for AC Interference between Electric Transmission Lines and Steel Pipelines

As discussed, magnetically induced voltage and current is a known phenomenon that can be greatly reduced with mitigation measures that can be incorporated into the design of either the pipeline or the transmission line. When a new transmission line is proposed to be co-located with an existing pipeline, the conductor arrangement can be changed along the common corridor to greatly minimize the magnetic field produced by the line. This re-arrangement is called transposition and is commonly used in transmission line design for this type of application.

Different conductor arrangements greatly influence the magnetic field surrounding the transmission line. A delta configuration can reduce the need for transpositions based on the length of the parallel path. Transposition of the conductors is most effective when done at 1/3 and 2/3 of the distance where the new transmission line and pipeline are in parallel. **Figure 5-25** shows a transposition of conductors for a single AC circuit.

Other mitigation strategies to minimize high voltage AC interference can be implemented on a case-by-case basis that is determined from field measurements and testing.

Figure 5-25. Transpositions to reduce magnetic field around conductors.



The most effective measure is to maximize the distance between the two, but, in a constrained corridor, this is not always feasible. Based on soil resistivity tests, the pipeline might require cathodic protection (grounding in intermittent locations) to minimize corrosion damage due to induced currents. This type of protection provides a path for the currents to flow to ground rather than through the length of the pipeline. This protection can be added after the pipeline has been buried at the expense of the transmission line constructor. For new pipeline construction, a zinc ribbon might be used to make the pipeline appear to have a higher resistance thereby reducing the unwanted current flow in the pipeline. Similarly, this type of protection can also be added after the line has been buried, but it is much more difficult and expensive. Several other mitigation measures for new pipelines are documented in the literature[7] referenced in this section.

[1] http://standards.ieee.org/about/nesc/index.html

[2] http://www.nerc.com/pa/Stand/Pages/Default.aspx

[3] https://www.rd.usda.gov/files/UEP_Bulletin_1724E-200.pdf

[4] Interstate Natural Gas Association of America, "Criteria for Pipelines Co-Existing with Electric Power Lines, October 2015"

[5] INGAA Report, "Building Interstate Gas Transmission Pipelines: A Primer, January 2013"

[6] Canadian Energy Pipeline Association, "AC Interference Guideline Final Report, June 2014"

[7] Canadian Energy Pipeline Association, "AC Interference Guideline Final Report, June 2014"

APPENDIX A: COMPLETE LIST OF INTERAGENCY OPERATING PROCEDURES (IOPs)

These Interagency Operating Procedures (IOPs) are adopted as part of the plan amendments and are mandatory, as appropriate, for projects proposed within the Section 368 corridors. Not all IOPs will be appropriate for all projects; those that apply to pipelines, for instance, are not appropriate to transmission lines. These IOPs are practicable means to avoid or minimize environmental harm from future project development that may occur within the designated corridors.

The IOPs set forth below are not intended and should not be construed to alter applicable provisions of law or regulation or to reduce the protections afforded thereby to the resources addressed in the IOPs.

These IOPs are adopted as proposed in the Final PEIS, with minor technical edits and clarifications.

Project Planning

Regulatory Compliance

1. The appropriate agency, assisted by the applicant, must conduct project-specific NEPA analyses in compliance with Section 102 of NEPA. The scope, content, and type of analysis shall be determined on a project-by-project basis by the Agencies and the applicants.
2. The appropriate agency, assisted by the project applicant, must comply with Section 106 of the NHPA on a project-by-project basis. Consultation with SHPOs, any federally recognized Tribes, and other appropriate parties as per regulations (36 CFR 800) must begin early in the planning process and continue throughout project development and execution. The ACHP retains the option to comment on all undertakings (36 CFR 800.9).
3. The appropriate agency, assisted by the project applicant, must consult with the USFWS and the NMFS as required by Section 7 of ESA. The specific consultation requirements, as set forth in regulations at 50 CFR Part 402, would be applied on a project by project basis. Applicants shall identify known occupied sites, such as nest sites, for threatened and endangered species and special status species (BLM 2008).
4. The appropriate agency, assisted by the project applicant, must coordinate and consult with NMFS regarding potential impacts to essential fish habitat (EFH) as required by the 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act.

Agency Coordination

1. Applicants seeking to develop energy transport projects within corridors located on or near DOD facilities or flight training areas (see Appendix L of the PEIS for applicable corridors) must, early in the planning process and in conjunction with the appropriate agency staff, inform

and coordinate with the DOD regarding the characteristics and locations of the anticipated project infrastructure.

2. Early in the planning process, applicants seeking a ROW authorization within a Section 368 energy corridor that is located within 5 miles of a unit of the NPS should contact the appropriate Agency staff and work with the NPS regarding the characteristics and locations of anticipated project infrastructure. In those instances where corridors cross lands within the boundaries of a unit of the NPS, the National Park Service Organic Act and other relevant laws and policies shall apply.

3. In those instances where projects using energy corridors are proposed to also cross National Wildlife Refuge System lands, the National Wildlife System Administration Act and other relevant laws and policies pertinent to national wildlife refuges shall apply.

4. For electricity transmission projects, the applicant shall notify the Federal Aviation Administration (FAA) as early as practicable in the planning process in order to identify appropriate aircraft safety requirements.

5. All project applications must reflect applicable findings, mitigation, and/or standards contained in regional land management plans, such as the Northwest Forest Plan, when such regional plans have been incorporated into agency planning guidelines and requirements. Modification of some standards may be needed to reasonably allow for energy transport within a corridor.

Government-to-Government Consultation

1. The appropriate agency, assisted by the project applicant, must initiate government-to-government consultation with affected Tribes at the outset of project planning and shall continue consultation throughout all phases of the project, as necessary. Agencies should determine how to consult in a manner that reflects the cultural values, socioeconomic factors, and administrative structures of the interested Tribes.

2. The agency POC may require the project proponent to prepare an ethnographic study when Tribal consultation indicates the need. The study shall be conducted by a qualified professional selected in consultation with the affected Tribe.

General

1. Applicants seeking to develop an electricity transmission or pipeline project will develop a project-specific plan of development (POD). The POD should display the location of the project infrastructure (i.e., towers, power lines) and identify areas of short- and long-term land and resource impacts and the mitigation measures for site-specific and resource specific environmental impacts. The POD should also include notification of project termination and decommissioning to the agencies at a time period specified by the agencies.

2. Applicants, working with the appropriate agencies, shall design projects to comply with all appropriate and applicable agency policies and guidance.

3. Project planning shall be based on the current state of knowledge. Where corridors are subject to sequential projects, project-related planning (such as the development of spill-response plans, cultural resource management plans, and visual resource management plans) and project-specific mitigation and monitoring should incorporate information and lessons learned from previous projects.

4. Applicants shall follow the best management practices for energy transport project siting, construction, and operations of the states in which the proposed project would be located, as well as Federal agency practices.

5. Corridors are to be efficiently used. The applicant, assisted by the appropriate agency, shall consolidate the proposed infrastructure, such as access roads, wherever possible and utilize existing roads to the maximum extent feasible, minimizing the number, lengths, and widths of roads, construction support areas, and borrow areas.

6. When concurrent development projects are proposed and implemented within a corridor, the agency POCs shall coordinate the projects to ensure consistency with regard to all regulatory compliance and consultation requirements, and to avoid duplication of effort.

7. Applicants, assisted by the appropriate agency, shall prepare a monitoring plan for all project-specific mitigation activities.

8. Potential cumulative impacts to resources should be considered during the early stages of the project. Agency POCs must coordinate various development projects to consider and minimize cumulative impacts. A review of resource impacts resulting from other projects in the region should be conducted and any pertinent information be considered during project planning.

Project Design

1. Applicants shall locate desired projects within energy corridors to promote effective use of the corridors by subsequent applicants and to avoid the elimination of use or encumbrance of use of the corridors by ROW holders. Proposed projects should be compatible with identified energy transport modes and avoid conflicts with other land uses within a corridor.

2. Applicant shall identify and delineate existing underground metallic pipelines in the vicinity of a proposed electricity transmission line project and design the project to avoid accelerating the corrosion of the pipelines and/or pumping wells.

Transportation

1. The applicant shall prepare an access road siting and management plan that incorporates relevant agency standards regarding road design, construction, maintenance, and decommissioning. Corridors will be closed to public vehicular access unless determined by the appropriate Federal land manager to be managed as part of an existing travel and transportation network in a land use plan or subsequent travel management plan(s).

2. The applicant shall prepare a comprehensive transportation plan for the transport of transmission tower or pipeline components, main assembly cranes, and other large equipment. The plan should address specific sizes, weights, origin, destination, and unique equipment handling requirements. The plan should evaluate alternative transportation routes and should comply with state regulations and all necessary permitting requirements. The plan should address site access roads and eliminate hazards from truck traffic or adverse impacts to normal traffic flow. The plan should include measures such as informational signage and traffic controls that may be necessary during construction or maintenance of facilities.

3. Applicants shall consult with local planning authorities regarding increased traffic during the construction phase, including an assessment of the number of vehicles per day, their size, and type. Specific issues of concern (e.g., location of school bus routes and stops) should be identified and addressed in the traffic management plan.

Groundwater

1. Applicants must identify and delineate all sole source aquifers in the vicinity of a proposed project and design the project to avoid disturbing these aquifers or to minimize potential risks that the aquifers could be contaminated by spills or leaks of chemicals used in the projects.

2. In instances where a project within an energy corridor crosses sole source aquifers, the applicant must notify the U.S. Environmental Protection Agency (EPA) and the agencies that administer the land as early as practicable in the planning process. Section 1424(e) of the Safe Drinking Water Act (42 USC Chapter 6A) and other relevant laws and policies pertinent to the corridors that cross sole source aquifers shall apply.

Surface Water

1. Applicants must identify all wild and scenic rivers (designated by act of Congress or by the Secretary of the Interior under Section 3(a) or 2(a)(ii) of the Wild and Scenic Rivers Act (16 USC 1271-1287), respectively), congressionally authorized wild and scenic study rivers, and agency identified (eligible or suitable) wild and scenic study rivers in the vicinity of a proposed project and design the project to avoid the rivers or mitigate the disturbance to the rivers and their vicinity.

2. In instances where a project within an energy corridor crosses a wild and scenic river or a wild and scenic study river, the appropriate Federal permitting agency, assisted by the project applicant, must coordinate and consult with the river-administrating agency regarding the protection and enhancement of the river's free-flowing condition, water quality, and outstandingly remarkable natural, cultural, and recreational values.

3. Applicants shall identify all streams in the vicinity of proposed project sites that are listed as impaired under Section 303(d) of the Clean Water Act (33 USC Chapter 26) and provide a management plan to avoid or mitigate adverse impacts on those streams.

Paleontological Resources

1. The applicant shall conduct an initial scoping assessment to determine whether construction activities would disturb formations that may contain important paleontological resources. Potential impacts to significant paleontological resources should be avoided by moving or rerouting the site of construction or removing or reducing the need for surface disturbance. When avoidance is not possible, a mitigation plan should be prepared to identify physical and administrative protective measures and protocols such as halting work, to be implemented in the event of fossil discoveries. The scoping assessment and mitigation plan should be conducted in accordance with the managing agency's fossil management practices and policies.

2. If significant paleontological resources are known to be present in the project area, or if areas with a high potential to contain paleontological material have been identified, the applicant shall prepare a paleontological resources management and mitigation plan. If adverse impacts to paleontological resources cannot be avoided or mitigated within the designated corridors, the agency may consider alternative development routes to avoid, minimize, or mitigate adverse effects.

3. A protocol for unexpected discoveries of significant paleontological resources should be developed. Unexpected discovery during construction should be brought to the immediate attention of the responsible Federal agency's authorized officer. Work should be halted in the vicinity of the discovery to avoid further disturbance of the resource while the resource is being evaluated and appropriate mitigation measures are being developed.

Ecological Resources

1. Applicants shall identify important, sensitive, or unique habitats and BLM-special status species (BLM 2008), FS-sensitive, and state-listed species in the vicinity of proposed projects and design the project to avoid or mitigate impacts to these habitats and species.

2. To restore disturbed habitats, the applicant will prepare a habitat restoration plan that identifies the approach and methods to be used to restore habitats disturbed during project construction activities. The plan will be designed to expedite the recovery to natural habitats supporting native vegetation, and require restoration to be completed as soon as practicable after completion of construction, minimizing the habitat converted at any one time. To ensure rapid and successful restoration efforts, the plan will include restoration success criteria, including time frames, which will be developed in coordination with the appropriate agency and which must be met by the applicant. Bonding to cover the full cost of restoration will be required.

3. In consultation with the U.S. Army Corps of Engineers, the appropriate agency, assisted by the project applicant, will identify wetlands (including ephemeral, intermittent, and isolated wetlands), riparian habitats, streams, and other aquatic habitats in the project area and design the project to avoid or mitigate impacts to these habitats.

Vegetation Management

Applicants shall develop an integrated vegetation management plan consistent with applicable regulations and agency policies for the control of unwanted vegetation, noxious weeds, and invasive species (E.O. 13112). The plan should address monitoring; ROW vegetation management; the use of certified weed-seed-free hay, straw, and/or mulch; the cleaning of vehicles to avoid the introduction of invasive weeds; education of personnel on weed identification, the manner in which weeds spread, and the methods for treating infestations (BLM 2006, 2007a,b, 2008).

Cultural Resources

1. Cultural resources management services and individuals providing those services shall meet the Secretary of the Interior's Standards for Archeology and Historic Preservation, 48 FR 44716 (Sept. 29, 1983).

2. The project applicant may, with the approval of the agency POC, assign a Cultural Resource Coordinator to ensure an integrated compliance process across administrative and jurisdictional boundaries. The Cultural Resource Coordinator will facilitate and coordinate compliance with multiple laws, policies, regulations, and existing pertinent agreements (PAs, MOAs, or MOUs) among multiple agencies and other entities, jurisdictions, and federally recognized Tribes. The coordinator may assist with development of pertinent agreements among concerned parties during the course of the project. The coordinator shall be a qualified professional with experience in cultural resource compliance. Where appropriate, the Cultural Resource Coordinator may also serve as the Tribal Coordinator. Alternatively, the agency POC may assign such coordinators, to be paid for through project cost-recovery funds. The agencies, through the POC, remain responsible for consultation.

3. The project applicant may, with the approval of the agency POC, assign a Tribal Coordinator to facilitate and coordinate consultation and compliance with multiple laws, agencies, and Tribes in order to ensure effective government-to-government consultation throughout the life of the project. Alternatively, the agency POC may assign such coordinators, to be paid for through project cost-recovery funds. The agencies, through the POC, remain responsible for consultation.

4. All historic properties in the Area of Potential Effect (APE) will be identified and evaluated. The APE shall include that area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties and shall include a reasonable construction buffer zone and laydown areas, access roads, and borrow areas, as well as a reasonable assessment of areas subject to effects from visual, auditory, or atmospheric impacts, or impacts from increased access.

5. Project proponents must develop a cultural resources management plan (CRMP) to outline the process for compliance with applicable cultural resource laws during pre-project planning, management of resources during operation, and consideration of the effect of decommissioning. The CRMPs should meet the specifications of the appropriate agency and address compliance with all appropriate laws. The CRMPs should include the following, as appropriate: identification of the federally recognized Tribes, State Historic Preservation Offices (SHPOs), and consulting parties for the project; identification of long- and short-term management goals for cultural resources within the APE of the project; the definition of the APE; appropriate procedures for inventory, evaluation, and identification of effects to historic properties; evaluation of eligibility for the National Register of Historic Places (NRHP)

for all resources in the APE; description of the measures to avoid, minimize, or mitigate adverse effects to historic properties; procedures for inadvertent discovery; procedures for considering Native American Graves Protection and Repatriation Act (NAGPRA) issues, monitoring needs, and plans to be employed during construction; curation procedures; anticipated personnel requirements and qualifications; public outreach and interpretation plans; and discussion of other concerns. The draft CRMP should be reviewed and approved by the agency POC in consultation with historic preservation partners, including appropriate SHPOs, Tribes, and consulting parties. The CRMPs must specify procedures that would be followed for compliance with cultural resource laws should the project change during the course of implementation.

6. Project applicants will provide cultural resources training for project personnel regarding the laws protecting cultural resources, appropriate conduct in the field (such as procedures for the inadvertent discovery of human remains), and other project-specific issues identified in the CRMP. Training plans should be part of the CRMP and should be subject to the approval of the POC. When government-to-government consultation identifies the need and the possibility, Tribes may be invited to participate in or contribute to relevant sessions.

7. If adverse effects to historic properties will result from a project, a Historic Property Treatment Plan will be developed in consultation with the SHPO, the appropriate federally recognized Tribes, and any consulting parties. The plan will outline how the impacts to the historic properties would be mitigated, minimized, or avoided. Agency officials will give full consideration to the applicable mitigation measures found in Section 3.10.5.2 of the Final PEIS when consulting during the project pre-planning stages to resolve adverse effects on historic properties.

8. As directed by the agency POC, project proponents will prepare a public education and outreach component regarding project-related cultural resource issues (e.g., discoveries, impacts) such as a public presentation, a news article, a publication, or a display. Public education and outreach components will be subject to Agency approval and Tribal review and consultation when the content or format is of interest to affected Tribes.

9. Cultural resources inventory, evaluation, and mitigation practices should incorporate modeling and sampling strategies to the extent practicable, in concurrence with SHPOs and other relevant parties, and as approved by the agency POC.

10. Project applicants shall provide all cultural resources reports and data in an electronic format that is approved by the Agency POC and integrated across jurisdictional boundaries, that meets current standards, and that is compatible with SHPO systems. The Agency will submit this data to the SHPO in a timely fashion. Project proponents should submit cultural resources data on a regular basis to ensure that SHPO systems are kept up to date for reference as the different phases of the project proceed. Paper records may also be required by the agency.

11. Cultural resources inventory procedures, specified in the CRMP, will include development of historic contexts based on the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 FR 44716) sufficient to support the evaluation of cultural resources encountered in the APE.

Tribal Traditional Cultural Resources

1. The appropriate agency, assisted by the applicant, must comply with all laws, policies, and regulations pertaining to government-to-government consultation with federally recognized Tribes. Agencies shall initiate consultation with affected Tribes at the outset of project planning and shall continue consultation throughout project planning, construction, operation, and decommissioning. Consultation shall include, but not be limited to, the following: (a) identification of potentially affected Tribes; (b) identification of appropriate Tribal contacts and the preferred means of communication with these Tribes; (c) provision to the Tribes of project-specific information (e.g., project proponents, maps, design features, proposed ROW routes, construction methods, etc.) at the outset of project planning and throughout the life of the project; (d) identification of issues of concern specific to affected Tribes (e.g., potential impacts to culturally sensitive areas or resources, hazard and safety management plans, treaty reserved rights and trust responsibilities);

(e) identification of areas and resources of concern to Tribes; and (f) resolution of concerns (e.g., actions to avoid, minimize, or mitigate impacts to important resources; Memoranda of Agreement stating what actions would be taken to mitigate project effects; or agreements for Tribal participation in monitoring efforts or operator training programs).

2. The appropriate agency, assisted by the applicant, must comply with all pertinent laws, policies, and regulations addressing cultural and other resources important to Tribes, including the NHPA, the Archaeological Resources Protection Act (ARPA), the Native American Graves Protection Act (NAGPRA), and other laws and regulations as listed in Table 3.11-2 in Volume I of the PEIS.

3. The agencies shall recognize the significance to many Tribes of traditional cultural places, such as sacred sites, sacred landscapes, gathering grounds, and burial areas, and shall seek to identify such areas through consultation with affected Tribes early in the project planning process. Agencies shall seek to avoid, minimize, or mitigate impacts to such places in consultation with the Tribes, project proponents, and other relevant parties. Where confidentiality concerning these areas is important to an affected Tribe, agencies shall honor such confidentiality unless the Tribe agrees to release the information.

4. A protocol must be developed for inadvertent discovery of Native American human remains and funerary items to comply with the NAGPRA in consultation with appropriate federally recognized Tribes. Unexpected discovery of such items during construction must be brought to the immediate attention of the responsible Federal agency's authorized officer. Work must be halted in the vicinity of the find of Native American graves and funerary items to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation measures are being developed. The procedures for reporting items covered under NAGPRA must be identified in the CRMP.

Visual Resources

1. Applicants shall identify and consider visual resource management (VRM) and scenery management (SMS) issues early in the design process to facilitate integration of VRM and scenery treatments into the overall site development program and construction documents. Visual/scenery management considerations, environmental analyses, mitigation planning, and design shall reference and be in accordance with the land management agency visual/scenery management policies and procedures applicable to the jurisdiction the project lies within. Applicants shall coordinate between multiple agencies on visual/scenery sensitive issues when projects transition from one jurisdiction to another, especially when transitions occur within a shared viewshed.

2. Applicants shall prepare a VRM or scenery management plan. The applicant's planning team shall include an appropriately trained specialist, such as a landscape architect with demonstrated VRM and/or scenery management system (SMS) experience. The VRM/SMS specialist shall coordinate with the BLM/FS on the availability of the appropriate visual or scenic inventory data, VRM management class delineations, Scenic Integrity Objectives (SIOs), and Federal agency expectations for preparing project plans and mitigation strategies to comply with RMP or LRMP direction related to scenery and/or visual resources. Applicants shall confirm that a current Visual Resource Inventory and/or Scenic Class inventory is available and that the resource management plan (RMP) or land resource and management plan (LRMP) VRM classifications or SIOs have been designated in the current land management plan. Project plans shall abide by the VRM class designations and SIOs and consider sensitivities defined within the visual or scenic resource inventory.
If visual or scenic management objectives are absent, then the proper inventory and classification process shall be followed to develop them in accordance with the BLM VRM manual and handbooks or FS SMS process, depending on the agency.

When the VRM management classes or SIOs are absent, then the project alternatives must reflect a range of management options related to scenery and visual resources that reflect the values identified in the visual/scenic inventory. Responsibility for developing an inventory or VRM management classes (or in the case of the FS, Scenic Classes and SIOs) will remain with the respective agency, but how to accomplish these tasks will be determined by the field office manager or forest supervisor, who will consider the applicant's role and financial participation in completing the work.

3. Visual and scenic mitigation planning/design and analysis shall be performed through integrated field assessment, applied global positioning system (GPS) technology, field photo documentation, use of computer-aided design and development software, 3-D modeling GIS software, and visual simulation software, as appropriate. Proposed activities, projects, and site development plans shall be analyzed and further developed using these technologies to meet visual and scenic objectives for the project area and surrounding areas sufficient to provide the full context of the viewshed. Visual simulations shall be prepared according to BLM Handbook H-8432-1, or other agency requirements, to create spatially accurate depictions of the appearance of proposed facilities, as reflected in the 3 D design models. Simulations shall depict proposed project appearance from sensitive/scenic locations as well as more typical viewing locations. Transmission towers, roads, compressor stations, valves, and other aboveground infrastructure should be integrated aesthetically with the surrounding landscape in order to minimize contrast with the natural environment.

4. Applicants shall develop adequate terrain mapping on a landscape/viewshed scale for site planning/design, visual impact analysis, visual impact mitigation planning/design, and for full assessment and mitigation of cumulative visual impacts through applied, state-of-the-art design practices using the cited software systems. The landscape/viewshed scale mapping shall be geo-referenced and at the same Digital Elevation Model (DEM) resolution and contour interval within the margin of error suitable for engineered site design. This level of mapping shall enable proper placement of proposed developments into the digital viewshed context. Final plans shall be field verified for compliance.

5. The full range of visual and scenic best management practices shall be considered, and plans shall incorporate all pertinent best management practices (BMPs). Visual and scenic resource monitoring and compliance strategies shall be included as a part of the project mitigation plans.

6. Compliance with VRM/SMS objectives shall be determined through the use of the BLM Contrast Rating procedures defined in BLM Handbook H-8431-1 Visual Contrast Rating, or the FS SMS Handbook 701. Mitigation of visual impacts shall abide by the requirements of these handbooks.

Public Health and Safety

1. An electricity transmission project shall be planned by the applicant to comply with FAA regulations, including lighting regulations, and to avoid potential safety issues associated with proximity to airports, military bases or training areas, or landing strips.

2. A health and safety program shall be developed by the applicant to protect both workers and the general public during construction, operation, and decommissioning of an energy transport project. The program should identify all applicable Federal and state occupational safety standards, establish safe work practices for each task (e.g., requirements for personal protective equipment and safety harnesses, Occupational Safety and Health Administration [OSHA] standard practices for safe use of explosives and blasting agents, measures for reducing occupational electromagnetic field [EMF] exposures), and define safety performance standards (e.g., electrical system standards). The program should include a training program to identify hazard training requirements for workers for each task and establish procedures for providing required training to all workers. Documentation of training and a mechanism for reporting serious accidents to appropriate agencies should be established.

3. The health and safety program shall establish a safety zone or setback from roads and other public access areas that is sufficient to prevent accidents resulting from various hazards. It should identify requirements for temporary fencing around staging areas, storage yards, and excavations during construction or decommissioning activities. It should also identify measures to be taken during the operations phase to limit public access to those components of energy facilities that present health or safety risks.

4. Applicants shall develop a comprehensive emergency plan that considers the vulnerabilities of their energy system to all credible events initiated by natural causes (earthquakes, avalanches, floods, high winds, violent storms, etc.), human error, mechanical failure, cyber-attack, sabotage, or deliberate destructive acts of both domestic and international origin and the potential for and possible consequences of those events. Vulnerability, threat, and consequence assessment methodologies and criteria in the sector-specific plan (SSP) for energy[1] will be used and appropriate preemptive and mitigative response actions will be identified. The applicant must coordinate emergency planning with state, local, and Tribal emergency and public safety authorities and with owners and operators of other energy systems collocated in the corridor or in adjacent corridors that could also be impacted.

5. In addition to directives contained in other IOPs herein, the applicant must identify all Federal, state, and local regulations pertaining to environmental protection, worker health and safety, public safety, and system reliability that are applicable throughout the construction, operation, and decommissioning phases of their facility's life cycle and must develop appropriate compliance strategies, including securing all necessary permits and approvals.

Hazardous Materials Management

Applicants for petroleum pipelines and projects involving oil-filled electrical devices shall develop a spill prevention and response plan identifying spill prevention measures to be implemented, training requirements, appropriate spill response actions, and procedures for making timely notifications to authorities. The spill prevention and response plan should include identification of any sensitive biotic resources and locations (such as habitats) that require special measures to provide protection, as well as the measures needed to provide that protection.

Fire Management

1. Applicants shall develop a fire management strategy to implement measures to minimize the potential for a human-caused fire during project construction, operation, and decommissioning. The strategy should consider the need to reduce hazardous fuels (e.g., native and non-native annual grasses and shrubs) and to prevent the spread of fires started outside or inside a corridor, and clarify who has responsibility for fire suppression and hazardous fuels reduction for the corridor.

2. Applicants must work with the local land management agency to identify project areas that may incur heavy fuel buildups, and develop a long-term strategy on vegetation management of these areas. The strategy may include land treatment during project construction, which may extend outside the planned ROW clearing limits.

Project Construction

General

1. To avoid conflict with Federal and non-Federal operations, the applicant shall be aware of liabilities pertaining to environmental hazards, safety standards, and military flying areas.

2. The applicant shall locate all stationary construction equipment (i.e., compressors and generators) as far as practicable from nearby residences.

3. Applicants shall pay fair market value to the land management agency for any merchantable forest products that will be cut during ROW clearing. The local land management agency will determine the fair market value, which will be paid prior to clearing. The applicant will either remove the forest products from the area or will stack the material at locations determined by the local land management agency. Treatment of unmerchantable products will be determined by the local land management agency.

Soils, Excavation, and Blasting

1. Applicants shall salvage, safeguard, and reapply topsoil from all excavations and construction activities during restoration.

2. All areas of disturbed soil shall be restored by the applicant using weed-free native grasses, forbs, shrubs, and trees as directed by the agency. Restoration should not be unnecessarily delayed. If native species are not available, noninvasive vegetation recommended by agency specialists may be used.

3. The applicant must not create excessive slopes during excavation. Areas of steep slopes, biological soil crusts, erodible soil, and stream channel crossings will often require site-specific and specialized construction techniques by the applicant. These specialized construction techniques should be implemented by adequately trained and experienced employees.

4. Blasting activities will be avoided or minimized in the vicinity of sole source aquifer areas to reduce the risk of releasing sediments or particles into the groundwater and inadvertently plugging water supply wells.

5. The applicant must backfill foundations and trenches with originally excavated material as much as possible. Excess excavation materials should be disposed of by the applicant only in approved areas.

6. The applicant shall obtain borrow (fill) material only from authorized sites. Existing sites should be used in preference to new sites.

7. The applicant shall prepare an explosives use plan that specifies the times and meteorological conditions when explosives will be used and specifies minimum distances from sensitive vegetation and wildlife or streams and lakes.

8. If blasting or other noisy activities are required during the construction period, the applicant must notify nearby residents in advance.

Mitigation and Monitoring

All control and mitigation measures established for the project in the POD and other required plans shall be maintained and implemented by the applicant throughout construction. Necessary adjustments may be made with the concurrence of the appropriate agency.

Surface and Groundwater Resources

1. The applicant shall safeguard against the possibility of dewatering shallow groundwater and/or wetlands in the vicinity of project sites during foundation excavations or excavations for buried pipelines.

2. The applicant shall implement erosion controls complying with county, state, and Federal standards, such as jute netting, silt fences, and check dams, and secure all necessary storm water pollution prevention plan (SWPPP) permits.

3. The applicant shall minimize stream crossings by access roads to the extent practicable. All structures crossing intermittent and perennial streams shall be located and constructed so that the structures do not decrease channel stability, increase water velocity, or impede fish passage.

4. Applicants shall not alter existing drainage systems and shall give particular care to sensitive areas such as erodible soils or steep slopes. Soil erosion shall be reduced at culvert outlets by appropriate structures. Catch basins, roadway ditches, and culverts shall be cleaned and maintained.

5. Applicants must not create hydrologic conduits between aquifers.

Paleontological Resources

1. Project construction activities will follow the protective measures and protocols identified in the paleontological resources mitigation plan.

2. All paleontological specimens found on Federal lands remain the property of the U.S. government. Specimens, therefore, shall only be collected by a qualified paleontologist under a permit issued by the managing agency and must be curated in an approved repository.

Ecological Resources

1. Areas that are known to support ESA-listed species, BLM-special status species, FS-sensitive, and state-listed species or their habitats shall be identified and marked with flagging or other appropriate means to avoid direct impacts during construction activities. Construction activities upslope of these areas should be avoided to prevent indirect impacts of surface water and sediment runoff.

2. All construction activities that could affect wetlands or waters of the United States shall be conducted in accordance with the requirements identified in permits issued by the U.S. Army Corps of Engineers.

Visual Resources

A pre-construction meeting with BLM/FS landscape architects or other designated visual/scenic resource specialist shall be held before construction begins to coordinate on the VRM/SMS mitigation strategy and confirm the compliance-checking schedule and procedures. Applicants shall integrate interim/final reclamation VRM/SMS mitigation elements early in the construction, which may include treatments such as thinning and feathering vegetation along project edges, enhanced contour grading, salvaging landscape materials from within construction areas, special revegetation requirements, etc. Applicants shall coordinate with BLM/FS in advance to have BLM/FS landscape architects or other designated visual/scenic resource specialists onsite during construction to work with implementing BMPs.

Cultural Resources

1. Project applicants shall provide all cultural resources reports and data in an approved electronic format that is integrated across jurisdictional boundaries, that meets current standards, and that is compatible with SHPO systems. Project proponents shall submit cultural resources data on a regular basis to ensure that SHPO systems are kept up-to-date for reference as the different phases of the project proceed.

2. When an area is identified as having a high potential for cultural resources but none are found during a pre-construction field survey, a professionally qualified cultural resources specialist will be required to monitor ground-disturbing activities during project construction, and to complete a report when the activities are finished. The protocol for monitoring should be identified in the CRMP.

3. When human remains, funerary objects, sacred objects, or objects of cultural patrimony are inadvertently discovered, the provisions of NAGPRA shall apply and the process identified in the CRMP must be followed.

Hazardous Materials and Wastewater Management

1. Any wastewater generated by the applicant in association with temporary, portable sanitary facilities must be periodically removed on a schedule approved by the agency, by a licensed hauler and introduced into an existing municipal sewage treatment facility. Temporary, portable sanitary facilities provided for construction crews should be adequate to support expected onsite personnel and should be removed at completion of construction activities.

2. All hazardous materials (including vehicle and equipment fuels) brought to the project site will be in appropriate containers and will be stored in designated and properly designed storage areas with appropriate secondary

containment features. Excess hazardous materials will be removed from the project site after completion of the activities in which they are used.

Air Emissions

1. The applicant shall cover construction materials and stockpiled soils if these are sources of fugitive dust.

2. To minimize fugitive dust generation, the applicant shall water land before and during surface clearing or excavation activities. Areas where blasting would occur should be covered with mats.

Noise

The applicant shall limit noisy construction activities (including blasting) to the least noise-sensitive times of day (i.e., daytime only between 7 a.m. and 10 p.m.) and weekdays.

Fire Safety

1. The applicant must ensure that all construction equipment used is adequately muffled and maintained and that spark arrestors are used with construction equipment in areas with, and during periods of, high fire danger.

2. Flammable materials (including fuels) will be stored in appropriate containers.

Project Operation

Mitigation and Monitoring

All control and mitigation measures established for the project shall be maintained and implemented by the applicant throughout the operation of the project. Necessary adjustments may be made with the concurrence of the appropriate agency.

Ecological Resources

1. Applicants shall review existing information regarding plant and animal species and their habitats in the vicinity of the project area and identify potential impacts to the applicable agencies.

2. Project developer staff shall avoid harassment or disturbance of wildlife, especially during reproductive courtship, migratory, and nesting seasons.

3. Observations by project staff of potential wildlife problems, including wildlife mortality, will be immediately reported to the applicable agency authorized officer.

Pesticide and Herbicide Use

1. If pesticides are used, the applicant shall ensure that pesticide applications as specified in the integrated vegetation management plan are conducted within the framework of agency policies and entail only the use of EPA-registered pesticides that are applied in a manner consistent with label directions and state pesticide regulations. Pesticide use shall be limited to non persistent immobile pesticides and shall be applied only in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications (BLM 2007a).

2. Pesticide and herbicide uses shall be avoided in the vicinity of sole source aquifer areas (BLM 2007a).

Visual Resources

Terms and conditions for VRM/SMS mitigation compliance shall be maintained and monitored for compliance with visual objectives, adaptive management adjustments, and modifications as necessary and approved by the BLM/FS landscape architect or other designated visual/scenic resource specialist.

Hazardous Materials, Wastes, and Wastewater Management

1. The applicant shall provide secondary containment for all onsite hazardous materials and waste storage areas.
2. The applicant shall ensure that wastes are properly containerized and removed periodically for disposal at appropriate offsite permitted disposal facilities.
3. In the event of an accidental release to the environment, the applicant shall initiate spill cleanup procedures and document the event, including a cause analysis, appropriate corrective actions taken, and a characterization of the resulting environmental or health and safety impacts. Documentation of the event shall be provided to the land management agency's authorized officer and other Federal and state agencies, as required.

Air Quality

Dust abatement techniques (e.g., water spraying) shall be used by the applicant on unpaved, unvegetated surfaces to minimize airborne dust. Water for dust abatement shall be obtained and used by the applicant under the appropriate state water use permitting system. Used oil will not be used for dust abatement.

Noise

The applicant shall ensure that all equipment has sound-control devices no less effective than those provided on the original equipment.

Project Decommissioning

General

1. Where applicable, decommissioning activities will conform to agency standards and guidance for mitigation and reclamation (e.g., BLM's Gold Book[2]).
2. Applicants must receive approval for changes to the ROW authorization prior to any modifications to the ROW required for decommissioning.
3. Gravel work pads will be removed; gravel and other borrow material brought to the ROW during construction will be disposed of as approved by the agency.
4. Any wells constructed on the ROW to support operations shall be removed and properly closed in accordance with applicable local or state regulations.
5. All equipment, components, and above-ground structures shall be cleaned and removed from the site for reclamation, salvage, or disposal; all below-ground components shall be removed to a minimum depth of 3 feet to establish a root zone free of obstacles; pipeline segments and other components located at greater depths may be abandoned in place provided they are cleaned (of all residue) and filled with inert material to prevent possible future subsidence.
6. Dismantled and cleaned components shall be promptly removed; interim storage of removed components or salvaged materials that is required before final disposition is completed will not occur on Federal land.
7. At the close of decommissioning, applicants will provide the Federal land manager with survey data precisely locating all below-grade components that were abandoned in place.

Mitigation and Monitoring

All control and mitigation measures established for the project in the POD and other required plans shall be incorporated into a decommissioning plan that shall be approved by the Federal land manager(s); the decommissioning plan shall include a site reclamation plan and a monitoring program and shall be coordinated with owners and operators of other systems on the corridor to ensure no disruption to the operation of those systems.

Surface Water

A SWPPP permit shall be obtained and its provisions implemented for all affected areas before any ground-disturbance activities commence.

Transportation

Additional access roads needed for decommissioning shall follow the paths of access roads established during construction to the greatest extent possible; all access roads not required for the continued operation and maintenance of other energy systems present in the corridor shall be removed and their footprints reclaimed and restored.

Restoration

1. Topsoil removed during decommissioning activities shall be salvaged and reapplied during final reclamation; all areas of disturbed soil shall be reclaimed using weed-free native shrubs, grasses, and forbs or other plant species approved by the land management agency; grades shall be returned to pre development contours to the greatest extent feasible.

2. The vegetation cover, composition, and diversity shall be restored to values commensurate with the ecological setting, as approved by the authorizing officer.

Hazardous Materials and Waste Management

1. All fuels, hazardous materials, and other chemicals shall be removed from the site and properly disposed of or reused.

2. Incidental spills of petroleum products and other chemicals shall be removed and the affected area cleaned to meet applicable standards.

3. Solid wastes generated during decommissioning shall be accumulated, transported, and disposed in permitted offsite facilities in accordance with state and local requirements; no solid wastes shall be disposed of within the footprint of the ROW or the corridor.

4. Hazardous wastes generated as a result of component cleaning shall be containerized and disposed of in permitted facilities.

References

BLM, 2006, BLM Manual 9011-Chemical Pest Control.

BLM, 2007a, Record of Decision for the Final Programmatic Environmental Impact Statement for Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States, U.S. Department of the Interior, September.

BLM, 2007b, Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Final Programmatic Environmental Report, U.S. Department of the Interior, June.

BLM, 2008, Integrated Vegetation Management Handbook 1740-2, Programmatic Biological Assessment for Vegetation Management, U.S. Department of the Interior.

[1] The SSP for energy, developed by the Department of Energy's Office of Electricity Delivery and Energy Reliability, is one of seventeen such SSPs that comprise the National Infrastructure Protection Plan (NIPP). The energy SSP (redacted) is available at http://www.oe.energy.gov/DocumentsandMedia/Energy_SSP_Public.pdf. The NIPP is available at http://www.dhs.gov/xlibrary/assets/NIPP_Plan.pdf.

[2] Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, 4th Edition, revised 2007. Available electronically at http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html.

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT